

**MINISTRY OF EDUCATION AND TRAINING
UNIVERSITY OF ECONOMICS HO CHI MINH CITY**



LE DUC NHA

**THE NEXUS BETWEEN TRADE, GENDER EQUALITY, ENVIRONMENT,
AND INSTITUTION: INSIGHTS FROM THE GRAVITATIONAL AND
KUZNETS CURVE APPROACH**

DOCTORAL DISSERTATION

Ho Chi Minh City – 2026

**MINISTRY OF EDUCATION AND TRAINING
UNIVERSITY OF ECONOMICS HO CHI MINH CITY**



LE DUC NHA

**THE NEXUS BETWEEN TRADE, GENDER EQUALITY, ENVIRONMENT,
AND INSTITUTION: INSIGHTS FROM THE GRAVITATIONAL AND
KUZNETS CURVE APPROACH**

Major: Development Economics

Major ID: 9310105

DOCTORAL DISSERTATION

**ACADEMIC SUPERVISOR:
ASSOC. PROF. DR. PHAM KHANH NAM**

Ho Chi Minh City – 2026

DECLARATION

I hereby declare that this dissertation is the result of my own independent work and investigation. All sources and supports used have been properly acknowledged. Furthermore, this work has not been submitted, either in whole or in part, for any other degree or professional qualification at any other institution.

Ho Chi Minh City, July 2026

Le Duc Nha

ACKNOWLEDGEMENT

This dissertation would not have been possible without the invaluable contributions of many individuals. First and foremost, I would like to express my deepest gratitude to my wonderful supervisor, Assoc. Prof. Dr. Pham Khanh Nam, for his exceptional guidance and unwavering support throughout this journey. I am profoundly grateful for his patience, insightful advice, and the inspiration he provided during the early stages of my research career. His profound expertise in development economics has been instrumental in improving my research and enhancing my academic writing skills.

Secondly, I wish to extend my sincere gratitude to Prof. Dr. Su Dinh Thanh, Assoc. Prof. Dr. Nguyen Phu Son, Assoc. Prof. Dr. Nguyen Ngoc Duy Phuong, Dr. Tran Thi Tuan Anh, Dr. Truong Dang Thuy, Dr. Nguyen Hoang Bao, Dr. Pham Thai Binh, Dr. Ho Quoc Thong, Dr. Pham Quang Anh Thu, Dr. Nguyen Luu Bao Doan, Dr. Nguyen Quang, Dr. Pham Tien Thanh, Dr. Ngo Hoang Thao Trang, Dr. Nguyen Thi Tuyet Nhung, Dr. Nguyen Tran Minh Thanh, and two independent academic reviewers for their invaluable contributions to this research. Their immense guidance, comments, and supports in research methodology, research framework, and their insightful feedback were instrumental in the completion of this dissertation.

Furthermore, I would like to express my appreciation to the administrative staff at the UEH CELG and the Ph.D. Program Division for their dedicated assistance and administrative support throughout my doctoral journey. My sincere thanks also go to my classmates, colleagues, and friends from UEH University, Hoa Sen University, Ton Duc Thang University, and HCMC Open University, whose constant encouragement and support have been a source of strength during this process.

Finally, I wish to dedicate a special acknowledgement to my family – my parents, my wife, my son, and my relatives. Words cannot adequately express my gratitude for your boundless love, sacrifice, and support (spiritual, mental, and

financial dimensions). You have been my greatest source of strength and motivation, and this achievement belongs to you as much as it does to me.

Thank you all very much.

Ho Chi Minh City, July 2026

Le Duc Nha

LIST OF AUTHOR'S PUBLICATIONS

1. Le, D. N., & Pham, N. K. (2025). Trade, gender equality and institutional quality: Evidence from the gravitational approach. *International Journal of Development Issues*, 24(1), 106-124.
2. Le, D. N., & Pham, N. K. (2025). Revisiting the Gender Kuznets Curve hypothesis: The role of trade openness and institutional quality. *Proceedings of The International Conference on Economics, Law and Government (ELG 2025)*, 54-82.

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES.....	vi
LIST OF ABBREVIATIONS.....	viii
ABSTRACT	ix
CHAPTER 1: INTRODUCTION	1
1.1. Research background and context	1
1.1.1. The global nexus between trade, gender equality, environment, and institutions	1
1.1.2. The nexus between trade and gender equality	4
1.1.3. The relationship between trade and environment	6
1.1.4. The relationship between trade and institution	7
1.1.5. The role of institution in gender and environment issues	8
1.2. Problem statement	9
1.2.1. The trade-gender nexus	9
1.2.2. The trade-environment nexus.....	12
1.2.3. The role of institution in trade, gender, and environment nexus	16
1.3. Research gaps and research questions.....	23
1.4. Research objectives.....	25
1.5. Scopes of the research	26
1.6. Research methodology.....	27
1.6.1. Combined fixed effect estimation methods.....	27
1.6.2. Generalized Method of Moments estimation methods	28
1.6.3. Poisson Pseudo Maximum Likelihood estimation method for robustness check of gravity models	29
1.7. Contributions of the dissertation.....	30
1.7.1. Theoretical contributions.....	30
1.7.2. Practical contributions.....	31
1.8. Structure of the dissertation	31
CHAPTER 2: THEORETICAL BACKGROUNDS AND LITERATURE REVIEW	33
2.1. Research concepts	33
2.1.1. Trade and trade openness	33

2.1.2. Gender equality	33
2.1.3. Environmental quality	35
2.1.4. Institutional quality and environmental institutional quality	35
2.2. The Trade Gravity model	36
2.3. The Environmental Kuznets Curve (EKC) Hypothesis	38
2.4. The Gender-driven Kuznets Curve Hypothesis.....	39
2.5. Theoretical foundations of the trade-gender nexus.....	41
2.5.1. The impact of gender equality on trade.....	41
2.5.2. The impact of trade on gender equality.....	42
2.6. Theoretical foundations of the trade-environment nexus.....	47
2.6.1. The impact of trade on environmental quality	47
2.6.2. The impact of environmental quality on trade	49
2.7. Theoretical foundations of the trade-institution nexus	51
2.8. The moderating role of institutional quality: Theoretical perspectives ..	51
2.9. Analytical frameworks	52
CHAPTER 3: THE GRAVITATIONAL APPROACH TO THE TRADE, GENDER EQUALITY, AND INSTITUTIONAL QUALITY NEXUS	57
3.1. Introduction.....	57
3.2. Model specification, variable measurement, and estimation strategy	59
3.2.1. Model specification and variable measurement	59
3.2.2. Estimation strategy	61
3.3. Empirical results and discussion	64
3.3.1. Descriptive and preliminary analysis	64
3.3.2. Results for the aggregated sample.....	66
3.3.3. Results for the high institutional quality sample (high-high).....	72
3.3.4. Results for the low institutional quality sample (low-low).....	75
3.3.5. Results for the different institutional quality sample (high-low and low-high).....	78
3.4. Concluding remarks	81
CHAPTER 4: THE GRAVITATIONAL APPROACH TO THE TRADE, ENVIRONMENTAL QUALITY, AND INSTITUTIONAL QUALITY NEXUS	84

4.1. Introduction.....	84
4.2. Model specification, variable measurement, and estimation strategy	86
4.2.1. Model specification and variable measurement	86
4.2.2. Estimation strategy	87
4.3. Empirical results and discussion	89
4.3.1. Descriptive and preliminary analysis	89
4.3.2. Results for the aggregated sample.....	91
4.3.3. Results for the high institutional quality sample (high-high).....	94
4.3.4. Results for the low institutional quality sample (low-low).....	96
4.3.5. Results for the different institutional quality sample (high-low and low-high).....	98
4.4. Concluding remarks	100
CHAPTER 5: THE GENDER-BASED KUZNETS CURVE APPROACH TO THE NEXUS BETWEEN GENDER EQUALITY, TRADE, AND INSTITUTIONAL QUALITY	103
5.1. Introduction.....	103
5.2. Model specification, variable measurement, and estimation strategy ...	107
5.2.1. Model specification and variable measurement	107
5.2.2. Estimation strategy	109
5.3. Empirical results and discussion	110
5.3.1. Descriptive and preliminary analysis	110
5.3.2. Results for the aggregated sample.....	113
5.3.3. Results for the high institutional quality sample	119
5.3.4. Results for the low institutional quality sample	125
5.3.5. Results for the high openness sample	130
5.3.6. Results for the low openness sample.....	136
5.4. Concluding remarks	141
CHAPTER 6: THE OPENNESS-BASED ENVIRONMENTAL KUZNETS CURVE APPROACH TO THE NEXUS BETWEEN ENVIRONMENTAL QUALITY, TRADE, AND INSTITUTIONAL QUALITY	146
6.1. Introduction.....	146
6.2. Model specification, variable measurement, and estimation strategy ...	150

6.2.1. Model specification and variable measurement	150
6.2.2. Estimation strategy	152
6.3. Empirical results and discussion	154
6.3.1. Descriptive and preliminary analysis	154
6.3.2. Results for the aggregated sample	156
6.3.3. Results for the high institutional quality sample	159
6.3.4. Results for the low institutional quality sample	161
6.3.5. Results for the high openness sample	163
6.3.6. Results for the low openness sample	165
6.4. Concluding remarks	168
CHAPTER 7: CONCLUSIONS AND POLICY IMPLICATIONS	172
7.1. Summary of key findings	172
7.1.1. Findings on the gravitational approach to the nexus between trade, gender equality, and institutional quality	172
7.1.2. Findings on the gravitational approach to the nexus between trade, environmental quality, and institutional quality	173
7.1.3. Findings on the Gender-based Kuznets Curve approach to the nexus between gender equality, trade, and institutional quality	174
7.1.4. Findings on the Openness-based Environmental Kuznets Curve approach to the nexus between environmental quality, trade, and institutional quality ..	178
7.2. Policy implications	180
7.2.1. Implications from the link between bilateral trade, gender equality, and institutional quality	180
7.2.2. Implications from the link between bilateral trade, environmental quality, and institutional quality	181
7.2.3. Implications from the link between gender equality, trade liberalization, and institutional quality	182
7.2.4. Implications from the link between environmental quality, trade liberalization, and institutional quality	185
7.3. Limitations and future research directions	186
7.4. Conclusions	188
REFERENCES	i

APPENDICES OF VARIABLE MEASUREMENT AND LIST OF COUNTRIES	i
(APPENDICES A).....	i
APPENDICES OF CROSS-SECTIONAL DEPENDENCE, PANEL UNIT-ROOT, AND PANEL COINTEGRATION TESTS (APPENDICES B)	xvi
APPENDICES OF CHAPTER 2	xxiv
APPENDICES OF CHAPTER 3	xxxii
APPENDICES OF CHAPTER 4	clxv
APPENDICES OF CHAPTER 5	ccxx
APPENDICES OF CHAPTER 6	ccxci

LIST OF TABLES AND FIGURES

Figure 2.1: The integrated analytical framework.....	54
Table 2.1. Research hypotheses.....	52
Table 3.1: Descriptive statistics	64
Table 3.2: Pearson correlation matrix	64
Table 3.3: Estimation results summary for models of the aggregated sample	66
Table 3.4: Estimation results summary for models of the partners of high institutional quality sample	72
Table 3.5: Estimation results summary for models of the partners of low institutional quality sample	75
Table 3.6: Estimation results summary for models of the partners of different institutional quality sample	78
Table 4.1: Descriptive statistics	90
Table 4.2: Pearson correlation matrix	90
Table 4.3: Estimation results summary for models of the aggregated sample	92
Table 4.4: Estimation results summary for models of the partners of high institutional quality sample	95
Table 4.5: Estimation results summary for models of the partners of low institutional quality sample	97
Table 4.6: Estimation results summary for models of the partners of different institutional quality sample	99
Table 5.1: Descriptive statistics	111
Table 5.2: Pearson correlation matrix	111
Table 5.3: Estimation results summary for models of the aggregated sample	113
Table 5.4: Estimation results summary for models of the high institutional quality sample.....	120
Table 5.5: Estimation results summary for models of the low institutional quality sample.....	125
Table 5.6: Estimation results summary for models of the high openness sample ..	130
Table 5.7: Estimation results summary for models of the low openness sample ..	136
Table 6.1: Descriptive statistics	154
Table 6.2: Pearson correlation matrix	155

Table 6.3: Estimation results summary for models of the aggregated sample	157
Table 6.4: Estimation results summary for models of the high institutional quality sample.....	159
Table 6.5: Estimation results summary for models of the low institutional quality sample.....	161
Table 6.6: Estimation results summary for models of the high openness sample .	163
Table 6.7: Estimation results summary for models of the low openness sample ..	165

LIST OF ABBREVIATIONS

ASEAN	Association of Southeast Asian Nations
BRICS	Brazil, Russia, India, China, and South Africa
CO ₂	Carbon dioxide
COC	Control of corruption
DGMM-II	Difference Generalized Method of Moments two-step
EAC	Environmental Assimilative Capacity
EKC	Environmental Kuznets Curve
EPS	Environmental Policy Stringency
EU	European Union
FE	Fixed effect
FLA	Female labor force participation
FTA	Free Trade Agreement
GDI	Gender development (index)
GDP	Gross domestic product
GII	Gender inequality (index)
GKC	Gender-based Kuznets Curve
GVE	Government effectiveness
H-O	Heckscher-Ohlin
IQ	Institutional quality
LCUs	Local currency units
OECD	Organisation for Economic Co-operation and Development
OEKC	Openness-based Environmental Kuznets Curve
OWD	Our World in Data project of the Global Change Data Lab
POS	Political stability and absence of violence/terrorism
PPML	Poisson Pseudo Maximum Likelihood
RE	Random effect
REQ	Regulatory quality
RG	Research gap
RO	Research objective
ROL	Rule of law
RQ	Research question
SC	Self-constructed (variables)
SDGs	Sustainable Development Goals
SGMM-II	System Generalized Method of Moments two-step
SS	Stolper-Samuelson
UNCTAD	United Nations Trade and Development
VAC	Voice and accountability
WB	World Bank
WTO	World Trade Organization

ABSTRACT

Driven by the global sustainable development agenda, this dissertation investigates the complex nexus between trade, gender equality, environment, and institution. The research scope encompasses a bilateral analysis of Vietnam and its 40 largest trading partners alongside a broader study of 113 worldwide economies in the 2002-2021 period to examine the gravitational and Kuznets curve hypotheses. The dissertation aims to examine the effects of gender equality and environmental quality on bilateral trade, the effects of trade openness and institutional quality on gender equality and environmental quality, and the moderating and contextual effects of institutional quality and trade openness on gender-related and environment-related nexuses. The empirical analysis employs robust estimation techniques, including combined fixed effects, random effects, Poisson Pseudo Maximum Likelihood and both system and difference generalized method of moments. Findings of the dissertation have provided three primary contributions. The first contribution is the bilateral analysis of how gender equality and environmental quality influence trade flows from the gravitational approach to both exporting and importing sides simultaneously. The second contribution is the investigation of the curvilinear (U-shaped or inverse U-shaped) relationship between trade liberalization and environmental quality. The third contribution is the examination of the moderating and contextual factors of the nexus between trade, gender equality, environment, and institution from the gravitational and Kuznets curve approaches. These results offer valuable insights for the policy formulation relevant to trade, gender equality, environment, and institution.

Keywords: *Environmental quality; Gender equality; Gravitational approach; Gravity model; Institutional quality; Kuznets curve; Trade; Trade openness*

CHAPTER 1: INTRODUCTION

1.1. Research background and context

1.1.1. The global nexus between trade, gender equality, environment, and institutions

In response to the urgent mandates of the 2030 Agenda for Sustainable Development, specifically Goals 5, 13, and 17, this dissertation explores how international trade interacts with gender equality and environmental quality within diverse institutional and liberalization settings. The dissertation is strategically structured into two empirical dimensions: a bilateral trade analysis focusing on Vietnam and its 40 primary trading partners from 2002 to 2021 using a gravity framework, and a global cross-country analysis involving 113 worldwide economies to test the Gender-based and Openness-based Environmental Kuznets Curve hypotheses in the 2002-2021 period.

The 2030 Agenda for Sustainable Development (The Agenda 2030) has stressed out the importance of economic integration, institution, gender, and environment. The five pillars of sustainable development goals (SDGs) are 5Ps, which include *People*, *Planet*, *Prosperity*, *Peace*, and *Partnership*. The detailed interpretation of 5Ps has suggested the nexus between trade, institution, gender, and environment (TIGE). Furthermore, the Agenda 2030 includes 17 SDGs and 169 detailed targets whose contents indicate the inherent bi-directional links between trade, institution, gender, and environment. Particularly, *Goal 5 (Gender Equality)* indicates the role of institutions in gender equality (Sub-goal 5c), while Sub-goals 5.5 and 5a imply the contribution of trade liberalization to gender equality. Meanwhile, *Goal 13 (Climate Action)* highlights the role of institutions in environmental quality and climate change (Sub-goal 13.2 and 13.3), and the nexus between institutions, environment, and gender equality (Sub-goal 13b). Most noticeably, *Goal 17 (Partnerships for the Goals)* emphasizes the role of institutions in facilitating bilateral

trade flows (Sub-goal 17.10 and 17.12) and enhancing sustainable development issues (Sub-goal 17.14 and 17.15), while Sub-goal 17.16 implies the role of trade liberalization in achieving sustainable development goals. Those goals and sub-goals have suggested idea of an integrated analytical framework for the complex nexus between trade, gender, environment, and institution. The interaction between these goals is defined by several key dynamics:

(i) *Trade as a driver for gender equality (Goals 17 & 5)*: International trade acts as an instrument for improving women's lives, particularly in developing and emerging nations, by narrowing the income gap and expanding employment in global value chains. Empirical evidence suggests that trade liberalization generally has a significant positive effect on gender equality, which includes gender development and female labor force participation. However, this progress is not inevitable, without inclusive institutional frameworks, trade can also lead to a *race to the bottom* where female labor is exploited to maintain export competitiveness.

(ii) *The tension between trade and environmental quality (Goals 17 & 13)*: While trade drives prosperity, it often increases CO₂ emissions through expanded economic scale (the scale effect), which potentially deteriorates environmental quality. The dissertation identifies an Openness-based Environmental Kuznets Curve (OEKC), which explores how the relationship between trade and emissions can be non-linear, often showing a U-shaped or inverse U-shaped pattern, where environmental degradation initially rises with trade but can eventually decline as greener technologies are adopted.

(iii) *Institutional quality as the critical catalyst*: The strength of a nation's institutions (Goal 17) determines whether trade leads to a *race to the top* characterized by green technology and social justice. Institutional quality acts as a moderator that can either amplify or mitigate the impacts of trade on gender and the environment. For example, sound governance reduces transaction costs for green technology

transfers (Goal 13) and facilitates the enforcement of anti-discrimination laws (Goal 5) during global integration.

Ultimately, the nexus between trade, gender equality, environment, and institution suggests that achieving the inclusive promise of Goal 5 and the environmental protection of Goal 13 depends on leveraging Goal 17's global partnerships through the essential catalyst of multi-dimensional institutions. At the heart of this entire nexus is the centrality of trade and openness, which serve as the fundamental mechanisms for modern development. Trade openness is treated not only as a variable, but as the primary indicator of a nation's integration into the global economy and its commitment to liberalization.

From the empirical perspective, Barbier & Burgess (2019) have pointed out the trade-off links between environment-related SDGs and the other economic and social goals, which recommends the possible interlinks between SDGs in general and TIGE-related goals in particular. Mohammed (2017) has argued the driving role of trade in contributing to the achievement of 17 SDGs and their 169 detailed targets in The Agenda 2030. Reforming the ways in which global economies have been trading with each other is the key solution to making SDGs and their detailed targets obtainable. The central role of trade has been emphasized in the global economy by worldwide policymakers and politicians (Fiorini & Hoekman, 2018; UNCTAD, 2021; Xu et al., 2020). However, this role is not inevitable, instead it needs to be established and nurtured by sound SDGs-led institutions and policies (Fiorini & Hoekman, 2018; George & Kirkpatrick, 2004). According to SDG 17 and Point 68 in The Agenda 2030, international trade is identified as one of the means of building global partnership, which facilitates inclusiveness, eradicates poverty, and promotes the sustainability of the economy (UNCTAD, 2021).

There are two opposing thoughts on the relationship between trade and sustainable development, which are *race to the bottom* and *race to the top* approaches. The former advocates the negative impacts of trade liberalization on sustainable development which include social incohesion and long-run environmental

degradation (Borrs & Knauth, 2021; Dorn et al., 2022; Egger & Kreickemeier, 2012; Helpman et al., 2017; Meschi & Vivarelli, 2009; Naanwaab, 2022; Nathaniel & Khan, 2020; Udeagha & Ngepah, 2019; Yasmeen et al., 2018; Zhu & Trefler, 2005). Meanwhile, the latter lends support to the benefits gained from liberalizing trade globally which include increased prosperity and equality, improved productivity, technology spillovers, research and development activities, peace consolidation and short-run environmental performance (Fracasso & Marzetti, 2015; Ghazalian, 2012; Hegre et al., 2010; Kim & Kim, 2015; McDonald, 2004; Pempel, 2022; Udeagha & Ngepah, 2019; Yasmeen et al., 2018; Zhou & Song, 2016).

Given the continuous concerns of worldwide policymakers and academic community, and the existing two-fold research mainstream relevant to trade and its impacts on the other SDGs-related issues, this dissertation aims at contributing to the contemporary understanding of nexus between trade, institution, gender, and environment, which are important to the policy-makers when analyzing and formulating detailed policies and regulations. By examining trade through both aggregate openness and specific bilateral flows, the dissertation, in one hand from the Kuznets curve approach, demonstrates that cross-border economic activity is the engine that drives changes in social and environmental landscapes. In the other hand from the gravitational approach, gender equality and environmental quality are redefined as critical determinants of national comparative advantage, rather than just social or environmental concerns.

1.1.2. The nexus between trade and gender equality

At the global level, The Joint Declaration on Trade and Women's Economic Empowerment in the WTO Ministerial Conference 2017 has acknowledged the intertwined relationship between trade and gender equality. Accordingly, gender equality could be achieved by gender-responsive and inclusive trade policies. Meanwhile, the elimination of women-facing trade barriers is included in the working agenda of members of The World Trade Organization, which aims at sustainable trade. Most recently, Okonjo-Iweala (2022a) has echoed that trade is an instrument

for the improvement of women's lives and well-beings, especially those in developing and poor countries. World Bank (2011) has recommended that the facilitated trade flows could enhance income prospects of poor women, which has highlighted the role of trade in narrowing the income gap between men and women. World Trade Organization (2022) has reported that 42% developing countries have recognized the role of trade in boosting gender equality, which has been facilitating the inclusion of women's benefits and empowerment in trade policies. In addition, it has been argued that enterprises doing business internationally and engaging in trade activities and global value chains appear to create more jobs and pay more income for women than those with only domestic operations (World Bank & World Trade Organization, 2020). Also reported in the World Trade Organization (2022), the government of Republic of Korea has identified trade as the most important tool to initiate and foster economic empowerment for women.

In a reverse direction, women ownership and management have been recorded in the case of several micro, small, and medium companies in emerging economies, which enhances the performance and participation in international trade of those enterprises (Korinek et al., 2021). World Bank & World Trade Organization (2020) indicated that female workers accounts for about 60-80% of the total workforce in the apparel industry, which on one hand implies that expanded apparel export could enhance women income and employment. On the other hand, enhancing female labor force participation and upskilling can drive productivity gains, which ultimately bolsters the export competitiveness of the apparel sector.

According to UNCTAD/DITC (2021), most export processing and exporting firms in least developed countries have employed a majority of female workers for their productions and operations. Moreover, wage levels and working conditions in those firm are higher and better than non-exporting sectors. Within the Common Market for Eastern and Southern Africa region, UNCTAD/DITC (2016) notes that female labor bolsters comparative advantage through high productivity, while low female wages are leveraged to drive export competitiveness in agricultural sectors. In

the labour-intensive manufacturing sectors, UNCTAD/DITC (2016) mentioned the feminization of labour which aims at reducing labour costs and financing international competitiveness in foreign markets. However, regional economic integration and the removal of trade barriers may intensify pressure on exporting firms, which stimulates them to invest more in labour-downsizing technologies, which ultimately hampers employment and income opportunities of women. UNCTAD/UN Women (2020) highlights the reciprocal relationship between trade and gender equality when analyzing gender-related contents of trade agreements. While trade can foster inclusive growth and gender equality, gender equality conversely shapes trade reforms and policies (Braunstein, 2017; Fontana, 2016).

Given the above-mentioned evidence, there has been inadequate academic attention paid to the relationship between trade and gender equality, and also to the role of institutional quality in this nexus. Particularly, the research gap is two-fold. The first is whether the gender equality significantly influences bilateral trade, and whether the effect is significantly moderated by institutional quality. The second is whether trade liberalization could significantly mitigate gender inequality and whether the mitigating effect is influenced by institutional quality, and also the moderating effect of trade liberalization on the link between gender equality and institutional quality.

1.1.3. The relationship between trade and environment

UNCTAD/DITC (2020) has reported that environmental degradation, climate change, and policy responses could adversely influence the climate-sensitive sectors of developing countries, which decreases export competitiveness and trade resilience. In addition, the accumulation of CO₂ and the other greenhouse gases in the atmosphere has changed the weather conditions, which increases trade-related costs and decreases productivity and output of exporting sectors which are vulnerable to climate change and global warming. This has implied the influences of environmental quality on trade. Moreover, UNCTAD/DITC (2020) has warned that the developing

countries will suffer from climate change if they do not implement adaptation policies. WTO/ERSD (2022) has explored that a large number of MSMEs, which account for a considerable portion of the total number of exporting firms, expect the rise of costs relevant to the implemented climate change policies. Furthermore, WTO/ERSD (2022) has unveiled that countries which have deeper participation in global value chains have greater concerns about negative impacts of climate changes on their operations. It appears that the interlink between trade and environment have been increasingly recognized by global businesses, especially those in developing countries with significant openness to global markets. It is also emphasized that the impacts of environmental degradation on trade may be dependent on whether the country is a developed or developing economy because of previous differences in export structure of climate-sensitive products (WTO/ERSD, 2022). Most recently, Okonjo-Iweala (2022b) has argued that trade could help countries adapt to climate change and environmental degradation. Reversely, environmental quality contributes to the comparative advantages, which drives trade patterns between partners. Given the relevant reports and statistics, the research gaps include the investigation of the two-way relationship between trade and environment, and whether their relationship is moderated by institutional quality. In addition, the contextual effects of institutional quality and trade liberalization have been examined in the research models.

1.1.4. The relationship between trade and institution

At the global level, OECD/CAF/ECLAC (2018) has stressed out the two-way link between institutional quality and the well-being of countries in the Latin America and the Caribbean region. On one hand, institutional quality enhances public trust and satisfaction with the governments, which stimulates economic activities and innovations, which ultimately increases national prosperity. On the other hand, improved well-being finances and facilitates the government's capacity to provide better public services, which ultimately consolidate institutional quality. In addition, OECD/CAF/ECLAC (2018) recommended that institutions should be built and nurtured, which incentivizes trade and productivity, which helps nations avoid

middle-income trap and boosts inclusiveness. Furthermore, The SDG 17.10, 17.11, and 17.12 in The Agenda 2030 have explicitly recognized the importance of the rule-based environment for multilateral trading relationships, which implies that institutional quality can influence trade and liberalization. Despite the fact that several recent studies have been concentrating on the direct impacts of institutional quality on trade, for example, the research of Álvarez et al. (2018), Lin et al. (2020), Peiró-Palomino et al. (2022), and Yusuf et al. (2021), the research gaps include the moderating and contextual impacts of institutional quality on the trade-gender and trade-environment nexuses.

1.1.5. The role of institution in gender and environment issues

In SDG 17.13, 17.14, 17.15 – The Agenda 2030, sustainable development could arguably be achieved by the coherence of the policy and institutional environment, which has implied the moderating and contextual roles of institutional quality on sustainable development issues which include gender equality and environmental quality. Meanwhile, SDG 13.2 has emphasized the need of integrating climate-related issues in the institutional components, which indicates the role institutional quality in environment-related issues. OECD/CAF/ECLAC (2018) has categorized institutions into three components, which include policies, organizations, and high-level laws. Those components influence all of the interactions and links in the economy (World Bank, 2017), which encompasses the nexus between trade, gender, and environment. In addition, inclusive growth must be placed at the center in the process of establishing and nurturing institutions. The inclusive growth is relevant to equality issues which obviously include gender equality. From the perspective of green growth, World Bank (2017) has pointed out the importance of *natural capital* which could be enhanced by the environmental protection policies or environment-specific institutional quality. UNCTAD (2023) has posited that investment promotion policies could enhance the benefits of foreign direct investment for gender equality and women empowerment. Arguably, institutions have been acting as a moderating driver which directs the financial inflows towards

the sustainable development issues. In addition, institutions could influence the operations of foreign companies in the recipient countries, which aims at improving gender equality in the destination economies (UNCTAD, 2020). This has explicitly echoed the moderating role of institutional quality in the achievements of not only gender equality but also the other sustainable development issues which include environmental concerns.

1.2. Problem statement

1.2.1. The trade-gender nexus

1.2.1.1. The impacts of gender equality on trade

From the theoretical perspective, Feminist Trade Theory (Elson et al., 2012) suggests gender inequality affects trade twofold. The *competitiveness underachiever effect* hinders trade by limiting women's access to necessary resources (UNCTAD/DITC, 2022). Conversely, the *source of competitiveness effect* boosts trade by exploiting low-cost female labor (UNCTAD/DITC, 2022). Thus, gender equality can either promote or hamper trade flows depending on the mechanism. In addition, The Heckscher-Ohlin model suggests that higher female labor participation increases the labor-intensive goods supply due to the *Rybczynski effect* (Rybczynski, 1955). By expanding the production possibilities frontier for these sectors, gender equality acts as a comparative advantage that boosts export growth for labor-abundant nations. Based on Porter's Competition Theory (Porter, 1994), gender equality strengthens a destination's *locational advantage* by expanding the labor pool (*labor market pooling effect*). Increased female participation boosts labor availability, attracting vertical foreign direct investment, which ultimately drives higher export revenues for the host country. Also following The Diamond Framework (Porter, 1990), gender equality strengthens *advanced factor endowments*. The inclusion of female talent bolsters industry-specific competitive advantages, ultimately driving higher export growth.

From the perspective of empirical studies, there are some mixed results for the impacts of gender equality on trade. Particularly, while some traditional trade studies occasionally indicated gender wage inequality as a tool for export competitiveness (Seguino, 1997; Seguino, 2000; Busse & Spielmann, 2006) which is reflected by export sales and export growth, recent longitudinal data has suggested a reversal of this trend. New evidence from the ASEAN region (Ryu & Nam, 2024) and the D-8 countries (Sajid et al., 2025) indicates that institutionalizing gender equality is a driver for trade expansion and openness.

Even though some prior research has acknowledged the influence of gender equality on trade, the impacts of gender equality of the exporting and importing partners on bilateral trade flows have not yet been examined. In addition, the moderating and contextual role of institutional quality in trade-gender nexus has been nascent in the relevant literature. Therefore, this dissertation is about to explore the impacts of exporter's and importer's gender equality on bilateral trade flows. In addition, the moderating role of exporter's and importer's institutional quality in shaping the trade-gender nexus has been discovered. Furthermore, this dissertation will investigate the contextual role of institutional quality in shaping the trade-gender nexus.

1.2.1.2. The impacts of trade on gender equality

The relationship between economic development and gender equality has been analyzed using the Gender-driven Kuznets Curve (GKC) hypothesis which was inspired by the original theory of Kuznets (1955) which proposed an inverse U-shaped relationship between income inequality and economic growth. Based on the GKC framework as proposed by Eastin and Prakash (2013), numerous studies have investigated the impact of macroeconomic factors, including trade openness (as a proxy for trade and economic integration), on various dimensions of gender equality (Anyanwu, 2016; Nguyen & Su, 2021; Nguyen, 2022; Nguyen & Nguyen, 2023).

Additionally, Ghosh (2022) has used the GKC model to explore the positive influence of export diversification on female labor force participation.

For studies not adopting the Gender-based Kuznets Curve model, mixed findings on the relationship between trade openness and gender equality have been explored. Particularly, some studies have suggested that trade openness can decrease gender inequality. For example, Berik (2000) explored that export orientation reduced gender wage inequality in expanding export-oriented industries. Bussmann (2009) indicated that increased trade openness is significantly associated with higher female education enrollment. Juhn et al. (2013) and Juhn et al. (2014) discovered that trade openness can encourage firms to adopt modern technologies, which consequently increases female participation in blue-collar jobs. Schultz (2014) indicated that trade liberalization contributes to gender equality in health and education. Potrafke and Ursprung (2012) found a positive relationship between economic globalization and gender equality.

However, other research has unveiled that trade openness can worsen gender inequality. Balamoune-Lutz (2007) explored the deteriorating effect of trade openness on gender equality in Sub-Saharan Africa due to increased unskilled labor supply. Menon and Van der Meulen Rodgers (2009) indicated larger gender wage gaps in Indian manufacturing industries as a result of greater trade openness. Orkoh et al. (2022) discovered that trade openness worsens the gender wage gap for urban and low-skilled workers in Ghana. Moreover, the impact of trade openness can vary across different contexts. Oostendorp (2009) found that trade openness mitigates the gender income gap in the low-skilled labor force in both low- and high-income countries, and in the high-skilled labor force in high-income countries. Bussmann (2009) explored that the effect of trade liberalization on female labor force participation is divergent, which is increasing in developing countries and decreasing in OECD countries. Furthermore, trade openness triggers a sectoral shift for female workforce, which is towards service sectors in developed countries and industry and agriculture sectors in developing countries, which indicates the impact of

liberalization on gender-related employment distribution. Yahmed (2023) argued that trade openness has ambiguous effects on the gender wage gap, depending on the competitive landscape and firms' discriminatory practices in the post-openness stage.

Even though prior research has examined the impacts of trade on gender equality, the moderating and contextual roles of institutional quality and trade openness in shaping gender-openness and gender-institution links have not been previously discovered. Therefore, this dissertation is about to contribute to these gaps by investigating the moderating and contextual roles and institutions and trade in gender-related links.

1.2.2. The trade-environment nexus

1.2.2.1. The impacts of environmental quality on trade

The academic exploration of the relationship between CO₂ emissions and trade openness has grown significantly, which has been driven by the increasing urgency to understand the nexus between economic globalization and environmental sustainability. Researchers have employed primarily panel data analysis and Granger causality tests (Dumitrescu & Hurlin, 2012; Granger, 1969) to investigate the intricate dynamics of this relationship across diverse geographical regions and economic development levels.

A significant amount of literature has been demonstrating the existence of the bidirectional causality between CO₂ emissions and trade openness, which has unveiled a reciprocal long-run influence between these two variables. Jamel and Maktouf (2017) provided evidence of this bidirectional causality in their study of 40 European countries spanning from 1985 to 2014. Similarly, Ben Jebil et al. (2019) demonstrated long-run bidirectional causality in 22 Central and South American countries during the period of 1995-2010. This finding implies that trade openness not only affects the CO₂ emissions level, potentially through increased production and transportation, but is also influenced by environmental factors, such as the implementation of stricter environmental policies in response to increasing

emissions. This bidirectional causal link has been further supported by studies focusing on specific countries and regions. Rahman et al. (2020) and Amin et al. (2023) have confirmed the bidirectional link between CO₂ emissions and trade openness in South Asian countries. Zameer et al. (2020) explored similar results for India, while Aydin (2023) and Pata et al. (2023) discovered bidirectional causality in G8 and ASEAN countries, respectively. Rahman (2021) also indicated bidirectional causality between energy consumption and trade in BRICS and ASEAN countries, which implies the valid effect of CO₂ emissions on trade due to the strong link between energy consumption and CO₂ emissions. Dou et al. (2021) explored the bidirectional causal link between CO₂ emissions and trade openness in the case of China, Japan, and South Korea.

However, the relevant literature also reveals evidence of unidirectional causality in certain contexts. Cialani (2017) discovered a unidirectional causal link from per capita CO₂ emissions to international trade for non-OECD countries based on the analysis of 150 countries from 1960 to 2008. Mutascu (2018) explored the medium-term causality running from CO₂ emissions on trade openness in the case of France in 1960-2013. Rahman and Alam (2022) similarly identified a unidirectional causal link running from CO₂ emissions to trade openness in 60 of the most open countries worldwide with data spanning from 1960 to 2020. These findings have suggested that in some economies, environmental quality, as reflected in CO₂ emissions, could be a significant driver of changes in trade patterns, which potentially influences comparative advantages and trade flows. In addition to causality, some studies have explored the broader relationships between CO₂ emissions, trade, and other macroeconomic variables. Le and Ozturk (2020) examined 47 emerging and developing economies and confirmed the existence of the Environmental Kuznets Curve hypothesis. They also explored a feedback effect of CO₂ emissions on globalization, which highlights the inter-connectedness of environmental and economic factors.

Overall, the literature on CO₂ emissions and trade openness reveals a complex and multifaceted relationship. While bidirectional causality appears to be prevalent in many contexts, unidirectional causality is also observed in specific regions and country groups. However, the effects of environmental quality of exporting and importing countries on bilateral trade flows have been underexplored by relevant literature. In other words, whether the environmental quality of the two sides in a bilateral trading relationship has influenced the cross-border trade flows has remained under-investigated. Therefore, this dissertation aims at using the trade gravity model to contribute to this research gap.

1.2.2.2. The impacts of trade on environmental quality

The relationship between trade openness and CO₂ emissions which is a proxy for environmental quality has been the subject of extensive scholarly research with various and diverse findings. Several studies have indicated a positive relationship between trade openness and CO₂ emissions, which has implied that increased trade activities contribute to environmental degradation. Ansari et al. (2020) focused on top CO₂ emitting countries and explored unidirectional causality running from trade openness to CO₂ emissions in the case of the US, Canada, France, and Iran. Similarly, Le and Ozturk (2020) discovered a promoting effect of globalization, measured by economic indices including trade openness, on CO₂ emissions in 47 emerging market and developing economies. Aslam et al. (2021) also discovered a positive co-integration of trade openness and CO₂ emissions in the Chinese economy. Furthermore, Dou et al. (2021) concluded that increased trade openness significantly contributes to higher CO₂ emissions in China, Japan, and South Korea. Similarly, Ibrahim and Ajide (2021), Li and Haneklaus (2022), Adebayo et al. (2023), Balsalobre-Lorente et al. (2023), Chhabra et al. (2023), Ozkan et al. (2023), and Jiang and Jiang (2025) have also advocated the exacerbating effect of trade openness and globalization on CO₂ emissions.

However, some studies have presented contrasting evidence which has indicated that trade openness could reduce CO₂ emissions. Koc and Bulus (2020)

demonstrated that trade openness reduces per capita CO₂ emissions in South Korea. Bandyopadhyay and Rej (2021) explored that trade openness could mitigate CO₂ emissions in the long run in the Indian economy, which has echoed the role of trade policies in promoting a greener economy. Yang et al. (2022) also suggested that trade openness could decrease CO₂ emissions due to growth-boosting and sustainable technology-transferring effects. Furthermore, some research has investigated the relationship between trade openness and CO₂ emissions by considering other factors. Dou et al. (2021) discovered that while increased trade openness generally increases CO₂ emissions, the establishment of Free Trade Agreements (FTA) has potentially mitigated this effect. This research also distinguishes between the impacts of imports and exports, which indicates that imports tend to increase CO₂ emissions, whereas exports may have an impeding effect on CO₂ emissions. Moreover, the research highlights that trade openness can also indirectly influence CO₂ emissions through scale, technical, and structural effects. More recently, Aydin (2023) has revealed that trade openness could increase CO₂ emissions in some countries and decrease them in others, and Jiang and Jiang (2025) have argued that trade openness increases CO₂ emissions due to the scale effect but reduces CO₂ emissions thanks to the enhancement of environmental regulations.

Overall, the contemporary literature has been demonstrating a complex and conflicting view of the relationship between trade openness and CO₂ emissions. While numerous studies have suggested that trade openness contributes to increased CO₂ emissions, others have demonstrated that it can play a role in environmental pollution mitigation, which is dependent on specific contexts, policy interventions, and the consideration of various direct and indirect effects. This inconsistency has highlighted the need for a more specific understanding of the trade-environment nexus. The traditional Environmental Kuznets Curve model typically uses per capita gross domestic product and its squared term as explanatory variables. However, this approach could not fully capture the specific role of trade openness dynamics in influencing CO₂ emissions. Therefore, this dissertation introduces a new Openness-

based EKC model that shifts the focus from per capita GDP to trade openness (and its squared term). This new approach hopefully allows a direct examination of the potential non-linear relationship between trade openness and CO₂ emissions. The Openness-based EKC model aims at providing new insights into how trade openness specifically impacts environmental quality. This is important for shaping effective trade and environmental policies that promote sustainable trade practices and mitigate emissions. Furthermore, this dissertation examines the moderating and contextual role of institutional quality and trade in influencing the trade-environment nexus.

1.2.3. The role of institution in trade, gender, and environment nexus

1.2.3.1. The impact of institutional quality on environmental quality, trade openness and gender equality

Regarding the nexus between institutional quality and environmental quality (proxied by CO₂ emissions), the relationship between institutional quality and CO₂ emissions has been the subject of several empirical studies, which have demonstrated various findings across different countries and time periods. For example, Anwar et al. (2025) and Anwar and Malik (2021) focused on G7 countries in 1996-2018 and explored that improved institutional quality, measured by the control of corruption index, could reduce CO₂ emissions. This implies that in developed economies, strong institutions play a role in mitigating environmental degradation.

From another perspective, studies focusing on developing economies have indicated different and various results. For example, Khan and Rana (2021) examined 41 Asian countries in 1996-2015 and explored that institutional quality, proxied by both economic and political dimensions, could hamper CO₂ emissions. Whereas, Obobisa et al. (2022) investigated 25 African countries during 2000-2018 and explored that institutional quality, represented by the law and order index, could increase CO₂ emissions. These findings imply that the impact of institutional quality

might vary based on the level of economic development and the specific characteristics of the different institutions.

Furthermore, Wenlong et al. (2023) have analyzed 10 Asian countries between 1995 and 2018. Their results which are generated by various panel data techniques have indicated that higher institutional quality has a deteriorating impact on environmental quality. Amin et al. (2023) also explored a long-run positive impact of institutional quality which is measured by the economic freedom index on CO₂ emissions in selected South Asian countries in 1995-2020. However, Chhabra et al. (2023) has delivered an opposite result for the case of BRICS countries in 1991-2019. Their analysis indicated a long-run negative effect of institutional quality on CO₂ emissions which implies a mitigating role of strong institutions in these emerging economies. Xue et al. (2022) have studied the case of France in 1987-2019 and highlighted the complex interlink between institutional factors and environmental outcomes which demonstrates that strong institutions characterized by stability, transparency, and the rule of law could mitigate the negative link between economic policy uncertainty and CO₂ emissions.

Overall, the recent literature has demonstrated the inconclusive results regarding the effect of institutional quality on CO₂ emissions. While some studies explore that improved institutions can lead to lower CO₂ emissions, others have implied the boosting effect of institutional quality on CO₂ emissions. These divergent findings have highlighted the importance of considering the specific context, the measurement of institutional quality, and the countries or regions in consideration when analyzing this relationship. Therefore, this dissertation is about to examine the impacts of six dimensions of institutional quality on environmental quality.

Regarding the nexus between institutional quality and trade openness and trade, this nexus has been receiving significant attention in the economic literature. The underlying rationale has argued that sound institutions can reduce transaction costs, enhance contract enforcement, and foster a more predictable and stable

economic environment, which consequently boosts both the trade revenue and trade openness. Several studies have provided empirical evidence for the positive impact of institutional quality on trade flows. For example, Abreo et al. (2021) examined the bilateral trade flows of Colombia with 136 major trading partners in 2005-2018. Employing the Poisson pseudo-maximum likelihood estimating technique, the findings have demonstrated a boosting effect of the exporter's institutional quality on the export value. The research has included six dimensions of the Worldwide Governance Indicators (World Bank) as the proxies for institutional quality, which provides a comprehensive measurement of various institutional aspects. Most recently, Nam et al. (2025) have examined the case of 27 European Union (EU) countries in 1998-2022. Their research has indicated a positive effect of institutional quality on trade. In this paper, institutional quality is measured as the sum of the six Worldwide Governance Indicators. Meanwhile, trade is measured as the sum of export and import revenue. This paper has highlighted the importance of strong institutions within a developed economic group in facilitating trade activities.

The impact of specific dimensions of institutional quality has also been explored. For example, Ngouhouo et al. (2021) investigated 36 Sub-Saharan African countries in 1996-2017. By employing the generalized method of moments estimation, the research demonstrated that government effectiveness, regulatory quality, and the rule of law all have a promoting effect on trade openness. Therefore, it has appeared that this study has highlighted the relevance of these institutional dimensions in boosting greater integration into the global trading system for developing economies. Furthermore, the direction of causality between institutional quality and trade openness has been concerned by some studies. For example, Qamruzzaman (2021) examined a broad sample of 113 countries in 1971-2019 which were divided into low, lower-middle, and upper-middle-income economies. Based on the Toda and Yamamoto causality test, the study documented a bidirectional causal link between institutional quality and trade openness across these income groups. This suggests a dynamic and long-term relationship where improvements in

institutions can lead to greater trade, and increased trade openness could trigger pressures for institutional reforms. The positive influence of institutional quality on trade openness has also been observed in the context of major global economies. Zhuang et al. (2021) focused on the G20 economies during 1998-2020. Based on the fully modified least square (FMOLS) and dynamic least square (DOLS) models, their research explored the positive influence of institutional quality on trade openness within this group of leading economies.

Overall, the empirical evidence presented in relevant literature has been consistently implying a significant and positive relationship between institutional quality and both the volume of trade and trade openness. While the specific methodologies, country samples, and time periods are different, the overall conclusion remains that stronger institutions facilitate international trade and trade openness. Therefore, this dissertation is about to investigate the direct and moderating and contextual impacts of institutional quality on trade and trade liberalization.

Regarding the nexus between institutional quality and gender equality, some recent research has provided empirical evidence for a positive association between strong institutions and enhanced gender equality. For example, Achuo et al. (2024) have conducted a comprehensive analysis of 142 countries in 1996-2020. Findings of the two-step System GMM and Driscoll-Kraay fixed effect estimations have demonstrated the significant positive impact of strong institutions on gender equality. Furthermore, their decomposition of institutional quality into specific governance indicators has unveiled that most dimensions, except for corruption control, contribute substantially to women's empowerment. This suggests that various aspects of institutional quality have different roles in building an environment which is conducive to gender equality.

Furthermore, studies focusing on specific regions have highlighted the detrimental effects of weak institutional quality on female labor force participation. For example, Opeloyeru et al. (2024) have investigated 39 African countries in 2000-

2018 and found that low institutional quality acts as a significant inhibitor to women's involvement in the labor market. Findings of the two-step System GMM and Driscoll-Kraay Fixed Effect estimations have identified corruption and political instability as critical bottlenecks which hinder female labor force participation in the African context. This regional focus reveals the context-specific nature of institutional impacts. Supporting these empirical findings, Saha and Singh (2025) have argued a more conceptual perspective which indicates that institutional and political dynamics are pivotal in shaping women's engagement in the workforce. Their research has emphasized the necessity of a gender-inclusive policy environment that directly addresses these institutional factors to promote greater female labor force participation. Examining the European context, Nam et al. (2025) have explored the mitigating effect of institutional quality on workforce inequality across 27 EU countries in 1998-2022. Their findings indicate that higher institutional quality is associated with reduced workforce inequality, where inequality is defined as the female labor force participation relative to that of male workers. This study highlights the role of strong institutions in fostering a more equitable labor market within developed economies. However, the relationship between institutional quality and female labor force participation is not always straightforward. Umar et al. (2025) have examined 36 Asian countries in 1996-2021 and explored a more complex reality. Their Driscoll-Kraay Fixed Effect estimations have revealed that the impact of institutional quality on female labor force participation can be both positive and negative, which is contingent on the specific institutional indicators included in the models.

Overall, existing relevant literature has established a significant nexus between institutional quality and gender equality (Achuo et al., 2024; Opeloyeru et al., 2024; Saha & Singh, 2025; Nam et al., 2025; Umar et al., 2025). However, a potential research gap still exists in the disaggregated analysis of institutional dimensions. While studies have demonstrated the overall influence of strong institutions on gender inclusion (Achuo et al., 2024) and the inhibiting effect of low

institutional quality on female labor force participation (Opeloyeru et al., 2024), there remains a limited understanding of the impact of specific institutional factors on gender equality. Prior research has not comprehensively identified which dimensions of institutional quality exert the most significant influence on gender equality. Furthermore, the moderating role of institutional dimensions in the relationship between gender equality and trade, specifically bilateral trade and trade openness, has remained underexplored. To address these potential gaps, this dissertation investigates direct effects of individual dimensions of institutional quality on gender equality. Moreover, this dissertation will contribute to the literature by examining the moderating and contextual effects of these disaggregated institutional quality measures on the relationship between gender equality and trade openness.

1.2.3.2. The moderating role of institutional quality

Institutional quality has a significant moderating role in various relationships, particularly in the nexus between trade openness, environmental quality (CO₂ emissions), and gender equality.

With respect to trade openness and CO₂ emissions, several studies have examined how institutional quality moderates the relationship between trade openness and CO₂ emissions. Adebayo et al. (2023) have suggested that pro-sustainability institutions moderate the positive link between trade openness and CO₂ emissions, which emphasizes the importance of incentivizing greener technologies through sound policies. Dou et al. (2021) explored that the establishment of Free Trade Agreements (FTAs) can mitigate the CO₂-promoting effect of trade openness, and institutional quality strengthening could further amplify the mitigating effects by fostering stability, transparency, and effective environmental regulations. Khan and Rana (2021) also indicated that good institutional quality could mitigate the negative impacts of trade openness on CO₂ emissions.

With respect to CO₂ emissions and its determinants, institutional quality also moderates the relationship between CO₂ emissions and its determinants. Koc and

Bulus (2020) explored the moderating role of institutional quality in environment-related issues, which has supported environmentally-friendly policies and renewable energy consumption. Khan and Rana (2021) demonstrated that economic and political institutional quality could mitigate the negative impacts of income, foreign direct investment, and trade openness on CO₂ emissions. Nchofoung and Asongu (2022) confirmed the moderating impacts on the nexus between infrastructural development and CO₂ emissions. Xue et al. (2022) suggested that weak institutional quality can exacerbate the impact of economic policy uncertainty on CO₂ emissions, while strong institutions can mitigate this negative nexus.

With respect to trade openness and other issues, beside environmental concerns, institutional quality also moderates the relationship between trade openness and other socio-economic factors. Omoke and Opuala–Charles (2021) explored that institutional quality could mitigate the long-run deteriorating impact of imports on economic growth in Nigeria. Zhuang et al. (2021) revealed that institutional quality bolsters the contribution of economic growth and foreign direct investment to trade openness among G20 countries. More recently, Nam et al. (2024) have demonstrated that institutional quality could trigger the positive impact of trade openness on inequality at the initial stage of liberalization but facilitate the mitigating impact at a later stage with high openness in ASEAN countries.

With respect to gender equality and other issues, the moderating role of institutional quality is also investigated in studies on gender equality. For example, Cooray et al. (2017) indicated that political institutions enhance the nexus between trade openness and female labor force participation in Sub-Saharan African countries. More recently, Opeloyeru et al. (2024) have unveiled that low institutional quality could hamper the positive impact of government health expenditure on female labor force participation in African countries. Osinubi and Simatele (2025) have explored that poor governance quality could hinder the promoting effect of female labor force participation on sustainable development in selected African countries. Furthermore,

Umar et al. (2025) have indicated that institutional quality facilitates the contribution of the fertility rate to female labor force participation in Asian countries.

Overall, the relevant literature has highlighted some potential research gaps where institutional quality acts as a moderator. Firstly, institutional quality needs to be examined across multiple dimensions rather than a single aggregate index. Secondly, there is still a lack of research evaluating the moderating effects of each specific dimension of institutional quality on the nexuses between trade, environment, and gender. Therefore, this dissertation aims to address these two research gaps using trade gravity models, Environmental Kuznets Curve (EKC) model and Gender-based Kuznets Curve (GKC) model.

1.3. Research gaps and research questions

Based on a comprehensive review of the current literature, this dissertation systematically identifies several critical research gaps categorized into the following dimensions. *Theoretically*, there is a notable absence of an integrated framework that explores the complex trade-gender-environment nexus under the moderating and contextual effects of multi-dimensional institutional quality. *Empirically*, existing studies have predominantly focused on unilateral impacts, leaving a significant gap in bilateral trade analysis that considers the dynamics of gender equality and environmental quality from both the exporting and importing perspectives. *Methodologically*, while the linear relationship between trade and environmental quality is well-documented, there remains limited evidence regarding the potential curvilinear nature (U-shaped or inverse U-shaped) of these linkages within the Kuznets curve framework. Furthermore, a *contextual gap* exists in understanding how these relationships vary across countries with different levels of trade openness and institutional settings. Finally, a *data and measurement gap* is identified, as prior research often relies on single aggregate indices of institutional quality rather than examining its specific dimensions, which are essential for building precise policy mechanisms.

Given the research contexts which have arisen from the sustainable development agenda, the dissertation has recognized the following potential research gaps and research questions relevant to the relationship between trade, gender, environment, and institution. Particularly, the research gap (RG) is three-fold.

❖ **RG 1:** *The impacts of gender equality and environmental quality on bilateral trade flows which arise from both sides (exporting and importing) of the trading relationship:* Existing literature has predominantly been focusing on unilateral impacts of gender and environmental variables, which implies a research gap in understanding how these variables simultaneously interact within bilateral trade flows from both exporting and importing perspectives.

❖ **RG 2:** *The linear and curvilinear impacts of trade liberalization (trade openness) on environmental quality:* While the link between trade liberalization and environmental quality is well-established, there has been limited evidence regarding the potential curvilinear (U-shaped or inverse U-shaped) nature of this relationship.

❖ **RG 3:** *The moderating and contextual impacts of institutional quality and trade liberalization on the links between trade, gender equality, and environmental quality:* There has been a lack of integrated research exploring the complex moderating roles of institutional quality and trade liberalization in the nexus of trade, gender equality, and environment.

Based on the research gaps, the dissertation has specified four research questions (RQ) as follows:

- **RQ 1: (a)** Is bilateral trade influenced by gender equality? **(b)** Are those influences moderated by the level of institutional quality of the exporting and importing country? **(c)** Do they vary by directions of trade in terms of institutional quality levels (high and low) of trading partners?

- **RQ 2: (a)** Is bilateral trade influenced by environmental quality? **(b)** Are those influences moderated by the level of institutional quality of the exporting and importing country? **(c)** Do they vary by directions of trade in terms of institutional quality levels (high and low) of trading partners?

- **RQ 3: (a)** Do trade openness and institutional quality influence gender equality? **(b)** Are the moderating and contextual impacts of trade openness and institutional quality on the gender-related links significant?
- **RQ 4: (a)** Does trade openness and institutional quality influence environmental quality? **(b)** Are the moderating and contextual impacts of trade openness and institutional quality on the environment-related links significant?

1.4. Research objectives

In order to solve the research questions, a number of research objectives (RO) have been established as follows:

Regarding RQ 1:

- **RO 1.1:** To examine the direct impacts of gender equality of the exporting and importing countries on the bilateral trade flows.
- **RO 1.2:** To assess the moderating impacts of institutional quality (six dimensions) on the relationship between bilateral trade and gender equality.
- **RO 1.3:** To investigate whether the level of institutional quality has the significant contextual effects (high-high, low-low, and different) on the relationship between bilateral trade and gender equality.

Regarding RQ 2:

- **RO 2.1:** To examine the direct impacts of environmental quality of the exporting and importing countries on the bilateral trade flows.
- **RO 2.2:** To assess the moderating impact of institutional quality on the relationship between bilateral trade and environmental quality.
- **RO 2.3:** To investigate whether the level of institutional quality has the significant contextual effects (high-high, low-low, and different) on the relationship between bilateral trade and environmental quality.

Regarding RQ 3:

- **RO 3.1:** To examine the direct impacts of trade openness and institutional quality on gender equality.

➤ **RO 3.2:** To assess the moderating impacts of trade openness and institutional quality on gender-related (gender-institution and gender-openness) links.

➤ **RO 3.3:** To investigate whether the level of trade openness (high and low) and institutional quality (high and low) has the significant contextual effects on the gender-institution and gender-openness links.

Regarding RQ 4:

➤ **RO 4.1:** To examine the direct impacts of trade openness (linear and curvilinear) and institutional quality on environmental quality.

➤ **RO 4.2:** To assess the moderating impacts of institutional quality on the relationship between environmental quality and trade openness (linear and curvilinear).

➤ **RO 4.3:** To investigate whether the level of trade openness (high and low) and institutional quality (high and low) has the significant contextual effects on the environment-openness and environment-institution links.

1.5. Scopes of the research

In order to solve the research questions and achieve the research objectives, three underlying research models which are recommended by two conceptual frameworks have been proposed by the dissertation, which include the Trade Gravity model (for solving RQ 1 and RQ 2), the GKC model (for solving RQ 3), and the OEKC model (for solving RQ 4). Accordingly, due to data availability, the three datasets have been built for investigating the proposed hypotheses in the three models. The first, second, and third dataset has been applied to the Trade Gravity model, the GKC model, and the OEKC model, respectively: (i) The first dataset covers the 2002-2021 period with 41 worldwide trading economies, which includes Vietnam and 40 largest trading partners. The selection of trading economies has been dependent on the trade revenue (export and import) in the 2017-2021 period. The spatial and temporal scope of the first dataset has generated a panel data sample of 32,800 observations (41 x 40 x 20) due to the symmetry of the bilateral trade flows;

(ii) The second dataset covers the 2002-2021 period with 113 worldwide economies, which has generated a panel data sample of 2,260 observations (113×20); and (iii) The third dataset covers the 2002-2020 period with 113 worldwide economies, which has generated a panel data sample of 2,147 observations (113×19).

1.6. Research methodology

This dissertation applies the combined fixed effect (FE), random effect (RE), two-step difference generalized method of moments (DGMM-II), and two-step system generalized method of moments (SGMM-II) methods to the proposed research models.

1.6.1. Combined fixed effect estimation methods

The combined fixed effect estimation is applied to deal with the heterogeneity in the panel data which includes several countries (Cheng & Wall, 2005; Gupta et al., 2025; Huang et al., 2024; Le & Pham, 2024; Lohani, 2024). This dissertation is about to employ two types of fixed effect estimation to gravity models: (1) The first type (FE-I) estimation includes year-fixed and dyad-fixed effect (Carter & Poast, 2020; Le, 2022; Le & Pham, 2024; Lohani, 2024; Magee, 2008); (2) The second type (FE-II) estimation includes reporter-fixed (exporter-fixed), partner-fixed (importer-fixed) and year-fixed effect (Anderson & Van Wincoop, 2003; Gupta et al., 2025; Le, 2022; Le & Pham, 2024; Lohani, 2024; Song et al., 2022; Yu et al., 2020). For Kuznets curve models, this dissertation applies the country-fixed and year-fixed effects to capture the effect of time-invariant and country-specific factors and global macroeconomic shocks and common trends (Huang et al., 2024; Iqbal et al., 2022; Mahadevan & Suardi, 2024; Polat & Cil, 2025).

In the combined fixed effect estimations of the gravity and Kuznets curve models, the year-fixed effect is used to deal with global macroeconomic shocks and common trends, which consequently ensures that the estimated coefficients are not distorted by external factors affecting all trading partners simultaneously. Meanwhile, the dyad-fixed effect in gravity models is used to mitigate the endogeneity and

omitted variable bias, which controls for all unobservable factors that are unique to each pair of trading partners and constant over time in addition to included common variables in the models. Finally, the exporter-fixed and importer-fixed effects in gravity models are included to capture the effect of time-invariant and country-specific factors which could distort the estimated coefficients if not included. In Kuznets curve models, country-fixed effect is included to capture the effect of time-invariant and country-specific factors which could distort the estimated coefficients if not included.

1.6.2. Generalized Method of Moments estimation methods

In order to deal with the endogeneity in dynamic panel models of macroeconomic variables, several studies have been using the two-step difference GMM (DGMM-II) and two-step system GMM (SGMM-II) estimation methods to deal with endogeneity caused by reverse causality (or simultaneity bias) and dynamic model with lagged dependent variables. For example, Bussmann (2009) solved endogeneity by employing two-step GMM estimation with lagged variables as the instruments. More recently, Emikonel (2022), Gupta et al. (2025), Le and Pham (2024), Nguyen and Su (2021), and Osinubi and Simatele (2025) have applied the two-step system GMM and two-step difference GMM to dealing with endogeneity which is caused by the dynamic panel data with large N and short T (Roodman, 2009).

Reverse causality occurs when both variables influence each other simultaneously, which is very popular in macroeconomic models because most macroeconomic variables are correlated with each other. In a standard regression model, it is assumed that the independent variable X triggers changes in the dependent variable Y. However, if Y also has a causal effect on X, the model faces a simultaneity bias due to reverse causality. Particularly, when Y affects X, the change of Y (which is reflected in the error term) will also change X. As a result, X is correlated with the error term, which ultimately leads to the endogeneity. In addition, in the dynamic model, lagged dependent variable is correlated with time-invariant and country-

specific components (which is a component of the error term), which consequently leads to endogeneity.

GMM method addresses endogeneity by exploiting instrumental variables. Instead of using external instruments, which are often difficult to find, GMM takes the advantage of the panel data structure by using the lagged values of the endogenous variables themselves as instruments. The reason is that past values of X (such as X_{t-1} and X_{t-2}) can influence the current value of X , which satisfies the *relevance condition*. Crucially, these past values cannot be influenced by the current value of Y or current shocks because the future cannot change the past. This satisfies the *exogeneity condition*, which allows these lagged values to be valid instruments to generate unbiased and consistent estimates.

Difference GMM (Arellano & Bond, 1991) addresses endogeneity by applying a first-difference transformation to the model, which effectively eliminates time-invariant fixed effects. Then, it uses deeper lags of the dependent and independent variables in levels as instrumental variables with the assumption that these past values are not correlated with the current error term. Meanwhile, System GMM (Blundell & Bond, 1998) estimates a system of two simultaneous equations: the equation in differences and the original equation in levels. While the difference equation uses level instruments, the level equation uses lagged first-differences as instruments. This dual approach significantly resolves the weak instrument problem Difference GMM, which occurs when variables are highly persistent, which provides more efficient and consistent estimates by exploiting additional moment conditions.

1.6.3. Poisson Pseudo Maximum Likelihood estimation method for robustness check of gravity models

To ensure the stability and reliability of the baseline results obtained from fixed effects, difference GMM, and system GMM in the gravity models, this dissertation further employs the Poisson Pseudo Maximum Likelihood (PPML) method of Silva and Tenreyro (2006) as a robustness check. While GMM techniques

are instrumental in addressing endogeneity and dynamic panel bias, they typically rely on a log-linear transformation of the dependent variable. This approach can be problematic for two primary reasons:

(i) Treatment of zero-trade observations in gravity models: In the presence of zero-trade values, log-linearization leads to the exclusion of these observations, potentially introducing selection bias. PPML avoids this by estimating the model in levels, thereby preserving the information contained in the zero-value data points.

(ii) Heteroskedasticity in log-linear models: As noted by Silva and Tenreyro (2006), if the variance of the error term depends on the regressors, the expected value of the log-transformed error will also depend on the regressors, leading to inconsistent estimates in OLS or GMM. PPML provides consistent estimates even in the presence of heteroskedasticity by assuming that the conditional variance is proportional to the conditional mean.

By using PPML estimations as the robustness check, the dissertation can verify whether the estimated elasticities are driven by the specific functional form or the exclusion of non-positive entries. This ensures that the reported relationships are robust across different distributional assumptions and estimation techniques. Therefore, the dissertation applies the Poisson Pseudo Maximum Likelihood (PPML) technique to gravity models only as a robustness check because all zero values of bilateral trade have been increased by one unit prior to fixed effect, difference GMM, and system GMM estimations (Hong et al., 2023).

1.7. Contributions of the dissertation

1.7.1. Theoretical contributions

This dissertation generates five main contributions by integrating gender, environment, and institutional quality into trade and development frameworks. First, it extends the gravity model to establish gender equality as a significant determinant of national comparative advantage, which is the extended contribution to the relevant literature. Second, it employs gravity model symmetry to analyze the dual impact of

environmental quality from both trading partners and the moderating role of institutional dimensions, which is the extended contribution to the relevant literature. Third, it applies a Gender-driven Kuznets Curve, which indicates the linear and curvilinear relationships between gender equality and income, which is the inherited contribution to the relevant literature. Fourth, it identifies an Openness-based Environmental Kuznets Curve (OEKC), which highlights how trade openness and institutions jointly shape environmental outcomes, which is the extended contribution to the relevant literature. Finally, it provides a comprehensive contextual analysis of how institutional quality and trade openness moderate the complex nexus between trade, gender, and the environment, which is a new contribution to the relevant literature.

1.7.2. Practical contributions

The practical contributions of this dissertation are specifically contextualized within two strategic dimensions. First, for a number of the largest trading economies, the dissertation provides an evidence-based framework for integrating gender-responsive and environmental mandates into bilateral trade negotiations and national export policies, which ensures that trade growth and liberalization in SDG 17 aligns with SDG 5 and SDG 13. Second, on a global scale of worldwide economies, the findings offer a tailored roadmap for policymakers to navigate the trade-gender-environment nexus based on their specific institutional settings and degrees of openness. By identifying the critical moderating role of specific institutional dimensions, such as the rule of law in mitigating carbon emissions, the dissertation assists national governments in designing targeted institutional reforms. Ultimately, these contributions serve as a practical guide for aligning trade liberalization with the 2030 Agenda for Sustainable Development, which provides mechanisms to balance economic incentives with gender equality and environmental preservation.

1.8. Structure of the dissertation

The structure of the dissertation is seven-fold, which is as follows:

Chapter 1: Introduction – This chapter identifies the research problems, establishes the objectives, questions, and scopes, and outlines the methodological approach and contributions of the dissertation.

Chapter 2: Theoretical backgrounds and literature review – This chapter reviews the fundamental theories and existing empirical studies to construct an integrated analytical framework for the trade-gender-environment-institution nexus.

Chapter 3: The gravitational approach to the trade, gender equality, and institutional quality nexus – Utilizing a gravity model for Vietnam and its 40 major partners, this chapter investigates how gender equality and institutional dimensions influence bilateral trade flows.

Chapter 4: The gravitational approach to the trade, environmental quality, and institutional quality nexus – Utilizing a gravity model for Vietnam and its 40 major partners, this chapter investigates how environmental quality and institutional dimensions influence bilateral trade flows.

Chapter 5: The Gender-based Kuznets Curve approach to the nexus between gender equality, trade, and institutional quality – This chapter employs the Gender-based Kuznets Curve (GKC) model to explore the effects of trade liberalization and institutional quality on gender equality.

Chapter 6: The Openness-based Environmental Kuznets Curve approach to the nexus between environmental quality, trade, and institutional quality – This chapter proposes the Openness-based Environmental Kuznets Curve (OEKC) model to discover the effects of trade liberalization and institutional quality on environmental quality.

Chapter 7: Conclusions and policy implications – This chapter synthesizes the key findings across all empirical chapters to offer strategic policy recommendations for achieving sustainable development goals.

CHAPTER 2: THEORETICAL BACKGROUNDS AND LITERATURE REVIEW

2.1. Research concepts

2.1.1. Trade and trade openness

A number of empirical studies have employed trade openness as an indicator of trade and trade liberalization (Afesorgbor & Demena, 2022; Aydin & Turan, 2020; Ben Jebli et al., 2019; Cialani, 2017; Dorn et al., 2022). Trade is proxied by the total of export and import value divided by the gross domestic product (Amri, 2018; Barros & Martínez-Zarzoso, 2022; Ben Jebli et al., 2019; Cialani, 2017), which is the openness of an economy to the global trading system. In this dissertation, trade openness is the measurement of the extent to which an economy is open to the world economy. In general, trade openness of country i in year t is calculated as follows:

$$Trade\ Openness_{i,t} = \frac{Export\ Revenue_{i,t} + Import\ Revenue_{i,t}}{GDP_{i,t}} \times 100$$

In other words, trade openness reflects the relationship between the trade scale and economy scale. Higher value of trade openness indicates deeper integration of the national economy to the world trading environment. In addition to openness, several studies have been investigating issues relevant to *bilateral trade flows* between partners within the trade gravity framework (Akboostanci et al., 2023; Guo & Mai, 2023; Islam et al., 2024; Le, 2022; Le & Pham, 2024; Lohani, 2024). Therefore, in this dissertation, *trade* is considered on two aspects, which include *openness* (or *liberalization*, interchangeably) in Chapters 5 and 6 with the Kuznets curve approach, and *bilateral trade* (export and import) between trading partners in Chapters 3 and 4 with the gravitational approach.

2.1.2. Gender equality

Busse and Spielmann (2006) measured gender inequality by there dimensions which include wage, employment, and literacy and secondary school enrollment,

which demonstrated the disparity between female and male population in the above-mentioned dimensions. Balamoune-Lutz (2007) pointed out that gender equality could be viewed from various dimensions, which includes the accessibility of education and health care services, employability, income, empowerment, regulatory discrimination, etc. Potrafke and Ursprung (2012) considered gender equality as an important objective in the economic development process, which benefits the female population. Therefore, gender equality is the equality provided and ensured for female rather than male individuals. In addition, Potrafke and Ursprung (2012) mentioned certain areas which could raise gender-specific concerns, specifically education, literacy, labour force participation, income, and productivity. Branisa et al. (2013) used the Social Institutions and Gender Index (SIGI) and its sub-indicators which measured the decision-making power, freedom of social participation, mortality bias, and property ownership and access. Ruiters and Charteris (2020) measured gender equality by the female to male labor force participation. More recently, Bilgili et al. (2022) have exploited female labor market participation and gender parity index published by the World Bank as the proxies for gender equality, and the latter is relevant to education. In this dissertation, gender equality has been proxied by three indicators which include gender development, gender inequality, and female labor force participation (Nam et al., 2025; Ryu & Nam, 2024).

+ Gender development is reflected by the ratio of female to the male human development index. The increasing value of gender development implies the mitigated gender inequality.

+ Gender inequality is a composite measurement of health, empowerment, education, and labor market competition of female as compared to male population. The higher value of gender inequality indicates the exacerbated gender inequality.

+ Female labor force participation reflects the portion of female workers in the national workforce. Increasing participation indicates the improved gender equality.

2.1.3. Environmental quality

As carbon dioxide (CO₂) emission accounts for a dominant percentage of greenhouse gas emissions (GHGs), the amount of emitted CO₂ is the major environmental polluting source, which causes climate change at global scale and its widespread catastrophic aftermaths (Bilgili et al., 2022; Gill et al., 2019; Wang et al., 2021). Several studies have employed CO₂ emissions per capita and CO₂ emissions as the proxies for environmental quality (Afesorgbor & Demena, 2022; Ahmed, 2020; Allard et al., 2018; Bilgili et al., 2022; Jamel & Maktouf, 2017; Gill et al., 2019; Wang et al., 2020). This dissertation considers environmental quality proxied by the CO₂ emissions per capita (or CO₂ emissions for short) (Wang et al., 2020).

2.1.4. Institutional quality and environmental institutional quality

North (1981; 1990) defined *institution* as “*a set of rules, compliance procedures, and moral and ethical behavioural norms designed to constrain the behaviour of individuals*”. This definition has echoed the role of the governance of the society which is comprised of a large number of individuals and their behavioural interactions. Thus, the quality of institution is proxied by the quality of governance in several studies (Alonso & Garcimartín, 2013; Álvarez et al., 2018; Buchanan et al., 2012; Chambers & Munemo, 2019; Méon & Sekkat, 2008). National governance quality is measured and issued by the World Bank, which include six component indicators (Omri, 2020; Omri & Hadj, 2020; Shan et al., 2021). Méon and Sekkat (2008) have classified those governance-specific indicators into three separate groups, which arguably enables the multi-dimensional analysis of institutional quality and its impacts on macroeconomic variables, which ultimately allows more detailed and specific policy implications to be discussed. The first group reflects the effectiveness and efficiency of the government relevant to policies establishment and implementation. The second group reflects the perception, awareness, and recognition of individuals in the nation about the enforcement of policies, rules, laws, and regulations in practice. The third group measures the extent to which feedback

and ideas of the people are heard and respected, and the security relevant to political risks. This dissertation exploits six indicators of institutional quality which are called the Worldwide Governance Indicators which are published by The World Bank. They include *control of corruption, government effectiveness, political stability and absence of violence/terrorism, regulatory quality, rule of law and voice and accountability*.

Wang et al. (2020) have employed the Environmental Policy Stringency (EPS) index as the proxy for environmental institutional quality. The EPS index is published by The Organization for Economic Co-operation and Development (OECD). The higher value indicates stricter environmental policies. The scope of EPS index covers the OECD countries. However, the EPS index allows the multi-dimensional measurement of environmental policy stringency, which includes economic or market-based measures (tariffs, permit, fees, and limits or caps), and administrative or nonmarket-based measures (ban, prohibition, etc.). In addition, Wang et al. (2020) have pointed out the two-fold impact of the EPS on environmental quality, which include direct and indirect cost channel. The former is relevant to penalties imposed on emissions, while the latter incentivizes the actions of greener and more sustainable economic activities. Several studies have also employed the EPS index in the impact assessment on environmental issues (Ahmed, 2020; Galeotti et al., 2020; Li et al., 2023; Martínez-Zarzoso et al., 2019; Usman et al., 2024; Wang et al., 2022; Xie et al., 2023). Therefore, this dissertation employs the EPS index as the proxy for environmental institutional quality in the research models. The EPS index ranges from zero (no environmental policy – the lowest) to six (the highest stringency).

2.2. The Trade Gravity model

As suggested by Poyhonen (1963) and Tinbergen (1962), original trade gravity model posited the positive relationship between bilateral trade and the size of the trading economies and the negative relationship between bilateral trade and the geographic distance between trading partners. From the exporting side, a greater

economic size indicates higher production capacity, which consequently increases the export supply (Jing et al., 2020). From the importing side, a larger economy implies higher income, which ultimately incentivizes import demand for consumption (Jing et al., 2020). Meanwhile, geographic distance is positively associated with logistics and transportation costs, which reduces the profitability of cross-border transactions thereby acting as an obstacle to bilateral trade.

$$Bilateral\ trade_{ijt} = \frac{GDP_{it}^{\alpha_1} \times GDP_{jt}^{\alpha_2}}{Distance_{ij}^{\alpha_3}}$$

(the original model)

In this model, bilateral trade is the export value from country i (the exporting country) to j (the importing country) in year t . The size of the economy is proxied by the gross domestic product (GDP). The coefficients α_1 , α_2 , and α_3 denote the impact magnitude of relevant determinants. Based on the original model, augmented models have been including a number of national macro-determinants of bilateral trade, which allows the analysis of the links between trade and relevant issues, which has been as follows:

$$Bilateral\ trade_{ijt} = \frac{GDP_{it}^{\alpha_1} \times GDP_{jt}^{\alpha_2}}{Distance_{ij}^{\alpha_3}} \times X_{kit}^{\alpha_{kit}} \times X_{kjt}^{\alpha_{kjt}}$$

(the augmented model)

where $X_{kit}^{\alpha_{kit}}$ and $X_{kjt}^{\alpha_{kjt}}$ denote the determinants of the exporting (i) and importing country (j) in year t . As could be seen in Table C2.1 (please see the Appendices of Chapter 2), a number of most recent studies have applied the augmented trade gravity model to the analysis of various macroeconomic factors' influences on aggregated and sectoral trade (Akbostanci et al., 2023; Emikonel, 2022; Eshetu & Goshu, 2021; Jing et al., 2020; Golovko & Sahin, 2021; Greaney & Kiyota, 2020; Guo & Mai, 2023; Islam et al., 2024; Kabir et al., 2017; Le, 2022; Le & Pham, 2024; Lohani, 2024; Martínez-Martínez et al., 2023; Nasrullah et al., 2020; Nawrot,

2023; Song et al., 2022; Tandra & Suroso, 2023; Vu et al., 2020). Several studies have been applying the trade gravity model to analyzing links between trade and sustainable development issues such as include gender equality (Le & Pham, 2024), logistics development (Le, 2022), institutional quality (Eshetu & Goshu, 2021; Golovko & Sahin, 2021), renewable energy consumption and generation (Jing et al., 2020; Guo & Mai, 2023), water sustainability (Akbostanci et al., 2023), extreme weather events and temperature (Martínez-Martínez et al., 2023), particulate and carbon dioxide emissions (Guo & Mai, 2023), natural resources sustainability (Guo & Mai, 2023), or global partnership (Song et al., 2022).

2.3. The Environmental Kuznets Curve (EKC) Hypothesis

The EKC hypothesis is originated from the Kuznets curve model which demonstrates the inverse U-shaped relationship between economic development and income inequality (Kuznets, 1955). Accordingly, the phase of positive link is driven by the concentration of savings and migration in urban areas, while the phase of negative link is facilitated by the enhanced productivity and extended employment due to those concentrations (Martínez-Navarro et al., 2020). Economic development is proxied by gross domestic product per capita or human development index (HDI), while income inequality is typically proxied by the Gini index ((Martínez-Navarro et al., 2020). In line with the logic of the primary Kuznets curve model, the EKC model suggests the inverse U-shaped link between environmental deterioration and economic development (Stern, 1998). In the first period, increasing economic activities have the negative impact on environmental quality due to the intensive exploitation of resources. The environment-economy link in the first phase could be demonstrated as: $\frac{\partial \ln CO_2}{\partial \ln Econ\_Growth} > 0$ (Murad et al., 2025). In the subsequent phases, higher economic development facilitates the implementation of carbon-neutral or carbon-negative technologies in various industries and segments of the economy, which consequently mitigates environmental degradation. In addition, the higher living standard of consumers imposes pressure on manufacturers for more

sustainable business practices and greener operations. The environment-economy link in the second phase could be demonstrated as: $\frac{\partial \ln CO_2}{\partial \ln Econ\_Growth} < 0$ (Murad et al., 2025).

As could be seen in Table C2.2 (please see the Appendices of Chapter 2), in a flourishing number of most recent empirical studies on the EKC model, environmental quality has been disproportionately proxied by carbon dioxide (CO₂) emissions (Achuo & Ojong, 2024; Amankwa et al., 2024; Boujedra & Jebli, 2025; Caporin et al., 2024; Demiral et al., 2024; Guo & Shahbaz, 2024; Gupta et al., 2025; Gyamfi et al., 2024; Huang et al., 2024; Mahadevan & Suardi, 2024; Murad et al., 2025; Phiri et al., 2024; Polat & Cil, 2025; Rasheed & Liu, 2024; Shao et al., 2025; Wang et al., 2024; Wu et al., 2025; Zeraibi et al., 2024), which is caused by intensive energy consumption as a result of economic upscaling, industrialization, urbanization, and globalization (Achuo & Ojong, 2024; Caporin et al., 2024; Demiral et al., 2024; Gupta et al., 2025; Gyamfi et al., 2024; Huang et al., 2024; Kaika & Zervas, 2013; Mahadevan & Suardi, 2024; Rasheed & Liu, 2024; Shao et al., 2025; Wu et al., 2025; Zeraibi et al., 2024).

2.4. The Gender-driven Kuznets Curve Hypothesis

As inspired by the EKC model, the Gender-driven Kuznets Curve (GKC) model has demonstrated the impact of economic development on gender equality (Eastin & Prakash, 2013). In particular, there is an N-shaped or S-shaped relationship between economic growth and gender equality, which is a three-phase relationship (Eastin & Prakash, 2013). Previously, there were three different approaches to the link between economic development and gender equality (Eastin & Prakash, 2013). The first feminist approach advocates the negative impact of economic development on gender equality (Tinker et al., 1976). Accordingly, economic development could consolidate men's welfares and patriarchal institutions, which exacerbates the employment and income prospects of women labor force, which ultimately decreases gender equality. The second optimistic and neoliberal approach supports the positive

influence of economic development on gender equality (Clark, 1991; Clark et al., 1991; Forsythe et al., 2000; Weiss et al., 1976). Accordingly, economic development enhances the living standard, educational opportunities, and social networking of women. In addition, globalization with the growing trade openness and foreign direct investment inflows could improve the technological capacity and gender-related responsibilities of sectors and industries, which eventually increases gender equality. The third approach suggested by Goldin (1990) and Iversen and Rosenbluth (2006) recommended the U-shaped relationship between economic growth and gender equality. In the first phase, economic development undermines gender equality, which is similar to the approach of Tinker et al. (1976). However, in the subsequent phase, gender equality could be achieved as a result of extended labor force participation and income growth of women which balances the bargaining power of women and weakens the patriarchal institutions and social structures.

In terms of empirical studies, as could be seen in Table C2.3 (please see the Appendices of Chapter 2), almost immediately after the research of Eastin and Prakash (2013), Anyanwu and Augustine (2013) applied the GKC model to examining the impacts of income per capita, institutions, investment, education, and urbanization on gender equality in overall employment. Findings supported the existence of the U-shaped relationship between income per capita and gender equality in employment in the case of North African countries. Focusing only on gender equality in youth employment, Anyanwu (2016) confirmed the existence of the U-shaped relationship between income per capita and gender equality in youth employment in the case of the overall sample of Africa and the sub-sample of Sub-Saharan Africa. Ruiters and Charteris (2020) have contributed to the literature by exploring the facilitating effect of economic development on female labor force participation in South Africa. More recently, the linear and curvilinear relationship between income (as a proxy for economic development) and gender equality (from the dimensions of employment, health, education, and women's rights) has been investigated by Nguyen and Su (2021), which highlights the application of the GKC

model to empirical studies on gender-related issues. In addition, Nguyen and Su (2021) have included a number of macro-determinants of gender equality which include trade openness, FDI net inflows, and institutional quality, which unveiled the potential exploitation of the GKC model in a growing amount of research relevant to gender equality and sustainability-specific concerns. Ghosh (2022) has confirmed the significant U-shaped relationship between female labour force participation and economic growth (proxied by GDP per capita). Iqbal et al. (2022) have also pointed out the boosting and spill-over effects of income (proxied by GDP per capita) on gender equality. Nguyen (2022) has applied the GKC model to the link between tourism development and gender equality, which unveils the existence of the inverse U-shaped and U-shaped relationship between income per capita and specific gender equality indicators. Nguyen and Nguyen (2023) have also indicated the inverse U-shaped and U-shaped between income and gender equality (employment, health, education, rights) in the full sample and specific sub-samples (divided based on income levels). Most recently, Shittu et al. (2025) have confirmed the existence of the GKC in the case of 45 developing countries in the 2005-2021 period. In addition, the moderating role of institutional quality has been explored in gender-related links.

2.5. Theoretical foundations of the trade-gender nexus

2.5.1. The impact of gender equality on trade

From the perspective of the *Feminist Trade Theory*, the research of Elson et al. (2012) has suggested a two-fold influences of gender inequality on trade, which includes the *source of competitiveness* and *competitiveness underachiever* effect. Regarding the *competitiveness underachiever* effect, gender inequality hampers the accessibility of resources, knowledge, and information to women exporting entrepreneurship, which ultimately decreases trade (UNCTAD/DITC, 2022). Regarding the *source of competitiveness* effect, gender inequality weakens the bargaining power of women workers in the labour market, which reduces production costs of exporting firms and consolidates the low-cost advantages. This ultimately

increases the trade flows of labour-intensive industries, which indicates the positive association between gender inequality and trade (UNCTAD/DITC, 2022).

From the viewpoint of the *Rybczynski theorem* of the *Heckscher-Ohlin (H-O) trade theory*, gender equality enhances female labour force participation, which triggers the expansion of the production possibilities frontier biasedly towards the products whose production intensively uses female labour (Rybczynski, 1955). Eventually, the increase of the relative supply of those products boosts the export growth of countries which are abundantly endowed with female labour. Moreover, the *H-O trade theory*, which is also known as the *factor-proportions theory*, has demonstrated the determining role of factor intensity and abundance in shaping trade patterns between countries. Accordingly, the enhanced abundance of labour supply due to increasing female labour force participation could facilitate the export flows of labour-intensive industries.

Relevant to *The Competition Theory*, gender equality could strengthen the *location economy* or *location attractiveness* of specific destinations due to *labour market pooling* effect (Porter, 1994), which ultimately boosts the inflows of vertical foreign direct investment which consequently contributes to the export growth (trade flows) of the host countries. Furthermore, according to the *competitive advantage theory* or the *Diamond Framework* of Porter (1990), the component of *factor endowments*, particularly the *advanced factors*, could be strengthened by the increasing number of female employees and managers and their managerial capabilities. In this case, gender equality has nurtured the national competitive advantages of certain industries, which ultimately increases export growth of those industries. Similarly, components of *demand conditions* and *firm strategy, structure, and rivalry* are also improved as a result of better gender equality.

2.5.2. The impact of trade on gender equality

The *Stolper-Samuelson Theorem* (Stolper & Samuelson, 1941) argued the relationship between relative goods price and relative factor price, which is

determined by the factor intensity. At first, trade openness triggers the convergence of relative goods price in the two countries. As a result of trade openness, the relative price of female labour-intensive goods in a country increases which consequently improves the relative price of female labour (or relative wage of female labour, and of course, women welfares and benefits) (the upward-sloping SS curve). In the other country, the relative price of female labour-intensive goods decreases, which consequently deteriorate women welfares and gender equality.

Another perspective is *The Three-fold Effect of Trade* (Abid & Sekrafi, 2021; Ertugrul et al., 2016; Liobikiene & Butkus, 2019), which could be applied to justifying the effects of trade openness on gender equality. The three-fold effect includes *scale*, *composition*, and *technique* effects.

- + *The scale effect*: Trade openness results in more job and income opportunities for female labour force (positive impact).

- + *The composition effect*: Trade openness facilitates the specialization in specific industries (based on national comparative advantages), which consequently influences the national economic structure. Particularly, some countries could concentrate their resources on female labour-intensive industries, while others focus on male labour-intensive sectors (positive or negative impact).

- + *The technique effect*: Trade openness incentivizes the technology transfer, which could create more job and income opportunities for high-skilled female labour force while deteriorate those of lower-skilled female workers (positive or negative impact).

In the previous part of the dissertation, the impact of economic development on gender equality has been studied by the exploitation of the Gender-driven Kuznet Curve (GKC) hypothesis (Eastin & Prakash, 2013), which was established based on the original Kuznets Curve hypothesis (Kuznets, 1955) which argued the inverse U-shaped relationship between economic development and income inequality. As inspired by the GKC hypothesis of Eastin and Prakash (2013), there have been an

increasing number of studies have been examining the impacts of macro-economic determinants on various dimensions of gender equality as could be seen in Table 2.3, which include trade openness as the proxy for trade and economic integration (Anyanwu, 2016; Nguyen & Su, 2021; Nguyen 2022; Nguyen & Nguyen, 2023). In addition, Ghosh (2022) has explored the contributing impact of export diversification on female labour force participation based on the exploitation of the GKC model.

Not having adopted the GKC framework in the analysis, a number of studies have also examined the effect of trade and trade openness on gender equality. For example, Berik (2000) indicated that export orientation decreases gender wage inequality due to the fact that male workers experienced more severe decrease in their wages compared to female workers within the expanding export-oriented industries. Balamoune-Lutz (2007) explored the deteriorating effect of trade openness on gender equality in education (literacy) in the case of sub-Saharan African countries as a result of the increase in unskilled labour supply. Oostendorp (2009) explored the mitigating effect of trade openness on gender income gap in the low-skilled labour force in both low-income and high-income countries, and in the high-skilled labour force in the high-income countries. Bussmann (2009) examined the case of 134 developed and developing countries in 1970-2000 period and explored that increased trade openness correlates with higher female education enrollment. However, the effect of trade liberalization on female labor force participation is divergent, which is increasing in developing countries and decreasing in OECD countries. Furthermore, trade openness triggers a sectoral shift for female workforce, which is towards service sectors in developed countries and industry and agriculture sectors in developing countries, which indicates the impact of liberalization on gender-related employment distribution. Menon and Van der Meulen Rodgers (2009) analyzed Indian households in 1983-2004 period and explored that greater trade openness is associated with larger wage gaps in Indian concentrated manufacturing industries. This is due to the increased competitive pressures and cost reduction challenges in the post-liberalization period. Instead of reducing discrimination, more intense international

competition and a lack of enforcement of anti-discrimination labor standards have resulted in less bargaining power of female workers, which consequently extends the gender wage gap in these industries. Papyrakis et al. (2012) reviewed relevant literature on the link between trade openness and gender inequality and argued that trade liberalization boosts female employment, particularly in unskilled manufacturing industries of developing countries. However, some research suggests that more liberalized trade tends to widen the gender wage gap. In addition, gender inequalities in labor markets could determine national comparative advantages and export patterns in the case of East Asian countries. Trade liberalization can restructure economic sectors, which consequently either strengthens or weakens established patterns of gender inequality (wage or employment) within the labor market and the broader economic structure. Potrafke and Ursprung (2012) confirmed the fostering impact of economic globalization on gender equality whereby the latter is proxied by the composite Social Institutions and Gender Index (SIGI). Juhn et al. (2013) and Juhn et al. (2014) pointed out that trade openness facilitated by tariff reduction could encourage firms to invest in modern technologies for exporting competition, which decreases the demand for physically-requiring tasks and allows women workers to participate in the labour market for blue-collar jobs and improve their income prospects. Sauré and Zoabi (2014) established a theoretical model which explains the relationship between trade and female labour force participation under the determination of female (male) intensity and capital (labour) intensity. Schultz (2014) unveiled that trade liberalization policy significantly contributes to the gender equality in health and education. Wamboye and Seguíno (2015) explored the employment-creating effect of trade liberalization on gender equality in the case of Sub-Saharan African countries which are divided into subordinate groups based on their capacity of natural resources.

More recently, Korinek et al. (2021) have proposed *three channels* of the impacts of trade on female benefits. *First*, trade in services could increase the employment and income opportunities for women workers as they are more

intensively employed in service sectors. *Second*, trade could facilitates the price reduction of consumer products which consequently improves the accessibility of women segments to those imported goods. *Third*, women's exporting entrepreneurship of small firms could be impeded due to burdensome trade costs incurring for smaller players. In addition, smaller firms, which have been disproportionately owned and managed by women leaders, are more vulnerable to trade than larger firms (Krugman et al., 2022, pp. 216-217).

The research Fontana (2016) suggested the *fourth channel* of public provision, which argues that trade openness with tariff elimination could decrease budget revenue and financial allocation for women welfare development programs, which consequently hampers gender equality. Orkoh et al. (2022) examined the Ghanaian household data and discovered that trade openness exacerbates the gender wage gap of urban and low-skilled workers. This could be due to the fact that trade liberalization results in the specialization in male-dominated sectors and increased demand for potentially male-biased higher skills. Furthermore, the chronic gender inequalities on Ghana in education and healthcare could worsen those effects, which prevents female workers from gaining benefits of trade openness. Yahmed (2023) has demonstrated that trade openness has ambiguous effects on the gender wage gap. Increased foreign competition can reduce discrimination by forcing out high-cost and discriminatory firms. However, access to larger export markets can either widen the wage gap if less competitive but discriminatory firms profit from lower export costs (market-size effect when there are few competitors) or narrow it if only productive and less-discriminatory firms benefit from export opportunities and increase their labor demand (selection effect when there are many competitors). The overall impact depends on the competitive landscape and ability of firms to implement discriminatory practices in foreign markets.

2.6. Theoretical foundations of the trade-environment nexus

2.6.1. The impact of trade on environmental quality

From the perspective the *Theory of three-fold effect of trade on emissions*, trade openness could eventually either increase or decrease carbon dioxide emissions which depends on which effect is more dominant (Abid & Sekrafi, 2021; Ertugrul et al., 2016; Liobikiene & Butkus, 2019). More particularly, relevant to the *Scale Effect*, trade openness expands economic activities, which increases carbon dioxide emissions. In other words, a larger economy could result in higher environmental degradation. Relevant to the *Composition Effect* of trade, trade openness facilitates the specialization in goods and services in which countries have the comparative advantages. This triggers the changes in economic structure of various countries. Particularly, some countries could concentrate their resources on more polluting or *carbon-intensive* industries, while others focus greener or *carbon-neutral* sectors. In other words, different comparative advantages lead to difference economic structure as a result of greater openness, which ultimately could either increase or decrease environmental deterioration. Relevant to the *Technique Effect* of trade, trade openness allows the technological transfers from developed nations to developing and emerging partners which are relevant to renewable production. This could help nations reduce carbon dioxide emissions.

From the perspective of the *Pollution Haven Hypothesis*, trade openness may influence the decisions of foreign investors in pollution-intensive industries on the location of their production facilities in developing and emerging countries, which eventually increases emissions in those countries (Abid & Sekrafi, 2021; Al-Mulali et al., 2016; Azam & Khan, 2016; Ertugrul et al., 2016; Shahbaz et al., 2015). Meanwhile, from the perspective of the *Pollution Halo Hypothesis*, trade openness may attract foreign investors with advanced and carbon-neutral technologies, which reduces emissions and facilitates the circular production in the destination countries (Kang et al., 2016; Kohler, 2013; Shahbaz et al., 2012).

Overall, the relationship between trade openness and CO₂ emissions is explained through the Theory of the Three-fold Effect, which describes how the net impact on the environment depends on the dominance of three distinct mechanisms. This interplay consequently results in an inverse U-shaped relationship, where emissions initially rise with trade but eventually decline as technological and structural shifts take hold.

+ **The linear mechanisms of trade:** The linear drivers of emissions are categorized into three effects that can either increase or decrease environmental degradation:

- *Scale effect:* This mechanism suggests a positive linear relationship between trade and emissions. As trade openness expands the overall scale of economic activities, it results in higher environmental degradation and increased CO₂ emissions.
- *Composition effect:* This effect involves changes in a country's economic structure based on its comparative advantage. If a country specializes in carbon-intensive industries, emissions will increase; conversely, if it focuses on carbon-neutral or greener sectors, emissions will decrease.
- *Technique effect:* This mechanism provides a negative linear relationship. Trade openness facilitates the transfer of advanced technologies from developed nations to developing partners, particularly those related to renewable production, which helps nations reduce their emissions.

+ **The curvilinear mechanism (the inverse U-shaped relationship):** The curvilinear or inverse U-shaped relationship occurs because the balance between these linear effects shifts as trade openness increases. This shift is often explained through two competing hypotheses:

- The upward slope (Pollution Haven Hypothesis): In the earlier stages of trade openness, emissions tend to rise. This is often due to the Pollution Haven Hypothesis, where foreign investors in pollution-intensive industries relocate their

production facilities to developing and emerging countries, thereby increasing emissions in those destination countries. During this phase, the expansionary scale effect typically outweighs the technique effect. In addition, in this stage, several carbon-intensive industries are flourishing due to the expansion of exporting opportunities, which implies the boosting effect of trade openness on CO₂ emissions, which eventually contributes to the emissions increase as a result of the composition effect.

The downward slope (Pollution Halo Hypothesis): As trade openness continues to grow, it can reach a turning point where emissions begin to fall. This is supported by the Pollution Halo Hypothesis, which posits that trade openness attracts foreign investors bringing advanced, carbon-neutral technologies. These investments facilitate circular production and allow the technique effect, which is driven by technological transfers, to become dominant over the scale effect, ultimately leading to a reduction in total carbon dioxide emissions. In addition, in this stage, countries tend to shift the structure towards greener and carbon-neutral industries, which implies the hampering effect of trade openness on CO₂ emissions, which eventually contributes to the emissions decrease as a result of the composition effect.

Therefore, this dissertation introduces a new Openness-based EKC model that shifts the focus from per capita GDP to trade openness (and its squared term). This new approach hopefully allows a direct examination of the potential non-linear relationship between trade openness and CO₂ emissions. The Openness-based EKC model aims at providing new insights into how trade openness specifically impacts environmental quality.

2.6.2. The impact of environmental quality on trade

The *Theory of Environmental Assimilative Capacity (EAC)* proposed by Walter (1974) argued the driving role of EAC in determining trade patterns between countries as recommended in the *Heckscher-Ohlin Theory* (Heckscher, 1919; Ohlin, 1935). Accordingly, the EAC abundance, which is significantly affected by

emissions, could foster trading flows of exported goods whose production has a large amount of pollutant waste. In this theory, EAC is defined as the environment's natural ability to absorb and neutralize pollution without showing significant signs of damage or degradation. Therefore, environmental quality proxied by CO₂ emissions could decrease the EAC abundance, which consequently affect trade flows between countries of different EAC resources and trade openness of those countries. In line with the logic of Walter (1974), Siebert (1992) extended the *Heckscher-Ohlin Theory* to the analysis on the link between environmental quality and national comparative advantage (Jayadevappa & Chhatre, 2000). The research argued that the *pollution intensity* of various industries could increase or decrease export revenue of specific products. More importantly, the research emphasized the determining role of environmental measures in cross-border flows of pollution-intensive products in small and large countries (Jayadevappa & Chhatre, 2000).

According to the *Theory of Competitive Advantage* or *Diamond Model* of Porter (1990), environmental degradation due to polluting emissions could increase consumer awareness of environmental issues and environmentally-responsible consumption, which is the *Demand Conditions* component of the national competitive advantage. Consequently, more environmentally-demanding and ecologically-sophisticated consumers impose innovation pressures on incumbent firms, which ultimately bolsters product quality and export competitiveness in the global markets, and therefore foster trade flows and facilitate greater openness. By this way, environmental degradation could be considered as the *Opportunity* component of the Diamond Model. In line with this logic, environmental institutional quality, which is included in the *Policy* component, could also strengthens the national competitive advantage, which eventually strengthens export competitiveness and increases export growth and openness of the countries. Regarding the *factor endowments* component, environmental quality could affect EAC which is considered as a productive resource by Walter (1974). In this case, EAC is included in the factor endowments component.

2.7. Theoretical foundations of the trade-institution nexus

According to the *Theory of Competitive Advantage* or *Diamond Model* of Porter (1990), the *Policy* component, which is relevant to institutional quality, has the critical role in bolstering the four major components of the national competitive advantages in specific industries and sectors which are the determinants of specialization and trade. This has implied that institutional quality could contribute significantly to bilateral trade flows. In addition, the *Theory of Institutional Comparative Advantage* of Belloc (2006) hypothesized that institutional quality has the significant influences on transaction costs, industrial structure, and financial markets, which are the dynamics of trade openness. Furthermore, from the perspective of the *Transaction Cost Theory*, institutional quality could considerably influence *coordination costs* and *transaction risks* in international trade transactions (Clemons & Row, 1992; Yigitbasioglu, 2010), which eventually affects trade and openness. Considering *institutions as the source of comparative advantages*, the research of Levchenko (2007) has implied the effect of institutional quality on trade and openness, and the losses and gains of countries as a result of their openness to trade.

2.8. The moderating role of institutional quality: Theoretical perspectives

From the perspective of the *Transaction Cost Theory*, institutional quality could considerably influence *coordination costs* and *transaction risks* (Clemons & Row, 1992; Yigitbasioglu, 2010), which could hamper or bolster the links between trade liberalization, environmental quality, and gender equality. For example, the sound quality of institutions relevant to contract enforcement and property protection could reduce the transaction costs of foreign investors with advanced and carbon-neutral technologies, which ultimately encourages their destination selection and technology transfer and mitigates environmental deterioration of the host countries. Moreover, corruption control could reduce the transactions costs of small and medium enterprises which have exporting activities and using female labour force.

This amplifies the contribution of gender equality (female labour force participation) to sectoral comparative advantages and bilateral trade flows.

From the perspective of the *New Institutional Economics Theory* (North, 1990), Ménard (2011) argued the roles of four institutional components which include *Law, Polity, Administration, and Ideology*. *The law component* is relevant to the formal rules that are established and enforced by the state. *The polity component* is relevant to the political structure and governance of a society. *The administration component* is relevant to the bureaucratic apparatus and the practical application of rules. *The ideology component* is relevant to the informal norms and beliefs that guide human behavior. These institutional components function as the moderators that determine how macroeconomic issues which include trade, gender equality, and environmental quality. For example, while law and polity establish the legal frameworks and political priorities which are necessary to safeguard women's rights and environmental standards during global integration, the administration ensures these regulations are effectively enforced in practice rather than remaining only "on papers". Furthermore, ideology acts as a powerful informal and underpinning moderator, as societal beliefs and cultural norms can either foster voluntary compliance or hamper progress toward gender equality and environmental quality regardless of formal rules and regulations.

2.9. Analytical frameworks

Table 2.1 demonstrates the research hypotheses relevant to the four research objectives of the dissertation.

Table 2.1. Research hypotheses

Research Objective (RO)	Research Hypothesis (H)
RO 1	H.1.1: Gender equality (of the exporting and importing country) has a <i>significant positive effect</i> on bilateral trade. H.1.2: Institutional quality (of the exporting and importing country) has a <i>significant positive effect</i> on bilateral trade. H.1.3: Institutional quality (of the exporting and importing country) <i>significantly moderates</i> the link between bilateral trade and gender equality.

	H.1.4: Institutional quality (of the exporting and importing country) has a <i>significant contextual effect</i> on the link between bilateral trade and gender link.
RO 2	H.2.1: Environmental quality (of the exporting and importing country) has a <i>significant positive effect</i> on bilateral trade. H.2.2: Institutional quality (of the exporting and importing country) has a <i>significant positive effect</i> on bilateral trade. H.2.3: Institutional quality (of the exporting and importing country) <i>significantly moderates</i> the link between bilateral trade and environmental quality. H.2.4: Institutional quality (of the exporting and importing country) has a <i>significant contextual effect</i> on the link between bilateral trade and environmental quality.
RO 3	H.3.1: Trade liberalization has a <i>significant positive effect</i> on gender equality. H.3.2: Institutional quality has a <i>significant positive effect</i> on gender equality. H.3.3: Trade liberalization <i>significantly moderates</i> the link between gender equality and institutional quality. H.3.4: Institutional quality <i>significantly moderates</i> the link between gender equality and trade liberalization. H.3.5: Trade liberalization has a <i>significant contextual effect</i> on the gender-liberalization and gender-institution links. H.3.6: Institutional quality has a <i>significant contextual effect</i> on the gender-liberalization and gender-institution links.
RO 4	H.4.1: Trade liberalization has a <i>significant effect</i> on environmental quality H.4.2: Institutional quality has a <i>significant positive effect</i> on environmental quality H.4.3: Institutional quality <i>significantly moderates</i> the link between environmental quality and trade liberalization. H.4.4: Trade liberalization has a <i>significant contextual effect</i> on the environment-liberalization and environment-institution links. H.4.5: Institutional quality has a <i>significant contextual effect</i> on the environment-liberalization and environment-institution links.

Source: The author.

In order to achieve four research objectives and test the research hypotheses of the dissertation, the integrated analytical framework, which includes Panel A and Panel B, has been proposed as follows:

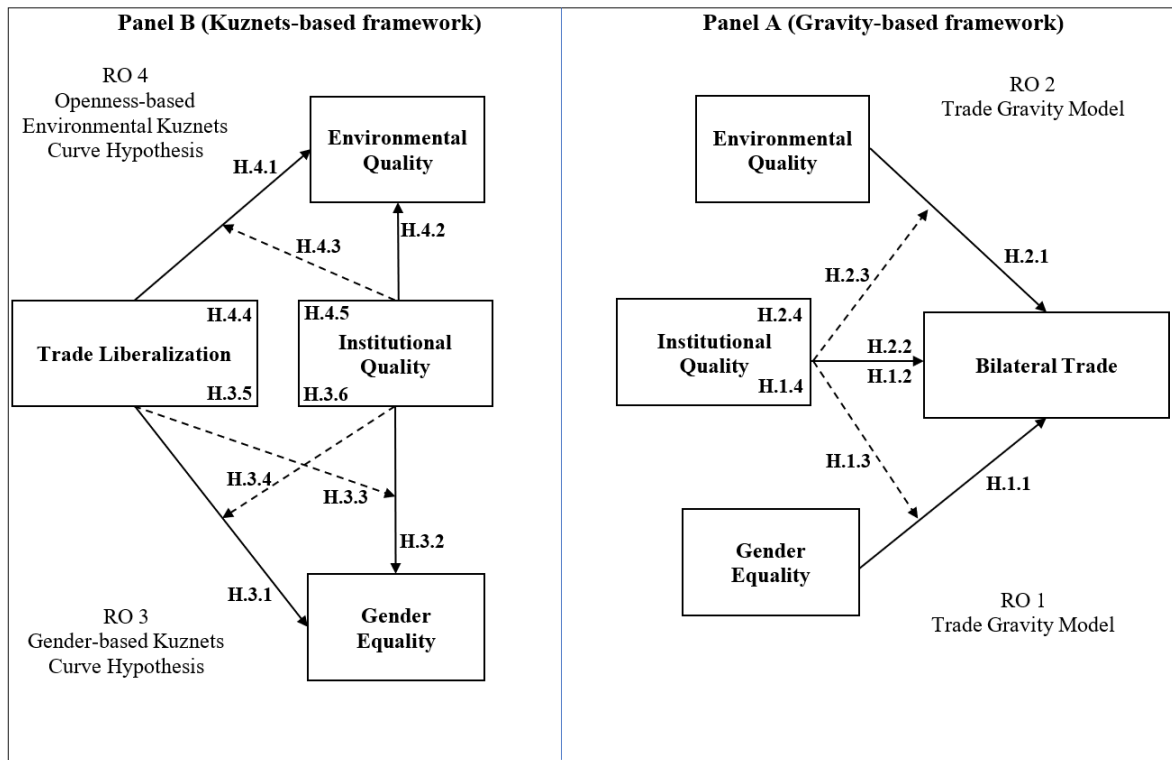


Figure 2.1: The integrated analytical framework

Source: The author.

As could be seen in Figure 2.1, the integrated analytical framework aims at investigating the relationships between trade (liberalization and bilateral flows), environmental quality, gender quality, and institutional quality (six institutional dimensions and environmental institutional quality). For achieving RO 1 and RO 2 in Panel A, the *Trade Gravity Model* is employed to analyze the direct effects of gender equality, environmental quality, and institutional quality on bilateral trade flows. In addition, the moderating and contextual effects of institutional quality on trade-gender and trade-environment links are investigated. For achieving RO 3 in Panel B, the *Gender-based Kuznets Curve Hypothesis (GKC model)* is applied to discovering the nexus between trade liberalization and gender equality. The moderating effects of institutional quality and trade liberalization on the gender-

liberalization and gender-institution links have also been investigated by the GKC framework. For achieving RO 4 in Panel B, the *Openness-based Environmental Kuznets Curve Hypothesis (OEKC model)* is applied to exploring the linear and curvilinear relationship between trade liberalization and environmental quality. In addition, the moderating effect of institutional quality on the linear and curvilinear environment-liberalization link has been examined by the OEKC framework. The integrated analytical framework presented in Figure 2.1 makes a substantial theoretical contribution by unifying the trade gravity approach with the Gender-based (GKC) and Openness-based Environmental Kuznets Curve (OEKC) hypotheses into a single and cohesive research structure. This framework advances existing theory by systematically exploring the complex nexus between trade, gender equality, and environmental quality, addressing the notable gap in integrated research that simultaneously considers these three pillars of sustainability. A key theoretical contribution of this framework is the conceptualization of institutional quality as a multi-dimensional moderator rather than a single aggregate index, which allows for a more granular analysis of how specific governance dimensions influence both linear and curvilinear relationships. By bridging bilateral and global macro-perspectives, the proposed framework provides a robust theoretical foundation for understanding the conditions under which trade liberalization aligns with inclusive and green growth mandates.

The four following empirical chapters of this dissertation (Chapters 3, 4, 5, and 6) are logically interconnected within an integrated framework in Figure 2.1 that explores the trade-gender-environment nexus under the overarching influence of institutional quality. Chapters 3 and 4 will establish the bilateral foundation by utilizing a trade gravity approach to investigate how gender equality and environmental quality influence trade flows, while examining how these relationships are moderated by specific institutional settings. To continue the logic, Chapters 5 and 6 will switch to a global macro-perspective by testing the Gender-based (GKC) and Openness-based Environmental Kuznets Curve (OEKC) hypotheses. Across all four

empirical chapters, institutional quality serves as the unifying thread which acts as a critical moderator that determines whether trade liberalization can be effectively aligned with gender inclusion and environmental sustainability mandates. This multi-dimensional approach ensures a comprehensive understanding of the path toward sustainable development on both bilateral and global basements.

CHAPTER 3: THE GRAVITATIONAL APPROACH TO THE TRADE, GENDER EQUALITY, AND INSTITUTIONAL QUALITY NEXUS

3.1. Introduction

As driven by Goal 5 and Goal 17 in the SDGs of The Agenda 2030, this chapter employs trade gravity model to investigating the nexus between bilateral trade (global partnership), gender equality, and institutional quality. As previously reviewed in Chapter 2, there have been some relevant theories which suggest the under-explored effects of gender equality on trade, namely *The Feminist Trade Theory* (Elson et al., 2012), *The Rybczynski Theorem of The Heckscher-Ohlin (H-O) Theory* (Rybczynski, 1955), and *The Competitive Advantage Theory* (Porter, 1990). The feminist trade theory (Elson et al., 2012; UNCTAD/DITC, 2022) argues that gender inequality could act either as a barrier to women exporting entrepreneurship (hampering effect on trade) or as a driver of low-cost advantages of labour-intensive exporting firms (boosting effect on trade). Based on the Rybczynski theorem (Rybczynski, 1955), it could be argued that the biased expansion towards female labour-intensive goods of the production possibility frontier could increase the relative supply which ultimately boosts the exporting flows of those goods. The biased expansion is caused by the increasing female labour force participation as a result of improved gender equality. Thus, this theorem has suggested the contribution of gender equality to trade (export). Finally, the competitive advantage theory (Porter, 1990) emphasizes the contribution of factor endowments to the national advantage, which ultimately boosts the export growth of given industries/sectors. Gender equality increases factor endowments by increasing female labour force participation (basic factors) and empowering women entrepreneurs (advanced factors).

From the empirical perspective, previous research has indicated mixed results relevant to the impacts of gender equality on trade. For example:

(-) Negative impacts: Gender wage inequality increases export sales and export growth of labour-intensive industries (Busse & Spielmann, 2006; Seguino, 1997; Seguino, 2000);

(+) Positive impacts: Ryu and Nam (2024) has explored the positive impact of gender equality on trade in the case of 10 ASEAN member economies in 1998-2021 period. Sajid et al. (2025) has highlighted the crucial role of gender equality in driving trade openness for the case of Developing-8 (D-8) countries in 1990-2020 period.

However, the research gap is the effects of gender equality on bilateral trade which include the two sides of a trading relationship (exporting and importing). In addition, the moderating and contextual effects of institutional quality on the nexus between bilateral trade and gender equality have been under-examined by previous research. Therefore, the chapter proposes four hypotheses as follows:

H.1.1: Gender equality (of the exporting and importing country) has a significant positive effect on bilateral trade.

H.1.1.1: Gender development (of the exporting and importing country) has a significant positive effect on bilateral trade.

H.1.1.2: Gender inequality (of the exporting and importing country) has a significant negative effect on bilateral trade.

H.1.1.3: Female labor force participation (of the exporting and importing country) has a significant positive effect on bilateral trade.

H.1.2: Institutional quality (of the exporting and importing country) has a significant positive effect on bilateral trade.

H.1.3: Institutional quality (of the exporting and importing country) significantly moderates the link between bilateral trade and gender equality.

H.1.3.1: Institutional quality (of the exporting and importing country) significantly moderates the link between bilateral trade and gender development.

H.1.3.2: Institutional quality (of the exporting and importing country) significantly moderates the link between bilateral trade and gender inequality.

H.1.3.3: Institutional quality (of the exporting and importing country) significantly moderates the link between bilateral trade and female labor force participation.

H.1.4: Institutional quality (of the exporting and importing country) has a significant contextual effect on the link between bilateral trade and gender equality.

3.2. Model specification, variable measurement, and estimation strategy

3.2.1. Model specification and variable measurement

To examine the proposed hypotheses, the general dynamic trade gravity model with gender equality and institutional quality has been proposed as follows (Eshetu & Goshu, 2021; Golovko & Sahin, 2021; Islam et al., 2024; Lohani, 2024; Martínez-Martínez et al., 2023):

$$\begin{aligned} \text{Trade}_{ijt} = & \alpha_0 + \alpha_1 \text{Trade}_{ij,t-1} + \alpha_2 \text{Trade}_{ij,t-2} + \alpha_3 \text{Size}_{it1} + \alpha_4 \text{Size}_{it2} + \alpha_5 \text{Size}_{jt1} \\ & + \alpha_6 \text{Size}_{jt2} + \alpha_7 \text{Distance}_{ij} + \alpha_8 \text{IQ}_{it} + \alpha_9 \text{IQ}_{jt} + \alpha_{10} \text{GE}_{it} + \alpha_{11} \text{GE}_{jt} \\ & + \alpha_{12} (\text{IQ} \cdot \text{GE})_{it} + \alpha_{13} (\text{IQ} \cdot \text{GE})_{jt} + \alpha_{14} \text{MRT}_{it} + \alpha_{15} \text{MRT}_{jt} \\ & + \sum_{k=16}^{26} \alpha_k \text{Control}_{k,ij,t,ij,ijt} + \sum_{m=27}^{30} \alpha_m \text{FE}_{m,ij,ij,t} + \varepsilon_{ijt} \end{aligned}$$

where i and j denote the exporting and importing country, t denotes the year of the observation, α denotes the coefficients of explanatory variables (except for α_0 which denotes the y-intercept of the estimation), and $t-1$ and $t-2$ denote the first and second lags of the dependent variable Trade_{ijt} . Trade_{ijt} is the bilateral trade, Size_{it1} , Size_{it2} , Size_{jt1} , and Size_{jt2} denotes gross domestic product (economic size) and population, Distance_{ij} is the geographic distance, IQ_{it} and IQ_{jt} denote the institutional quality, GE_{it} and GE_{jt} denote the gender equality, $(\text{IQ} \cdot \text{GE})_{it}$ and $(\text{IQ} \cdot \text{GE})_{jt}$ denote the cross-terms of institutional quality and gender equality, which

allows the examination of the moderating effect of institutional quality on the trade-gender nexus, MRT_{it} and MRT_{jt} are the multilateral resistance terms (MRT) for addressing the *third-country effect* on the bilateral trading relationship as pointed out by Anderson and Van Wincoop (2003), Baier and Bergstrand (2009), and Head and Mayer (2014), $\sum_{k=16}^{26} \alpha_k Control_{k,i,j,t,ij,ijt}$ denotes the set of control variables for the individual and common characteristics of country i and j in year t and for the special global events in year t , $\sum_{m=27}^{30} \alpha_m FE_{m,i,j,ij,t}$ denotes the set of control variables for exporter-fixed (i), importer-fixed (j), countrypair-fixed (ij), and year-fixed effects (t), and ε_{ijt} denotes the error term of the estimation. Based on the general model, the specific model has been proposed whose variables are interpreted in Table A.1 (the Appendices A).

The three gender equality variables (dependent variables) and six institutional quality variables (explanatory variables) are included separately in the research models in order to avoid the potential multi-collinearity. Control variables include:

- + Bilateral exchange rates: Fluctuations affect the relative prices of imports and exports, influencing trade competitiveness and stability
- + Income gap: A larger gap can either encourage trade due to comparative advantages or discourage it due to differing consumer preferences
- + Economic similarity: Economically similar countries tend to trade more with each other, particularly in differentiated manufacturing goods (intra-industry trade).
- + Regional trade agreements: Trade agreements artificially lower trade barriers by reducing or eliminating tariffs and quotas.
- + Landlockedness: Being landlocked significantly raises transport costs and acts as a barrier to international trade.
- + Common colonial history: Historical ties typically establish enduring legal, institutional, and cultural networks that facilitate trade.

+ Common official language: A common language dramatically lowers communication costs, reduces information asymmetry, and simplifies contract negotiations.

+ Common land border: Shared borders drastically reduce transit times and trade costs, boosting trade volume.

+ Global economic and financial crisis: This accounts for massive, systemic drops in worldwide aggregate demand and trade financing.

+ Global COVID-19 pandemic: This accounts for exogenous shocks like border closures, supply chain bottlenecks, and sudden shifts in global supply and demand.

The panel data samples include the aggregated, partners of high institutional quality (high-high direction), partners of low institutional quality (low-low direction), and partners of different institutional quality (high-low and low-high directions). Data sources are built from the databases of World Bank and World Trade Organization. The distance and common characteristics variables are built based on Conte et al. (2022). The panel includes 41 countries (Vietnam and 40 largest trading partners) in the 2002-2021 period. The panel size is $41 \times 40 \times 20 = 32,800$ observations, which includes Vietnam and the most dynamic trading economies which are selected based on the total trade value in the 2017-2021 period.

3.2.2. Estimation strategy

To estimate the proposed models, this chapter employs the combined fixed effect (FE), random effect (RE), and two-step system generalized method of moments (SGMM-II) methods. The combined fixed effect estimation is applied to deal with the heterogeneity in the panel data which includes several countries (Cheng & Wall, 2005; Gupta et al., 2025; Huang et al., 2024; Le & Pham, 2024; Lohani, 2024). Two types of fixed effect estimation include:

+ The first type (FE-I) estimation includes year-fixed and dyad-fixed effect (Carter & Poast, 2020; Le, 2022; Le & Pham, 2024; Lohani, 2024; Nasrullah et al., 2020; Magee, 2008).

+ The second type (FE-II) estimation includes reporter-fixed (exporter-fixed), partner-fixed (importer-fixed) and year-fixed effect (Anderson & Van Wincoop, 2003; Gupta et al., 2025; Le, 2022; Le & Pham, 2024; Lohani, 2024; Song et al., 2022; Yu et al., 2020).

Furthermore, the chapter does not apply the PPML technique to research models because all zero values of bilateral trade have been increased by one unit (Hong et al., 2023).

For treating the endogeneity in dynamic panel models of macroeconomic variables, several recent studies have been using the SGMM-II method to deal with endogeneity caused by reverse causality (or simultaneity bias) and dynamic model with lagged dependent variables. For example, Emikonel (2022), Eshetu and Goshu (2021), Gupta et al. (2025), Kahouli (2016), Le (2022), Le and Pham (2024), Nguyen (2021), and Osinubi and Simatele (2025) have applied the SGMM-II methods to alleviate endogeneity which is caused by the dynamic panel data with large N and short T (Arellano & Bond, 1991; Blundell & Bond, 1998; Roodman, 2009). Therefore, this chapter also applies System-GMM two-step to the estimation of research models.

The endogenous variables include gross domestic product of the exporting and importing countries and the bilateral exchange rate (Kahouli, 2016; Le, 2022; Le & Pham, 2024). This is due to three reasons. First, the measurement unit of those variables are currency, which is similar to that of the dependent variable (bilateral trade value), which consequently leads to considerable possibility of reverse causality as compared to other variables of gender equality and institutional quality (those variables are indices of no measurement or percentage unit). Second, it is highly unlikely that specific bilateral trade between the two nations would have a reverse

impact on their overall national gender equality and institutional quality. Third, simultaneously addressing the endogeneity of multiple regressors (exceeding three in this chapter) leads to an explosion in the number of instruments relative to the number of cross-sectional units (N). This instrument proliferation can weaken the Hansen test's power to detect overidentifying restrictions, potentially leading to misleadingly high p-values and biased estimates. Furthermore, the number of groups (N) will also decrease in the models of contextual effects, which could exacerbate the negative effect of instrument proliferation.

Regarding diagnostic tests, the Hausman test (Hausman, 1978) is applied to the justification of fixed and random effect methods. The rejection of the null hypothesis justifies the fixed effect method for the research models. For the SGMM-II method, the tests of Arellano and Bond first and second autocorrelation AR(1) and AR(2) (z), and Hansen's over-identification restrictions (χ^2) (Arellano & Bond, 1991; Roodman, 2009) are employed. The SGMM-II estimation is justified when the p-value of AR(1) test is lower than 5% and the p-values of AR(2) and Hansen tests are higher than 5%.

To ensure the reliability of the findings, the dissertation has conducted a cross-comparison between FE-I, FE-II, and SGMM-II estimations. This is due to the fact that for a subset of variables the estimated coefficients exhibited conflicting signs. Such divergences often results from the inability of FE models to account for dynamic endogeneity or the inherent bias in short-panel datasets ($T < 30$). To maintain the reliability for empirical significance, the dissertation has not considered coefficients with conflicting signs from the discussion of confirmed impacts. This could be seen in the note at the end of each summary table. Therefore, the results reported in the summary tables in this chapter focus exclusively on those variables where the direction of the effect is harmonized and consistent across both estimators, thereby providing a more reliable basis for the conclusions.

3.3. Empirical results and discussion

3.3.1. Descriptive and preliminary analysis

Before proceeding with the estimations, this section provides an overview of the dataset's characteristics. To define the scope of the analysis, the selection of global trading partners included in the panel data is presented. Table A.5 (the Appendices A) details the specific bilateral partners analyzed in this chapter.

Table 3.1 demonstrates the descriptive statistics of the original variables.

Table 3.1: Descriptive statistics

Variables	Unit	Observation	Mean	Std. Dev.	Min	Max
BIT _{ijt}	Billion US\$	32,800	0.006	0.020	0	0.577
GDP _{it,jt}	Billion US\$	32,800	1,480.201	2,960.989	35.064	23,315.08
POP _{it,jt}	Million people	32,800	117.597	278.146	3.634	1,412.36
DIST _{ij}	Kilometer	32,800	6,817.251	4,634.26	59.61723	19,079.88
GDI _{it,jt}	-	32,800	0.965	0.050	0	1.05
GII _{it,jt}	-	32,800	0.215	0.157	0	0.69
FLA _{it,jt}	-	32,800	51.184	10.190	15.184	72.636
COC _{it,jt}	-	32,800	0.810	1.014	-1.141	2.459
GVE _{it,jt}	-	32,800	0.959	0.788	-0.602	2.426
POS _{it,jt}	-	32,800	0.374	0.790	-2.095	1.753
REQ _{it,jt}	-	32,800	0.910	0.747	-0.866	2.255
ROL _{it,jt}	-	32,800	0.838	0.881	-1.011	2.125
VAC _{it,jt}	-	32,800	0.615	0.946	-1.907	1.801
EXG _{jit}	LCU	32,800	450.917	2,686.701	0.00003	34,798.37
ESIM _{ijt}	-	32,800	0.335	0.143	0.006	0.5
DIN _{ijt}	US\$/person	32,800	24,625.69	18,953.34	1.332	101,475.4

Source: The author.

Table 3.2 demonstrates the Pearson correlation matrix of continuous variables included in the research models.

Table 3.2: Pearson correlation matrix

	$\ln(1 + \text{BIT})_{ijt}$	$\ln \text{GDP}_{it}$	$\ln \text{GDP}_{jt}$	$\ln \text{POP}_{it}$	$\ln \text{POP}_{jt}$	$\ln \text{DIST}_{ij}$	$\ln \text{GDI}_{it}$
$\ln(1 + \text{BIT})_{ijt}$	1.000						
$\ln \text{GDP}_{it}$	0.460 ^c	1.000					
$\ln \text{GDP}_{jt}$	0.477 ^c	0.043 ^c	1.000				
$\ln \text{POP}_{it}$	0.221 ^c	0.647 ^c	-0.008	1.000			

lnPOP_{jt}	0.233 ^c	-0.008	0.647 ^c	-0.024 ^c	1.000			
lnDIST_{ij}	-0.385 ^c	0.083 ^c	0.083 ^c	0.228 ^c	0.228 ^c	1.000		
lnGDI_{it}	0.099 ^c	-0.064 ^c	0.044 ^c	-0.356 ^c	0.015 ^c	-0.110 ^c	1.000	
lnGDI_{jt}	0.002	0.044 ^c	-0.064 ^c	0.015 ^c	-0.356 ^c	-0.110 ^c	0.006	
lnGII_{it}	-0.222 ^c	-0.070 ^c	-0.057 ^c	0.554 ^c	-0.023 ^c	0.252 ^c	-0.372 ^c	
lnGII_{jt}	-0.152 ^c	-0.057 ^c	-0.070 ^c	-0.023 ^c	0.554 ^c	0.252 ^c	-0.038 ^c	
lnFLA_{it}	0.199 ^c	0.022 ^c	0.019 ^c	-0.197 ^c	0.008	-0.026 ^c	0.715 ^c	
lnFLA_{jt}	0.045 ^c	0.019 ^c	0.022 ^c	0.008	-0.197 ^c	-0.026 ^c	-0.004	
lnEXG_{jit}	0.039 ^c	-0.126 ^c	0.126 ^c	0.230 ^c	-0.230 ^c	0.001	-0.132 ^c	
lnDIN_{ijt}	0.007	0.041 ^c	0.041 ^c	-0.084 ^c	-0.084 ^c	0.057 ^c	0.038 ^c	
lnESIM_{ijt}	-0.223 ^c	-0.228 ^c	-0.228 ^c	-0.190 ^c	-0.190 ^c	-0.077 ^c	-0.069 ^c	
	lnGDI_{jt}	lnGII_{it}	lnGII_{jt}	lnFLA_{it}	lnFLA_{jt}	lnEXG_{jit}	lnDIN_{ijt}	lnESIM_{ijt}
lnGDI_{jt}	1.000							
lnGII_{it}	-0.038 ^c	1.000						
lnGII_{jt}	-0.372 ^c	0.054 ^c	1.000					
lnFLA_{it}	-0.004	-0.466 ^c	-0.009 ^a	1.000				
lnFLA_{jt}	0.715 ^c	-0.009 ^a	-0.466 ^c	-0.019 ^c	1.000			
lnEXG_{jit}	0.132 ^c	0.293 ^c	-0.293 ^c	-0.008	0.008	1.000		
lnDIN_{ijt}	0.038 ^c	-0.162 ^c	-0.162 ^c	0.078 ^c	0.078 ^c	0.001	1.000	
lnESIM_{ijt}	-0.069 ^c	-0.071 ^c	-0.071 ^c	-0.080 ^c	-0.080 ^c	0.001	-0.004	1.000

Letters a, b, and c denote the 10%, 5%, and 1% significance levels respectively.

Source: The author.

Table B.1 (please see Appendices B) confirms the cross-dependence of all variables in the research models (CD tests) at the significance level of 1%. Therefore, the Pesaran tests for non-stationarity (Pesaran, 2004) are applied to those variables. However, the critical values of the tests have not been provided by the statistical software due to the technical limits which results in the undecided stationarity. Nevertheless, the Kao (Kao, 1999) and Westerlund (Westerlund, 2005) tests have indicated the co-integration or the long-term relationship between bilateral trade, gender equality, and the other continuous variables in the research models. Therefore, all of the variables are included in the level form (not the difference form). Moreover, the variables in level allow the examination of long-term relationships instead of immediate or short-term links between variables. More importantly, the SGMM-II method includes the differencing of variables in the estimation process, thus the inclusion of variables in difference will lead to the double-differencing which makes the results meaningless or even uninterpretable. As a result, all of the variables are

included in the models in the level form. Furthermore, while the second-generation tests are generally preferred for handling cross-sectional dependence, the results from first-generation tests in Table B.2 (Appendices B) are often sufficient in research practice when software constraints make advanced tests impractical (Choi, 2001; Harris & Tzavalis, 1999; Im et al., 2003; Levin et al., 2002). Therefore, this chapter uses these robust and widely accepted first-generation tests to serve as the primary official evidence for established stationarity, which provides a reliable and valid basis for the subsequent econometric analyses.

3.3.2. Results for the aggregated sample

Table 3.3 demonstrates the summary of estimation results for the models of the aggregated sample. Column (1), (2), and (3) indicate the results of FE-I, FE-II, and SGMM-II methods. Please see the Appendices of Chapter 3 for detailed reports of estimation results in Table C3.1, C3.2, C3.3, C3.4, C3.5, C3.6, and C3.7. As could be seen in the Appendices of Chapter 3, the Hausman tests have indicated that fixed effect estimation is more appropriate than random effect estimation at the significant level of 5%, except the VAC model with female labor force participation (Table C3.6 – Column (8)) which justifies the random effect estimation. SGMM-II estimations are justified as the p-value of AR(1) test is lower than 5% and the p-values of AR(2) and Hansen tests are higher than 5%. For robustness check, Table C3.29, C3.30, and C3.31 demonstrate the PPML estimation results for GDI, GII, and FLA models (Appendices of Chapter 3).

Table 3.3: Estimation results summary for models of the aggregated sample

Institutional quality's dimensions	Gender equality indicators	FE-I (1)	FE-II (2)	SGMM-II (3)
Control of Corruption (COC)	Exporter's COC (direct)			
	Importer's COC (direct)			
	Exporter's GDI (direct)	3.385 ^c	3.487 ^c	
	Importer's GDI (direct)	3.385 ^c	3.487 ^c	
	Exporter's COC*GDI (moderating)	-5.196 ^c	-5.194 ^a	
	Importer's COC*GDI (moderating)	-4.338 ^c	-4.400 ^c	
	Exporter's COC (direct)	0.082 ^a		
	Importer's COC (direct)			

	Exporter's GII (direct)	0.080 ^a		
	Importer's GII (direct)	0.117 ^b	0.128 ^b	
	Exporter's COC*GII (moderating)	0.158 ^c	0.164 ^c	
	Importer's COC*GII (moderating)	0.050 ^b	0.057 ^b	
	Exporter's COC (direct)			
	Importer's COC (direct)			
	Exporter's FLA (direct)			
	Importer's FLA (direct)			6.209^a
	Exporter's COC*FLA (moderating)	-0.058 ^c	-0.060 ^c	0.563 ^b
	Importer's COC*FLA (moderating)			0.614 ^b
Government Effectiveness (GVE)	Exporter's GVE (direct)	0.231 ^c	0.235 ^b	
	Importer's GVE (direct)			
	Exporter's GDI (direct)	5.056^c	5.111^c	
	Importer's GDI (direct)	3.033^c	3.136^c	
	Exporter's GVE*GDI (moderating)	-3.443^c	-3.336^b	
	Importer's GVE*GDI (moderating)	-1.796^c	-1.755^c	
	Exporter's GVE (direct)	0.352 ^c	0.365 ^c	
	Importer's GVE (direct)			
	Exporter's GII (direct)	0.244 ^c	0.256 ^c	
	Importer's GII (direct)	0.156^c	0.169^c	
	Exporter's GVE*GII (moderating)			
	Importer's GVE*GII (moderating)			
	Exporter's GVE (direct)	0.270^c	0.276^c	
	Importer's GVE (direct)			
	Exporter's FLA (direct)			
	Importer's FLA (direct)			
	Exporter's GVE*FLA (moderating)	0.020 ^c		
	Importer's GVE*FLA (moderating)			
Political Stability and Absence of Violence/Terrorism (POS)	Exporter's POS (direct)	-0.057 ^b		
	Importer's POS (direct)	-0.064^b	-0.053^a	
	Exporter's GDI (direct)	4.677 ^c	4.738 ^b	-24.988 ^c
	Importer's GDI (direct)	2.591 ^c	2.693 ^c	-18.682 ^b
	Exporter's POS*GDI (moderating)	-2.922 ^c	-2.785 ^a	12.782 ^b
	Importer's POS*GDI (moderating)			12.351 ^b
	Exporter's POS (direct)			
	Importer's POS (direct)	-0.055 ^b		
	Exporter's GII (direct)	0.202 ^c	0.213 ^b	
	Importer's GII (direct)	0.146^c	0.158^c	
	Exporter's POS*GII (moderating)			
	Importer's POS*GII (moderating)			
	Exporter's POS (direct)	-0.070 ^b		
	Importer's POS (direct)	-0.060 ^b		
	Exporter's FLA (direct)			
	Importer's FLA (direct)			
	Exporter's POS*FLA (moderating)	0.020 ^c		-0.093 ^b
	Importer's POS*FLA (moderating)			-0.095 ^b
Regulatory Quality (REQ)	Exporter's REQ (direct)	-0.227^c	-0.213^b	
	Importer's REQ (direct)	-0.153^c	-0.139^b	
	Exporter's GDI (direct)	4.659 ^c	4.679 ^b	-30.575 ^b
	Importer's GDI (direct)	2.830 ^c	2.890 ^c	-30.303 ^b

	Exporter's REQ*GDI (moderating)	-2.271 ^c		
	Importer's REQ*GDI (moderating)	-1.487^b	-1.312^a	
Rule of Law (ROL)	Exporter's REQ (direct)			
	Importer's REQ (direct)	-0.087 ^b		-0.640 ^a
	Exporter's GII (direct)	0.128 ^c		
	Importer's GII (direct)	0.138 ^c	0.153 ^c	
	Exporter's REQ*GII (moderating)	0.072^c	0.077^c	
	Importer's REQ*GII (moderating)			
	Exporter's REQ (direct)	-0.156 ^c		-0.780 ^b
	Importer's REQ (direct)	-0.142^c	-0.135^c	-0.783^b
	Exporter's FLA (direct)			
	Importer's FLA (direct)			
	Exporter's REQ*FLA (moderating)			
	Importer's REQ*FLA (moderating)			
	Exporter's ROL (direct)	0.163 ^c		
	Importer's ROL (direct)			
	Exporter's GDI (direct)	4.881 ^c	4.990 ^c	-37.866 ^a
Voice and Accountability (VAC)	Importer's GDI (direct)	2.664 ^c	2.819 ^c	-35.354 ^a
	Exporter's ROL*GDI (moderating)	-3.517 ^c		
	Importer's ROL*GDI (moderating)	-1.245 ^a	-1.063 ^a	17.751 ^a
	Exporter's ROL (direct)	0.185 ^c		
	Importer's ROL (direct)			
	Exporter's GII (direct)	0.183 ^c	0.193 ^a	
	Importer's GII (direct)	0.148 ^c	0.159 ^c	
	Exporter's ROL*GII (moderating)	0.044 ^c		
	Importer's ROL*GII (moderating)		0.027 ^a	
	Exporter's ROL (direct)	0.091 ^a		
	Importer's ROL (direct)			
	Exporter's FLA (direct)			
	Importer's FLA (direct)			
	Exporter's ROL*FLA (moderating)	0.035 ^c		
	Importer's ROL*FLA (moderating)			
	Exporter's VAC (direct)	-0.293^c	-0.287^c	
	Importer's VAC (direct)			
	Exporter's GDI (direct)	4.293 ^c	4.337 ^b	-41.361 ^c
	Importer's GDI (direct)	2.220 ^b	2.297 ^b	-34.688 ^b
	Exporter's VAC*GDI (moderating)	-2.445^b		-15.401^a
	Importer's VAC*GDI (moderating)	1.653 ^b	1.936 ^b	-15.284 ^a
	Exporter's VAC (direct)	-0.222^c	-0.214^b	
	Importer's VAC (direct)			
	Exporter's GII (direct)	0.145 ^c		
	Importer's GII (direct)	0.119 ^c	0.135 ^c	
	Exporter's VAC*GII (moderating)	0.043^c	0.044^a	
	Importer's VAC*GII (moderating)	0.036^c	0.036^c	
	Exporter's VAC (direct)	-0.289^c	-0.217^c	
	Importer's VAC (direct)		-0.195 ^c	
	Exporter's FLA (direct)		0.330 ^c	
	Importer's FLA (direct)		0.264 ^c	
	Exporter's VAC*FLA (moderating)			
	Importer's VAC*FLA (moderating)	-0.013^b	-0.036^c	

Overall Institutional Quality (IQ)	Exporter's IQ (direct)	4.190 ^c		
	Importer's IQ (direct)	-4.762 ^c	-4.988 ^c	
	Exporter's GDI (direct)	4.399 ^c	4.460 ^b	-29.419 ^a
	Importer's GDI (direct)	2.285^b	2.385^b	
	Exporter's IQ*GDI (moderating)	-6.089 ^c		
	Importer's IQ*GDI (moderating)	6.986 ^c	7.331 ^c	
	Exporter's IQ (direct)	-0.463^c	-0.477^c	
	Importer's IQ (direct)		-0.102 ^b	0.814 ^a
	Exporter's GII (direct)	0.130 ^c		
	Importer's GII (direct)	0.148 ^c	0.157 ^c	
	Exporter's IQ*GII (moderating)	3.039 ^c	3.162 ^c	-4.284 ^a
	Importer's IQ*GII (moderating)		0.550 ^a	-5.696 ^b
	Exporter's IQ (direct)	4.835^c	4.942^c	
	Importer's IQ (direct)			
	Exporter's FLA (direct)	0.269 ^b		
	Importer's FLA (direct)			
	Exporter's IQ*FLA (moderating)	-1.220^c	-1.245^b	
	Importer's IQ*FLA (moderating)			

Note: (1) Blank cells demonstrate non-significant links; Grey cells indicate non-confirmed links; Italic numbers indicate significant negative links; Values in bold indicate the links further supported by PPML estimation for robustness check. (2) Links are not confirmed when (i) there are conflicting results of FE-I, FE-II, SGMM-II, and PPML estimations or (ii) the links are only significant in one of FE-I, FE-II, and PPML estimations or (iii) the links are only significant in one of FE-I and FE-II estimations. (3) Letters a, b, and c represent the 10%, 5%, and 1% significance levels respectively.

Source: The author.

Regarding the effects of gender equality on bilateral trade:

- (i) *Exporter's GDI* positively affects bilateral trade in COC and GVE models, while *importer's GDI* positively affects bilateral trade in COC, GVE, and IQ models;
- (ii) *Importer's GII* positively affects bilateral trade in all models.

Interestingly, exporter's GDI increases bilateral trade, which supports the *hampering effect of gender inequality* suggested by the feminist trade theory (Elson et al., 2012; UNCTAD/DITC, 2022), the Rybczynski theorem (Rybczynski, 1955), and the competitive advantage theory (Porter, 1990). From the importing side, while importer's GDI increases bilateral trade, importer's GII also increases bilateral trade. In the importing country, GDI could weaken the low-cost advantage of labour-intensive firms (Elson et al., 2012; UNCTAD/DITC, 2022), which consequently increases the domestic prices and facilitates the import flows of cheaper "like"

products from foreign suppliers. Whereas, GII could weaken the advanced factor endowments of the competitive advantage of specific domestic industries (Porter, 1990), which ultimately facilitates the import flows of competing foreign products.

Regarding the effects of institutional quality on bilateral trade:

(i) *Exporter's GVE* positively affects bilateral trade in GDI, GII, and FLA models.

(ii) *Importer's POS* negatively affects bilateral trade in the GDI models.

(iii) *Exporter's REQ* negatively affects bilateral trade in GDI and FLA models, while *importer's REQ* negatively affects bilateral trade in GDI and FLA models.

(iv) *Exporter's VAC* negatively affects bilateral trade in GDI, GII, and FLA models.

Exporter's GVE, which reflects the efficiency and capacity of the government in rules execution, could increase export value due to the cost and time saving effect on exporting firms, which is consistent with the research of Abreo et al. (2021), Nam et al. (2025), and Ngouhouo et al. (2021). Noticeably, findings on exporter's REQ and VAC, which reflect the private sector regulations, public participation, and political freedom, are somewhat counter-intuitive. This could be potentially explained by the proximity-concentration trade-off between exporting and foreign direct investment (Helpman et al., 2004). Accordingly, sound institutions could make domestic production more expensive due to higher compliance costs, which incentivizes offshoring activities of domestic firms to serve foreign markets and consequently decreases export flows. From the importing side, findings have consistently documented the negative effects on bilateral trade of POS and REQ. Those effects have indicated the mitigating role of institutional quality in trade deficit. In addition, improved institutional quality could make a country less dependent on import. These are new findings which contribute the relevant research on trade deficit. Particularly, import restriction measures should be removed and substituted by institutional quality enhancements in the effort of alleviating chronic trade deficit.

Regarding the moderating effect of institutional quality on the link between gender equality and bilateral trade:

(i) *Exporter's and importer's COC* negatively moderates the bilateral trade-GDI link and positively moderates the bilateral trade-GII link. These findings imply that when COC is high the positive effect of GDI on bilateral trade is weakened and the positive effect of GII on bilateral trade is strengthened. Meanwhile, *importer's COC* positively moderates the bilateral trade-FLA link, which implies that the positive effect of FLA on bilateral trade is enhanced when the COC is high.

(ii) *Exporter's and importer's GVE* negatively moderates the bilateral trade-GDI link. These findings have unveiled that the boosting effect of GDI on bilateral trade is hampered when GVE is high.

(iii) *Importer's POS* positively moderates the bilateral trade-GDI link and negatively moderates the bilateral trade-FLA link. These findings have indicated that high importer's POS facilitates the boosting effect of GDI and the hampering effect of FLA on import flows.

(iv) *Importer's REQ* negatively moderates the bilateral trade-GDI link, while *exporter's REQ* positively moderates the bilateral trade-GII link. From the importing side, high REQ initiates the hampering effect of GDI on import flows. Meanwhile, from the exporting side, high REQ triggers the promoting effect of GII on export flows.

(v) *Exporter's VAC* negatively moderates the bilateral trade-GDI link. Meanwhile, *exporter's and importer's VAC* positively moderates the bilateral trade-GII link. *Importer's VAC* negatively moderates the bilateral trade-FLA link. From the exporting side, high VAC triggers the hampering effect of GDI and the promoting effect of GII on export flows. From the importing side, high VAC strengthens the boosting effect of GII and triggers the hampering effect of FLA on bilateral trade.

(vi) *Exporter's overall IQ* negatively moderates the bilateral trade-FLA link. From the exporting side, high overall IQ triggers the hampering effect of FLA on export flows.

3.3.3. Results for the high institutional quality sample (high-high)

Table 3.4 demonstrates the summary of estimation results for the models of the high institutional quality sample. Column (4), (5), and (6) indicate the results of FE-I, FE-II, and SGMM-II methods. Please the Appendices of Chapter 3 for detailed reports of estimation results in Table C3.8, C3.9, C3.10, C3.11, C3.12, C3.13, and C3.14. As could be seen in the Appendices of Chapter 3, the Hausman tests have indicated that fixed effect estimation is more appropriate than random effect estimation at the significant level of 5%. SGMM-II estimations are justified as the p-value of AR(1) test is lower than 5% and the p-values of AR(2) and Hansen tests are higher than 5%. For robustness check, Table C3.32, C3.33, and C3.34 demonstrate the PPML estimation results for GDI, GII, and FLA models (Appendices of Chapter 3).

Table 3.4: Estimation results summary for models of the partners of high institutional quality sample

Institutional quality's dimensions	Gender equality indicators	FE-I (4)	FE-II (5)	SGMM-II (6)
Control of Corruption (COC)	Exporter's COC (direct)			
	Importer's COC (direct)			
	Exporter's GDI (direct)	4.294 ^c	4.720 ^c	
	Importer's GDI (direct)	2.660 ^a		
	Exporter's COC (direct)			
	Importer's COC (direct)			
	Exporter's GII (direct)			-0.594 ^b
	Importer's GII (direct)			
	Exporter's COC (direct)			
	Importer's COC (direct)			
	Exporter's FLA (direct)	0.594 ^b		
	Importer's FLA (direct)	0.624 ^b	0.567 ^b	
Government Effectiveness (GVE)	Exporter's GVE (direct)			0.756 ^b
	Importer's GVE (direct)			0.681 ^a
	Exporter's GDI (direct)	4.791 ^c	7.211 ^c	
	Importer's GDI (direct)		4.140 ^a	
	Exporter's GVE (direct)			

	Importer's GVE (direct)	0.091^b	0.116^c	
	Exporter's GII (direct)			-0.463^a
	Importer's GII (direct)			
	Exporter's GVE (direct)			0.839^b
	Importer's GVE (direct)	0.105^b	0.139^c	0.807^b
	Exporter's FLA (direct)	0.473 ^a		
	Importer's FLA (direct)	0.454 ^b	0.764 ^a	
Political Stability and Absence of Violence/Terrorism (POS)	Exporter's POS (direct)	0.331^c	0.332^c	
	Importer's POS (direct)	0.298^c	0.333^c	
	Exporter's GDI (direct)		4.895 ^b	
	Importer's GDI (direct)			-15.259^a
	Exporter's POS (direct)	0.386^c	0.409^c	
	Importer's POS (direct)	0.282 ^c	0.335 ^b	
	Exporter's GII (direct)	0.200 ^c		-1.034^b
	Importer's GII (direct)	0.172 ^c	0.188 ^b	-0.765^a
	Exporter's POS (direct)	0.381^c	0.399^c	
	Importer's POS (direct)	0.280 ^c	0.327 ^b	
	Exporter's FLA (direct)	1.045 ^c	1.307 ^c	
	Importer's FLA (direct)			
Regulatory Quality (REQ)	Exporter's REQ (direct)			
	Importer's REQ (direct)			
	Exporter's GDI (direct)	5.047 ^c	4.176 ^a	
	Importer's GDI (direct)	4.255 ^b		
	Exporter's REQ (direct)			
	Importer's REQ (direct)			
	Exporter's GII (direct)	0.165 ^c		
	Importer's GII (direct)			
	Exporter's REQ (direct)			
	Importer's REQ (direct)			
Rule of Law (ROL)	Exporter's FLA (direct)			
	Importer's FLA (direct)	0.635 ^b		
	Exporter's ROL (direct)			
	Importer's ROL (direct)			
	Exporter's GDI (direct)	5.835 ^c	6.824 ^c	
	Importer's GDI (direct)	3.484 ^a		
	Exporter's ROL (direct)			
	Importer's ROL (direct)			
	Exporter's GII (direct)			-1.087^a
	Importer's GII (direct)			
Voice and Accountability (VAC)	Exporter's ROL (direct)			
	Importer's ROL (direct)			
	Exporter's FLA (direct)			
	Importer's FLA (direct)	0.437 ^a		
	Exporter's VAC (direct)	-0.310 ^c	-0.295 ^a	
	Importer's VAC (direct)	0.267 ^c	0.250 ^c	
	Exporter's GDI (direct)	5.891 ^c	4.859 ^b	
	Importer's GDI (direct)	4.850 ^b	4.193 ^a	
	Exporter's VAC (direct)	-0.318 ^c		
	Importer's VAC (direct)	0.226 ^c	0.209 ^b	
	Exporter's GII (direct)	0.106 ^b		

Overall Institutional Quality (IQ)	Importer's GII (direct)			
	Exporter's VAC (direct)	-0.345^c	-0.331^a	-0.797^a
	Importer's VAC (direct)	0.246 ^c	0.228 ^b	
	Exporter's FLA (direct)			
	Importer's FLA (direct)			-2.256 ^a
	Exporter's GDI (direct)	6.560 ^c	5.613 ^b	
	Importer's GDI (direct)	8.201^c	9.447^b	
	Exporter's GII (direct)			
	Importer's GII (direct)			
	Exporter's FLA (direct)	1.044 ^c	1.116 ^b	
	Importer's FLA (direct)	1.153 ^c	1.414 ^b	

Note: (1) Blank cells demonstrate non-significant links; Grey cells indicate non-confirmed links; Italic numbers indicate significant negative links; Values in bold indicate the links further supported by PPML estimation for robustness check. (2) Links are not confirmed when (i) there are conflicting results of FE-I, FE-II, SGMM-II, and PPML estimations or (ii) the links are only significant in one of FE-I, FE-II, and PPML estimations or (iii) the links are only significant in one of FE-I and FE-II estimations. (3) Letters a, b, and c represent the 10%, 5%, and 1% significance levels respectively.

Source: The author.

Regarding the effects of gender equality on bilateral trade in the high-high institutional trading relationship:

(i) *Exporter's GII* negatively affects bilateral trade in COC, GVE, and ROL models.

(ii) *Exporter's FLA* positively affects bilateral trade in the overall IQ model.

From the exporting side, findings have indicated that exporter's FLA increase export flows, while exporter's GII restricts export flows. These findings have been supported by the feminist trade theory on the hampering effect of GII (Elson et al., 2012; UNCTAD/DITC, 2022), Rybczynski theorem (Rybczynski, 1955), and the competitive advantage theory (Porter, 1990). Meanwhile, there has been no effects from the importing side which are confirmed by the findings.

Regarding the effects of institutional quality on bilateral trade in the high-high institutional trading relationship:

(i) *Exporter's GVE* positively affects bilateral trade in GDI and FLA models, while *importer's GVE* positively affects bilateral trade in GDI, GII, and FLA models.

(ii) *Exporter's and importer's POS* positively affects bilateral trade in GDI, GII, and FLA models.

(iii) *Exporter's VAC* negatively affects bilateral trade in GDI and FLA models, while *importer's VAC* positively affects bilateral trade in GDI, GII, and FLA models.

From the exporting side, while GVE and POS increase export flows, VAC decreases export flows. From the importing side, GVE, POS, and VAC increase import flows.

3.3.4. Results for the low institutional quality sample (low-low)

Table 3.5 demonstrates the summary of estimation results for the models of the low institutional quality sample. Column (7), (8), and (9) indicate the results of FE-I, FE-II, and SGMM-II methods. Please see the Appendices of Chapter 3 for detailed reports of estimation results in Table C3.15, C3.16, C3.17, C3.18, C3.19, C3.20, and C3.21. As could be seen in the Appendices of Chapter 3, the Hausman tests have indicated that fixed effect estimation is more appropriate than random effect estimation at the significant level of 5%. SGMM-II estimations are justified as the p-value of AR(1) test is lower than 5% and the p-values of AR(2) and Hansen tests are higher than 5%. For robustness check, Table C3.35, C3.36, and C3.37 demonstrate the PPML estimation results for GDI, GII, and FLA models (Appendices of Chapter 3).

Table 3.5: Estimation results summary for models of the partners of low institutional quality sample

Institutional quality's dimensions	Gender equality indicators	FE-I (7)	FE-II (8)	SGMM-II (9)
Control of Corruption (COC)	Exporter's COC (direct)			
	Importer's COC (direct)			
	Exporter's GDI (direct)			
	Importer's GDI (direct)			
	Exporter's COC (direct)			
	Importer's COC (direct)			
	Exporter's GII (direct)			
	Importer's GII (direct)			
	Exporter's COC (direct)			

	Importer's COC (direct)			
	Exporter's FLA (direct)			
	Importer's FLA (direct)			
Government Effectiveness (GVE)	Exporter's GVE (direct)	0.217 ^b		
	Importer's GVE (direct)	-0.214 ^a		
	Exporter's GDI (direct)			
	Importer's GDI (direct)			
	Exporter's GVE (direct)	0.265 ^c	-0.934 ^a	
	Importer's GVE (direct)	-0.161 ^a	-1.144 ^b	
	Exporter's GII (direct)	0.265 ^b		
	Importer's GII (direct)			
	Exporter's GVE (direct)	0.226 ^c		
	Importer's GVE (direct)	-0.208 ^b		
	Exporter's FLA (direct)			
	Importer's FLA (direct)			
Political Stability and Absence of Violence/Terrorism (POS)	Exporter's POS (direct)	-0.206 ^c	-0.205 ^a	0.708 ^a
	Importer's POS (direct)	-0.145 ^c	-0.147 ^c	
	Exporter's GDI (direct)			
	Importer's GDI (direct)			
	Exporter's POS (direct)	-0.196 ^c	-0.185 ^a	
	Importer's POS (direct)	-0.144 ^c	-0.144 ^c	
	Exporter's GII (direct)			
	Importer's GII (direct)			
	Exporter's POS (direct)	-0.212 ^c	-0.210 ^a	
	Importer's POS (direct)	-0.142 ^c	-0.144 ^c	
	Exporter's FLA (direct)			
	Importer's FLA (direct)			
Regulatory Quality (REQ)	Exporter's REQ (direct)			
	Importer's REQ (direct)	-0.205 ^b	-0.145 ^a	
	Exporter's GDI (direct)			
	Importer's GDI (direct)			
	Exporter's REQ (direct)			
	Importer's REQ (direct)	-0.157 ^b		
	Exporter's GII (direct)			
	Importer's GII (direct)			-1.114 ^a
	Exporter's REQ (direct)			
	Importer's REQ (direct)	-0.183 ^b		
	Exporter's FLA (direct)			
	Importer's FLA (direct)			
Rule of Law (ROL)	Exporter's ROL (direct)	0.228 ^c		
	Importer's ROL (direct)			
	Exporter's GDI (direct)			-38.074 ^a
	Importer's GDI (direct)			
	Exporter's ROL (direct)	0.205 ^b		
	Importer's ROL (direct)			
	Exporter's GII (direct)			
	Importer's GII (direct)	0.256 ^a		
	Exporter's ROL (direct)	0.209 ^b		
	Importer's ROL (direct)			
	Exporter's FLA (direct)			

	Importer's FLA (direct)		
	Exporter's VAC (direct)		
	Importer's VAC (direct)	0.173 ^a	
	Exporter's GDI (direct)		-24.145 ^b
	Importer's GDI (direct)		-19.077 ^a
Voice and Accountability (VAC)	Exporter's VAC (direct)		
	Importer's VAC (direct)		
	Exporter's GII (direct)		
	Importer's GII (direct)	0.288^c	0.248^b
	Exporter's VAC (direct)		
	Importer's VAC (direct)	0.167 ^a	
	Exporter's FLA (direct)		
	Importer's FLA (direct)		
Overall Institutional Quality (IQ)	Exporter's GDI (direct)	2.009^b	2.576^a
	Importer's GDI (direct)		
	Exporter's GII (direct)	0.171 ^b	
	Importer's GII (direct)	0.248^c	0.214^b
	Exporter's FLA (direct)		
	Importer's FLA (direct)		

Note: (1) Blank cells demonstrate non-significant links; Grey cells indicate non-confirmed links; Italic numbers indicate significant negative links; Values in bold indicate the links further supported by PPML estimation for robustness check. (2) Links are not confirmed when (i) there are conflicting results of FE-I, FE-II, SGMM-II, and PPML estimations or (ii) the links are only significant in one of FE-I, FE-II, and PPML estimations or (iii) the links are only significant in one of FE-I and FE-II estimations. (3) Letters a, b, and c represent the 10%, 5%, and 1% significance levels respectively.

Source: The author.

Regarding the effects of gender equality on bilateral trade in the low-low institutional trading relationship, exporter's GDI positively affects export flows in the overall IQ model. These findings have been supported by the Rybczynski theorem (Rybczynski, 1955) and the competitive advantage theory (Porter, 1990).

Regarding the effects of institutional quality on bilateral trade in the low-low institutional trading relationship:

(i) *Importer's GVE* negatively affects import flows in the GII model.

(ii) *Exporter's POS* negatively affects export flows in GII and FLA models, while *importer's POS* negatively affects import flows in GDI, GII, and FLA models.

(iii) *Importer's REQ* negatively affects import flows in the GDI model.

Interestingly, findings have unveiled that in a given low-low institutional quality trading relationship exporter's POS decreases export flows while importer's decreases import flows. In other words, the improvement of POS has the hampering effect on bilateral trade of partners with low institutional quality. From the importing side, findings have explored the hampering effects on import flows of GVE, POS, and REQ. Those findings have documented the role of specific institutional dimensions in mitigating trade deficit of countries with low institutional quality.

3.3.5. Results for the different institutional quality sample (high-low and low-high)

Table 3.6 demonstrates the summary of estimation results for the models of the different institutional quality sample. Column (10), (11), and (12) indicate the results of FE-I, FE-II, and SGMM-II methods. Please see the Appendices of Chapter 3 for detailed reports of estimation results in Table C3.22, C3.23, C3.24, C3.25, C3.26, C3.27, and C3.28. As could be seen in the Appendices of Chapter 3, the Hausman tests have indicated that fixed effect estimation is more appropriate than random effect estimation at the significant level of 5%. SGMM-II estimations are justified as the p-value of AR(1) test is lower than 5% and the p-values of AR(2) and Hansen tests are higher than 5%. For robustness check, Table C3.38, C3.39, and C3.40 demonstrate the PPML estimation results for GDI, GII, and FLA models (Appendices of Chapter 3).

Table 3.6: Estimation results summary for models of the partners of different institutional quality sample

Institutional quality's dimensions	Gender equality indicators	FE-I (10)	FE-II (11)	SGMM-II (12)
Control of Corruption (COC)	Exporter's COC (direct)	0.143 ^b		
	Importer's COC (direct)			-0.883 ^a
	Exporter's GDI (direct)	2.070 ^b		-29.403 ^c
	Importer's GDI (direct)			-23.049 ^c
	Exporter's COC (direct)	0.148 ^b		
	Importer's COC (direct)			
	Exporter's GII (direct)			
	Importer's GII (direct)	-0.103 ^a		

	Exporter's COC (direct)	0.153 ^b		
	Importer's COC (direct)			
	Exporter's FLA (direct)			
	Importer's FLA (direct)			
Government Effectiveness (GVE)	Exporter's GVE (direct)	0.194^c	0.204^b	
	Importer's GVE (direct)	-0.087 ^b	-0.120 ^a	
	Exporter's GDI (direct)	3.563^c	2.626^a	
	Importer's GDI (direct)	1.394 ^b	1.929 ^b	-16.353 ^b
	Exporter's GVE (direct)	0.201^c	0.224^b	
	Importer's GVE (direct)	-0.087 ^b		
	Exporter's GII (direct)			
	Importer's GII (direct)		0.100 ^a	
	Exporter's GVE (direct)	0.204^c	0.206^b	
	Importer's GVE (direct)	-0.084 ^b	-0.118 ^a	
	Exporter's FLA (direct)			
	Importer's FLA (direct)			
Political Stability and Absence of Violence/Terrorism (POS)	Exporter's POS (direct)			
	Importer's POS (direct)			
	Exporter's GDI (direct)	4.190 ^c		-37.178 ^a
	Importer's GDI (direct)	1.756 ^a		
	Exporter's POS (direct)			
	Importer's POS (direct)			
	Exporter's GII (direct)	0.136 ^c		
	Importer's GII (direct)			
	Exporter's POS (direct)			
	Importer's POS (direct)			
Regulatory Quality (REQ)	Exporter's REQ (direct)	-0.102 ^b		
	Importer's REQ (direct)			
	Exporter's GDI (direct)	3.558 ^c	3.755 ^b	-45.011 ^c
	Importer's GDI (direct)			-40.453 ^c
	Exporter's REQ (direct)			
	Importer's REQ (direct)		0.109 ^a	
	Exporter's GII (direct)			
	Importer's GII (direct)			
	Exporter's REQ (direct)			
	Importer's REQ (direct)			
Rule of Law (ROL)	Exporter's FLA (direct)			
	Importer's FLA (direct)			
	Exporter's ROL (direct)	0.163 ^c	0.209 ^a	
	Importer's ROL (direct)			
	Exporter's GDI (direct)	3.180 ^c	2.452 ^a	-31.056 ^b
	Importer's GDI (direct)	1.195 ^a		-28.075 ^b
	Exporter's ROL (direct)	0.109^a		2.543^a
	Importer's ROL (direct)			
	Exporter's GII (direct)			
	Importer's GII (direct)			
	Exporter's ROL (direct)	0.117 ^b		
	Importer's ROL (direct)			

	Exporter's FLA (direct)			
	Importer's FLA (direct)			
	Exporter's VAC (direct)	-0.150^c	-0.222^a	
	Importer's VAC (direct)			
	Exporter's GDI (direct)	3.502 ^c	3.685 ^a	-37.154 ^b
	Importer's GDI (direct)	1.548 ^b	2.183 ^b	-37.708 ^a
	Exporter's VAC (direct)	-0.144^c		1.913 ^a
	Importer's VAC (direct)			2.064 ^b
	Exporter's GII (direct)			
	Importer's GII (direct)			
	Exporter's VAC (direct)	-0.138^b		
	Importer's VAC (direct)			
	Exporter's FLA (direct)			-5.768 ^b
	Importer's FLA (direct)			-4.023 ^a
	Exporter's GDI (direct)	3.830 ^c	3.017 ^a	-19.149 ^a
	Importer's GDI (direct)	1.471 ^a		
	Exporter's GII (direct)	0.089 ^a		
	Importer's GII (direct)			
	Exporter's FLA (direct)			
	Importer's FLA (direct)	-0.240^a		

Note: (1) Blank cells demonstrate non-significant links; Grey cells indicate non-confirmed links; Italic numbers indicate significant negative links; Values in bold indicate the links further supported by PPML estimation for robustness check. (2) Links are not confirmed when (i) there are conflicting results of FE-I, FE-II, SGMM-II, and PPML estimations or (ii) the links are only significant in one of FE-I, FE-II, and PPML estimations or (iii) the links are only significant in one of FE-I and FE-II estimations. (3) Letters a, b, and c represent the 10%, 5%, and 1% significance levels respectively.

Source: The author.

Regarding the effects of gender equality on bilateral trade in the low-high and high-low institutional trading relationship, *exporter's GDI* positively affects bilateral trade in the GVE model, while *importer's GDI* negatively affects bilateral trade in the COC model. From the exporting side, exporter's GDI significantly increases export flows. Those findings appear to be divergent. From the importing side, importer's GDI significantly decreases import flows. These findings have implied that gender equality could mitigate trade deficit and make importing countries less dependent on import.

Regarding the effects of institutional quality on bilateral trade:

(i) *Importer's COC* negatively affects bilateral trade in the GDI model.

(ii) *Exporter's GVE* positively affects bilateral trade in GDI, GII, and FLA models, while *importer's GVE* negatively affects bilateral trade in the FLA model.

(iii) *Exporter's ROL* positively affects bilateral trade in GDI and GII models.

(iv) *Exporter's VAC* negatively affects bilateral trade in the GDI model.

From the exporting side, findings have been divergent as GVE and ROL increase export flows while VAC decreases export flows. From the importing side, COC and GVE decrease import flows. These findings have implied that institutional quality could mitigate trade deficit and make importing countries less dependent on import.

3.4. Concluding remarks

As inspired by Goal 5 and Goal 17 in the SDGs of The Agenda 2030, this chapter has employed the trade gravity model to explore the effects of gender equality and institutional quality on bilateral trade. To solve the research objective, this chapter has proposed research hypotheses which are relevant to the direct effects of gender equality and institutional quality on bilateral trade, and the moderating and contextual effects of institutional quality on the link between bilateral trade and gender equality. In this chapter, gender equality is proxied by gender development index, gender inequality index, and female labor force participation. Institutional quality is proxied by six governance indicators and an overall institutional quality variable. Noticeably, the contextual effect of institutional quality is examined by three types of trading relationship, which includes high-high, low-low, and low-high & high-low (different) institutional settings. The panel data includes 41 countries (Vietnam and 40 largest trading partners) in the 2002-2021 period. The panel size is $41 \times 40 \times 20 = 32,800$ observations. Estimation methods include random effect, combined fixed effect (dyad-fixed, exporter-fixed, importer-fixed, and year-fixed), and two-step system GMM in order to deal with heterogeneity and endogeneity. Some noticeable findings of this chapter are as follows (please see Table C3.41 and C3.42 in the Appendices of Chapter 3 for the summary of explored effects):

Regarding the direct effect of gender equality on bilateral trade:

In the aggregated sample, exporter's and importer's GDI and GII have divergent effects on bilateral trade. Particularly, while gender equality proxied by GDI significantly increases bilateral trade, it significantly decreases bilateral trade when proxied by GII (importer's GII is positively associated with import flows).

In the high-high institutional trading relationship, exporter's gender equality, which is proxied by GII and FLA, significantly increases export flows.

In the low-low institutional trading relationship, exporter's gender equality, which is proxied by GDI, significantly increases export flows.

In the low-high & high-low (or different) institutional trading relationship, exporter's gender equality has the divergent effects, which significantly increases export flows when proxied by GDI. Meanwhile, importer's gender equality, which is proxied by GDI, significantly decreases import flows.

Regarding the direct effect of institutional quality on bilateral trade:

In the aggregated sample, exporter's institutional quality has the divergent effects on export flows. While exporter's GVE significantly increases export flows, exporter's REQ and VAC significantly decrease export flows. However, consistently from the importing side, importer's POS and REQ significantly reduce import flows.

In the high-high institutional trading relationship, exporter's institutional quality has divergent effects on export flows. Particularly, exporter's GVE and POS significantly boost export flows, whereas exporter's VAC have the significant detrimental effect on export flows. From the importing side, importer's GVE, POS, and VAC significantly increase import flows.

In the low-low institutional trading relationship, exporter's POS significantly decrease export flows. From the importing side, importer's GVE and POS significantly hamper import flows.

In the low-high & high-low (or different) institutional trading relationship, exporter's institutional quality has divergent effects on export flows. Particularly, exporter's GVE and ROL significantly increase export flows, while exporter's VAC significantly hamper export flows. From the importing side, importer's COC significantly decreases import flows.

Regarding the moderating effect of institutional quality on the link between gender equality and bilateral trade:

From the exporting side, exporter's COC, GVE, REQ, VAC, and the overall IQ negatively moderates the link between gender equality and bilateral trade. Those findings have implied that high institutional quality significantly triggers the detrimental effect of gender equality on export flows.

From the importing side, the findings are divergent which are dependent on specific proxies for gender equality and dimensions of institutional quality:

(i) In terms of GDI, importer's COC, GVE, and REQ have the negative moderating effect, while POS has the positive moderating effect.

(ii) In terms of GII, importer's COC positively moderates the link between gender inequality and import flows. This has implied that high COC triggers the hampering effect of gender equality on import flows.

(iii) In terms of FLA, findings have documented that importer's COC has the positive moderating effect. Meanwhile, POS and VAC have the negative moderating effect.

CHAPTER 4: THE GRAVITATIONAL APPROACH TO THE TRADE, ENVIRONMENTAL QUALITY, AND INSTITUTIONAL QUALITY NEXUS

4.1. Introduction

As driven by Goal 13 and Goal 17 in the SDGs of the Agenda 2030, this chapter utilizes the trade gravity model to examining the link between bilateral trade, environmental quality, and institutional quality. As previously reviewed in Chapter 2, there have been relevant theories which recommend the under-investigated effects of environmental quality on bilateral trade, namely *The Theory of Environmental Assimilative Capacity (EAC)* (Siebert, 1992; Walter, 1974), *The Heckscher-Ohlin Theory* (Heckscher, 1919; Ohlin, 1935), and *The Theory of Competitive Advantage or Diamond Model* (Porter, 1990). The EAC theory (Walter, 1974) has suggested the effect of environmental quality, which is proxied by carbon dioxide emissions, on EAC abundance, which consequently influences trade flows between partners of different EACs. Based on this theory, Siebert (1992) applied the *The Heckscher-Ohlin Theory* (Heckscher, 1919; Ohlin, 1935) to the link between environmental quality and national comparative advantage (Jayadevappa & Chhatre, 2000). The research suggested that the *pollution intensity* of various industries could increase or decrease export revenue of specific products. More importantly, the research emphasized the determining role of environmental measures in cross-border flows of pollution-intensive products in small and large countries (Jayadevappa & Chhatre, 2000).

From the perspective of the *Theory of Competitive Advantage or Diamond Model* of Porter (1990), environmental degradation due to polluting emissions could increase consumer awareness of environmental issues and environmentally-responsible consumption, which is the *Demand Conditions* component of the national competitive advantage. Consequently, more environmentally-demanding and ecologically-sophisticated consumers impose innovation pressures on incumbent firms, which ultimately bolsters product quality and export competitiveness in the

global markets, and therefore foster trade flows and facilitate greater openness. By this way, environmental degradation could be considered as the *Opportunity* component of the Diamond Model. In line with this logic, environmental institutional quality, which is included in the *Policy* component, could also strengthen the national competitive advantage, which eventually strengthens export competitiveness and increases export growth and openness of the countries.

From the empirical perspective, a majority of studies have only documented the *bidirectional* (Amin et al. 2023; Aydin, 2023; Ben Jebil et al. 2019; Dou et al., 2021; Jamel & Maktouf, 2017; Pata et al., 2023; Rahman et al. 2020; Zameer et al. 2020) or *unidirectional* causality (Cialani, 2017; Le & Ozturk, 2020; Mutascu, 2018; Rahman & Alam, 2022) between CO₂ emissions and trade openness in selected regions or countries. Therefore, the research gap is the effects of environmental quality on bilateral trade which include the two sides of a trading relationship (exporting and importing). In addition, the moderating and contextual effects of institutional quality on the link between bilateral trade and environmental quality have been under-examined by previous research. Therefore, the following hypotheses have been proposed as follows:

H.2.1: Environmental quality (of the exporting and importing country) has a significant positive effect on bilateral trade.

H.2.2: Institutional quality (of the exporting and importing country) has a significant positive effect on bilateral trade.

H.2.3: Institutional quality (of the exporting and importing country) significantly moderates the link between bilateral trade and environmental quality.

H.2.4: Institutional quality (of the exporting and importing country) has a significant contextual effect on the link between bilateral trade and environmental quality.

4.2. Model specification, variable measurement, and estimation strategy

4.2.1. Model specification and variable measurement

To examine the proposed hypotheses, the general dynamic trade gravity model with environmental quality and institutional quality has been proposed as follows (Eshetu & Goshu, 2021; Golovko & Sahin, 2021; Guo & Mai, 2023; Islam et al., 2024; Lohani, 2024; Martínez-Martínez et al., 2023):

$$\begin{aligned} Trade_{ijt} = & \beta_0 + \beta_1 Trade_{ij,t-1} + \beta_2 Trade_{ij,t-2} + \beta_3 Size_{it1} + \beta_4 Size_{it2} + \beta_5 Size_{jt1} \\ & + \beta_6 Size_{jt2} + \beta_7 Distance_{ij} + \beta_8 IQ_{it} + \beta_9 IQ_{jt} + \beta_{10} EQ_{it} + \beta_{11} EQ_{jt} \\ & + \beta_{12} (IQ \cdot EQ)_{it} + \beta_{13} (IQ \cdot EQ)_{jt} + \beta_{14} MRT_{it} + \beta_{15} MRT_{jt} \\ & + \sum_{k=16}^{26} \beta_k Control_{k,i,j,t,ij,ijt} + \sum_{m=27}^{30} \beta_m FE_{i,j,ij,t} + \eta_{ijt} \end{aligned}$$

where i and j denote the exporting and importing country, t denotes the year of the observation, β denotes the coefficients of explanatory variables (except for β_0 which denotes the y-intercept of the estimation), and $t-1$ and $t-2$ denote the first and second lags of the dependent variable $Trade_{ijt}$. $Trade_{ijt}$ is the bilateral trade, $Size_{it1}$, $Size_{it2}$, $Size_{jt1}$, and $Size_{jt2}$ denotes gross domestic product (economic size) and population, $Distance_{ij}$ is the geographic distance, IQ_{it} and IQ_{jt} denote the institutional quality, EQ_{it} and EQ_{jt} denote the environmental quality, $(IQ \cdot EQ)_{it}$ and $(IQ \cdot EQ)_{jt}$ denote the cross-terms of institutional quality and environmental quality, which allows the examination of the moderating effect of institutional quality on the trade-environment link, MRT_{it} and MRT_{jt} are the multilateral resistance terms (MRT) for addressing the *third-country effect* on the bilateral trading relationship as pointed out by Anderson and Van Wincoop (2003), Baier and Bergstrand (2009), and Head and Mayer (2014), $\sum_{k=16}^{26} \beta_k Control_{k,i,j,t,ij,ijt}$ denotes the set of control variables for the individual and common characteristics of country i and j in year t and for the special global events in year t , $\sum_{m=27}^{30} \beta_m FE_{i,j,ij,t}$ denotes the set of control variables for exporter-fixed (i), importer-fixed (j), country pair-fixed (ij), and year-fixed effects

(t), and η_{ijt} denotes the error term of the estimation. Based on the general model, the specific model has been proposed whose variables are interpreted in Table A.2 (the Appendices A).

The six institutional quality variables (explanatory variables) are included separately in the research models in order to avoid the potential multi-collinearity. Control variables are similar to those presented in the Sub-section 3.2.1 of Chapter 3. The panel data samples include the aggregated, partners of high institutional quality (high-high direction), partners of low institutional quality (low-low direction), and partners of different institutional quality (high-low and low-high directions). Data sources are built from the databases of The World Bank, The World Trade Organization, and The Our World in Data project of the Global Change Data Lab (for the CO₂ emissions). The distance and common characteristics variables are built based on Conte et al. (2022). The panel includes 41 countries (Vietnam and 40 largest trading partners) in the 2002-2021 period. The panel size is $41 \times 40 \times 20 = 32,800$ observations, which includes Vietnam and the most dynamic trading economies which are selected based on the total trade value in the 2017-2021 period.

4.2.2. Estimation strategy

To estimate the proposed models, this chapter employs the combined fixed effect (FE), random effect (RE), and two-step system generalized method of moments (SGMM-II) methods. The combined fixed effect estimation is applied to deal with the heterogeneity in the panel data which includes several countries (Cheng & Wall, 2005; Gupta et al., 2025; Huang et al., 2024; Le & Pham, 2024; Lohani, 2024). Two types of fixed effect estimation include:

- + The first type (FE-I) estimation includes year-fixed and dyad-fixed effect (Carter & Poast, 2020; Le, 2022; Le & Pham, 2024; Lohani, 2024; Nasrullah et al., 2020; Magee, 2008).

- + The second type (FE-II) estimation includes reporter-fixed (exporter-fixed), partner-fixed (importer-fixed) and year-fixed effect (Anderson & Van Wincoop,

2003; Gupta et al., 2025; Le, 2022; Le & Pham, 2024; Lohani, 2024; Song et al., 2022; Yu et al., 2020).

Furthermore, the chapter does not apply the PPML technique to research models because all zero values of bilateral trade have been increased by one unit (Hong et al., 2023).

For treating the endogeneity in dynamic panel models of macroeconomic variables, several recent studies have been using the SGMM-II method to deal with endogeneity caused by reverse causality (or simultaneity bias) and dynamic model with lagged dependent variables. For example, Emikonel (2022), Eshetu and Goshu (2021), Gupta et al. (2025), Kahouli (2016), Le (2022), Le and Pham (2024), Nguyen and Su (2021), and Osinubi and Simatele (2025) have applied the SGMM-II methods to alleviate endogeneity which is caused by the dynamic panel data with large N and short T (Arellano & Bond, 1991; Blundell & Bond, 1998; Roodman, 2009). Therefore, this chapter also applies System-GMM two-step to the estimation of research models.

The endogenous variables include gross domestic product of the exporting and importing countries and the bilateral exchange rate (Kahouli, 2016; Le, 2022; Le & Pham, 2024). This is due to three reasons. First, the measurement unit of those variables are currency, which is similar to that of the dependent variable (bilateral trade value), which consequently leads to considerable possibility of reverse causality as compared to other variables of environmental quality and institutional quality (those variables are indices of no measurement or gas emissions). Second, it is highly unlikely that specific bilateral trade between the two nations would have a reverse impact on their overall national environmental quality and institutional quality. Third, simultaneously addressing the endogeneity of multiple regressors (exceeding three in this chapter) leads to an explosion in the number of instruments relative to the number of cross-sectional units (N). This instrument proliferation can weaken the Hansen test's power to detect overidentifying restrictions, potentially leading to misleadingly

high p-values and biased estimates. Furthermore, the number of groups (N) will also decrease in the models of contextual effects, which could exacerbate the negative effect of instrument proliferation.

Regarding diagnostic tests, the Hausman test (Hausman, 1978) is applied to the justification of fixed and random effect methods. The rejection of the null hypothesis justifies the fixed effect method for the research models. For the SGMM-II method, the tests of Arellano and Bond first and second autocorrelation AR(1) and AR(2) (z), and Hansen's over-identification restrictions (chi2) (Arellano & Bond, 1991; Roodman, 2009) are employed. The SGMM-II estimation is justified when the p-value of AR(1) test is lower than 5% and the p-values of AR(2) and Hansen tests are higher than 5%.

To ensure the reliability of the findings, the dissertation has conducted a cross-comparison between FE-I, FE-II, and SGMM-II estimations. This is due to the fact that for a subset of variables the estimated coefficients exhibited conflicting signs. Such divergences often results from the inability of FE models to account for dynamic endogeneity or the inherent bias in short-panel datasets ($T < 30$). To maintain the reliability for empirical significance, the dissertation has not considered coefficients with conflicting signs from the discussion of confirmed impacts. This could be seen in the note at the end of each summary table. Therefore, the results reported in the summary tables in this chapter focus exclusively on those variables where the direction of the effect is harmonized and consistent across both estimators, thereby providing a more reliable basis for the conclusions.

4.3. Empirical results and discussion

4.3.1. Descriptive and preliminary analysis

Before proceeding with the estimations, this section provides an overview of the dataset's characteristics. To define the scope of the analysis, the selection of global trading partners included in the panel data is presented. Table A.5 (the Appendices A) details the specific bilateral partners analyzed in this chapter.

Table 4.1 demonstrates the descriptive statistics of the original variables.

Table 4.1: Descriptive statistics

Variables	Unit	Observation	Mean	Std. Dev.	Min	Max
BIT _{ijt}	Billion US\$	32,800	0.006	0.020	0	0.577
GDP _{it,jt}	Billion US\$	32,800	1,480.201	2,960.989	35.064	23,315.08
POP _{it,jt}	Million people	32,800	117.597	278.146	3.634	1,412.36
DIST _{ij}	Kilometer	32,800	6,817.251	4,634.26	59.61723	19,079.88
CEpc _{it}	Tonnes/person	32,800	8.138	4.971	0.757	27.997
COC _{it,jt}	-	32,800	0.810	1.014	-1.141	2.459
GVE _{it,jt}	-	32,800	0.959	0.788	-0.602	2.426
POS _{it,jt}	-	32,800	0.374	0.790	-2.095	1.753
REQ _{it,jt}	-	32,800	0.910	0.747	-0.866	2.255
ROL _{it,jt}	-	32,800	0.838	0.881	-1.011	2.125
VAC _{it,jt}	-	32,800	0.615	0.946	-1.907	1.801
EPS _{it,jt}	-	25,080	2.447	1.045	0.167	4.889
EXG _{jit}	LCU	32,800	450.917	2,686.701	0.00003	34,798.37
ESIM _{ijt}	-	32,800	0.335	0.143	0.006	0.5
DIN _{ijt}	US\$/person	32,800	24,625.69	18,953.34	1.332	101,475.4

Source: The author.

Table 4.2 demonstrates the Pearson correlation matrix of continuous variables included in the research models.

Table 4.2: Pearson correlation matrix

	$\ln(1 + \text{BIT})_{ijt}$	$\ln \text{GDP}_{it}$	$\ln \text{GDP}_{jt}$	$\ln \text{POP}_{it}$	$\ln \text{POP}_{jt}$	$\ln \text{DIST}_{ij}$	$\ln \text{CEpc}_{it}$
$\ln(1 + \text{BIT})_{ijt}$	1.000						
$\ln \text{GDP}_{it}$	0.460 ^c	1.000					
$\ln \text{GDP}_{jt}$	0.477 ^c	0.043 ^c	1.000				
$\ln \text{POP}_{it}$	0.221 ^c	0.647 ^c	-0.008	1.000			
$\ln \text{POP}_{jt}$	0.233 ^c	-0.008	0.647 ^c	-0.024 ^c	1.000		
$\ln \text{DIST}_{ij}$	-0.385 ^c	0.083 ^c	0.083 ^c	0.228 ^c	0.228 ^c	1.000	
$\ln \text{CEpc}_{it}$	0.107 ^c	0.202 ^c	-0.014 ^b	-0.381 ^c	0.008	-0.091 ^c	1.000
$\ln \text{CEpc}_{jt}$	0.164 ^c	-0.014 ^b	0.202 ^c	0.008	-0.381 ^c	-0.091 ^c	-0.021 ^c
$\ln \text{EXG}_{jit}$	0.039 ^c	-0.126 ^c	0.126 ^c	0.230 ^c	-0.230 ^c	0.001	-0.329 ^c
$\ln \text{DIN}_{ijt}$	0.007	0.041 ^c	0.041 ^c	-0.084 ^c	-0.084 ^c	0.057 ^c	0.022 ^c
$\ln \text{ESIM}_{ijt}$	-0.223 ^c	-0.228 ^c	-0.228 ^c	-0.190 ^c	-0.190 ^c	-0.077 ^c	-0.058 ^c
	$\ln \text{CEpc}_{jt}$	$\ln \text{EXG}_{jit}$	$\ln \text{DIN}_{ijt}$	$\ln \text{ESIM}_{ijt}$			
$\ln \text{CEpc}_{jt}$	1.000						
$\ln \text{EXG}_{jit}$	0.329 ^c	1.000					
$\ln \text{DIN}_{ijt}$	0.022 ^c	0.001	1.000				

$\ln \text{ESIM}_{ijt}$	-0.058 ^c	0.001	-0.004	1.000

Letters a, b, and c represent the 10%, 5%, and 1% significance levels respectively.

Source: The author.

Table B.1 (please see the Appendices B) confirms the cross-dependence of all variables in the research models (CD tests) at the significance level of 1%. Therefore, the Pesaran tests for non-stationarity (Pesaran, 2004) are applied to those variables. However, the critical values of the tests have not been provided by the statistical software due to the technical limits which results in the undecided stationarity. Nevertheless, the Kao (Kao, 1999) and Westerlund (Westerlund, 2005) tests have indicated the co-integration or the long-term relationship between bilateral trade, environmental quality, and the other continuous variables in the research models. Therefore, all of the variables are included in the level form (not the difference form). Moreover, the variables in level allow the examination of long-term relationships instead of immediate or short-term links between variables. More importantly, the SGMM-II method includes the differencing of variables in the estimation process, thus the inclusion of variables in difference will lead to the double-differencing which makes the results meaningless or even uninterpretable. As a result, all of the variables are included in the models in the level form. Furthermore, while the second-generation tests are generally preferred for handling cross-sectional dependence, the results from first-generation tests in Table B.2 (Appendices B) are often sufficient in research practice when software constraints make advanced tests impractical (Choi, 2001; Harris & Tzavalis, 1999; Im et al., 2003; Levin et al., 2002). Therefore, this chapter uses these robust and widely accepted first-generation tests to serve as the primary official evidence for established stationarity, which provides a reliable and valid basis for the subsequent econometric analyses.

4.3.2. Results for the aggregated sample

Table 4.3 demonstrates the summary of estimation results for the models of the aggregated sample. Column (1), (2), and (3) indicate the results of FE-I, FE-II, and SGMM-II methods. Please see the Appendices of Chapter 4 for detailed reports

of estimation results in Table C4.1, C4.2, and C4.3. As could be seen in the Appendices of Chapter 4, the Hausman tests have indicated that fixed effect estimation is more appropriate than random effect estimation at the significant level of 5%. SGMM-II estimations are justified as the p-value of AR(1) test is lower than 5% and the p-values of AR(2) and Hansen tests are higher than 5%. For robustness check, Table C4.13 demonstrates the PPML estimation results for the aggregated sample (Appendices of Chapter 4).

Table 4.3: Estimation results summary for models of the aggregated sample

Institutional quality's dimensions	Tested effects	FE-I (1)	FE-II (2)	SGMM-II (3)
Control of Corruption (COC)	Exporter's COC (direct)			
	Importer's COC (direct)	-0.090^a	-0.086^a	
	Exporter's CEpc (direct)	0.606^c	0.644^c	
	Importer's CEpc (direct)	0.447^c	0.485^c	
	Exporter's COC*CEpc (moderating)	-0.047^b		0.906 ^a
	Importer's COC*CEpc (moderating)	0.079^c	0.074^c	1.026^a
Government Effectiveness (GVE)	Exporter's GVE (direct)	0.182 ^c		
	Importer's GVE (direct)	-0.075^a		
	Exporter's CEpc (direct)	0.481^c	0.520^c	
	Importer's CEpc (direct)	0.486^c	0.522^c	
	Exporter's GVE*CEpc (moderating)	0.052 ^c		
	Importer's GVE*CEpc (moderating)	0.033^b	0.031^b	
Political Stability and Absence of Violence/Terrorism (POS)	Exporter's POS (direct)			
	Importer's POS (direct)			
	Exporter's CEpc (direct)	0.567^c	0.605^c	
	Importer's CEpc (direct)	0.468^c	0.505^c	
	Exporter's POS*CEpc (moderating)	0.028 ^c		-0.171^b
	Importer's POS*CEpc (moderating)			-0.158^b
Regulatory Quality (REQ)	Exporter's REQ (direct)	-0.160^c		
	Importer's REQ (direct)	-0.135^c	-0.127^c	
	Exporter's CEpc (direct)	0.588^c	0.626^c	
	Importer's CEpc (direct)	0.452^c	0.489^c	
	Exporter's REQ*CEpc (moderating)			
	Importer's REQ*CEpc (moderating)	0.025^c	0.024^c	
Rule of Law (ROL)	Exporter's ROL (direct)	0.132 ^c		
	Importer's ROL (direct)			
	Exporter's CEpc (direct)	0.549^c	0.592^c	1.838^b
	Importer's CEpc (direct)	0.454^c	0.495^c	1.705^b
	Exporter's ROL*CEpc (moderating)	0.071 ^c		
	Importer's ROL*CEpc (moderating)	0.051^c	0.044^c	
	Exporter's VAC (direct)	-0.238^c	-0.232^b	
	Importer's VAC (direct)			

Voice and Accountability (VAC)	Exporter's CEpc (direct)	0.561^c	0.598^c	2.770^b
	Importer's CEpc (direct)	0.457^c	0.493^c	2.467^b
	Exporter's VAC*CEpc (moderating)	0.017 ^b		
	Importer's VAC*CEpc (moderating)			
Environmental Policy Stringency (EPS)	Exporter's EPS (direct)			<i>-0.420^a</i>
	Importer's EPS (direct)			
	Exporter's CEpc (direct)	0.566^c	0.575^c	
	Importer's CEpc (direct)	0.599^c	0.611^c	
	Exporter's EPS*CEpc (moderating)			
	Importer's EPS*CEpc (moderating)			
Overall Institutional Quality (IQ)	Exporter's IQ (direct)	<i>-0.348^c</i>		
	Importer's IQ (direct)	<i>-0.301^c</i>	<i>-0.331^c</i>	
	Exporter's CEpc (direct)	0.537^c	0.567^c	
	Importer's CEpc (direct)	0.438^c	0.466^c	
	Exporter's IQ*CEpc (moderating)	0.192 ^c		
	Importer's IQ*CEpc (moderating)	0.139 ^c	0.156 ^c	

Note: (1) Blank cells demonstrate non-significant links; Grey cells indicate non-confirmed links; Italic numbers indicate significant negative links; Values in bold indicate the links further supported by PPML estimation for robustness check. (2) Links are not confirmed when (i) there are conflicting results of FE-I, FE-II, SGMM-II, and PPML estimations or (ii) the links are only significant in one of FE-I, FE-II, and PPML estimations or (iii) the links are only significant in one of FE-I and FE-II estimations. (3) Letters a, b, and c represent the 10%, 5%, and 1% significance levels respectively.

Source: The author.

Regarding the effects of environmental quality on bilateral trade, exporter's and importer's CO₂ emissions significantly increase export and import flows in the FE-I, FE-II, and SGMM-II estimations of COC, GVE, POS, REQ, ROL, VAC, EPS, and IQ models. These findings have implied that improving environmental quality significantly decreases export and import flows. This has contributed to the *Theory of Environmental Assimilative Capacity (EAC)* (Jayadevappa & Chhatre, 2000; Siebert, 1992; Walter, 1974) and the *Heckscher-Ohlin Theory* (Heckscher, 1919; Ohlin, 1935). Particularly, from the exporting side, boosting export growth at the expense of environment (by increasing carbon emissions) could consequently result in the deterioration of EAC abundance and environmental resilience. From the importing side, polluting the environment (by increasing carbon emissions) could result in the increasing import dependence and trade deficit due to the degraded EAC abundance. In addition, those findings could be explained by the *Theory of Competitive Advantage* or *Diamond Model* of Porter (1990). Particularly,

environmental degradation due to increasing CO₂ emissions could bolster consumer awareness of environmental issues and environmentally-responsible consumption, which is the *Demand Conditions* component of the national competitive advantage. Consequently, more environmentally-demanding and ecologically-sophisticated consumers impose innovation pressures on incumbent firms, which ultimately bolsters product quality and export competitiveness in the global markets, and therefore foster export flows. From the importing side, *Demand Conditions* could result in the increasing import flows of more environmentally-friendly products from foreign producers with higher environmental responsibilities.

Regarding the effects of institutional quality on bilateral trade, *exporter's* VAC and *EPS* significantly decrease export flows, and *importer's* COC, REQ, and *overall IQ* significantly decrease import flows. Those findings have indicated the hampering effect of institutional quality on bilateral trade.

Regarding the moderating effects of institutional quality on the link between bilateral trade and environmental quality, *importer's institutional quality* has divergent effects on the trade-environment link. Particularly, while findings strongly indicate the positive moderating effects of COC, GVE, REQ, ROL, and *overall IQ*, the moderating effect of POS is significantly negative. The positive moderating effect has implied that high institutional quality facilitates the hampering impact of environmental quality on import flows. In other words, when institutional quality is high, reducing CO₂ emissions (improving environmental quality) significantly decreases import flows. Meanwhile, the negative moderating effect has indicated that high institutional quality triggers the boosting impact of environmental quality on import flows.

4.3.3. Results for the high institutional quality sample (high-high)

Table 4.4 demonstrates the summary of estimation results for the models of the high institutional quality sample. Column (4), (5), and (6) indicate the results of FE-I, FE-II, and SGMM-II methods. Please see the Appendices of Chapter 4 for

detailed reports of estimation results in Table C4.4, C4.5, and C4.6. As could be seen in the Appendices of Chapter 4, the Hausman tests have indicated that fixed effect estimation is more appropriate than random effect estimation at the significant level of 5%. SGMM-II estimations are justified as the p-value of AR(1) test is lower than 5% and the p-values of AR(2) and Hansen tests are higher than 5%. For robustness check, Table C4.14 demonstrates the PPML estimation results for the high institutional quality sample (Appendices of Chapter 4).

Table 4.4: Estimation results summary for models of the partners of high institutional quality sample

Institutional quality's dimensions	Tested effects	FE-I (4)	FE-II (5)	SGMM-II (6)
Control of Corruption (COC)	Exporter's COC (direct)			
	Importer's COC (direct)			
	Exporter's CEpc (direct)	0.317^c	0.249^b	
	Importer's CEpc (direct)	0.569^c	0.505^c	
Government Effectiveness (GVE)	Exporter's GVE (direct)			0.725^b
	Importer's GVE (direct)		0.092^b	0.627^a
	Exporter's CEpc (direct)			
	Importer's CEpc (direct)	0.452^c	0.402^c	
Political Stability and Absence of Violence/Terrorism (POS)	Exporter's POS (direct)	0.341 ^c	0.359 ^c	-0.492 ^a
	Importer's POS (direct)	0.230 ^c	0.276 ^b	
	Exporter's CEpc (direct)	0.419^c	0.438^b	1.599^a
	Importer's CEpc (direct)	0.512^c	0.532^c	1.815^a
Regulatory Quality (REQ)	Exporter's REQ (direct)			
	Importer's REQ (direct)			
	Exporter's CEpc (direct)	0.303^c	0.379^c	
	Importer's CEpc (direct)	0.520^c	0.589^c	
Rule of Law (ROL)	Exporter's ROL (direct)			
	Importer's ROL (direct)	0.239 ^a		
	Exporter's CEpc (direct)	0.178 ^a		
	Importer's CEpc (direct)	0.574^c	0.454^c	0.999^a
Voice and Accountability (VAC)	Exporter's VAC (direct)	-0.393 ^c	-0.369 ^a	
	Importer's VAC (direct)	0.162 ^b	0.147 ^a	
	Exporter's CEpc (direct)	0.380^c	0.360^b	
	Importer's CEpc (direct)	0.581^c	0.581^c	
Environmental Policy Stringency (EPS)	Exporter's EPS (direct)	-0.133 ^a		
	Importer's EPS (direct)	-0.122 ^a		
	Exporter's CEpc (direct)	0.370 ^c		
	Importer's CEpc (direct)	0.532^c	0.538^c	0.991^a
Overall Institutional Quality (IQ)	Exporter's CEpc (direct)	0.448^c	0.344^a	
	Importer's CEpc (direct)	0.482 ^c	0.542 ^b	

Note: (1) Blank cells demonstrate non-significant links; Grey cells indicate non-confirmed links; Italic numbers indicate significant negative links; Values in bold indicate the links further supported by PPML estimation for robustness check. (2) Links are not confirmed when (i) there are conflicting results of FE-I, FE-II, SGMM-II, and PPML estimations or (ii) the links are only significant in one of FE-I, FE-II, and PPML estimations or (iii) the links are only significant in one of FE-I and FE-II estimations. (3) Letters a, b, and c represent the 10%, 5%, and 1% significance levels respectively.

Source: The author.

Regarding the effects of environmental quality on bilateral trade in the high-high institutional trading relationship, *exporter's CO₂ emissions* significantly increases export flows in COC, POS, REQ, VAC, and IQ models, and *importer's CO₂ emissions* significantly increases import flows in all models. Those findings have unveiled that improving environmental quality has the detrimental effect on export and import flows. Those findings have been consistent with the aggregated sample, which have been supported by the *Theory of Environmental Assimilative Capacity (EAC)* (Jayadevappa & Chhatre, 2000; Siebert, 1992; Walter, 1974), the *Heckscher-Ohlin Theory* (Heckscher, 1919; Ohlin, 1935), and the *Theory of Competitive Advantage or Diamond Model* (Porter, 1990).

Regarding the effects of institutional quality on bilateral trade in the high-high institutional trading relationship, from the exporting side, *exporter's GVE* significantly increases export flows, while *exporter's VAC* significantly decreases export flows. From the importing side, *importer's GVE, POS, and VAC* significantly increase import flows. Those findings have indicated that institutional quality has divergent effects on bilateral trade, which is determined by specific dimensions, which is a new contribution to relevant literature on the link between bilateral trade and institutional quality.

4.3.4. Results for the low institutional quality sample (low-low)

Table 4.5 demonstrates the summary of estimation results for the models of the low institutional quality sample. Column (7), (8), and (9) indicate the results of FE-I, FE-II, and SGMM-II methods. Please see the Appendices of Chapter 4 for

detailed reports of estimation results in Table C4.7, C4.8, and C4.9. As could be seen in the Appendices of Chapter 4, the Hausman tests have indicated that fixed effect estimation is more appropriate than random effect estimation at the significant level of 5%. SGMM-II estimations are justified as the p-value of AR(1) test is lower than 5% and the p-values of AR(2) and Hansen tests are higher than 5%. For robustness check, Table C4.15 demonstrates the PPML estimation results for the low institutional quality sample (Appendices of Chapter 4).

Table 4.5: Estimation results summary for models of the partners of low institutional quality sample

Institutional quality's dimensions	Tested effects	FE-I (7)	FE-II (8)	SGMM-II (9)
Control of Corruption (COC)	Exporter's COC (direct)			
	Importer's COC (direct)			
	Exporter's CEpc (direct)	0.503^c	0.551^a	
	Importer's CEpc (direct)	0.252 ^b		
Government Effectiveness (GVE)	Exporter's GVE (direct)	0.196 ^b		
	Importer's GVE (direct)	-0.224 ^b		
	Exporter's CEpc (direct)	0.473^c	0.678^b	
	Importer's CEpc (direct)	0.358^c	0.362^a	
Political Stability and Absence of Violence/Terrorism (POS)	Exporter's POS (direct)	-0.164 ^c		
	Importer's POS (direct)	-0.115 ^c	-0.112 ^c	
	Exporter's CEpc (direct)	0.791^c	0.924^c	
	Importer's CEpc (direct)	0.516^c	0.557^c	
Regulatory Quality (REQ)	Exporter's REQ (direct)			
	Importer's REQ (direct)	-0.189 ^b	-0.135 ^a	
	Exporter's CEpc (direct)	0.598^c	0.693^c	
	Importer's CEpc (direct)	0.396 ^b	0.383 ^a	
Rule of Law (ROL)	Exporter's ROL (direct)	0.297 ^c		
	Importer's ROL (direct)			
	Exporter's CEpc (direct)	0.708^c	0.872^c	
	Importer's CEpc (direct)	0.384^b	0.482^b	
Voice and Accountability (VAC)	Exporter's VAC (direct)			
	Importer's VAC (direct)	0.193^a	0.215^b	
	Exporter's CEpc (direct)	0.455^c	0.488^b	
	Importer's CEpc (direct)	0.415^c	0.421^b	
Environmental Policy Stringency (EPS)	Exporter's EPS (direct)		-0.145 ^a	
	Importer's EPS (direct)		-0.108 ^c	
	Exporter's CEpc (direct)	0.758^c	1.188^c	
	Importer's CEpc (direct)	0.608^c	0.929^c	
Overall Institutional Quality (IQ)	Exporter's CEpc (direct)	0.573^c	0.619^c	
	Importer's CEpc (direct)	0.431^c	0.484^c	

Note: (1) Blank cells demonstrate non-significant links; Grey cells indicate non-confirmed links; Italic numbers indicate significant negative links; Values in bold indicate the links further supported by PPML estimation for robustness check. (2) Links are not confirmed when (i) there are conflicting results of FE-I, FE-II, SGMM-II, and PPML estimations or (ii) the links are only significant in one of FE-I, FE-II, and PPML estimations or (iii) the links are only significant in one of FE-I and FE-II estimations. (3) Letters a, b, and c represent the 10%, 5%, and 1% significance levels respectively.

Source: The author.

Regarding the effects of environmental quality on bilateral trade in the low-low institutional trading relationship, *exporter's CO₂ emissions* significantly increases export flows in all models, and *importer's CO₂ emissions* significantly increases import flows in all models except the COC model. These findings have documented the detrimental effect of environmental quality on bilateral trade. Particularly, reducing carbon emissions (improving environmental quality) significantly decreases export and import flows. These findings have been strongly consistent with the aggregated and high-high institutional samples.

Regarding the effects of institutional quality on bilateral trade in the low-low institutional trading relationship, *importer's POS* and *REQ* significantly decrease import flows, while *importer's VAC* have the significant boosting effect on import flows. These findings have discovered the divergent effects of importer's specific institutional dimensions, which is a new contribution to relevant literature on the link between bilateral trade and institutional quality.

4.3.5. Results for the different institutional quality sample (high-low and low-high)

Table 4.6 demonstrates the summary of estimation results for the models of the different institutional quality sample. Column (10), (11), and (12) indicate the results of FE-I, FE-II, and SGMM-II methods. Please see the Appendices of Chapter 4 for detailed reports of estimation results in Table C4.10, C4.11, and C4.12. As could be seen in the Appendices of Chapter 4, the Hausman tests have indicated that fixed effect estimation is more appropriate than random effect estimation at the significant

level of 5%. SGMM-II estimations are justified as the p-value of AR(1) test is lower than 5% and the p-values of AR(2) and Hansen tests are higher than 5%. For robustness check, Table C4.16 demonstrates the PPML estimation results for the different institutional quality sample (Appendices of Chapter 4).

Table 4.6: Estimation results summary for models of the partners of different institutional quality sample

Institutional quality's dimensions	Tested effects	FE-I (10)	FE-II (11)	SGMM-II (12)
Control of Corruption (COC)	Exporter's COC (direct)	0.143 ^b		
	Importer's COC (direct)			
	Exporter's CEpc (direct)	0.299^c	0.409^b	
	Importer's CEpc (direct)	0.215^c	0.297^c	
Government Effectiveness (GVE)	Exporter's GVE (direct)	0.181^c	0.173^a	
	Importer's GVE (direct)	-0.109 ^c	-0.156 ^b	
	Exporter's CEpc (direct)	0.272^c	0.390^c	
	Importer's CEpc (direct)	0.256^c	0.405^c	
Political Stability and Absence of Violence/Terrorism (POS)	Exporter's POS (direct)			
	Importer's POS (direct)			
	Exporter's CEpc (direct)	0.578^c	0.515^b	
	Importer's CEpc (direct)	0.328^c	0.369^c	
Regulatory Quality (REQ)	Exporter's REQ (direct)	-0.092 ^a		0.556 ^a
	Importer's REQ (direct)			
	Exporter's CEpc (direct)	0.358^c	0.447^b	
	Importer's CEpc (direct)	0.213^c	0.233^b	
Rule of Law (ROL)	Exporter's ROL (direct)	0.143 ^b	0.196 ^a	
	Importer's ROL (direct)			
	Exporter's CEpc (direct)	0.376^c	0.407^c	
	Importer's CEpc (direct)	0.251^c	0.264^c	
Voice and Accountability (VAC)	Exporter's VAC (direct)	-0.116 ^b		1.613 ^a
	Importer's VAC (direct)			1.697^a
	Exporter's CEpc (direct)	0.441^c	0.518^c	
	Importer's CEpc (direct)	0.308^c	0.346^c	
Environmental Policy Stringency (EPS)	Exporter's EPS (direct)	-0.095 ^b		
	Importer's EPS (direct)			
	Exporter's CEpc (direct)			
	Importer's CEpc (direct)	0.365^c	0.804^c	
Overall Institutional Quality (IQ)	Exporter's CEpc (direct)	0.470^c	0.472^c	
	Importer's CEpc (direct)	0.318^c	0.359^c	

Note: (1) Blank cells demonstrate non-significant links; Grey cells indicate non-confirmed links; Italic numbers indicate significant negative links; Values in bold indicate the links further supported by PPML estimation for robustness check. (2) Links are not confirmed when (i) there are conflicting results of FE-I, FE-II, SGMM-II, and PPML estimations or (ii) the links are only significant in one of FE-I, FE-II, and PPML estimations or (iii)

the links are only significant in one of FE-I and FE-II estimations. (3) Letters a, b, and c represent the 10%, 5%, and 1% significance levels respectively.

Source: The author.

Regarding the effects of environmental quality on bilateral trade in the low-high and high-low institutional trading relationship, *exporter's CO₂ emissions* significantly increases export flows in all models except the EPS model, and *importer's CO₂ emissions* significantly increases import flows in all models. Those findings have revealed the hampering effect of environmental quality on bilateral trade. Particularly, restricting carbon emissions (enhancing environmental quality) significantly decreases export and import flows. These findings have documented the consistent links between bilateral trade and environmental quality in the aggregated, high-high, low-low, and different institutional samples.

Regarding the effects of institutional quality on bilateral trade in the low-high and high-low institutional trading relationship, *exporter's GVE* and *ROL* significantly increase export flows. Meanwhile, *importer's GVE* has the hampering effect and *importer's VAC* have the promoting effect on import flows. Again, these findings have indicated the divergent effects of institutional quality on bilateral trade, which is determined by specific institutional dimensions.

4.4. Concluding remarks

As inspired by Goal 13 and Goal 17 in the SDGs of The Agenda 2030, this chapter has employed the trade gravity model to explore the effects of environmental quality and institutional quality on bilateral trade. To solve the research objective, this chapter has proposed research hypotheses which are relevant to the direct effects of environmental quality and institutional quality on bilateral trade, and the moderating and contextual effects of institutional quality on the link between bilateral trade and environmental quality. In this chapter, environmental quality is proxied by carbon emissions per capita. Institutional quality is proxied by six governance indicators, environmental policy stringency, and an overall institutional quality

variable. Noticeably, the contextual effect of institutional quality is examined by three types of trading relationship, which includes high-high, low-low, and low-high & high-low (different) institutional settings. The panel data includes 41 countries (Vietnam and 40 largest trading partners) in the 2002-2021 period. The panel size is $41 \times 40 \times 20 = 32,800$ observations. Estimation methods include random effect, combined fixed effect (dyad-fixed, exporter-fixed, importer-fixed, and year-fixed), and two-step system GMM in order to deal with heterogeneity and endogeneity. Some noticeable findings of this chapter are as follows (please see Table C4.17, C4.18, and C4.19 in the Appendices of Chapter 4 for the summary of explored effects):

Regarding the direct effect of environmental quality on bilateral trade, findings have consistently indicated the boosting effects of exporter's and importer's CO₂ emissions on bilateral trade in the aggregated, high-high, low-low, and different institutional trading settings. This has implied that environmental quality has the detrimental effect on export and import flows. Those findings have extended the understanding of the *Theory of Environmental Assimilative Capacity (EAC)* (Jayadevappa & Chhatre, 2000; Siebert, 1992; Walter, 1974), the *Heckscher-Ohlin Theory* (Heckscher, 1919; Ohlin, 1935), and the *Theory of Competitive Advantage or Diamond Model* (Porter, 1990).

Regarding the direct effect of institutional quality on bilateral trade, which is based on the consideration of consistent findings of Chapter 3 and Chapter 4,

In the aggregated sample, exporter's VAC and EPS significantly decrease export flows, while importer's REQ and overall IQ significantly decrease import flows.

In the high-high institutional trading relationship, exporter's GVE significantly increases export flows, while exporter's VAC significantly decreases export flows. From the importing side, importer's GVE, POS, and VAC significantly increase import flows.

In the low-low institutional trading relationship, importer's POS and REQ significantly decrease import flows.

In the different institutional trading relationship, exporter's GVE and ROL significantly increase export flows, while importer's GVE significantly decreases import flows.

Regarding the moderating effect of institutional quality on the link between environmental quality and bilateral trade, the significant positive moderating effects of importer's COC, GVE, REQ, ROL, and overall IQ on the import-emission link have indicated that high institutional quality triggers the hampering effect of environmental quality on import flows. Meanwhile, importer's POS has appeared to significantly facilitate the boosting effect of environmental quality on import flows.

CHAPTER 5: THE GENDER-BASED KUZNETS CURVE APPROACH TO THE NEXUS BETWEEN GENDER EQUALITY, TRADE, AND INSTITUTIONAL QUALITY

5.1. Introduction

As driven by Goal 5 and Goal 17 in the SDGs of The Agenda 2030, this chapter examines the relationship between gender equality, trade liberalization (trade openness), and institutional quality. As grounded by *The Stolper-Samuelson Theorem* (Stolper & Samuelson, 1941), the relationship between relative goods price and relative factor price is determined by the factor intensity. At first, trade openness triggers the convergence of relative goods price in the two trading partners. As a result of trade liberalization, the relative price of female labour-intensive goods in a country increases which consequently improves the relative price of female labour (or relative wage of female labour, and of course, women welfares and benefits) (the upward-sloping SS curve). In the other trading partner, the relative price of female labour-intensive goods decreases, which consequently deteriorate women welfares and gender equality.

Another perspective is *The Three-fold Effect of Trade* (Abid & Sekrafi, 2021; Ertugrul et al., 2016; Liobikiene & Butkus, 2019), which could be applied to justifying the effects of trade openness on gender equality. The three-fold effect includes *scale*, *composition*, and *technique* effects, which are as follows:

- + *The scale effect*: Trade openness results in more job and income opportunities for female labour force (positive impact).

- + *The composition effect*: Trade openness facilitates the specialization in specific industries (based on national comparative advantages), which consequently influences the national economic structure. Particularly, some countries could concentrate their resources on female labour-intensive industries, while others focus on male labour-intensive sectors (positive or negative impact).

+ *The technique effect*: Trade openness incentivizes the technology transfer, which could create more job and income opportunities for high-skilled female labour force while deteriorate those of lower-skilled female workers (positive or negative impact).

In the effort of categorizing the impacts of trade on gender equality, Fontana (2016) and Korinek et al. (2021) have proposed four impacting channels, which include:

(i) *Female labour-intensive service industries*: Trade in services could increase the employment and income opportunities for women workers as they are more intensively employed in service sectors;

(ii) *Consumption*: Trade could facilitates the price reduction of consumer products which consequently improves the accessibility of female segments to those imported goods.

(iii) *Firm scale*: Smaller firms, which have been disproportionately owned and managed by women leaders, are more vulnerable to trade than larger firms.

(iv) *Public provision*: Trade openness with tariff elimination could decrease budget revenue and financial allocation for women welfare development programs, which consequently hampers gender equality.

Regarding empirical foundations, the impact of economic development on gender equality has been investigated by the exploitation of the Gender-driven Kuznet Curve (GKC) hypothesis (Eastin & Prakash, 2013), which was established based on the original Kuznets Curve hypothesis (Kuznets, 1955) which argued the inverse U-shaped relationship between economic development and income inequality. As inspired by the GKC hypothesis of Eastin and Prakash (2013), there have been an increasing number of studies have been examining the impacts of macro-economic determinants on various dimensions of gender equality (Anyanwu, 2016; Ghosh, 2022; Nguyen & Su, 2021; Nguyen 2022; Nguyen & Nguyen, 2023). Not having adopted the GKC framework in the analysis, a number of studies have

also examined the effect of trade and trade openness on gender equality. Nevertheless, there have been mixed results between the relevant studies, particularly for example as follows:

(-) Negative impact: Balamoune-Lutz (2007); Bussmann (2009) for female labour force participation (OECD countries); Menon and Van der Meulen Rodgers (2009); Papyrakis et al. (2012) for widened wage gap; Fontana (2016); Orkoh et al. (2022); Yahmed (2023) for market-size effect.

(+) Positive impact: Berik (2000); Oostendorp (2009); Bussmann (2009) for higher female education enrollment and female labour force participation (developing countries); Papyrakis et al. (2012) for female employment; Potrafke and Ursprung (2012); Juhn et al. (2013); Juhn et al. (2014); Schultz (2014); Wamboye and Seguino (2015); Korinek et al. (2021); Yahmed (2023) for selection effect.

Based on those relevant literature and empirical mixed results, the research gaps include the direct impacts of trade liberalization (trade openness) and institutional quality on gender equality, and the moderating and contextual impacts of trade liberalization (trade openness) and institutional quality on gender-institution and gender-liberalization links. Therefore, the following hypotheses have been proposed as follows:

H.3.1: Trade liberalization has a significant positive effect on gender equality.

H.3.1.1: Trade liberalization has a significant positive effect on gender development.

H.3.1.2: Trade liberalization has a significant negative effect on gender inequality.

H.3.1.3: Trade liberalization has a significant positive effect on female labor force participation.

H.3.2: Institutional quality has a significant positive effect on gender equality.

H.3.2.1: Institutional quality has a significant positive effect on gender development.

H.3.2.2: Institutional quality has a significant negative effect on gender inequality.

H.3.2.3: Institutional quality has a significant positive effect on female labor force participation.

H.3.3: Trade liberalization significantly moderates the link between gender equality and institutional quality.

H.3.3.1: Trade liberalization significantly moderates the link between gender development and institutional quality.

H.3.3.2: Trade liberalization significantly moderates the link between gender inequality and institutional quality.

H.3.3.3: Trade liberalization significantly moderates the link between female labor force participation and institutional quality.

H.3.4: Institutional quality significantly moderates the link between gender equality and trade liberalization.

H.3.4.1: Institutional quality significantly moderates the link between gender development and trade liberalization.

H.3.4.2: Institutional quality significantly moderates the link between gender inequality and trade liberalization.

H.3.4.3: Institutional quality significantly moderates the link between female labor force participation and trade liberalization.

H.3.5: Trade liberalization has a significant contextual effect on the gender-liberalization and gender-institution links.

H.3.6: Institutional quality has a significant contextual effect on the gender-liberalization and gender-institution links.

5.2. Model specification, variable measurement, and estimation strategy

5.2.1. Model specification and variable measurement

The general Gender-driven Kuznet Curve model in this chapter has been proposed as follows (Anyanwu, 2016; Ghosh, 2022; Nguyen & Su, 2021; Nguyen 2022; Nguyen & Nguyen, 2023):

$$\begin{aligned} GE_{it} = & \gamma_0 + \gamma_1 GE_{i,t-1} + \gamma_2 GE_{i,t-2} + \gamma_3 Income_{it} + \gamma_4 Income_{it}^2 + \gamma_5 Income_{it}^3 \\ & + \gamma_6 Openness_{it} + \gamma_7 IQ_{k,it} + \gamma_8 (IQ_{LEV,k} \cdot Openness)_{it} \\ & + \gamma_9 (Openness_{LEV} \cdot IQ_k)_{it} + \sum_{m=10}^{16} \gamma_m Control_{m,it,t} + \delta_t + \theta_{it} \end{aligned}$$

where i denotes the country of the observation, t denotes the year of the observation, $t-1$ and $t-2$ denote the first and second lags of the dependent variable GE_{it} , γ denotes the coefficients of explanatory variables (except for γ_0 which denotes the y-intercept of the estimation), GE_{it} denotes the gender equality, $Income_{it}$ denotes the income, $Openness_{it}$ denotes trade openness, $IQ_{k,it}$ represents six Worldwide Governance Indicators for constituent dimensions of institutional quality ($k = 1, \dots, 6$), $(IQ_{LEV,k} \cdot Openness)_{it}$ denotes the cross-terms of the level of institutional quality's dimensions and trade openness, $(Openness_{LEV} \cdot IQ_k)_{it}$ denotes the cross-terms of institutional quality's dimensions and trade openness level, $\sum_{m=10}^{16} \gamma_m Control_{m,it,t}$ represents the set of control variables, δ_t is the time-fixed effect, and θ_{it} is the error term of the estimation. Based on the general model, the specific model has been proposed whose variables are interpreted in Table A.3 (the Appendices A).

The three gender equality variables (dependent variables) and six institutional quality variables (explanatory variables) are included separately in the research models in order to avoid the potential multi-collinearity. Control variables include:

+ Urbanization: This typically accelerates cultural shifts, increases access to education, and expands formal job markets, which often correlates with improved gender equality

+ Inward foreign direct investment: This can boost gender equality by introducing progressive corporate diversity policies and creating employment opportunities that draw women into the formal labor force

+ Fertility rate: High fertility rates are heavily linked to traditional gender roles and often restrict women's ability to pursue higher education, enter the workforce, or attain economic independence.

+ WTO membership: This reflects integration into global trade, which can reshape local labor markets (sometimes benefiting women in export-oriented sectors) and expose the nation to international labor standards.

+ OECD membership: This acts as a proxy for highly developed, high-income economies that typically have robust legal frameworks, welfare states, and social policies explicitly designed to promote gender equality.

+ Global economic and financial crisis: This frequently hit vulnerable populations the hardest, often exacerbating gender inequality as female labor participation drops or welfare safety nets shrink

+ Global COVID-19 pandemic: This accounts for unique pandemic dynamics such as widespread school closures and lockdowns, which disproportionately increased unpaid care work for women and heavily disrupted female-dominated employment sectors.

The panel data samples include the aggregated, high institutional quality, low institutional quality, high openness, and low openness. Data sources are built from the databases of The World Bank, The World Trade Organization, and The United Nations Conference on Trade and Development. The panel data includes 113 worldwide countries in the 2002-2021 period. Therefore, the panel size is $113 \times 20 = 2,260$ observations.

5.2.2. Estimation strategy

To estimate the proposed models, this chapter employs the combined fixed effect (FE), random effect (RE), two-step difference generalized method of moments (DGMM-II), and two-step system generalized method of moments (SGMM-II) methods. The combined fixed effect estimation, which includes country-fixed and year-fixed effects, is applied to deal with the heterogeneity in the panel data of several countries (Gupta et al., 2025; Huang et al., 2024; Iqbal et al., 2022; Le & Pham, 2024; Lohani, 2024; Polat & Cil, 2025).

For treating the endogeneity in dynamic panel models of macroeconomic variables, several recent studies have been using the DGMM-II and SGMM-II method to deal with endogeneity caused by reverse causality (or simultaneity bias) and dynamic model with lagged dependent variables. For example, Emikonel (2022), Eshetu and Goshu (2021), Jiang and Khan (2023), Gupta et al. (2025), Huang et al. (2024), Kahouli (2016), Le (2022), Le and Pham (2024), Nguyen (2021), Osinubi and Simatele (2025), and Shittu et al. (2025) have applied the DGMM-II and SGMM-II methods to alleviate endogeneity which is caused by the dynamic panel data with large N and short T (Arellano & Bond, 1991; Blundell & Bond, 1998; Roodman, 2009).

In this chapter, the endogenous variables include gross domestic product per capita (income per capita) in the original, squared, and cubed terms as gender equality could have the significant impact on income per capita and economic growth (Akhtar et al., 2023; Klasen & Lamanna, 2009; Mitra et al., 2015; Nandan & Mallick, 2020), which much possibly triggers the reverse causality running from gender equality to income. In addition, simultaneously addressing the endogeneity of multiple regressors (exceeding three in this chapter) leads to an explosion in the number of instruments relative to the number of cross-sectional units (N). This instrument proliferation can weaken the Hansen test's power to detect overidentifying restrictions, potentially leading to misleadingly high p-values and biased estimates.

Furthermore, the number of groups (N) will also decrease in the models of contextual effects, which could exacerbate the negative effect of instrument proliferation.

Regarding diagnostic tests, the Hausman test (Hausman, 1978) is applied to the justification of fixed and random effect methods. The rejection of the null hypothesis justifies the fixed effect method for the research models. For the DGMM-II and SGMM-II method, the tests of Arellano and Bond first and second autocorrelation AR(1) and AR(2) (z), and Hansen's over-identification restrictions (chi2) (Arellano & Bond, 1991; Roodman, 2009) are employed. The DGMM-II and SGMM-II methods are justified when the p-value of AR(1) test is lower than 5% and the p-values of AR(2) and Hansen tests are higher than 5%.

To ensure the reliability of the findings, the dissertation has conducted a cross-comparison between FE, DGMM-II, and SGMM-II estimations. This is due to the fact that for a subset of variables the estimated coefficients exhibited conflicting signs. Such divergences often results from the inability of FE models to account for dynamic endogeneity or the inherent bias in short-panel datasets ($T < 30$). To maintain the reliability for empirical significance, the dissertation has not considered coefficients with conflicting signs from the discussion of confirmed impacts. This could be seen in the note at the end of each summary table. Therefore, the results reported in the summary tables in this chapter focus exclusively on those variables where the direction of the effect is harmonized and consistent across both estimators, thereby providing a more reliable basis for the conclusions.

5.3. Empirical results and discussion

5.3.1. Descriptive and preliminary analysis

Before proceeding with the estimations, this section provides an overview of the dataset's characteristics. To define the scope of the analysis, the selection of worldwide countries included in the panel data is presented in Table A.6 (the Appendices A).

Table 5.1 demonstrates the descriptive statistics of the original variables.

Table 5.1: Descriptive statistics

Variable	Unit	Observations	Mean	Std. Dev.	Min	Max
GDI _{it}	-	2,260	0.940	0.069	0.000	1.050
GII _{it}	-	2,260	0.359	0.200	0.013	0.788
FLA _{it}	%	2,260	53.033	14.844	12.718	87.812
GDPpc _{it}	US\$/person	2,260	14,470.690	20,533.810	114.367	133,590.100
TOI _{it}	-	2,260	84.191	53.547	0.757	437.327
COC _{it}	-	2,260	0.039	1.055	-1.597	2.459
GVE _{it}	-	2,260	0.136	0.985	-1.887	2.426
POS _{it}	-	2,260	-0.080	0.915	-2.810	1.753
REQ _{it}	-	2,260	0.188	0.948	-2.202	2.255
ROL _{it}	-	2,260	0.057	1.013	-1.870	2.125
VAC _{it}	-	2,260	0.097	0.956	-2.124	1.801
URB _{it}	%	2,260	60.091	20.822	8.682	100.000
IFDI _{it}	%	2,260	67.167	180.909	0.599	1,967.750
FER _{it}	Births per woman	2,260	2.744	1.526	0.808	7.671

Source: The author.

Table 5.2 demonstrates the Pearson correlation matrix of continuous variables included in the research models.

Table 5.2: Pearson correlation matrix

	lnGDI _{it}	lnGII _{it}	lnFLA _{it}	lnGDPpc _{it}	lnGDPpc ² _{it}	lnGDPpc ³ _{it}	lnTOI _{it}
lnGDI _{it}	1.000						
lnGII _{it}	-0.559 ^c	1.000					
lnFLA _{it}	0.283 ^c	-0.137 ^c	1.000				
lnGDPpc _{it}	0.618 ^c	-0.849 ^c	-0.030	1.000			
lnGDPpc ² _{it}	0.594 ^c	-0.870 ^c	0.005	0.996 ^c	1.000		
lnGDPpc ³ _{it}	0.566 ^c	-0.884 ^c	0.035 ^a	0.984 ^c	0.996 ^c	1.000	
lnTOI _{it}	0.334 ^c	-0.347 ^c	0.082 ^c	0.305 ^c	0.301 ^c	0.295 ^c	1.000
COC _{it}	0.448 ^c	-0.810 ^c	0.097 ^c	0.825 ^c	0.850 ^c	0.867 ^c	0.279 ^c
GVE _{it}	0.521 ^c	-0.841 ^c	0.052 ^b	0.882 ^c	0.897 ^c	0.903 ^c	0.324 ^c
POS _{it}	0.557 ^c	-0.674 ^c	0.209 ^c	0.689 ^c	0.697 ^c	0.700 ^c	0.457 ^c
REQ _{it}	0.542 ^c	-0.794 ^c	0.105 ^c	0.853 ^c	0.867 ^c	0.872 ^c	0.353 ^c
ROL _{it}	0.469 ^c	-0.819 ^c	0.064 ^c	0.846 ^c	0.868 ^c	0.882 ^c	0.301 ^c
VAC _{it}	0.490 ^c	-0.682 ^c	0.122 ^c	0.753 ^c	0.767 ^c	0.774 ^c	0.237 ^c
lnURB _{it}	0.530 ^c	-0.569 ^c	-0.211 ^c	0.781 ^c	0.752 ^c	0.720 ^c	0.272 ^c
lnIFDI _{it}	0.341 ^c	-0.310 ^c	0.047 ^b	0.374 ^c	0.365 ^c	0.357 ^c	0.580 ^c
lnFER _{it}	-0.710 ^c	0.710 ^c	0.106 ^c	-0.757 ^c	-0.735 ^c	-0.707 ^c	-0.355 ^c
	COC _{it}	GVE _{it}	POS _{it}	REQ _{it}	ROL _{it}	VAC _{it}	lnURB _{it}
COC _{it}	1.000						
GVE _{it}	0.944 ^c	1.000					

POS_{it}	0.761 ^c	0.747 ^c	1.000				
REQ_{it}	0.914 ^c	0.944 ^c	0.753 ^c	1.000			
ROL_{it}	0.962 ^c	0.962 ^c	0.782 ^c	0.945 ^c	1.000		
VAC_{it}	0.828 ^c	0.819 ^c	0.735 ^c	0.867 ^c	0.861 ^c	1.000	
lnURB_{it}	0.581 ^c	0.619 ^c	0.531 ^c	0.595 ^c	0.571 ^c	0.550 ^c	1.000
lnIFDI_{it}	0.317 ^c	0.339 ^c	0.402 ^c	0.394 ^c	0.339 ^c	0.299 ^c	0.388 ^c
lnFER_{it}	-0.558 ^c	-0.674 ^c	-0.556 ^c	-0.652 ^c	-0.606 ^c	-0.549 ^c	-0.645 ^c
	lnIFDI_{it}	lnFER_{it}					
lnIFDI_{it}	1.000						
lnFER_{it}	-0.279 ^c	1.000					

Letters a, b, and c represent the 10%, 5%, and 1% significance levels respectively.

Source: The author.

Table B.1 (please see the Appendices B) confirms the cross-dependence of all variables in the research models (CD tests) at the significance level of 1% except COC_{it} and GVE_{it} . Therefore, the Pesaran tests of non-stationarity (Pesaran, 2004) are applied to variables of cross-dependence and the Im-Pesaran-Shin tests of non-stationarity (Im et al., 2003) are applied to COC_{it} and GVE_{it} . The stationarity of variable $lnGDI_{it,jt}$ is undecided due to unbalanced panel. As could be seen in Table B.1, stationarity tests have indicated the non-stationarity of $lnFLA_{it}$, $lnTOI_{it}$, $lnURB_{it}$, $lnFER_{it}$, and VAC_{it} . The remaining variables are stationary at the significance levels of 10%, 5%, and 1%. Due to the variable $lnGII_{it}$ being stationary and the rejected no-co-integration of the Westerlund test (Westerlund, 2005) for this variable and the other non-stationary explanatory variables, the models with this variable do not necessarily include variables in difference form. In addition, variable differencing only allows the examination of immediate effects, which is possibly not appropriate for the research objective and the original GKC model. Moreover, the variables in level allow the examination of long-term relationships instead of immediate or short-term links between variables. More importantly, the DGMM-II and SGMM-II method include the variable differencing in the estimation process, thus the inclusion of variables in difference will lead to the double-differencing which makes the results meaningless or even uninterpretable. The similar logic has also been applied to the models with the dependent variable $lnGDI_{it}$. However, regarding the dependent

variable $\ln FLA_{it}$, this variable is non-stationary and the Westerlund test has documented no-integration between this variable and the other non-stationary explanatory variables. Therefore, the fixed and random effect models with this variable include the non-stationary variables in the difference form, particularly $d.\ln FLA_{it}$, $d.\ln TOI_{it}$, $d.\ln URB_{it}$, $d.\ln FER_{it}$, and $d.VAC_{it}$. Regarding the stationarity test for the variable $\ln GDI_{it}$, while the second-generation tests are generally preferred for handling cross-sectional dependence, the results from first-generation tests in Table B.3 (Appendices B) are often sufficient in research practice when software constraints make advanced tests impractical (Choi, 2001; Harris & Tzavalis, 1999; Im et al., 2003; Levin et al., 2002). Therefore, this chapter uses these robust and widely accepted first-generation tests to serve as the primary official evidence for established stationarity, which provides a reliable and valid basis for the subsequent econometric analyses.

5.3.2. Results for the aggregated sample

Table 5.3 demonstrates the summary of estimation results for the models of the aggregated sample. Column (1), (2), and (3) indicate the results of FE, DGMM-II, and SGMM-II methods. Please see the Appendices of Chapter 5 for detailed reports of estimation results in Table C5.1, C5.2, C5.3, C5.4, C5.5, and C5.6. As could be seen in the Appendices of Chapter 5, the Hausman tests have indicated that fixed effect estimation is more appropriate than random effect estimation at the significant level of 5%. SGMM-II estimations are justified as the p-value of AR(1) test is lower than 5% and the p-values of AR(2) and Hansen tests are higher than 5%.

Table 5.3: Estimation results summary for models of the aggregated sample

Institutional quality's dimensions	Gender equality indicators	FE (1)	DGMM-II (2)	SGMM-II (3)
Control of Corruption (COC)	Income ($\rightarrow$ GDI)	0.329 ^c	-0.079 ^b (L2)	
	Income ² ($\rightarrow$ GDI)	-0.032 ^c	0.010 ^b (L2)	
	Income ³ ($\rightarrow$ GDI)	0.001 ^b	-0.001 ^b (L2)	
	Openness (direct)		0.011 ^a	0.015 ^a
	COC (direct)	0.009 ^b		
	rCOC*Openness (moderating)			
	rTOI*COC (moderating)			

	Income (→ GII)	-1.815 ^b	0.803 ^c (L1)	
	Income ² (→ GII)	0.281 ^c	-0.081 ^c (L1)	
	Income ³ (→ GII)	-0.013 ^c	0.003 ^c (L1)	
	Openness (direct)	0.026 ^a	-0.124 ^c	
	COC (direct)		-0.173 ^c	
	rCOC*Openness (moderating)			
	rTOI*COC (moderating)			
	Income (→ FLA)			
	Income ² (→ FLA)			
	Income ³ (→ FLA)			
	Openness (direct)		0.041 ^a	
	COC (direct)		0.082 ^c	
	rCOC*Openness (moderating)	-0.027 ^b		
	rTOI*COC (moderating)		-0.020 ^b	
Government Effectiveness (GVE)	Income (→ GDI)	0.326 ^c		0.363 ^b (L1)
	Income ² (→ GDI)	-0.032 ^c		-0.039 ^a (L1)
	Income ³ (→ GDI)	0.001 ^b		0.001 ^a (L1)
	Openness (direct)			
	GVE (direct)		-0.018 ^b	
	rGVE*Openness (moderating)			
	rTOI*GVE (moderating)			
	Income (→ GII)	-1.832 ^b		
	Income ² (→ GII)	0.283 ^c		
	Income ³ (→ GII)	-0.013 ^c		
	Openness (direct)	0.026 ^a	-0.138 ^c	
	GVE (direct)		-0.117 ^a	
	rGVE*Openness (moderating)			
	rTOI*GVE (moderating)			
	Income (→ FLA)			
	Income ² (→ FLA)			
	Income ³ (→ FLA)			
	Openness (direct)			
	GVE (direct)	0.008 ^a	-0.128 ^c	
	rGVE*Openness (moderating)		0.032 ^c	
	rTOI*GVE (moderating)		-0.058 ^c	
Political Stability and Absence of Violence/Terrorism (POS)	Income (→ GDI)	0.331 ^c	0.146 ^b (L1)	
			-0.100^c (L2)	
	Income ² (→ GDI)	-0.032 ^c	-0.015 ^b (L1)	
			0.012^c (L2)	
	Income ³ (→ GDI)	0.001 ^b	0.001 ^b (L1)	
			-0.001^c (L2)	
	Openness (direct)			
	POS (direct)			
	rPOS*Openness (moderating)			
	rTOI*POS (moderating)		0.005 ^a	
	Income (→ GII)	-1.826 ^b		
	Income ² (→ GII)	0.282 ^c		
	Income ³ (→ GII)	-0.013 ^c		
	Openness (direct)		-0.117 ^b	
	POS (direct)		-0.113 ^b	-0.122 ^a
	rPOS*Openness (moderating)			

	rTOI*POS (moderating)		0.092 ^c	0.113 ^a
	Income (→ FLA)			
	Income ² (→ FLA)			
	Income ³ (→ FLA)			
	Openness (direct)			
	POS (direct)		-0.049 ^c	
	rPOS*Openness (moderating)			
	rTOI*POS (moderating)		-0.020 ^b	
Regulatory Quality (REQ)	Income (→ GDI)	0.332 ^c	0.165 ^b (L1)	
	Income ² (→ GDI)	-0.033 ^c	-0.018 ^b (L1)	
	Income ³ (→ GDI)	0.001 ^b	0.001 ^b (L1)	
	Openness (direct)			
	REQ (direct)			
	rREQ*Openness (moderating)		0.003 ^a	
	rTOI*REQ (moderating)			
	Income (→ GII)	-1.736 ^b	0.332^a (L2)	
	Income ² (→ GII)	0.272 ^b	-0.041^a (L2)	
	Income ³ (→ GII)	-0.013 ^c	0.002^b (L2)	
	Openness (direct)	0.029 ^a	-0.095 ^a	-0.098 ^a
	REQ (direct)		-0.095 ^b	
	rREQ*Openness (moderating)			
	rTOI*REQ (moderating)			
	Income (→ FLA)		0.256^a (L2)	
	Income ² (→ FLA)		-0.028^a (L2)	
	Income ³ (→ FLA)			
	Openness (direct)		0.084 ^c	0.065 ^a
	REQ (direct)		-0.161 ^c	-0.105 ^b
	rREQ*Openness (moderating)		0.016 ^b	0.024 ^b
	rTOI*REQ (moderating)		-0.019 ^a	
Rule of Law (ROL)	Income (→ GDI)	0.330 ^c	0.159 ^b (L1) -0.092^c (L2)	
	Income ² (→ GDI)	-0.032 ^c	-0.018 ^b (L1) 0.011^c (L2)	
	Income ³ (→ GDI)	0.001 ^b	0.001 ^b (L1) -0.001^c (L2)	
	Openness (direct)		0.011 ^a	0.010 ^b
	ROL (direct)			
	rROL*Openness (moderating)			
	rTOI*ROL (moderating)			
	Income (→ GII)	-1.815 ^b	1.968 ^b (L1) -1.580^a (L2)	2.500 ^a (L1) -2.308^a (L2)
	Income ² (→ GII)	0.280 ^c	-0.200 ^b (L1) 0.168^a (L2)	-0.258 ^a (L1) 0.246^a (L2)
	Income ³ (→ GII)	-0.013 ^c	0.007 ^b (L1)	
	Openness (direct)		-0.111 ^b	
	ROL (direct)			
	rROL*Openness (moderating)			
	rTOI*ROL (moderating)		0.054 ^c	
	Income (→ FLA)			
	Income ² (→ FLA)			
	Income ³ (→ FLA)			

Voice and Accountability (VAC)	Openness (direct)		0.036 ^a	
	ROL (direct)		-0.131 ^c	-0.050 ^a
	rROL*Openness (moderating)			
	rTOI*ROL (moderating)		-0.022 ^a	
	Income (→ GDI)	0.323 ^c	0.173 ^b (L1) -0.085^b (L2)	
	Income ² (→ GDI)	-0.032 ^c	-0.019 ^b (L1) 0.010^b (L2)	
	Income ³ (→ GDI)	0.001 ^b	0.001 ^b (L1) -0.001^b (L2)	
	Openness (direct)			0.011 ^b
	VAC (direct)			
	rVAC*Openness (moderating)	-0.007 ^a		
	rTOI*VAC (moderating)			
	Income (→ GII)	-1.826 ^b	0.813 ^c (L1)	
	Income ² (→ GII)	0.282 ^c	-0.080 ^b (L1)	
	Income ³ (→ GII)	-0.013 ^c	0.003 ^b (L1)	
	Openness (direct)	0.025 ^a	-0.163 ^c	
	VAC (direct)		-0.091 ^b	
	rVAC*Openness (moderating)			
	rTOI*VAC (moderating)			0.077 ^a
	Income (→ FLA)			
	Income ² (→ FLA)			
	Income ³ (→ FLA)			
	Openness (direct)		0.033 ^a	
	VAC (direct)			
	rVAC*Openness (moderating)		0.017 ^c	
	rTOI*VAC (moderating)		-0.044 ^c	-0.034 ^a

Note: Blank cells demonstrate non-significant links. Letters a, b, and c represent the 10%, 5%, and 1% significance levels respectively. Italic numbers indicate significant negative links. Links are not confirmed when (i) there are conflicting results between FE, DGMM-II, and SGMM-II estimations or (ii) the links are only significant in the FE estimation (except income variables). Grey cells indicate non-confirmed links. L1 and L2 indicate the lagged variables of income in year t-1 and t-2 respectively.

Source: The author.

Regarding the effects of income on gender equality:

(i) *Models with GDI:* The N-shaped relationship between gender equality and income has been consistently confirmed in the FE estimation of all models. This relationship is also significant with the first lags (t-1) of income variables in all models in the DGMM-II and SGMM-II estimations, except the COC integrated model. However, with the second lags (t-2) of income variables, the relationship is significantly inverse N-shaped in the DGMM-II and SGMM-II estimations of COC, POS, and ROL integrated models.

(ii) *Models with GII*: The N-shaped relationship between gender equality and income has been consistently confirmed in the FE estimation of all models. However, this relationship is significantly inverse N-shaped with the first lags (t-1) of income variables in the DGMM-II estimation of COC, ROL, and VAC integrated models.

(iii) *Models with FLA*: Findings have only indicated the inverse U-shaped relationship between gender equality and income (second-lagged variables) in the DGMM-II estimation of the REQ integrated model.

Those findings have contributed to the relevant research of the GKC model which has been examined by Anyanwu (2016), Anyanwu and Augustine (2013) Nguyen (2022), Nguyen and Nguyen (2023), Nguyen and Su (2021), Ghosh (2022), Shittu et al. (2025) due to the worldwide panel data in the contemporary period of 2002-2021 which consequently enhances the general applicability of the research findings. Consistently, current income has the N-shaped relationship with gender equality, particularly, increasing income in the earlier stage enhances gender equality, while in the subsequent stage, it has a hampering effect, and in the longer term, higher income eventually improves gender equality. Regarding lagged income variables, findings have implied, to a certain degree, that current income could significantly influence future gender equality due to the lag of income's effects on social issues.

Regarding the effects of trade liberalization (trade openness) on gender equality:

(i) *Models with GDI*: Trade liberalization significantly increases GDI in the DGMM-II and SGMM-II estimations of COC, ROL, and VAC integrated models.

(ii) *Models with GII*: Trade liberalization significantly decreases GII in the DGMM-II estimation of POS and ROL integrated models.

(iii) *Models with FLA*: Trade liberalization significantly increases FLA in the DGMM-II and SGMM-II estimations of the COC, REQ, ROL, and VAC integrated models.

Findings have consistently indicated the positive impact of trade liberalization on gender equality. These findings have been supported by *The Stolper-Samuelson Theorem* (Stolper & Samuelson, 1941). In addition, findings have implied that the *scale effect*, *composition effect*, and *technique effect* (Abid & Sekrafi, 2021; Ertugrul et al., 2016; Liobikiene & Butkus, 2019) have exerted significant promoting impacts on gender equality. Furthermore, findings have supported the positive impacting channels as proposed by Fontana (2016) and Korinek et al. (2021).

Regarding the effects of institutional quality on gender equality:

(i) *Models with GDI: GVE* significantly decreases GDI in the DGMM-II estimation.

(ii) *Models with GII: COC, GVE, POS, REQ, and VAC* significantly decrease GII in the DGMM-II and SGMM-II estimations.

(iii) *Models with FLA: COC* significantly increases FLA in the DGMM-II estimation. Meanwhile, *POS, REQ, and ROL* significantly decreases FLA in the DGMM-II and SGMM-II estimations.

Findings have consistently documented the mitigating effects of institutional quality on gender inequality, which is consistent with Achuo et al. (2024), Nam et al. (2025), Nguyen and Nguyen (2023), Opeloyeru et al. (2024), Saha and Singh (2025). However, the effect on female labor force participation has appeared to be divergent, which is consistent with Umar et al. (2025). More noticeably, findings have explored the hampering effect of government effectiveness on gender development.

Regarding the moderating effects of trade liberalization on gender-institution links:

(i) *Models with GDI: Trade liberalization* positively moderates the link between GDI and *POS* in the DGMM-II estimation.

(ii) *Models with GII: Trade liberalization* positively moderates the link between GII and *POS, ROL, and VAC* in the DGMM-II and SGMM-II estimations.

(iii) *Models with FLA*: Trade liberalization negatively moderates the link between FLA and all institutional dimensions in the DGMM-II and SGMM-II estimations.

Findings have explored divergent moderating effects of trade liberalization on gender-institution links which are determined by specific dimensions of gender equality and institutional quality. Particularly, high openness facilitates the boosting effect of *POS* on *GDI*. However, high openness triggers the worsening effects of *POS*, *ROL*, and *VAC* on *GII*. Noticeably, higher openness initiates the hampering effects of all institutional dimensions on *FLA*. Those findings have implied that women in more open economies are more vulnerable to gender inequality when institutions are improved.

Regarding the moderating effects of institutional quality on gender-liberalization links, *GVE*, *REQ*, and *VAC* positively moderates the link between *FLA* and trade liberalization. Findings have implied that high institutional quality facilitates the boosting effect of trade liberalization on *FLA*, which is consistent with Cooray et al. (2017), Opeloyeru et al. (2024), Osinubi and Simatele (2025), and Umar et al. (2025).

5.3.3. Results for the high institutional quality sample

Table 5.4 demonstrates the summary of estimation results for the models of the high institutional quality sample. Column (4), (5), and (6) indicate the results of FE, DGMM-II, and SGMM-II methods. Please see the Appendices of Chapter 5 for detailed reports of estimation results in Table C5.7, C5.8, C5.9, C5.10, C5.11, and C5.12. As could be seen in the Appendices of Chapter 5, the Hausman tests have indicated that fixed effect estimation is more appropriate than random effect estimation at the significant level of 5%. SGMM-II estimations are justified as the p-value of AR(1) test is lower than 5% and the p-values of AR(2) and Hansen tests are higher than 5%.

Table 5.4: Estimation results summary for models of the high institutional quality sample

Institutional quality's dimensions	Gender equality indicators	FE (4)	DGMM-II (5)	SGMM-II (6)
Control of Corruption (COC)	Income ($\rightarrow$ GDI)		0.159 ^c (L1)	
	Income ² ($\rightarrow$ GDI)		-0.016 ^b (L1)	
	Income ³ ($\rightarrow$ GDI)		0.001 ^b (L1)	
	Openness (direct)		-0.014 ^c	-0.038 ^b
	COC (direct)		-0.018 ^c	
	rTOI*COC (moderating)	-0.003 ^b		
	Income ($\rightarrow$ GII)	-2.735 ^b	1.657 ^c (L1)	
	Income ² ($\rightarrow$ GII)	0.411 ^b	-0.197 ^c (L1)	
	Income ³ ($\rightarrow$ GII)	-0.018 ^c	0.008 ^c (L1)	
	Openness (direct)			
	COC (direct)		-0.090 ^b	
	rTOI*COC (moderating)		-0.070 ^c	
	Income ($\rightarrow$ FLA)		0.266 ^a (L1)	-0.737 ^a (L2)
	Income ² ($\rightarrow$ FLA)		-0.030 ^b (L1)	0.085 ^b (L2)
	Income ³ ($\rightarrow$ FLA)		0.001 ^b (L1)	-0.003 ^b (L2)
	Openness (direct)		0.030 ^b	
	COC (direct)		-0.060 ^c	
	rTOI*COC (moderating)		-0.044 ^c	
Government Effectiveness (GVE)	Income ($\rightarrow$ GDI)	0.519 ^b		
	Income ² ($\rightarrow$ GDI)	-0.049 ^a		
	Income ³ ($\rightarrow$ GDI)	0.002 ^a		
	Openness (direct)			
	GVE (direct)		-0.013 ^c	
	rTOI*GVE (moderating)	-0.004 ^b	0.004 ^a	
	Income ($\rightarrow$ GII)		-1.556 ^b (L1)	-6.181 ^b (L2)
	Income ² ($\rightarrow$ GII)		0.150 ^b (L1)	0.658 ^b (L2)
	Income ³ ($\rightarrow$ GII)		-0.005 ^a (L1)	-0.023 ^b (L2)
	Openness (direct)		-0.220 ^c	
	GVE (direct)			
	rTOI*GVE (moderating)			
	Income ($\rightarrow$ FLA)		-0.762 ^c (L1)	
	Income ² ($\rightarrow$ FLA)		0.089 ^c (L1)	
	Income ³ ($\rightarrow$ FLA)		-0.003 ^c (L1)	
	Openness (direct)			
	GVE (direct)	0.012 ^a		
	rTOI*GVE (moderating)		-0.070 ^c	-0.055 ^a
Political Stability and Absence of Violence/Terrorism (POS)	Income ($\rightarrow$ GDI)	0.264 ^b	0.094 ^a (L1)	
	Income ² ($\rightarrow$ GDI)	-0.025 ^b		
	Income ³ ($\rightarrow$ GDI)	0.001 ^a		
	Openness (direct)		-0.006 ^a	
	POS (direct)			
	rTOI*POS (moderating)		0.009 ^c	
	Income ($\rightarrow$ GII)	-2.746 ^b	-1.321 ^b (L1)	
	Income ² ($\rightarrow$ GII)	0.391 ^b	0.128 ^b (L1)	

Regulatory Quality (REQ)	Income ³ (→ GII)	-0.017 ^b	-0.004 ^a (L1)	
	Openness (direct)		-0.083 ^b	
	POS (direct)			
	rTOI*POS (moderating)			
	Income (→ FLA)	-0.114 ^a	-0.453 ^c (L1)	
	Income ² (→ FLA)	0.013 ^a	0.053 ^c (L1)	
	Income ³ (→ FLA)		-0.002 ^c (L1)	
	Openness (direct)		0.048 ^c	0.043 ^a
	POS (direct)		0.048 ^c	0.079 ^a
	rTOI*POS (moderating)		-0.076 ^c	-0.088 ^a
	Income (→ GDI)		0.241 ^b (L1)	0.475 ^a (L1)
	Income ² (→ GDI)		-0.026 ^b (L1)	-0.049 ^a (L1)
	Income ³ (→ GDI)		0.001 ^b (L1)	0.002 ^a (L1)
	Openness (direct)			
	REQ (direct)			
	rTOI*REQ (moderating)			
	Income (→ GII)	-7.504 ^c	-3.297 ^c (L1)	-3.826^a (L2)
	Income ² (→ GII)	0.898 ^c	0.360 ^c (L1)	0.411^a (L2)
	Income ³ (→ GII)	-0.034 ^c	-0.012 ^c (L1)	-0.015^a (L2)
	Openness (direct)		-0.172 ^b	
Rule of Law (ROL)	REQ (direct)		-0.119 ^c	
	rTOI*REQ (moderating)		-0.154 ^c	
	Income (→ FLA)	-0.487 ^a		
	Income ² (→ FLA)	0.051 ^a		
	Income ³ (→ FLA)	-0.002 ^a		
	Openness (direct)	0.022 ^a	0.122 ^c	0.122 ^b
	REQ (direct)			
	rTOI*REQ (moderating)		-0.053 ^c	
	Income (→ GDI)			0.317^a (L2)
	Income ² (→ GDI)			-0.032^a (L2)
	Income ³ (→ GDI)			
	Openness (direct)		-0.020 ^c	
	ROL (direct)		-0.031 ^c	
	rTOI*ROL (moderating)	-0.003 ^a	0.009 ^c	
	Income (→ GII)	-3.611 ^c	2.461 ^c (L1)	
			-2.889^c (L2)	
	Income ² (→ GII)	0.500 ^c	-0.266 ^c (L1)	
			0.313^c (L2)	
	Income ³ (→ GII)	-0.021 ^c	0.009 ^c (L1)	
			-0.010^c (L2)	
	Openness (direct)		-0.291 ^c	-0.247 ^b
	ROL (direct)		0.115 ^b	
	rTOI*ROL (moderating)			
	Income (→ FLA)	-0.322 ^a	-0.563 ^b (L1)	
	Income ² (→ FLA)	0.037 ^a	0.061 ^b (L1)	
	Income ³ (→ FLA)	-0.001 ^a	-0.002 ^b (L1)	
	Openness (direct)		0.037 ^b	0.069 ^a
	ROL (direct)		-0.085 ^c	
	rTOI*ROL (moderating)		-0.023 ^c	
	Income (→ GDI)		0.218 ^c (L1)	

Voice and Accountability (VAC)	Income ² (→ GDI)		-0.023 ^c (L1)	
	Income ³ (→ GDI)		0.001 ^c (L1)	
	Openness (direct)	-0.008 ^a	0.012 ^c	
	VAC (direct)			
	rTOI*VAC (moderating)		0.006 ^c	
	Income (→ GII)	-3.251 ^c	-1.261^a (L2)	
	Income ² (→ GII)	0.450 ^c	0.143^a (L2)	
	Income ³ (→ GII)	-0.019 ^c	-0.005^a (L2)	
	Openness (direct)		-0.224 ^c	-0.255 ^a
	VAC (direct)			
	rTOI*VAC (moderating)			
	Income (→ FLA)		-0.842 ^c (L1)	
	Income ² (→ FLA)		0.095 ^c (L1)	
	Income ³ (→ FLA)		-0.003 ^c (L1)	
	Openness (direct)		0.054 ^c	
	VAC (direct)		0.020 ^a	
	rTOI*VAC (moderating)		-0.058 ^c	-0.061 ^b

Note: Blank cells demonstrate non-significant links. Letters a, b, and c represent the 10%, 5%, and 1% significance levels respectively. Italic numbers indicate significant negative links. Links are not confirmed when (i) there are conflicting results between FE, DGMM-II, and SGMM-II estimations or (ii) the links are only significant in the FE estimation (except income variables). Grey cells indicate non-confirmed links. L1 and L2 indicate the lagged variables of income in year t-1 and t-2 respectively.

Source: The author.

Regarding the effects of income on gender equality in high institutional quality countries:

(i) *Models with GDI:* Findings have indicated the N-shaped link between gender equality and income in the FE estimation of GVE and POS integrated models. Furthermore, the N-shaped link is also significant in the DGMM-II and SGMM-II estimations of COC, REQ, and VAC integrated models with the first lag of income variables.

(ii) *Models with GII:* Findings have indicated the N-shaped link between gender equality and income in the FE estimation of COC, POS, REQ, ROL, and VAC integrated models, and the DGMM-II and SGMM-II estimations of GVE, REQ, ROL, and VAC models with the second lag of income variables.

(iii) *Models with FLA:* Findings have indicated the consistent inverse N-shaped link between gender equality and income in the FE estimation of REQ and

ROL integrated models and the DGMM-II and SGMM-II estimations of COC and VAC models.

Findings have contributed to the relevant research of the GKC model which has been examined by Anyanwu (2016), Anyanwu and Augustine (2013) Nguyen (2022), Nguyen and Nguyen (2023), Nguyen and Su (2021), Ghosh (2022), Shittu et al. (2025) due to the contextual effect of institutional quality on the GKC links. Particularly, in models with GDI and GII, the N-shaped link between gender equality and income of institutionally-high countries is significant, which is consistent with the aggregated sample. However, the inverse N-shaped is documented in models with FLA.

Regarding the effects of trade liberalization (trade openness) on gender equality in high institutional quality countries:

(i) *Models with GDI:* Trade liberalization significantly decreases GDI in the DGMM-II and SGMM-II estimations of COC, POS, and ROL integrated models.

(ii) *Models with GII:* Trade liberalization significantly decreases GII in the DGMM-II and SGMM-II estimations of GVE, POS, REQ, ROL, and VAC integrated models.

(iii) *Models with FLA:* Trade liberalization significantly increases FLA in the FE, DGMM-II, and SGMM-II estimations of COC, POS, REQ, ROL, and VAC integrated models.

Findings of institutionally-high countries have indicated the consistent positive impacts of trade liberalization on gender equality in models with GII and FLA, which has been previously explored in the aggregated sample and supported by *The Stolper-Samuelson Theorem* (Stolper & Samuelson, 1941), *The Three-Fold Effect of Trade* (Abid & Sekrafi, 2021; Ertugrul et al., 2016; Liobikiene & Butkus, 2019), and *the positive impacting channels* (Fontana, 2016; Korinek et al., 2021). However, findings of institutionally-high countries have noticeably documented the hampering effect on GDI, which could be due to the negative impacts of the

composition and technique effects (Abid & Sekrafi, 2021; Ertugrul et al., 2016; Liobikiene & Butkus, 2019) and the negative impacting channels (Fontana, 2016; Korinek et al., 2021).

Regarding the effects of institutional quality on gender equality in high institutional quality countries:

(i) *Models with GDI:* COC, GVE, and ROL significantly decrease GDI in the DGMM-II estimation.

(ii) *Models with GII:* While COC and REQ significantly decrease GII, ROL significantly increases GII in the DGMM-II estimation.

(iii) *Models with FLA:* While COC and ROL significantly decrease FLA in the DGMM-II estimation, POS and VAC significantly increase FLA in the DGMM-II and SGMM-II estimations.

Findings of institutionally-high countries have unveiled the divergent effects of institutional quality on gender equality which are dependent on specific dimensions of gender equality and institutional quality, which is consistent with the research of Umar et al. (2025).

Regarding the moderating effects of trade liberalization on gender-institution links in high institutional quality countries:

(i) *Models with GDI:* Trade liberalization positively moderates the link between GDI and POS and VAC in the DGMM-II estimation.

(ii) *Models with GII:* Trade liberalization negatively moderates the link between GII and COC and REQ in the DGMM-II estimation.

(iii) *Models with FLA:* Trade liberalization negatively moderates the link between FLA and all institutional dimensions in the DGMM-II and SGMM-II estimations.

Findings of institutionally-high countries have indicated the consistent moderating effects of trade liberalization on the link between institutional quality and gender equality in the models with GDI and GII. Particularly, high openness facilitates the boosting effect of institutional quality on gender equality. However, findings have strikingly indicated that high openness could trigger the hampering effect of institutional quality on FLA of institutionally-high countries.

5.3.4. Results for the low institutional quality sample

Table 5.5 demonstrates the summary of estimation results for the models of the low institutional quality sample. Column (7), (8), and (9) indicate the results of FE, DGMM-II, and SGMM-II methods. Please see the Appendices of Chapter 5 for detailed reports of estimation results in Table C5.13, C5.14, C5.15, C5.16, C5.17, and C5.18. As could be seen in the Appendices of Chapter 5, the Hausman tests have indicated that fixed effect estimation is more appropriate than random effect estimation at the significant level of 5%, except the ROL integrated model with female labor force participation which is estimated by the Pooled OLS method due to the non-significant F-test (Table C5.17, Column (7)). SGMM-II estimations are justified as the p-value of AR(1) test is lower than 5% and the p-values of AR(2) and Hansen tests are higher than 5%.

Table 5.5: Estimation results summary for models of the low institutional quality sample

Institutional quality's dimensions	Gender equality indicators	FE (7)	DGMM-II (8)	SGMM-II (9)
Control of Corruption (COC)	Income ($\rightarrow$ GDI)	0.453 ^c	-0.705 ^c (L1) 0.480^b (L2)	
	Income ² ($\rightarrow$ GDI)	-0.052 ^c	0.094 ^c (L1) -0.062^b (L2)	
	Income ³ ($\rightarrow$ GDI)	0.002 ^b	-0.004 ^c (L1) 0.002^a (L2)	
	Openness (direct)			
	COC (direct)	0.014 ^b	-0.019 ^a	
	rTOI*COC (moderating)		0.011 ^a	
	Income ($\rightarrow$ GII)			
	Income ² ($\rightarrow$ GII)			
	Income ³ ($\rightarrow$ GII)			
	Openness (direct)		-0.045 ^c	

	COC (direct)		-0.090 ^c	-0.136 ^a
	rTOI*COC (moderating)		0.038 ^b	
	Income (→ FLA)			
	Income ² (→ FLA)			
	Income ³ (→ FLA)			
	Openness (direct)		0.082 ^c	
	COC (direct)		0.151 ^c	
	rTOI*COC (moderating)	0.004 ^a	-0.033 ^c	
	Income (→ GDI)	0.357 ^b	0.260 ^b (L1)	
	Income ² (→ GDI)	-0.038 ^a	-0.036 ^b (L1)	
Government Effectiveness (GVE)	Income ³ (→ GDI)		0.002 ^a (L1)	
	Openness (direct)		0.031 ^c	
	GVE (direct)		-0.013 ^c	
	rTOI*GVE (moderating)			
	Income (→ GII)		0.593 ^b (L1)	
	Income ² (→ GII)		-0.076 ^b (L1)	
	Income ³ (→ GII)		0.003 ^b (L1)	
	Openness (direct)		-0.027 ^b	
	GVE (direct)	-0.053 ^a	-0.087 ^c	-0.082 ^b
	rTOI*GVE (moderating)		0.080 ^c	
	Income (→ FLA)			
	Income ² (→ FLA)			
	Income ³ (→ FLA)			
	Openness (direct)			
	GVE (direct)			
	rTOI*GVE (moderating)		-0.019 ^a	
Political Stability and Absence of Violence/Terrorism (POS)	Income (→ GDI)	0.588 ^c	0.262 ^c (L1)	-0.300 ^b (L2)
	Income ² (→ GDI)	-0.070 ^c	-0.035 ^c (L1)	0.036 ^c (L2)
	Income ³ (→ GDI)	0.003 ^c	0.001 ^c (L1)	-0.002 ^c (L2)
	Openness (direct)		-0.017 ^c	
	POS (direct)			
	rTOI*POS (moderating)		-0.005 ^a	
	Income (→ GII)		-0.850 ^c (L1)	
	Income ² (→ GII)		0.128 ^c (L1)	
	Income ³ (→ GII)		-0.006 ^c (L1)	
	Openness (direct)		-0.054 ^c	-0.129 ^a
	POS (direct)		0.027 ^c	
	rTOI*POS (moderating)	0.025 ^a		
	Income (→ FLA)			1.022 ^a (L2)
	Income ² (→ FLA)		0.063 ^a (L2)	-0.143 ^a (L2)
	Income ³ (→ FLA)		0.003 ^a (L1)	0.007 ^a (L2)
	Openness (direct)		-0.003 ^b (L2)	
	Openness (direct)		0.030 ^b	
	POS (direct)		-0.048 ^c	-0.047 ^a
	rTOI*POS (moderating)	0.004 ^a	0.024 ^c	
Regulatory Quality (REQ)	Income (→ GDI)	0.415 ^b	0.314 ^b (L1)	
	Income ² (→ GDI)	-0.047 ^b	-0.046 ^b (L1)	
	Income ³ (→ GDI)		0.002 ^b (L1)	
	Openness (direct)		0.016 ^b	
	REQ (direct)		-0.014 ^b	

	rTOI*REQ (moderating)			
	Income (→ GII)			
	Income ² (→ GII)			
	Income ³ (→ GII)			
	Openness (direct)		-0.082 ^c	
	REQ (direct)		-0.073 ^c	
	rTOI*REQ (moderating)		0.044 ^c	
	Income (→ FLA)			
	Income ² (→ FLA)		0.100 ^a (L1)	
	Income ³ (→ FLA)		-0.005 ^a (L1)	
	Openness (direct)			
	REQ (direct)		-0.078 ^c	
	rTOI*REQ (moderating)			
	Income (→ GDI)	0.361 ^b	0.520 ^c (L1)	1.240^a (L2)
	Income ² (→ GDI)	-0.038 ^a	-0.071 ^c (L1)	-0.159^a (L2)
	Income ³ (→ GDI)		0.003 ^c (L1)	0.007^a (L2)
	Openness (direct)		0.037 ^c	
	ROL (direct)		0.035 ^c	
	rTOI*ROL (moderating)			
Rule of Law (ROL)	Income (→ GII)		-0.705 ^a (L1)	
	Income ² (→ GII)		0.106 ^b (L1)	
	Income ³ (→ GII)		-0.005 ^b (L1)	
	Openness (direct)			
	ROL (direct)			
	rTOI*ROL (moderating)		0.077 ^c	
	Income (→ FLA)			
	Income ² (→ FLA)			
	Income ³ (→ FLA)			
	Openness (direct)		0.047 ^b	
	ROL (direct)		-0.109 ^c	-0.114 ^b
	rTOI*ROL (moderating)		0.019 ^a	
Voice and Accountability (VAC)	Income (→ GDI)	0.374 ^c	0.191^c (L2)	
	Income ² (→ GDI)	-0.042 ^c	-0.024^c (L2)	
	Income ³ (→ GDI)	0.001 ^c	0.001^b (L2)	
	Openness (direct)		-0.026 ^c	
	VAC (direct)			
	rTOI*VAC (moderating)			
	Income (→ GII)	-3.156 ^c	-0.461 ^b (L1)	
	Income ² (→ GII)	0.464 ^c	0.078 ^c (L1)	
	Income ³ (→ GII)	-0.022 ^c	-0.004 ^c (L1)	
	Openness (direct)		-0.117 ^c	-0.209 ^b
	VAC (direct)			
	rTOI*VAC (moderating)		0.036 ^b	
	Income (→ FLA)		0.722 ^b (L1)	
	Income ² (→ FLA)		-0.097 ^b (L1)	
	Income ³ (→ FLA)		0.004 ^c (L1)	
	Openness (direct)		0.044 ^b	
	VAC (direct)		0.120 ^c	
	rTOI*VAC (moderating)		-0.039 ^c	

Note: Blank cells demonstrate non-significant links. Letters a, b, and c represent the 10%, 5%, and 1% significance levels respectively. Italic numbers indicate significant negative links. Links are not confirmed when (i) there are conflicting results between FE, DGMM-II, and SGMM-II estimations or (ii) the links are only significant in the FE estimation (except income variables). Grey cells indicate non-confirmed links. L1 and L2 indicate the lagged variables of income in year t-1 and t-2 respectively.

Source: The author.

Regarding the effects of income on gender equality in low institutional quality countries:

(i) *Models with GDI:* Findings have consistently indicated the inverse U-shaped relationship between gender equality and income in the FE estimation of all models of institutional dimensions.

(ii) *Models with GII:* Findings have not been consistent between models of institutional dimensions.

(iii) *Models with FLA:* Findings have not been consistent between models of institutional dimensions.

Findings of institutionally-low countries have been partially consistent with the N-shaped link in the institutionally-high countries. Particularly, the inverse U-shaped link between GDI and income has implied the that income could promote gender equality in the earlier stage and hamper it in the higher stage,

Regarding the effects of trade liberalization (trade openness) on gender equality in low institutional quality countries:

(i) *Models with GDI:* Findings have not been consistent between models of institutional dimensions.

(ii) *Models with GII:* Findings have consistently indicated that trade liberalization significantly decreases GII in the DGMM-II and SGMM-II estimations of COC, GVE, POS, REQ, and VAC integrated models.

(iii) *Models with FLA*: Findings have consistently indicated that trade liberalization significantly increases FLA in the DGMM-II estimation of COC, POS, ROL, and VAC integrated models.

Findings of low institutional quality countries have consistently indicated the boosting effect of trade liberalization on gender equality in the models of GII and FLA, which has been supported by *The Stolper-Samuelson Theorem* (Stolper & Samuelson, 1941), *The Three-Fold Effect of Trade* (Abid & Sekrafi, 2021; Ertugrul et al., 2016; Liobikiene & Butkus, 2019), and *the positive impacting channels* (Fontana, 2016; Korinek et al., 2021).

Regarding the effects of institutional quality on gender equality in low institutional quality countries:

(i) *Models with GDI*: While *GVE* and *REQ* significantly decrease GDI, *ROL* significantly increases GDI in the DGMM-II estimation.

(ii) *Models with GII*: While *COC*, *GVE*, and *REQ* significantly decrease GII in the FE, DGMM-II, and SGMM-II estimations, *POS* significantly increases GII in the DGMM-II estimation.

(iii) *Models with FLA*: While *POS*, *REQ*, and *ROL* significantly decrease FLA in the DGMM-II and SGMM-II estimations, *COC* and *VAC* significantly increase FLA in the DGMM-II estimation.

Findings of institutionally-low countries have unveiled the divergent effects of institutional quality on gender equality which are dependent on specific dimensions of gender equality and institutional quality, which is consistent with the research of Umar et al. (2025).

Regarding the moderating effects of trade liberalization on gender-institution links in low institutional quality countries:

(i) *Models with GDI*: Trade liberalization positively moderates the link between GDI and *COC* and negatively moderates the link between GDI and *POS*.

(ii) *Models with GII*: Trade liberalization positively moderates the link between GII and *COC*, *GVE*, *REQ*, *ROL*, and *VAC* in the DGMM-II estimation.

(iii) *Models with FLA*: Trade liberalization positively moderates the link between FLA and *POS* and *ROL* in the FE and DGMM-II estimations. However, trade liberalization negatively moderates the link between FLA and *GVE* and *VAC* in the DGMM-II estimation.

Findings of low institutional quality countries have explored the divergent moderating effects of trade liberalization on the link between gender equality (GDI and FLA) and specific dimensions of institutional quality. Regarding gender inequality, findings have implied that, in low institutional quality countries, high trade openness significantly triggers the worsening effect of institutional quality (specific dimensions) on gender equality.

5.3.5. Results for the high openness sample

Table 5.6 demonstrates the summary of estimation results for the models of the high openness sample. Column (10), (11), and (12) indicate the results of FE, DGMM-II, and SGMM-II methods. Please see the Appendices of Chapter 5 for detailed reports of estimation results in Table C5.19, C5.20, C5.21, C5.22, C5.23, and C5.24. As could be seen in the Appendices of Chapter 5, the Hausman tests have indicated that fixed effect estimation is more appropriate than random effect estimation at the significant level of 5%, except the REQ integrated model with female labor force participation which is estimated by random effect estimation due to the non-significant Hausman test (Table C5.22, Column (7)). SGMM-II estimations are justified as the p-value of AR(1) test is lower than 5% and the p-values of AR(2) and Hansen tests are higher than 5%.

Table 5.6: Estimation results summary for models of the high openness sample

Institutional quality's dimensions	Gender equality indicators	FE (10)	DGMM-II (11)	SGMM-II (12)
Control of Corruption (COC)	Income ($\rightarrow$ GDI)		0.173 ^b (L1)	-0.342 ^b (L2)
	Income ² ($\rightarrow$ GDI)		-0.020 ^b (L1)	0.037 ^a (L2)

	Income ³ (→ GDI)		0.001 ^b (L1)	-0.001^a (L2)
	Openness (direct)		-0.023 ^c	
	COC (direct)		-0.026 ^c	
	rCOC*TOI (moderating)		0.006 ^c	
	Income (→ GII)	-4.759 ^c	1.075 ^b (L1)	
	Income ² (→ GII)	0.637 ^c	-0.137 ^b (L1)	
	Income ³ (→ GII)	-0.027 ^c	0.005 ^c (L1)	
	Openness (direct)		-0.335 ^c	
	COC (direct)		-0.183 ^c	-0.184 ^a
	rCOC*TOI (moderating)			
	Income (→ FLA)	-0.131 ^a	-0.256^c (L2)	
	Income ² (→ FLA)	0.016 ^a	0.030^c (L2)	
	Income ³ (→ FLA)	-0.001 ^a	-0.001^c (L2)	
	Openness (direct)	0.016 ^a		0.043 ^a
	COC (direct)		0.051 ^c	
	rCOC*TOI (moderating)	-0.030 ^b	-0.009 ^c	
Government Effectiveness (GVE)	Income (→ GDI)			
	Income ² (→ GDI)			
	Income ³ (→ GDI)			
	Openness (direct)			
	GVE (direct)		0.020 ^c	
	rGVE*TOI (moderating)		-0.005 ^c	
	Income (→ GII)	-4.734 ^c	1.167 ^a (L1)	
	Income ² (→ GII)	0.633 ^c	-1.719^c (L2)	
	Income ³ (→ GII)	-0.027 ^c	0.172^b (L2)	
	Openness (direct)		-0.006^b (L2)	
	GVE (direct)		-0.251 ^c	
	rGVE*TOI (moderating)	-0.123 ^a	-0.182 ^c	
	Income (→ FLA)	-0.135 ^a	-0.272^b (L2)	
	Income ² (→ FLA)	0.016 ^a	0.031^b (L2)	
	Income ³ (→ FLA)	-0.001 ^a	-0.001^b (L2)	
Political Stability and Absence of Violence/Terrorism (POS)	Openness (direct)		-0.029 ^a	0.066 ^b
	GVE (direct)		-0.068 ^c	-0.052 ^b
	rGVE*TOI (moderating)		0.004 ^b	
	Income (→ GDI)			
	Income ² (→ GDI)			
	Income ³ (→ GDI)			
	Openness (direct)			
	POS (direct)		0.015 ^c	
	rPOS*TOI (moderating)		-0.001 ^a	-0.002 ^a
	Income (→ GII)	-4.783 ^c	0.935 ^b (L1)	
	Income ² (→ GII)	0.638 ^c	-0.123 ^b (L1)	
	Income ³ (→ GII)	-0.027 ^c	0.005 ^c (L1)	
	Openness (direct)		-0.393 ^c	-0.253 ^b
	POS (direct)			
	rPOS*TOI (moderating)			0.026 ^a
	Income (→ FLA)	-0.138 ^b		
	Income ² (→ FLA)	0.017 ^b		
	Income ³ (→ FLA)	-0.001 ^a		

Regulatory Quality (REQ)	Openness (direct)			0.048 ^a
	POS (direct)		-0.023 ^c	
	rPOS*TOI (moderating)		-0.004 ^c	
	Income (→ GDI)		-0.094 ^c (L1)	
	Income ² (→ GDI)		0.011 ^b (L1)	
	Income ³ (→ GDI)		-0.001 ^b (L1)	
	Openness (direct)			
	REQ (direct)			
	rREQ*TOI (moderating)		-0.001 ^a	
	Income (→ GII)	-4.588 ^c	0.761 ^a (L1)	
	Income ² (→ GII)	0.620 ^c	-0.094 ^b (L1)	
	Income ³ (→ GII)	-0.027 ^c	0.003 ^b (L1)	
	Openness (direct)		-0.425 ^c	
	REQ (direct)	-0.187 ^c		
	rREQ*TOI (moderating)	-0.166 ^b		
	Income (→ FLA)	-0.121 ^b	-0.187^b (L2)	
	Income ² (→ FLA)	0.015 ^b	0.023^b (L2)	
	Income ³ (→ FLA)	-0.001 ^b	-0.001^b (L2)	
	Openness (direct)			0.090 ^b
Rule of Law (ROL)	REQ (direct)		-0.054 ^c	-0.058 ^a
	rREQ*TOI (moderating)		0.008 ^c	
	Income (→ GDI)			
	Income ² (→ GDI)			
	Income ³ (→ GDI)			
	Openness (direct)		-0.014 ^a	
	ROL (direct)		0.017 ^c	
	rROL*TOI (moderating)			
	Income (→ GII)	-4.680 ^c	0.934 ^b (L1)	
	Income ² (→ GII)	0.627 ^c	-0.119 ^b (L1)	
	Income ³ (→ GII)	-0.027 ^c	0.004 ^b (L1)	
	Openness (direct)		-0.435 ^c	-0.278 ^a
	ROL (direct)			
	rROL*TOI (moderating)	-0.129 ^a	-0.011 ^a	
	Income (→ FLA)	-0.135 ^a		
	Income ² (→ FLA)	0.017 ^a		
	Income ³ (→ FLA)	-0.001 ^a		
	Openness (direct)	0.020 ^a		0.051 ^a
	ROL (direct)			
Voice and Accountability (VAC)	rROL*TOI (moderating)	-0.036 ^b	-0.009 ^b	
	Income (→ GDI)		-0.072 ^b (L1)	
	Income ² (→ GDI)		0.008 ^b (L1)	
	Income ³ (→ GDI)		-0.001 ^a (L1)	
	Openness (direct)			
	VAC (direct)			
	rVAC*TOI (moderating)			
	Income (→ GII)	-4.701 ^c	1.066 ^c (L1)	
	Income ² (→ GII)	0.630 ^c	-0.130 ^c (L1)	
	Income ³ (→ GII)	-0.027 ^c	0.005 ^c (L1)	
	Openness (direct)		-0.539 ^c	-0.294 ^a
	VAC (direct)		-0.110 ^b	

rVAC*TOI (moderating)	-0.159 ^b	0.026 ^b
Income (→ FLA)	-0.130 ^a	
Income ² (→ FLA)	0.016 ^a	
Income ³ (→ FLA)	-0.001 ^a	
Openness (direct)		0.042 ^a
VAC (direct)		0.039 ^c
rVAC*TOI (moderating)	-0.006 ^b	

Note: Blank cells demonstrate non-significant links. Letters a, b, and c represent the 10%, 5%, and 1% significance levels respectively. Italic numbers indicate significant negative links. Links are not confirmed when (i) there are conflicting results between FE, DGMM-II, and SGMM-II estimations or (ii) the links are only significant in the FE estimation (except income variables). Grey cells indicate non-confirmed links. L1 and L2 indicate the lagged variables of income in year t-1 and t-2 respectively.

Source: The author.

Regarding the effects of income on gender equality in high openness countries:

(i) *Models with GDI:* Findings have not been consistent between models of institutional dimensions.

(ii) *Models with GII:* Findings have consistently indicated the N-shaped link between gender equality and income in the FE estimation of all models with six institutional dimensions. In addition, the inverse N-shaped link is consistently significant in the DGMM-II estimation of all models (except the GVE integrated model) with the first lags of income variables.

(iii) *Models with FLA:* Findings have consistently indicated the inverse N-shaped link between gender equality and income in the FE estimation of all models with six institutional dimensions. In addition, the inverse N-shaped is confirmed in the DGMM-II estimation of COC, GVE, and REQ integrated models with the second lags of income variables.

Findings have contributed to the relevant research of the GKC model which has been examined by Anyanwu (2016), Anyanwu and Augustine (2013) Nguyen (2022), Nguyen and Nguyen (2023), Nguyen and Su (2021), Ghosh (2022), Shittu et al. (2025) due to the contextual effect of trade liberalization on the GKC links. Findings of the high openness countries have explored the N-shaped link between

gender equality and income in the models of GII. In addition, the inverse N-shaped link in models with the first lag of income variables has implied that current income could differently influence future gender equality due to the lag of macroeconomic effects. Noticeably, findings have discovered that, in high openness countries, income significantly decreases FLA in the earlier stage, increases it in the subsequent stage, and eventually improves it in the long-term when the countries become wealthier.

Regarding the effects of trade liberalization (trade openness) on gender equality in high openness countries:

(i) *Models with GDI:* Trade liberalization significantly decreases GDI in the DGMM-II estimation of COC and ROL integrated models.

(ii) *Models with GII:* Trade liberalization significantly decreases GII in the DGMM-II and SGMM-II estimations of models with all institutional dimensions.

(iii) *Models with FLA:* Trade liberalization significantly increases FLA in the FE and SGMM-II estimations of models with all institutional dimensions except the GVE integrated model.

Findings of high openness countries have indicated the divergent effects of trade liberalization on gender equality. In models with GII and FLA, findings have indicated the boosting effect of trade liberalization on gender equality, which has been supported by *The Stolper-Samuelson Theorem* (Stolper & Samuelson, 1941), the *scale effect*, *composition effect*, and *technique effect* (Abid & Sekrafi, 2021; Ertugrul et al., 2016; Liobikiene & Butkus, 2019), and the positive impacting channels (Fontana, 2016; Korinek et al., 2021). However, findings have strikingly documented the hampering effect of trade liberalization on GDI, which could be due to the negative impacts proposed by the three-fold effect of trade theory (Abid & Sekrafi, 2021; Ertugrul et al., 2016; Liobikiene & Butkus, 2019) and the negative impacting channels (Fontana, 2016; Korinek et al., 2021).

Regarding the effects of institutional quality on gender equality in high openness countries:

(i) *Models with GDI*: While *GVE*, *POS*, and *ROL* significantly increase GDI in the DGMM-II estimation, *COC* significantly decreases GDI in the DGMM-II estimation.

(ii) *Models with GII*: *COC*, *GVE*, and *VAC* significantly decreases GII in the DGMM-II and SGMM-II estimations.

(iii) *Models with FLA*: While *COC* and *VAC* significantly increase FLA in the DGMM-II estimation, *GVE* and *POS* significantly decrease FLA in the DGMM-II and SGMM-II estimations.

Findings of high openness countries have consistently documented the mitigating effects of institutional quality on GII, which is consistent with Achuo et al. (2024), Nam et al. (2025), Nguyen and Nguyen (2023), Opeloyeru et al. (2024), Saha and Singh (2025). However, the effects on GDI and FLA have appeared to be divergent, which is consistent with Umar et al. (2025).

Regarding the moderating effects of institutional quality on gender-liberalization links in high openness countries:

(i) *Models with GDI*: While *COC* positively moderates the link between GDI and trade liberalization in the DGMM-II estimation, *GVE*, *POS*, and *REQ* negatively moderate link between GDI and trade liberalization in the DGMM-II and SGMM-II estimations.

(ii) *Models with GII*: While *POS* positively moderates the link between GII and trade liberalization in the SGMM-II estimation, *ROL* negatively moderates the link between GII and trade liberalization in the FE and DGMM-II estimations.

(iii) *Models with FLA*: *GVE* and *REQ* positively moderate the link between FLA and trade liberalization in the DGMM-II estimation. Meanwhile, *COC*, *POS*, *ROL*, and *VAC* negatively moderate that link in the FE and DGMM-II estimations.

Findings of high openness countries have explored divergent moderating effects of institutional quality on the link between gender equality and trade

liberalization, which is dependent on specific dimensions of institutional quality and gender equality.

5.3.6. Results for the low openness sample

Table 5.7 demonstrates the summary of estimation results for the models of the low openness sample. Column (13), (14), and (15) indicate the results of FE, DGMM-II, and SGMM-II methods. Please see the Appendices of Chapter 5 for detailed reports of estimation results in Table C5.25, C5.26, C5.27, C5.28, C5.29, and C5.30. As could be seen in the Appendices of Chapter 5, the Hausman tests have indicated that fixed effect estimation is more appropriate than random effect estimation at the significant level of 5%, except six model with female labor force participation which is estimated by Pooled OLS due to the non-significant F tests (Column (7) of Table C5.25, C5.26, C5.27, C5.28, C5.29, and C5.30). SGMM-II estimations are justified as the p-value of AR(1) test is lower than 5% and the p-values of AR(2) and Hansen tests are higher than 5%.

Table 5.7: Estimation results summary for models of the low openness sample

Institutional quality's dimensions	Gender equality indicators	FE (13)	DGMM-II (14)	SGMM-II (15)
Control of Corruption (COC)	Income ($\rightarrow$ GDI)	0.255 ^b	0.193 ^c (L1)	
	Income ² ($\rightarrow$ GDI)		-0.020 ^c (L1)	
	Income ³ ($\rightarrow$ GDI)		0.001 ^b (L1)	
	Openness (direct)		-0.012 ^b	
	COC (direct)	0.015 ^c		
	rCOC*TOI (moderating)		0.006 ^c	0.008 ^a
	Income ($\rightarrow$ GII)		1.641 ^c (L1)	
	Income ² ($\rightarrow$ GII)		-0.180 ^c (L1)	
	Income ³ ($\rightarrow$ GII)		0.007 ^c (L1)	
	Openness (direct)		-0.094 ^c	-0.104 ^a
	COC (direct)			
	rCOC*TOI (moderating)			
	Income ($\rightarrow$ FLA)		-0.235 ^a (L1)	-1.533 ^a (L1)
	Income ² ($\rightarrow$ FLA)		0.031 ^b (L1)	0.174 ^a (L1)
	Income ³ ($\rightarrow$ FLA)		-0.001 ^c (L1)	-0.006 ^a (L1)
	Openness (direct)			
	COC (direct)		0.028 ^c	
	rCOC*TOI (moderating)		0.008 ^b	
Government Effectiveness (GVE)	Income ($\rightarrow$ GDI)	0.265 ^b	0.157 ^b (L1)	
	Income ² ($\rightarrow$ GDI)		-0.016 ^b (L1)	

	Income ³ (→ GDI)		0.001 ^a (L1)	
	Openness (direct)			0.021 ^a
	GVE (direct)		-0.023 ^c	
	rGVE*TOI (moderating)		0.004 ^c	
	Income (→ GII)		1.287 ^c (L1)	2.823 ^b (L1)
	Income ² (→ GII)		-0.143 ^c (L1)	-0.319 ^b (L1)
	Income ³ (→ GII)		0.006 ^c (L1)	0.012 ^b (L1)
	Openness (direct)		-0.073 ^c	
	GVE (direct)		-0.084 ^c	-0.098 ^a
	rGVE*TOI (moderating)		0.008 ^a	
	Income (→ FLA)		-0.312 ^a (L1)	
	Income ² (→ FLA)		0.039 ^b (L1)	
	Income ³ (→ FLA)		-0.020^a (L2)	
	Openness (direct)		-0.002 ^b (L1)	
	GVE (direct)		0.001^a (L2)	
	rGVE*TOI (moderating)		0.024 ^c	0.036 ^b
Political Stability and Absence of Violence/Terrorism (POS)	Income (→ GDI)	0.280 ^b	0.336 ^c (L1)	
	Income ² (→ GDI)		-0.036 ^c (L1)	
	Income ³ (→ GDI)		0.001 ^c (L1)	
	Openness (direct)		-0.017 ^b	
	POS (direct)	-0.007 ^a	-0.014 ^c	
	rPOS*TOI (moderating)			0.011 ^a
	Income (→ GII)		1.983 ^c (L1)	
	Income ² (→ GII)		-0.217 ^c (L1)	
	Income ³ (→ GII)		0.008 ^c (L1)	
	Openness (direct)		-0.074 ^c	-0.097 ^a
	POS (direct)		-0.044 ^b	
	rPOS*TOI (moderating)		-0.010 ^a	
	Income (→ FLA)		-0.229 ^b (L2)	
	Income ² (→ FLA)		0.030 ^b (L2)	
	Income ³ (→ FLA)		-0.001 ^c (L2)	
	Openness (direct)		-0.019 ^a	
	POS (direct)		-0.055 ^c	
	rPOS*TOI (moderating)			
Regulatory Quality (REQ)	Income (→ GDI)	0.264 ^b	0.210 ^c (L1)	0.793 ^a (L1)
	Income ² (→ GDI)		-0.022 ^b (L1)	-0.091 ^a (L1)
	Income ³ (→ GDI)		0.001 ^a (L1)	0.004 ^a (L1)
	Openness (direct)		-0.022 ^c	
	REQ (direct)			
	rREQ*TOI (moderating)		0.005 ^c	
	Income (→ GII)		0.914 ^c (L1)	0.760 ^b (L1)
	Income ² (→ GII)		-0.093 ^c (L1)	-0.082 ^a (L1)
	Income ³ (→ GII)		0.003 ^c (L1)	
	Openness (direct)		-0.071 ^c	
	REQ (direct)		-0.099 ^c	
	rREQ*TOI (moderating)			
	Income (→ FLA)		-0.434 ^a (L1)	
	Income ² (→ FLA)		0.057 ^b (L1)	

Rule of Law (ROL)	Income ³ (→ FLA)		-0.002 ^b (L1)	
	Openness (direct)		0.033 ^a	
	REQ (direct)		-0.117 ^c	
	rREQ*TOI (moderating)		0.018 ^c	0.030 ^a
	Income (→ GDI)	0.267 ^b	0.203 ^c (L1)	
	Income ² (→ GDI)		-0.022 ^c (L1)	
	Income ³ (→ GDI)		0.001 ^c (L1)	
	Openness (direct)		-0.014 ^c	
	ROL (direct)			0.063 ^c
	rROL*TOI (moderating)			
	Income (→ GII)		1.075 ^c (L1)	0.799 ^b (L1)
	Income ² (→ GII)		-0.112 ^c (L1)	-0.089 ^a (L1)
	Income ³ (→ GII)		0.004 ^c (L1)	0.003 ^a (L1)
	Openness (direct)		-0.098 ^c	
	ROL (direct)		-0.051 ^a	
	rROL*TOI (moderating)			
	Income (→ FLA)		0.542 ^b (L1)	
	Income ² (→ FLA)		-0.063 ^b (L1)	
	Income ³ (→ FLA)		0.003 ^b (L1)	
	Openness (direct)			
	ROL (direct)		-0.097 ^c	
	rROL*TOI (moderating)		-0.027 ^c	-0.019 ^a
Voice and Accountability (VAC)	Income (→ GDI)	0.257 ^b	0.126 ^c (L1)	
	Income ² (→ GDI)		-0.014 ^b (L1)	
	Income ³ (→ GDI)		0.001 ^b (L1)	
	Openness (direct)			
	VAC (direct)		0.027 ^c	0.044 ^a
	rVAC*TOI (moderating)	-0.015 ^b		
	Income (→ GII)		1.714 ^c (L1)	
	Income ² (→ GII)		-0.180 ^c (L1)	
	Income ³ (→ GII)		0.006 ^c (L1)	
	Openness (direct)	0.033 ^a	-0.126 ^c	-0.110 ^a
	VAC (direct)		-0.087 ^c	
	rVAC*TOI (moderating)		-0.012 ^b	
	Income (→ FLA)		-0.329 ^a (L1)	
	Income ² (→ FLA)		0.043 ^b (L1)	
	Income ³ (→ FLA)		-0.002 ^b (L1)	
	Openness (direct)			
	VAC (direct)		0.054 ^c	0.091 ^a
	rVAC*TOI (moderating)		0.009 ^c	

Note: Blank cells demonstrate non-significant links. Letters a, b, and c represent the 10%, 5%, and 1% significance levels respectively. Italic numbers indicate significant negative links. Links are not confirmed when (i) there are conflicting results between FE, DGMM-II, and SGMM-II estimations or (ii) the links are only significant in the FE estimation (except income variables). Grey cells indicate non-confirmed links. L1 and L2 indicate the lagged variables of income in year t-1 and t-2 respectively.

Source: The author.

Regarding the effects of income on gender equality in low openness countries:

(i) *Models with GDI:* Findings have consistently indicated the N-shaped link between gender equality and income in the DGMM-II and SGMM-II estimations of all models of six institutional dimensions with the first lag of income variables.

(ii) *Models with GII:* Findings have consistently indicated the inverse N-shaped link between gender equality and income in the DGMM-II and SGMM-II estimations of all models of six institutional dimensions with the first lag of income variables.

(iii) *Models with FLA:* Findings have not been consistent between models of institutional dimensions.

Findings of low openness countries have been divergent, which are dependent on specific proxies for gender equality. In models with GDI, the N-shaped link has been confirmed with the first lag of income variables, while in the models with GII, the inverse N-shaped link is significant. Therefore, findings have contributed to the relevant research of the GKC model which has been examined by Anyanwu (2016), Anyanwu and Augustine (2013) Nguyen (2022), Nguyen and Nguyen (2023), Nguyen and Su (2021), Ghosh (2022), Shittu et al. (2025) due to the contextual effect of trade liberalization on the GKC links and the different proxies for gender equality.

Regarding the effects of trade liberalization (trade openness) on gender equality in low openness countries:

(i) *Models with GDI:* Findings have not been consistent between models of institutional dimensions.

(ii) *Models with GII:* Trade liberalization significantly decreases GII in the DGMM-II and SGMM-II estimations of COC, GVE, POS, REQ, and ROL integrated models.

(iii) *Models with FLA*: Findings have not been consistent between models of institutional dimensions.

Findings of low openness countries have consistently indicated the promoting effect of trade liberalization on gender equality, which has been supported by *The Stolper-Samuelson Theorem* (Stolper & Samuelson, 1941), the *scale effect*, *composition effect*, and *technique effect* (Abid & Sekrafi, 2021; Ertugrul et al., 2016; Liobikiene & Butkus, 2019), and the positive impacting channels (Fontana, 2016; Korinek et al., 2021).

Regarding the effects of institutional quality on gender equality in low openness countries:

(i) *Models with GDI*: While *GVE* and *POS* significantly decrease GDI in the FE and DGMM-II estimations, *ROL* and *VAC* significantly increase GDI in the DGMM-II and SGMM-II estimations.

(ii) *Models with GII*: Consistently, *GVE*, *POS*, *REQ*, *ROL*, and *VAC* significantly decrease GII in the DGMM-II and SGMM-II estimations.

(iii) *Models with FLA*: While *COC* and *VAC* significantly increase FLA in the DGMM-II and SGMM-II estimations, *POS*, *REQ*, and *ROL* significantly decrease FLA in the DGMM-II estimation.

Findings of low openness countries have consistently documented the mitigating effects of institutional quality on GII, which is consistent with Achuo et al. (2024), Nam et al. (2025), Nguyen and Nguyen (2023), Opeloyeru et al. (2024), Saha and Singh (2025). However, the effects on GDI and FLA have appeared to be divergent, which is consistent with Umar et al. (2025).

Regarding the moderating effects of institutional quality on gender-liberalization links in low openness countries:

(i) *Models with GDI*: Consistently, *COC*, *GVE*, *POS*, and *REQ* positively moderate the link between GDI and trade liberalization in the DGMM-II and SGMM-II estimations.

(ii) *Models with GII*: While *GVE* positively moderates the link between GII and trade liberalization in the DGMM-II estimation, *POS* and *VAC* negatively moderates that link in the DGMM-II estimation.

(iii) *Models with FLA*: While *COC*, *GVE*, *REQ*, and *VAC* positively moderate the link between FLA and trade liberalization in the DGMM-II and SGMM-II estimations, *ROL* negatively moderates that link in the DGMM-II and SGMM-II estimations.

Findings of low openness countries have explored divergent moderating effects of institutional quality on the link between gender equality and trade liberalization, which is dependent on specific dimensions of institutional quality and gender equality.

5.4. Concluding remarks

As inspired by Goal 5 and Goal 17 in the SDGs of The Agenda 2030, this chapter has employed the Gender-based Kuznets Curve (GKC) model to explore the effects of trade liberalization and institutional quality on gender equality. To solve the research objective, this chapter has proposed research hypotheses which are relevant to the direct impacts of trade liberalization (trade openness) and institutional quality on gender equality, and the moderating and contextual impacts of trade liberalization (trade openness) and institutional quality on gender-institution and gender-liberalization links. In this chapter, gender equality is proxied by gender development index, gender inequality index, and female labor force participation. Institutional quality is proxied by six worldwide governance indicators. Income variables include original, squared, and cubed terms of gross domestic product per capita for the N-shaped GKC model. The panel data includes 113 worldwide countries in the 2002-2021 period. The panel size is $113 \times 20 = 2,260$ observations.

Estimation methods include random effect, combined fixed effect (country-fixed and year-fixed), Pooled OLS, and two-step system and difference GMM in order to deal with heterogeneity and endogeneity. Some noticeable findings of this chapter are as follows (please see Table C5.31, C5.32, C5.33, and C5.34 in the Appendices of Chapter 5 for the summary of explored effects):

Regarding the direct effects of income on gender equality:

(i) *In the aggregated sample*, findings have documented the N-shaped relationship. In addition, findings of models with lagged income have indicated the inverse N-shaped relationship, which implies that, to a certain degree, current income could significantly influence future gender equality due to the lag of income's effects on social issues.

(ii) *In high institutional quality countries*, the N-shaped link is significant in models with GDI (current and first-lagged income variables) and GII (current and second-lagged income variables). In models with FLA, the link is inverse N-shaped with current and second-lagged income variables.

(iii) *In the low institutional quality countries*, the inverse U-shaped link is significant in the models with GDI and current income variables.

(iv) *In the high openness countries*, the N-shaped link is significant in models with GII and current income variables, however, the inverse N-shaped link is confirmed in the models with first-lagged income variables. In models with FLA, the inverse N-shaped link is significant with both current and second-lagged income variables.

(v) *In the low openness countries*, the N-shaped link is significant in models of GDI and first-lagged income variables. However, in models with GII and first-lagged income variables, the link is inverse N-shaped.

Regarding the direct effects of trade liberalization (trade openness) on gender equality:

(i) *In the aggregated sample*, findings have consistently indicated the positive impact of trade liberalization on gender equality in all models.

(ii) *In the high institutional quality countries*, positive impact is significant in models with GII and FLA. Noticeably, negative impact has been documented in models of GDI and specific institutional quality dimensions.

(iii) *In the low institutional quality countries*, findings have consistently indicated the positive impact of trade liberalization on gender equality in models with GII and FLA.

(iv) *In the high openness countries*, positive impact is significant in models with GII and FLA. Noticeably, negative impact has been documented in models of GDI and specific institutional quality dimensions.

(v) *In the low openness countries*, positive impact is significant in models with GII and specific institutional quality dimensions.

Regarding the direct effects of institutional quality on gender equality:

(i) *In the aggregated sample*, positive impact is consistently significant in the models of GII and specific institutional quality dimensions (COC, GVE, POS, REQ, and VAC). Negative impact is significant in the model of GDI and GVE. Findings of models with FLA have been divergent on specific institutional quality dimensions.

(ii) *In the high institutional quality countries*, findings of models with GII and FLA have been divergent on specific institutional quality dimensions. Noticeably, the negative impact is significant in models of GDI and specific institutional quality dimensions (COC, GVE, and ROL).

(iii) *In the low institutional quality countries*, findings of models with three proxies for gender equality have been divergent on specific institutional quality dimensions.

(iv) *In the high openness countries*, findings of models with GDI and FLA have been divergent on specific institutional quality dimensions. Noticeably, the

positive impact is significant in models of GII and specific institutional quality dimensions (*COC*, *GVE*, and *VAC*).

(v) *In the low openness countries*, findings of models with GDI and FLA have been divergent on specific institutional quality dimensions. Noticeably, the positive impact is significant in models of GII and specific institutional quality dimensions (*GVE*, *POS*, *REQ*, *ROL*, and *VAC*).

Regarding the moderating effects of trade liberalization on gender-institution links:

(i) *In the aggregated sample*, findings have explored divergent moderating effects of trade liberalization on gender-institution links which are determined by specific dimensions of gender equality and institutional quality. In models with GDI, high openness significantly facilitates the boosting effect of *POS*. In models with GII, high openness triggers the worsening effects of *POS*, *ROL*, and *VAC*. In models with FLA, higher openness initiates the hampering effects of all institutional dimensions. Those findings have implied that women in more open economies are more vulnerable to gender inequality when institutions are improved.

(ii) *In the high institutional quality countries*, high openness facilitates the boosting effect of institutional quality on gender equality in models of GDI (with *POS* and *VAC*) and GII (with *COC* and *REQ*). However, findings have strikingly indicated that high openness could trigger the hampering effect of institutional quality on FLA (with all institutional dimensions).

(iii) *In the low institutional quality countries*, in models with GDI, high openness facilitates the boosting effect on *COC*, while triggering the hampering effect of *POS*. In models of GII, high openness consistently triggers the worsening effect of *COC*, *GVE*, *REQ*, *ROL*, and *VAC*.

Regarding the moderating effects of institutional quality on gender-liberalization links:

(i) *In the aggregated sample*, findings have indicated that high *GVE*, *REQ*, and *VAC* facilitate the boosting effect on *FLA*.

(ii) *In the high openness countries*, in models with *GDI*, high *COC* facilitates the boosting effect, while high *GVE*, *POS*, and *REQ* trigger the hampering effect on *GDI*. In models with *GII*, high *POS* triggers the worsening effect on *GII*, while high *ROL* facilitates the mitigating effect on *GII*. In models with *FLA*, high *GVE* and *REQ* facilitate the boosting effect on *FLA*, while high *COC*, *POS*, *ROL*, and *VAC* trigger the hampering effect on *FLA*.

(iii) *In the low openness countries*, in models with *GDI*, high *COC*, *GVE*, *POS*, and *REQ* facilitate the boosting effect on *GDI*. In models with *GII*, high *GVE* triggers the worsening effect on *GII*, while high *POS* and *VAC* facilitate the mitigating effect on *GII*. In models with *FLA*, high *COC*, *GVE*, *REQ*, and *VAC* facilitate the boosting effect, while high *ROL* triggers the hampering effect on *FLA*.

CHAPTER 6: THE OPENNESS-BASED ENVIRONMENTAL KUZNETS CURVE APPROACH TO THE NEXUS BETWEEN ENVIRONMENTAL QUALITY, TRADE, AND INSTITUTIONAL QUALITY

6.1. Introduction

As driven by Goal 13 and Goal 17 in the SDGs of The Agenda 2030, this chapter investigates the relationship between environmental quality, trade liberalization (trade openness), and institutional quality. From the perspective the *Theory of Three-Fold Effect of Trade on Emissions*, trade openness could eventually either increase or decrease CO₂ emissions which depends on which effect is more dominant (Abid & Sekrafi, 2021; Ertugrul et al., 2016; Liobikiene & Butkus, 2019), more particularly:

(i) *The scale effect*: Trade openness expands economic activities, which increases CO₂ emissions;

(ii) *The composition effect*: Trade openness facilitates the specialization in goods and services in which countries have the comparative advantages. This triggers the changes in economic structure of various countries. Particularly, some countries could concentrate their resources on more polluting or *carbon-intensive* industries, while others focus greener or *carbon-neutral* sectors. In other words, different comparative advantages lead to difference economic structure as a result of greater openness, which ultimately could either increase or decrease environmental deterioration.

(ii) *The technique effect*: Trade openness allows the technological transfers from developed nations to developing and emerging partners which are relevant to renewable production. This could help nations reduce CO₂ emissions.

From the perspective of the *Pollution Haven Hypothesis*, trade openness may influence the decisions of foreign investors in pollution-intensive industries on the location of their production facilities in developing and emerging countries, which eventually increases emissions in those countries (Abid & Sekrafi, 2021; Al-Mulali

et al., 2016; Azam & Khan, 2016; Ertugrul et al., 2016; Shahbaz et al., 2015). Meanwhile, from the perspective of the *Pollution Halo Hypothesis*, trade openness may attract foreign investors with advanced and carbon-neutral technologies, which reduces emissions and facilitates the circular production in the destination countries (Kang et al., 2016; Kohler, 2013; Shahbaz et al., 2012).

From the empirical perspective, relevant research has indicated mixed results of the nexus between trade and environmental quality, for example:

(-) Negative impacts: Trade and openness deteriorate environmental quality (proxied by CO₂ emissions): Adebayo et al. (2023); Ansari et al. (2020); Aslam et al. (2021); Balsalobre-Lorente et al. (2023); Chhabra et al. (2023); Dou et al. (2021); Ibrahim & Ajide (2021); Jiang & Jiang (2025); Le & Ozturk (2020); Li & Haneklaus (2022); Ozkan et al. (2023).

(+) Positive impacts: Trade and openness could reduce CO₂ emissions: Aydin (2023) (some countries); Bandyopadhyay & Rej (2021); Koc & Bulus (2020); Yang et al. (2022); Jiang and Jiang (2025) (with the enhancements of environmental regulations).

The relationship between trade openness and CO₂ emissions is explained through the Theory of the Three-fold Effect, which describes how the net impact on the environment depends on the dominance of three distinct mechanisms. This interplay consequently results in an inverse U-shaped relationship, where emissions initially rise with trade but eventually decline as technological and structural shifts take hold.

+ **The linear mechanisms of trade:** The linear drivers of emissions are categorized into three effects that can either increase or decrease environmental degradation:

- *Scale effect:* This mechanism suggests a positive linear relationship between trade and emissions. As trade openness expands the overall scale of

economic activities, it results in higher environmental degradation and increased CO₂ emissions.

- *Composition effect:* This effect involves changes in a country's economic structure based on its comparative advantage. If a country specializes in carbon-intensive industries, emissions will increase; conversely, if it focuses on carbon-neutral or greener sectors, emissions will decrease.

- *Technique effect:* This mechanism provides a negative linear relationship. Trade openness facilitates the transfer of advanced technologies from developed nations to developing partners, particularly those related to renewable production, which helps nations reduce their emissions.

+ **The curvilinear mechanism (the inverse U-shaped relationship):** The curvilinear or inverse U-shaped relationship occurs because the balance between these linear effects shifts as trade openness increases. This shift is often explained through two competing hypotheses:

- **The upward slope (Pollution Haven Hypothesis):** In the earlier stages of trade openness, emissions tend to rise. This is often due to the Pollution Haven Hypothesis, where foreign investors in pollution-intensive industries relocate their production facilities to developing and emerging countries, thereby increasing emissions in those destination countries. During this phase, the expansionary scale effect typically outweighs the technique effect. In addition, in this stage, several carbon-intensive industries are flourishing due to the expansion of exporting opportunities, which implies the boosting effect of trade openness on CO₂ emissions, which eventually contributes to the emissions increase as a result of the composition effect.

- **The downward slope (Pollution Halo Hypothesis):** As trade openness continues to grow, it can reach a turning point where emissions begin to fall. This is supported by the Pollution Halo Hypothesis, which posits that trade openness attracts foreign investors bringing advanced, carbon-neutral technologies. These investments

facilitate circular production and allow the technique effect, which is driven by technological transfers, to become dominant over the scale effect, ultimately leading to a reduction in total carbon dioxide emissions. In addition, in this stage, countries tend to shift the structure towards greener and carbon-neutral industries, which implies the hampering effect of trade openness on CO₂ emissions, which eventually contributes to the emissions decrease as a result of the composition effect.

Overall, the contemporary literature has been demonstrating a complex and conflicting view of the relationship between trade openness and CO₂ emissions. While numerous studies have suggested that trade openness contributes to increased CO₂ emissions, others have demonstrated that it can play a role in environmental pollution mitigation, which is dependent on specific contexts, policy interventions, and the consideration of various direct and indirect effects. This inconsistency has highlighted the need for a more specific understanding of the trade-environment link.

The traditional Environmental Kuznets Curve (EKC) model, which examines the relationship between economic growth and environmental degradation, typically uses per capita GDP and its squared term as explanatory variables. However, this approach could not fully capture the specific role of trade openness dynamics in influencing CO₂ emissions. Therefore, this chapter introduces a new Openness-based EKC model that shifts the focus from per capita GDP to trade openness (and its squared term). This new approach hopefully allows a direct examination of the potential non-linear relationship between trade openness and CO₂ emissions. The Openness-based EKC model aims at providing new insights into how trade openness specifically impacts environmental quality.

Based on those relevant literature and empirical mixed results, the research gaps include the direct impacts (linear and non-linear) of trade liberalization (trade openness) and institutional quality on environmental quality, and the moderating and contextual impacts of trade liberalization (trade openness) and institutional quality on

environment-institution and environment-liberalization links. Therefore, the following hypotheses have been proposed as follows:

H.4.1: Trade liberalization has a significant effect on environmental quality.

H.4.1.1: At lower levels, trade liberalization has a significant negative (positive) effect on environmental quality (CO₂ emissions).

H.4.1.2: At higher levels, trade liberalization has a significant positive (negative) effect on environmental quality (CO₂ emissions).

H.4.2: Institutional quality has a significant positive (negative) effect on environmental quality (CO₂ emissions).

H.4.3: Institutional quality significantly moderates the link between environmental quality and trade liberalization.

H.4.4: Trade liberalization has a significant contextual effect on the environment-liberalization and environment-institution links.

H.4.5: Institutional quality has a significant contextual effect on the environment-liberalization and environment-institution links.

6.2. Model specification, variable measurement, and estimation strategy

6.2.1. Model specification and variable measurement

Based on the original EKC hypothesis (Kuznets, 1955) and the most recent research of (Achuo & Ojong, 2024; Amankwa et al., 2024; Boujedra & Jebli, 2025; Caporin et al., 2024; Demiral et al., 2024; Guo & Shahbaz, 2024; Gupta et al., 2025; Gyamfi et al., 2024; Huang et al., 2024; Mahadevan & Suardi, 2024; Murad et al., 2025; Phiri et al., 2024; Polat & Cil, 2025; Rasheed & Liu, 2024; Shao et al., 2025; Wang et al., 2024; Wu et al., 2025; Zeraibi et al., 2024), the general Openness-based Environmental Kuznets Curve (OEKC) model in this chapter has been proposed as follows:

$$\begin{aligned}
EQ_{it} = & \rho_0 + \rho_1 EQ_{i,t-1} + \rho_2 EQ_{i,t-2} + \rho_3 Openness_{it} + \rho_4 Openness_{it}^2 + \rho_5 IQ_{it} \\
& + \rho_6 (IQ_{LEV} \cdot Openness)_{it} + \rho_7 (IQ_{LEV} \cdot Openness^2)_{it} \\
& + \sum_{m=8}^{14} \rho_m Control_{m,it,t} + \mu_t + \varphi_{it}
\end{aligned}$$

where i denotes the country of the observation, t denotes the year of the observation, $t-1$ and $t-2$ denote the first and second lags of the dependent variable EQ_{it} , ρ denotes the coefficients of explanatory variables (except for ρ_0 which denotes the y-intercept of the estimation), EQ_{it} denotes the environmental quality, $Openness_{it}$ and $Openness_{it}^2$ denote trade openness and its squared term, $(IQ_{LEV} \cdot Openness)_{it}$ and $(IQ_{LEV} \cdot Openness^2)_{it}$ denote the cross-terms of level of institutional quality (six dimensions) and trade openness (original and squared term), $\sum_{m=8}^{14} Control_{m,it,t}$ represents the set of control variables, μ_t is the time-fixed effect, and φ_{it} is the error term of the estimation. Based on the general model, the specific model has been proposed whose variables are interpreted in Table A.4 (the Appendices A).

The six institutional quality variables (explanatory variables) are included separately in the research models in order to avoid the potential multi-collinearity. Control variables include:

- + Urbanization: This typically increases energy consumption due to dense infrastructure and transportation needs, but it can also lead to efficiency gains through concentrated public transit and greener building technologies.

- + Inward foreign direct investment: This reflects the Pollution Haven Hypothesis (multinationals moving dirty industries to countries with lax regulations) versus the Pollution Halo Hypothesis (foreign firms bringing cleaner and more advanced technology that reduces emissions).

- + Income per capita: Emissions can rise during early economic growth but fall once a country becomes wealthy enough to invest in green technologies.

+ WTO membership: This accelerates international trade volume, which can increase emissions through expanded industrial production and freight transport (the scale effect).

+ OECD membership: OECD members usually possess stricter environmental regulations, higher environmental awareness, and greater structural capacity to transition to low-carbon economies

+ Global economic and financial crisis: This could result in massive exogenous drops in global industrial activity, manufacturing, and trade, which temporarily pull down worldwide emissions.

+ Global COVID-19 pandemic: This accounts for unprecedented, sharp drops in global emissions due to strict lockdowns, restricted international aviation, and slowed industrial supply chains

The panel data samples include the aggregated, high institutional quality, low institutional quality, high openness, and low openness. Data sources are built from the databases of The World Bank, The World Trade Organization, The United Nations Conference on Trade and Development, and The Our World in Data project of the Global Change Data Lab (for the CO₂ emissions). The panel data includes 113 worldwide countries in the 2002-2020 period. Therefore, the panel size is $113 \times 19 = 2,147$ observations.

6.2.2. Estimation strategy

To estimate the proposed models, this chapter employs the combined fixed effect (FE), random effect (RE), two-step difference generalized method of moments (DGMM-II), and two-step system generalized method of moments (SGMM-II) methods. The combined fixed effect estimation, which includes country-fixed and year-fixed effects, is applied to deal with the heterogeneity in the panel data of several countries (Gupta et al., 2025; Huang et al., 2024; Iqbal et al., 2022; Le & Pham, 2024; Lohani, 2024; Polat & Cil, 2025).

For treating the endogeneity in dynamic panel models of macroeconomic variables, several recent studies have been using the DGMM-II and SGMM-II method to deal with endogeneity caused by reverse causality (or simultaneity bias) and dynamic model with lagged dependent variables. Several recent studies have been using the DGMM-II and SGMM-II method. For example, Emikonel (2022), Eshetu and Goshu (2021), Jiang and Khan (2023), Gupta et al. (2025), Huang et al. (2024), Kahouli (2016), Le (2022), Le and Pham (2024), Nguyen (2021), Osinubi and Simatele (2025), and Shittu et al. (2025) have applied the DGMM-II and SGMM-II methods to alleviate endogeneity which is caused by the dynamic panel data with large N and short T (Arellano & Bond, 1991; Blundell & Bond, 1998; Roodman, 2009).

In this chapter, the endogenous variables include trade openness in the original and squared terms as environmental quality could have the significant impact on trade openness and liberalization, which much possibly triggers the reverse causality running from environmental quality to trade liberalization (trade openness) (Amin et al., 2023; Aydin, 2023; Ben Jebil et al., 2019; Dou et al., 2021; Jamel & Maktouf, 2017; Pata et al., 2023; Rahman et al., 2020). For example, Aydin (2023) and Pata et al. (2023) have discovered the bidirectional causality between CO₂ emissions and trade openness in the case of G8 and ASEAN countries. In addition, simultaneously addressing the endogeneity of multiple regressors (exceeding three in this chapter) leads to an explosion in the number of instruments relative to the number of cross-sectional units (N). This instrument proliferation can weaken the Hansen test's power to detect overidentifying restrictions, potentially leading to misleadingly high p-values and biased estimates. Furthermore, the number of groups (N) will also decrease in the models of contextual effects, which could exacerbate the negative effect of instrument proliferation.

Regarding diagnostic tests, the Hausman test (Hausman, 1978) is applied to the justification of fixed and random effect methods. The rejection of the null hypothesis justifies the fixed effect method for the research models. For the DGMM-

II and SGMM-II method, the tests of Arellano and Bond first and second autocorrelation AR(1) and AR(2) (z), and Hansen's over-identification restrictions (chi2) (Arellano & Bond, 1991; Roodman, 2009) are employed. The DGMM-II and SGMM-II methods are justified when the p-value of AR(1) test is lower than 5% and the p-values of AR(2) and Hansen tests are higher than 5%.

To ensure the reliability of the findings, the dissertation has conducted a cross-comparison between FE, DGMM-II, and SGMM-II estimations. This is due to the fact that for a subset of variables the estimated coefficients exhibited conflicting signs. Such divergences often results from the inability of FE models to account for dynamic endogeneity or the inherent bias in short-panel datasets ($T < 30$). To maintain the reliability for empirical significance, the dissertation has not considered coefficients with conflicting signs from the discussion of confirmed impacts. This could be seen in the note at the end of each summary table. Therefore, the results reported in the summary tables in this chapter focus exclusively on those variables where the direction of the effect is harmonized and consistent across both estimators, thereby providing a more reliable basis for the conclusions.

6.3. Empirical results and discussion

6.3.1. Descriptive and preliminary analysis

Before proceeding with the estimations, this section provides an overview of the dataset's characteristics. To define the scope of the analysis, the selection of worldwide countries included in the panel data is presented in Table A.6 (the Appendices A).

Table 6.1 demonstrates the descriptive statistics of the original variables.

Table 6.1: Descriptive statistics

Variable	Unit	Observations	Mean	Std. Dev.	Min	Max
CEpC _{it}	Tonnes/person	2,147	4.435	4.519	0.019	26.003
TOI _{it}	%	2,147	84.089	53.304	0.757	437.327
COC _{it}	-	2,147	0.039	1.056	-1.597	2.459
GVE _{it}	-	2,147	0.135	0.988	-1.887	2.426

POS _{it}	-	2,147	-0.080	0.918	-2.810	1.753
REQ _{it}	-	2,147	0.189	0.948	-2.202	2.255
ROL _{it}	-	2,147	0.056	1.015	-1.870	2.125
VAC _{it}	-	2,147	0.097	0.956	-2.124	1.801
URB _{it}	%	2,147	59.918	20.842	8.682	100.000
IFDI _{it}	%	2,147	65.626	178.291	0.599	1,967.750
GDPpc _{it}	US\$/person	2,147	14,258.650	20,236.840	114.367	123,678.700

Source: The author.

Table 6.2 demonstrates the Pearson correlation matrix of continuous variables included in the research models.

Table 6.2: Pearson correlation matrix

	lnCEpc _{it}	lnTOI _{it}	lnTOI ² _{it}	COC _{it}	GVE _{it}	POS _{it}	REQ _{it}
lnCEpc _{it}	1.000						
lnTOI _{it}	0.335 ^c	1.000					
lnTOI ² _{it}	0.348 ^c	0.978 ^c	1.000				
COC _{it}	0.633 ^c	0.275 ^c	0.287 ^c	1.000			
GVE _{it}	0.743 ^c	0.319 ^c	0.330 ^c	0.945 ^c	1.000		
POS _{it}	0.576 ^c	0.453 ^c	0.460 ^c	0.760 ^c	0.745 ^c	1.000	
REQ _{it}	0.683 ^c	0.348 ^c	0.358 ^c	0.914 ^c	0.944 ^c	0.751 ^c	1.000
ROL _{it}	0.668 ^c	0.297 ^c	0.313 ^c	0.962 ^c	0.962 ^c	0.781 ^c	0.945 ^c
VAC _{it}	0.564 ^c	0.232 ^c	0.225 ^c	0.829 ^c	0.821 ^c	0.732 ^c	0.869 ^c
lnURB _{it}	0.798 ^c	0.271 ^c	0.276 ^c	0.583 ^c	0.621 ^c	0.531 ^c	0.598 ^c
lnIFDI _{it}	0.332 ^c	0.582 ^c	0.630 ^c	0.321 ^c	0.343 ^c	0.407 ^c	0.400 ^c
lnGDPpc _{it}	0.863 ^c	0.299 ^c	0.318 ^c	0.825 ^c	0.883 ^c	0.687 ^c	0.853 ^c
	ROL _{it}	VAC _{it}	lnURB _{it}	lnIFDI _{it}	lnGDPpc _{it}		
ROL _{it}	1.000						
VAC _{it}	0.861 ^c	1.000					
lnURB _{it}	0.574 ^c	0.550 ^c	1.000				
lnIFDI _{it}	0.343 ^c	0.303 ^c	0.394 ^c	1.000			
lnGDPpc _{it}	0.846 ^c	0.753 ^c	0.782 ^c	0.377 ^c	1.000		

Letters a, b, and c denote the significance levels of 10%, 5%, and 1%.

Source: The author.

Table B.1 (please see the Appendices B) confirms the cross-dependence of all variables in the research models (CD tests) at the significance level of 1% except COC_{it} and GVE_{it} . Therefore, the Pesaran tests of non-stationarity (Pesaran, 2004) are applied to variables of cross-dependence and the Im-Pesaran-Shin tests of non-stationarity (Im et al., 2003) are applied only to COC_{it} and GVE_{it} . As could be seen

in Table B.1, stationarity tests have indicated the non-stationarity of $\ln TOI_{it}$, $\ln TOI^2_{it}$, $\ln URB_{it}$, and VAC_{it} . The remaining variables are stationary at the significance levels of 10%, 5%, and 1%. Due to the variable $\ln CEpc_{it}$ being stationary and the rejected no co-integration of the Westerlund tests (Westerlund, 2005) for this variable and the other non-stationary explanatory variables, the models with this variable does not necessarily include variables in difference form. In addition, variable differencing only allows the examination of immediate effects, which is possibly not appropriate for the research objective and the original EKC model. Moreover, the variables in level allow the examination of long-term relationships instead of immediate or short-term links between variables. More importantly, the DGMM-II and SGMM-II method include the variable differencing in the estimation process, thus the inclusion of variables in difference will lead to the double-differencing which makes the results meaningless or even uninterpretable. Furthermore, because the original EKC investigates the linear and non-linear links between environmental quality and income (in level), consequently, the inclusion of differenced openness variables is not appropriate for the estimation of the long-term EKC-based models. Therefore, the fixed and random effect models with this variable include only the non-stationary variable VAC_{it} in the difference form, particularly $d.VAC_{it}$. For robustness check, Table B.3 (the Appendices B) indicates the stationarity of the included variables in the first-generation panel unit-root tests (Choi, 2001; Harris & Tzavalis, 1999; Im et al., 2003; Levin et al., 2002).

6.3.2. Results for the aggregated sample

Table 6.3 demonstrates the summary of estimation results for the models of the aggregated sample. Column (1), (2), and (3) indicate the results of FE, DGMM-II, and SGMM-II methods. Please see the Appendices of Chapter 6 for detailed reports of estimation results in Table C6.1 and C6.2. As could be seen in the Appendices of Chapter 6, the Hausman tests have indicated that fixed effect estimation is more appropriate than random effect estimation at the significant level

of 5%. SGMM-II estimations are justified as the p-value of AR(1) test is lower than 5% and the p-values of AR(2) and Hansen tests are higher than 5%.

Table 6.3: Estimation results summary for models of the aggregated sample

Institutional quality's dimensions	Tested links	FE (1)	DGMM-II (2)	SGMM-II (3)
Control of Corruption (COC)	Openness	-0.267 ^b		
	Openness ²	0.049 ^b		
	COC (direct)			
	rCOC*Openness (moderating)		-0.220 ^c	-0.333 ^a
	rCOC*Openness ² (moderating)		0.049 ^c	
Government Effectiveness (GVE)	Openness	-0.268 ^b	-0.509 ^a (L1)	
	Openness ²	0.049 ^b	0.071 ^a (L1)	0.064 ^a (L1)
	GVE (direct)			
	rGVE*Openness (moderating)			
	rGVE*Openness ² (moderating)			
Political Stability and Absence of Violence/Terrorism (POS)	Openness	-0.277 ^c		
	Openness ²	0.053 ^b		
	POS (direct)			
	rPOS*Openness (moderating)		-0.282 ^b	-0.805 ^b
	rPOS*Openness ² (moderating)		0.060 ^a	0.181 ^b
Regulatory Quality (REQ)	Openness	-0.267 ^b		
	Openness ²	0.050 ^b		
	REQ (direct)			
	rREQ*Openness (moderating)		-0.196 ^a	-0.376 ^a
	rREQ*Openness ² (moderating)		0.055 ^b	0.098 ^a
Rule of Law (ROL)	Openness	-0.286 ^b	-0.774 ^c (L1)	
	Openness ²	0.055 ^b	0.085 ^c (L1)	
	ROL (direct)			
	rROL*Openness (moderating)			-0.246 ^a
	rROL*Openness ² (moderating)			0.058 ^b
Voice and Accountability (VAC)	Openness	-0.281 ^c		
	Openness ²	0.054 ^b		
	VAC (direct)		-0.181 ^b	
	rVAC*Openness (moderating)	0.140 ^b		-0.276 ^b
	rVAC*Openness ² (moderating)	-0.029 ^a		0.065 ^a

Note: Blank cells demonstrate non-significant links. Letters a, b, and c respectively indicate the significance levels of 10%, 5%, and 1%. Italic numbers indicate significant negative links. Links are not confirmed when (i) there are conflicting results between FE, DGMM-II, and SGMM-II estimations or (ii) the links are only significant in the FE estimation (except openness variables). Grey cells indicate non-confirmed links. L1 and L2 indicate the lagged variables of openness in year t-1 and t-2 respectively.

Source: The author.

Regarding the effect of trade liberalization (trade openness) on environmental quality, findings have consistently explored the U-shaped

relationship between CO₂ emissions and trade liberalization in the FE and DGMM-II estimations of current and first-lagged openness variables in all models with six institutional quality indicators. Particularly, in the earlier stage of liberalization, trade openness significantly decreases CO₂ emissions (promoting effect on environmental quality), while in the subsequent stage of liberalization, trade openness significantly increases CO₂ emissions (deteriorating effect on environmental quality). These findings have contributed to the EKC hypothesis, which has explored the linear and curvilinear links between environmental quality and trade liberalization (current and lagged variables). Furthermore, the two-fold effect of trade liberalization on environmental quality could be explained by The Three-fold Effect of Trade (Abid & Sekrafi, 2021; Ertugrul et al., 2016; Liobikiene & Butkus, 2019), the *Pollution Haven Hypothesis* (Abid & Sekrafi, 2021; Al-Mulali et al., 2016; Azam & Khan, 2016; Ertugrul et al., 2016; Shahbaz et al., 2015), and the *Pollution Halo Hypothesis* (Kang et al., 2016; Kohler, 2013; Shahbaz et al., 2012).

Regarding the effect of institutional quality on environmental quality, findings have only documented that VAC significantly decreases CO₂ emissions in the DGMM-II estimation, which consequently exerts the promoting effect on environmental quality. These findings have been consistent with the research of Anwar et al. (2025), Anwar and Malik (2021), Chhabra et al. (2023), and Khan and Rana (2021).

Regarding the moderating effect of institutional quality on the environment-liberalization link, findings of DGMM-II and SGMM-II estimations have consistently explored that *COC*, *POS*, *REQ*, and *ROL* negatively moderate the link between CO₂ emissions and trade liberalization in the earlier stage (original openness variable) and positively moderate that link in the subsequent stage (squared openness variable). Particularly, high *COC*, *POS*, *REQ*, and *ROL* facilitate the decreasing effect of trade openness on CO₂ emissions (promoting effect on environmental quality) in the earlier stage of liberalization. However, in the subsequent stage of higher liberalization, high *COC*, *POS*, *REQ*, and *ROL* triggers the increasing effect of trade

openness on CO₂ emissions (deteriorating effect on environmental quality). These findings have contributed to the relevant research of Adebayo et al. (2023), Dou et al. (2021), and Khan and Rana (2021).

6.3.3. Results for the high institutional quality sample

Table 6.4 demonstrates the summary of estimation results for the models of the high institutional quality sample. Column (4), (5), and (6) indicate the results of FE, DGMM-II, and SGMM-II methods. Please see the Appendices of Chapter 6 for detailed reports of estimation results in Table C6.3 and C6.4. As could be seen in the Appendices of Chapter 6, the Hausman tests have indicated that fixed effect estimation is more appropriate than random effect estimation at the significant level of 5%. SGMM-II estimations are justified as the p-value of AR(1) test is lower than 5% and the p-values of AR(2) and Hansen tests are higher than 5%.

Table 6.4: Estimation results summary for models of the high institutional quality sample

Institutional quality's dimensions	Tested links	FE (4)	DGMM-II (5)	SGMM-II (6)
Control of Corruption (COC)	Openness	1.679 ^b	0.807 ^c (L1) -1.317^c (L2)	0.669 ^a (L1)
	Openness ²	-0.161 ^a	-0.127 ^c (L1) 0.195^c (L2)	-0.075 ^a (L1)
	COC (direct)		0.268 ^c	
Government Effectiveness (GVE)	Openness	1.459 ^b	-1.974^c (L2)	1.428 ^b (L1)
	Openness ²	-0.138 ^a	0.187^b (L2)	-0.167 ^b (L1)
	GVE (direct)		0.508 ^c	0.511 ^b
Political Stability and Absence of Violence/Terrorism (POS)	Openness	1.246 ^a	-0.774^c (L2)	-0.829^a (L2)
	Openness ²		0.096^c (L2)	0.102^a (L2)
	POS (direct)			0.257 ^b
Regulatory Quality (REQ)	Openness	1.490 ^b	-1.217^c (L2)	0.977 ^b (L1)
	Openness ²	-0.141 ^a	0.154^c (L2)	-0.100 ^a (L1)
	REQ (direct)			
Rule of Law (ROL)	Openness	1.423 ^b		1.147 ^b (L1)
	Openness ²	-0.137 ^a		-0.130 ^b (L1)
	ROL (direct)		-0.544 ^c	
Voice and Accountability (VAC)	Openness	1.539 ^c	0.982 ^c (L1)	
	Openness ²	-0.159 ^c	-0.115 ^c (L1)	
	VAC (direct)		0.179 ^c	0.234 ^b

Note: Blank cells demonstrate non-significant links. Letters a, b, and c respectively indicate the significance levels of 10%, 5%, and 1%. Italic numbers indicate significant negative links. Links are not confirmed when

(i) there are conflicting results between FE, DGMM-II, and SGMM-II estimations or (ii) the links are only significant in the FE estimation (except openness variables). Grey cells indicate non-confirmed links. L1 and L2 indicate the lagged variables of openness in year t-1 and t-2 respectively.

Source: The author.

Regarding the effect of trade liberalization (trade openness) on environmental quality in the high institutional quality countries, findings have consistently indicated the inverse U-shaped relationship between CO₂ emissions and trade liberalization in the FE (current openness), DGMM-II (first-lagged openness), and SGMM-II (first-lagged openness) estimations of COC, GVE, REQ, ROL, and VAC models. Particularly, trade openness significantly increases CO₂ emissions (deteriorating environmental quality) in the earlier liberalization stage, and decreases CO₂ emissions (improving environmental quality) in the higher stage of liberalization. Most noticeably, in COC, GVE, POS, and REQ models, the U-shaped link between CO₂ emissions and trade liberalization (second-lagged openness) is significant in the DGMM-II and SGMM-II estimations. These findings have contributed to the EKC hypothesis, which has explored the linear and curvilinear links between environmental quality and trade liberalization (current and lagged variables) in high institutional quality countries. Furthermore, the two-fold effect of trade liberalization on environmental quality could be explained by The Three-fold Effect of Trade (Abid & Sekrafi, 2021; Ertugrul et al., 2016; Liobikiene & Butkus, 2019), the *Pollution Haven Hypothesis* (Abid & Sekrafi, 2021; Al-Mulali et al., 2016; Azam & Khan, 2016; Ertugrul et al., 2016; Shahbaz et al., 2015), and the *Pollution Halo Hypothesis* (Kang et al., 2016; Kohler, 2013; Shahbaz et al., 2012).

Regarding the effect of institutional quality on environmental quality in the high institutional quality countries, COC, GVE, POS, and VAC significantly increase CO₂ emissions (deteriorating effect on environmental quality) in the DGMM-II and SGMM-II estimations, which has been consistent with the research of Amin et al. (2023), Obobisa et al. (2022), and Wenlong et al. (2023). Meanwhile, ROL significantly decreases CO₂ emissions (promoting effect on environmental

quality) in the DGMM-II estimation, which has been consistent with the research of Anwar et al. (2025), Anwar and Malik (2021), Chhabra et al. (2023), and Khan and Rana (2021).

6.3.4. Results for the low institutional quality sample

Table 6.5 demonstrates the summary of estimation results for the models of the low institutional quality sample. Column (7), (8), and (9) indicate the results of FE, DGMM-II, and SGMM-II methods. Please see the Appendices of Chapter 6 for detailed reports of estimation results in Table C6.5 and C6.6. As could be seen in the Appendices of Chapter 6, the Hausman tests have indicated that fixed effect estimation is more appropriate than random effect estimation at the significant level of 5%. SGMM-II estimations are justified as the p-value of AR(1) test is lower than 5% and the p-values of AR(2) and Hansen tests are higher than 5%.

Table 6.5: Estimation results summary for models of the low institutional quality sample

Institutional quality's dimensions	Tested links	FE (7)	DGMM-II (8)	SGMM-II (9)
Control of Corruption (COC)	Openness	-0.270 ^b	0.581 ^c (L1)	
	Openness ²	0.060 ^b	-0.043 ^b (L1)	
	COC (direct)		0.179 ^b	0.180 ^a
Government Effectiveness (GVE)	Openness	-0.239 ^a		
	Openness ²	0.054 ^a		
	GVE (direct)			
Political Stability and Absence of Violence/Terrorism (POS)	Openness	-0.284 ^b	-0.236^a (L2)	-0.232 ^a (L1)
	Openness ²	0.062 ^b	0.049^b (L2)	0.040 ^b (L1)
	POS (direct)		0.109 ^b	
Regulatory Quality (REQ)	Openness	-0.276 ^b	0.326 ^a (L1)	
	Openness ²	0.065 ^c		
	REQ (direct)	-0.143 ^a	0.236 ^c	0.269 ^a
Rule of Law (ROL)	Openness	-0.270 ^b	0.539 ^c (L1)	
	Openness ²	0.058 ^b	-0.059 ^c (L1)	
	ROL (direct)		-0.147 ^b	
Voice and Accountability (VAC)	Openness	-0.347 ^c	-0.526^b (L2)	
	Openness ²	0.080 ^c	0.083^b (L2)	
	VAC (direct)			0.154 ^a

Note: Blank cells demonstrate non-significant links. Letters a, b, and c respectively indicate the significance levels of 10%, 5%, and 1%. Italic numbers indicate significant negative links. Links are not confirmed when (i) there are conflicting results between FE, DGMM-II, and SGMM-II estimations or (ii) the links are only

significant in the FE estimation (except openness variables). Grey cells indicate non-confirmed links. L1 and L2 indicate the lagged variables of openness in year t-1 and t-2 respectively.

Source: The author.

Regarding the effect of trade liberalization (trade openness) on environmental quality in the low institutional quality countries, findings have consistently indicated the U-shaped link between CO₂ emissions and trade liberalization in the FE estimation of all models of six institutional quality indicator. Particularly, trade openness significantly decreases CO₂ emissions (promoting effect on environmental quality) in the earlier stage of liberalization, and increases CO₂ emissions (deteriorating effect on environmental quality) in the higher liberalization stage. The U-shaped link between CO₂ emissions and trade liberalization (second-lagged openness) is also consistently significant in the DGMM-II estimation of POS and VAC models. These findings have contributed to the EKC hypothesis, which has explored the linear and curvilinear links between environmental quality and trade liberalization (current and lagged variables) in low institutional quality countries. Furthermore, the two-fold effect of trade liberalization on environmental quality could be explained by The Three-fold Effect of Trade (Abid & Sekrafi, 2021; Ertugrul et al., 2016; Liobikiene & Butkus, 2019), the *Pollution Haven Hypothesis* (Abid & Sekrafi, 2021; Al-Mulali et al., 2016; Azam & Khan, 2016; Ertugrul et al., 2016; Shahbaz et al., 2015), and the *Pollution Halo Hypothesis* (Kang et al., 2016; Kohler, 2013; Shahbaz et al., 2012).

Regarding the effect of institutional quality on environmental quality in the low institutional quality countries, COC, POS, and VAC significantly increase CO₂ emissions (deteriorating effect on environmental quality) in the DGMM-II and SGMM-II estimations, which has been consistent with the research of Amin et al. (2023), Obobisa et al. (2022), and Wenlong et al. (2023). Meanwhile, ROL significantly decreases CO₂ emissions (promoting effect on environmental quality) in the DGMM-II estimation, which has been consistent with the research of Anwar

et al. (2025), Anwar and Malik (2021), Chhabra et al. (2023), and Khan and Rana (2021).

6.3.5. Results for the high openness sample

Table 6.6 demonstrates the summary of estimation results for the models of the high openness sample. Column (10), (11), and (12) indicate the results of FE, DGMM-II, and SGMM-II methods. Please see the Appendices of Chapter 6 for detailed reports of estimation results in Table C6.7 and C6.8. As could be seen in the Appendices of Chapter 6, the Hausman tests have indicated that fixed effect estimation is more appropriate than random effect estimation at the significant level of 5%. SGMM-II estimations are justified as the p-value of AR(1) test is lower than 5% and the p-values of AR(2) and Hansen tests are higher than 5%.

Table 6.6: Estimation results summary for models of the high openness sample

Institutional quality's dimensions	Tested links	FE (10)	DGMM-II (11)	SGMM-II (12)
Control of Corruption (COC)	Openness		2.584 ^c (L1)	3.103 ^a (L1)
	Openness ²		-0.294 ^b (L1)	-0.359 ^a (L1)
	COC (direct)		0.569 ^c	
	rCOC*Openness (moderating)		-0.395 ^b	
	rCOC*Openness ² (moderating)		0.098 ^c	
Government Effectiveness (GVE)	Openness		1.530 ^a (L1)	3.034 ^a (L1)
	Openness ²			-0.343 ^a (L1)
	GVE (direct)		0.390 ^c	
	rGVE*Openness (moderating)		-0.488 ^c	
	rGVE*Openness ² (moderating)		0.113 ^c	
Political Stability and Absence of Violence/Terrorism (POS)	Openness		-2.089^b (L2)	2.733 ^a (L1)
	Openness ²		0.310^c (L2)	
	POS (direct)			
	rPOS*Openness (moderating)		-0.715 ^c	-0.671 ^b
	rPOS*Openness ² (moderating)		0.163 ^c	0.151 ^a
Regulatory Quality (REQ)	Openness		3.574 ^c (L1)	3.062 ^b (L1)
	Openness ²		-0.425 ^c (L1)	-0.355 ^b (L1)
	REQ (direct)			
	rREQ*Openness (moderating)			
	rREQ*Openness ² (moderating)			
Rule of Law (ROL)	Openness			3.292 ^b (L1)
	Openness ²		0.165^a (L2)	-0.389 ^b (L1)
	ROL (direct)			
	rROL*Openness (moderating)		-0.352 ^a	
	rROL*Openness ² (moderating)		0.087 ^a	
	Openness			2.240 ^b (L1)

Voice and Accountability (VAC)	Openness ² VAC (direct) rVAC*Openness (moderating) rVAC*Openness ² (moderating)	-0.240 ^a (L1)

Note: Blank cells demonstrate non-significant links. Letters a, b, and c respectively indicate the significance levels of 10%, 5%, and 1%. Italic numbers indicate significant negative links. Links are not confirmed when (i) there are conflicting results between FE, DGMM-II, and SGMM-II estimations or (ii) the links are only significant in the FE estimation (except openness variables). Grey cells indicate non-confirmed links. L1 and L2 indicate the lagged variables of openness in year t-1 and t-2 respectively.

Source: The author.

Regarding the effect of trade liberalization (trade openness) on environmental quality in the high openness countries, findings have consistently explored the inverse U-shaped link between CO₂ emissions and trade liberalization (first-lagged openness variables) in the DGMM-II and SGMM-II estimations of all models with institutional quality indicators except the POS model. Particularly, in the earlier stage of liberalization, current trade openness significantly increases CO₂ emissions (deteriorating effect on environmental quality) of the following year, and decreases it (promoting effect on environmental quality) in the higher liberalization stage. Those findings have documented the lagged effects of trade liberalization on environmental quality in high openness countries, which is a new contribution to relevant research. These findings have contributed to the EKC hypothesis, which has explored the linear and curvilinear links between environmental quality and trade liberalization (current and lagged variables) in low institutional quality countries. Furthermore, the two-fold effect of trade liberalization on environmental quality could be explained by The Three-fold Effect of Trade (Abid & Sekrafi, 2021; Ertugrul et al., 2016; Liobikiene & Butkus, 2019), the *Pollution Haven Hypothesis* (Abid & Sekrafi, 2021; Al-Mulali et al., 2016; Azam & Khan, 2016; Ertugrul et al., 2016; Shahbaz et al., 2015), and the *Pollution Halo Hypothesis* (Kang et al., 2016; Kohler, 2013; Shahbaz et al., 2012).

Regarding the effect of institutional quality on environmental quality in the high openness countries, findings have explored that COC and GVE significantly

increase CO₂ emissions in the DGMM-II estimation, which exerts the deteriorating effect on environmental quality. These findings have been consistent with the research of Amin et al. (2023), Obobisa et al. (2022), and Wenlong et al. (2023).

Regarding the moderating effect of institutional quality on environment-liberalization link in the high openness countries, findings of the DGMM-II and SGMM-II estimations have explored that high *COC*, *GVE*, *POS*, and *ROL* significantly facilitate the decreasing effect of trade openness on CO₂ emissions (promoting effect on environmental quality) in the earlier stage of liberalization, and trigger the increasing effect of trade openness on CO₂ emissions (deteriorating effect on environmental quality) in the higher stage of liberalization. These findings have contributed to the relevant research of Adebayo et al. (2023), Dou et al. (2021), and Khan and Rana (2021).

6.3.6. Results for the low openness sample

Table 6.7 demonstrates the summary of estimation results for the models of the low openness sample. Column (13), (14), and (15) indicate the results of FE, DGMM-II, and SGMM-II methods. Please see the Appendices of Chapter 6 for detailed reports of estimation results in Table C6.9 and C6.10. As could be seen in the Appendices of Chapter 6, the Hausman tests have indicated that fixed effect estimation is more appropriate than random effect estimation at the significant level of 5%. SGMM-II estimations are justified as the p-value of AR(1) test is lower than 5% and the p-values of AR(2) and Hansen tests are higher than 5%.

Table 6.7: Estimation results summary for models of the low openness sample

Institutional quality's dimensions	Tested links	FE (13)	DGMM-II (14)	SGMM-II (15)
Control of Corruption (COC)	Openness	-0.420 ^c	-0.284 ^a (L2)	1.291 ^b (L1) -0.822 ^a (L2)
	Openness ²	0.085 ^c	0.053 ^b (L2)	-0.214 ^b (L1) 0.157 ^c (L2)
	COC (direct)	0.129 ^c		0.507 ^b
	rCOC*Openness (moderating)			-0.307 ^b
	rCOC*Openness ² (moderating)			0.075 ^b
	Openness	-0.436 ^c	0.070 ^c (L2)	

Government Effectiveness (GVE)	Openness ²	0.090 ^c		
	GVE (direct)		-0.137 ^b	
	rGVE*Openness (moderating)			-0.354 ^a
	rGVE*Openness ² (moderating)			0.078 ^a
Political Stability and Absence of Violence/Terrorism (POS)	Openness	-0.453 ^c		0.155^c (L2)
	Openness ²	0.096 ^c		-0.023^b (L2)
	POS (direct)			
	rPOS*Openness (moderating)		-0.190 ^b	
	rPOS*Openness ² (moderating)		0.041 ^a	
Regulatory Quality (REQ)	Openness	-0.446 ^c	1.035 ^b (L1)	0.936 ^c (L1)
			-0.605^b (L2)	-0.693^a (L2)
	Openness ²	0.094 ^c	-0.163 ^b (L1)	-0.143 ^b (L1)
			0.122^c (L2)	0.119^b (L2)
	REQ (direct)			
	rREQ*Openness (moderating)		-0.160 ^a	
Rule of Law (ROL)	rREQ*Openness ² (moderating)		0.036 ^a	
	Openness	-0.445 ^c		
	Openness ²	0.094 ^c	0.054^b (L2)	
	ROL (direct)		-0.258 ^a	
	rROL*Openness (moderating)			-0.273 ^a
Voice and Accountability (VAC)	rROL*Openness ² (moderating)			0.071 ^a
	Openness	-0.416 ^c	1.171 ^a (L1)	0.879 ^a (L1)
			-0.477^b (L2)	-0.814^a (L2)
	Openness ²	0.088 ^c	-0.188 ^b (L1)	-0.142 ^b (L1)
			0.105^c (L2)	0.134^a (L2)
	VAC (direct)			
	rVAC*Openness (moderating)			-0.442 ^b
	rVAC*Openness ² (moderating)			0.098 ^a

Note: Blank cells demonstrate non-significant links. Letters a, b, and c respectively indicate the significance levels of 10%, 5%, and 1%. Italic numbers indicate significant negative links. Links are not confirmed when (i) there are conflicting results between FE, DGMM-II, and SGMM-II estimations or (ii) the links are only significant in the FE estimation (except openness variables). Grey cells indicate non-confirmed links. L1 and L2 indicate the lagged variables of openness in year t-1 and t-2 respectively.

Source: The author.

Regarding the effect of trade liberalization (trade openness) on environmental quality in the low openness countries, findings have consistently explored the U-shaped relationship between CO₂ emissions and trade liberalization in the FE estimation of all models with six institutional quality indicators. Particularly, trade openness significantly decreases CO₂ emissions (promoting effect on environmental quality) in the earlier stage of liberalization, and increases CO₂ emissions (deteriorating effect on environmental quality) in the higher liberalization stage. Noticeably, findings have also documented the inverse U-shaped link between

CO₂ emissions and trade liberalization (first-lagged openness variables) in the DGMM-II and SGMM-II estimations of COC, REQ, and VAC models. Those findings have implied that current trade openness significantly increases CO₂ emissions (deteriorating effect on environmental quality) of the following year in the earlier stage of liberalization, and decreases it (promoting effect on environmental quality) in the higher liberalization stage. These findings have contributed to the EKC hypothesis, which has explored the linear and curvilinear links between environmental quality and trade liberalization (current and lagged variables) in high institutional quality countries. Furthermore, the two-fold effect of trade liberalization on environmental quality could be explained by The Three-fold Effect of Trade (Abid & Sekrafi, 2021; Ertugrul et al., 2016; Liobikiene & Butkus, 2019), the *Pollution Haven Hypothesis* (Abid & Sekrafi, 2021; Al-Mulali et al., 2016; Azam & Khan, 2016; Ertugrul et al., 2016; Shahbaz et al., 2015), and the *Pollution Halo Hypothesis* (Kang et al., 2016; Kohler, 2013; Shahbaz et al., 2012).

Regarding the effect of institutional quality on environmental quality in the low openness countries, COC significantly increases CO₂ emissions in the FE and SGMM-II estimations, which is consistent with the research of Amin et al. (2023), Obobisa et al. (2022), and Wenlong et al. (2023). Meanwhile, GVE and ROL significantly decrease CO₂ emissions in the DGMM-II estimation, which is consistent with the research of Anwar et al. (2025), Anwar and Malik (2021), Chhabra et al. (2023), and Khan and Rana (2021).

Regarding the moderating effect of institutional quality on environment-liberalization link in the low openness countries, findings have consistently explored that the high level of all six institutional quality indicators significantly facilitates the decreasing effect of trade openness on CO₂ emissions (promoting effect on environmental quality) in the earlier stage of liberalization, and triggers the increasing effect of trade openness on CO₂ emissions (deteriorating effect on environmental quality) in the higher stage of liberalization. These findings have contributed to the

relevant research of Adebayo et al. (2023), Dou et al. (2021), and Khan and Rana (2021).

6.4. Concluding remarks

As inspired by Goal 13 and Goal 17 in the SDGs of The Agenda 2030, this chapter has introduced the Openness-based Environmental Kuznets Curve (OEKC) model to exploring the effects of trade liberalization and institutional quality on environmental quality. To solve the research objective, this chapter has proposed research hypotheses which are relevant to the direct impacts of trade liberalization (trade openness) and institutional quality on environmental quality, and the moderating and contextual impacts of trade liberalization (trade openness) and institutional quality on environment-institution and environment-liberalization links. In this chapter, environmental quality is proxied by CO₂ emissions per capita. Institutional quality is proxied by six worldwide governance indicators. Trade liberalization variables include the original and squared terms of trade openness for the OEKC model. The panel data includes 113 worldwide countries in the 2002-2020 period. The panel size is $113 \times 19 = 2,147$ observations. Estimation methods include random effect, combined fixed effect (country-fixed and year-fixed), and two-step system and difference GMM in order to deal with heterogeneity and endogeneity. Some noticeable findings of this chapter are as follows (please see Table C6.11, C6.12, and C6.13 in the Appendices of Chapter 6 for the summary of explored effects):

Regarding the direct effect of trade liberalization (trade openness) on environmental quality:

(i) *In the aggregated sample:* Findings have consistently explored ***the U-shaped relationship*** between CO₂ emissions and trade liberalization in the FE and DGMM-II estimations of current and first-lagged openness variables in all models with six institutional quality indicators.

(ii) *In the high institutional quality countries:* Findings have consistently indicated **the inverse U-shaped relationship** between CO₂ emissions and trade liberalization in the FE (current openness), DGMM-II (first-lagged openness), and SGMM-II (first-lagged openness) estimations of COC, GVE, REQ, ROL, and VAC models. Most noticeably, in COC, GVE, POS, and REQ models, **the U-shaped link** between CO₂ emissions and trade liberalization (second-lagged openness) is significant in the DGMM-II and SGMM-II estimations.

(iii) *In the low institutional quality countries:* Findings have consistently indicated **the U-shaped link** between CO₂ emissions and trade liberalization in the FE estimation of all models of six institutional quality indicator. **The U-shaped link** between CO₂ emissions and trade liberalization (second-lagged openness) is also consistently significant in the DGMM-II estimation of POS and VAC models.

(iv) *In the high openness countries:* Findings have consistently explored **the inverse U-shaped link** between CO₂ emissions and trade liberalization (first-lagged openness variables) in the DGMM-II and SGMM-II estimations of all models with institutional quality indicators except the POS model.

(v) *In the low openness countries:* Findings have consistently explored **the U-shaped relationship** between CO₂ emissions and trade liberalization in the FE estimation of all models with six institutional quality indicators. Noticeably, findings have also documented **the inverse U-shaped link** between CO₂ emissions and trade liberalization (first-lagged openness variables) in the DGMM-II and SGMM-II estimations of COC, REQ, and VAC models.

Regarding the direct effect of institutional quality on environmental quality,

(i) *In the aggregated sample:* Findings have only documented that VAC significantly decreases CO₂ emissions in the DGMM-II estimation, which consequently exerts the promoting effect on environmental quality.

(ii) *In the high institutional quality countries:* COC, GVE, POS, and VAC significantly increase CO₂ emissions (deteriorating effect on environmental quality)

in the DGMM-II and SGMM-II estimations. Meanwhile, *ROL* significantly decreases CO₂ emissions (promoting effect on environmental quality) in the DGMM-II estimation.

(iii) *In the low institutional quality countries:* *COC*, *POS*, and *VAC* significantly increase CO₂ emissions (deteriorating effect on environmental quality) in the DGMM-II and SGMM-II estimations. Meanwhile, *ROL* significantly decreases CO₂ emissions (promoting effect on environmental quality) in the DGMM-II estimation.

(iv) *In the high openness countries:* *COC* and *GVE* significantly increase CO₂ emissions in the DGMM-II estimation.

(v) *In the low openness countries:* *COC* significantly increases CO₂ emissions in the FE and SGMM-II estimations. Meanwhile, *GVE* and *ROL* significantly decrease CO₂ emissions in the DGMM-II estimation.

Regarding the moderating effect of institutional quality on the environment-liberalization link:

(i) *In the aggregated sample:* Findings of DGMM-II and SGMM-II estimations have consistently explored that *COC*, *POS*, *REQ*, and *ROL* negatively moderate the link between CO₂ emissions and trade liberalization in the earlier stage (original openness variable) and positively moderate that link in the subsequent stage (squared openness variable). Particularly, high *COC*, *POS*, *REQ*, and *ROL* facilitate the decreasing effect of trade openness on CO₂ emissions (promoting effect on environmental quality) in the earlier stage of liberalization. However, in the subsequent stage of higher liberalization, high *COC*, *POS*, *REQ*, and *ROL* triggers the increasing effect of trade openness on CO₂ emissions (deteriorating effect on environmental quality).

(ii) *In the high openness countries:* Findings of the DGMM-II and SGMM-II estimations have explored that high *COC*, *GVE*, *POS*, and *ROL* significantly facilitate the decreasing effect of trade openness on CO₂ emissions (promoting effect on

environmental quality) in the earlier stage of liberalization, and trigger the increasing effect of trade openness on CO₂ emissions (deteriorating effect on environmental quality) in the higher stage of liberalization.

(iii) *In the low openness countries:* Findings have consistently explored that the high level of all six institutional quality indicators significantly facilitates the decreasing effect of trade openness on CO₂ emissions (promoting effect on environmental quality) in the earlier stage of liberalization, and triggers the increasing effect of trade openness on CO₂ emissions (deteriorating effect on environmental quality) in the higher stage of liberalization.

CHAPTER 7: CONCLUSIONS AND POLICY IMPLICATIONS

7.1. Summary of key findings

In summary, this dissertation demonstrates that trade, analyzed through both bilateral flows and aggregate openness, is fundamentally intertwined with gender equality and environmental quality under the global mandates of the 2030 Agenda for Sustainable Development. By synthesizing the gravitational and Kuznets curve approaches within the integrated framework of Figure 2.1, the dissertation confirms that economic integration serves as a primary engine for social and ecological transformation. The unifying thread across all four research models is institutional quality, which acts as the critical catalyst in determining the major nexuses. Ultimately, the dissertation highlights that achieving SDGs 5, 13, and 17 necessitates a holistic policy approach where trade and institutional reforms are strategically aligned to foster a sustainable future that balances prosperity, people, and the planet.

7.1.1. Findings on the gravitational approach to the nexus between trade, gender equality, and institutional quality

7.1.1.1. *Direct effects of gender equality on bilateral trade*

In the worldwide aggregated sample, exporter's and importer's GDI significantly increases bilateral trade. In addition, importer's GII significantly increase import.

In the high-high institutional trading relationship, exporter's gender equality, which is proxied by GII and FLA, significantly increases export. In particular, exporter's FLA significantly increases export, while exporter's GII significantly decreases export.

In the low-low institutional trading relationship, exporter's gender equality, which is proxied by GDI, significantly increases export.

In the low-high & high-low (or different) institutional trading relationship, exporter's GDI significantly increases export. Meanwhile, importer's GDI significantly decreases import.

7.1.1.2. Moderating effect of institutional quality on the link between bilateral trade and gender equality

From the exporting side, exporter's COC, GVE, and VAC negatively moderate the link between export and GDI, while exporter's overall IQ negatively moderate the link between export and FLA. In addition, exporter's COC, REQ, and VAC positively moderate the link between export and GII.

From the importing side, the findings are divergent which are dependent on specific proxies for gender equality and dimensions of institutional quality:

(i) In terms of the Import-GDI link, importer's COC, GVE, and REQ have the negative moderating effect, while POS has the positive moderating effect.

(ii) In terms of the Import-GII link, importer's COC and VAC positively moderate the link between GII and import.

(iii) In terms of Import-FLA link, importer's COC has the positive moderating effect. Meanwhile, POS and VAC have the negative moderating effect.

7.1.2. Findings on the gravitational approach to the nexus between trade, environmental quality, and institutional quality

7.1.2.1. Direct effects of environmental quality on bilateral trade

Findings have consistently indicated the boosting effects of exporter's and importer's CO₂ emissions on bilateral trade in the aggregated, high-high, low-low, and different institutional trading settings. This has implied that environmental quality has the detrimental effect on export and import.

7.1.2.2. Direct effect of institutional quality on bilateral trade based on the consistent findings of Chapter 3 and Chapter 4

In the worldwide aggregated sample, exporter's VAC and EPS significantly decrease export. In the high-high institutional trading relationship, exporter's GVE significantly increases export, while exporter's VAC significantly decreases export. From the importing side, importer's GVE, POS, and VAC significantly increase import. In the low-low institutional trading relationship, importer's POS and REQ significantly decrease import. In the different institutional trading relationship, exporter's GVE and ROL significantly increase export, while importer's GVE significantly decreases import.

7.1.2.3. Moderating effect of institutional quality on the link between bilateral trade and environmental quality

The significant positive moderating effects of importer's COC, GVE, REQ, ROL, and overall IQ on the import-CO₂ emission link have indicated that high institutional quality triggers the hampering effect of environmental quality on import. Meanwhile, importer's POS has appeared to significantly facilitate the boosting effect of environmental quality on import.

7.1.3. Findings on the Gender-based Kuznets Curve approach to the nexus between gender equality, trade, and institutional quality

7.1.3.1. Direct effects of income on gender equality

In the worldwide aggregated sample, findings have documented the N-shaped relationship in GDI (t and t-1) and GII (t) models. In addition, findings of models with lagged income have indicated the inverse N-shaped relationship in GDI (t-2) and GII (t-1) models, which implies that, to a certain degree, current income could significantly influence future gender equality due to the lag of income's effects on social issues. In addition, findings have indicated the inverse U-shaped link in the FLA (t-2) model.

In high institutional quality countries, the N-shaped link is significant in models with GDI (t and t-1) and GII (t and t-2). In models with FLA (t and t-2), the link is inverse N-shaped.

In the low institutional quality countries, the inverse U-shaped link is significant in the GDI (t) model.

In the high openness countries, the N-shaped link is significant in models with GII (t), however, the inverse N-shaped link is confirmed in the models with first-lagged income variables (t-1). In models with FLA, the inverse N-shaped link is significant with both current and second-lagged income variables (t and t-2).

In the low openness countries, the N-shaped link is significant in models of GDI (t-1). However, in models with GII and first-lagged income variables (t-1), the link is inverse N-shaped.

7.1.3.2. Direct effects of trade liberalization on gender equality

In the worldwide aggregated sample, findings have consistently indicated the positive impact of trade liberalization on gender equality in all models. In particular, trade liberalization significantly increases GDI and FLA, while significantly mitigating GII.

In the high institutional quality countries, trade liberalization significantly increases FLA and decreases GII, while significantly hindering GDI.

In the low institutional quality countries, findings have consistently indicated the positive impact of trade liberalization on gender equality in models with GII and FLA. In particular, trade liberalization significantly enhances FLA and alleviates GII.

In the high openness countries, trade liberalization significantly increases FLA and decreases GII, while significantly hindering GDI.

In the low openness countries, trade liberalization significantly mitigates GII.

7.1.3.3. Direct effects of institutional quality on gender equality

In the worldwide aggregated sample, GVE significantly decreases GDI. In addition, COC, GVE, POS, REQ, and VAC significantly mitigate GII. Finally, COC significantly increases FLA, while POS, REQ, and ROL significantly hinder FLA.

In the high institutional quality countries, COC, GVE, and ROL significantly hinder GDI. In addition, COC and REQ significantly mitigate GII, while ROL significantly increases GII. Finally, COC and ROL significantly decrease FLA, while POS and VAC significantly increase FLA.

In the low institutional quality countries, GVE and REQ significantly hinder GDI, while ROL significantly promotes GDI. In addition, COC, GVE, and REQ significantly reduce GII, while POS significantly worsens GII. Finally, POS, REQ, and ROL significantly restrict FLA, while COC and VAC significantly enhance FLA.

In the high openness countries, COC significantly hinders GDI, while GVE, POS, and ROL significantly improve GDI. In addition, COC, GVE, and VAC significantly alleviate GII. Finally, COC and VAC significantly enhance FLA, while GVE and POS significantly restrict FLA.

In the low openness countries, GVE and POS significantly hamper GDI, while ROL and VAC significantly enhance GDI. In addition, GVE, POS, REQ, ROL, and VAC significantly mitigate GII. Finally, COC and VAC significantly enhance FLA, while POS, REQ, and ROL significantly restrict FLA.

7.1.3.4. Moderating effects of trade liberalization on gender-institution links

In the worldwide aggregated sample, findings have explored divergent moderating effects of trade liberalization on gender-institution links which are determined by specific dimensions of gender equality and institutional quality. In models with GDI, high openness significantly facilitates the boosting effect of POS dimension. In models with GII, high openness triggers the worsening effects of POS,

ROL, and VAC dimensions. In models with FLA, higher openness triggers the hampering effects of all institutional dimensions.

In the high institutional quality countries, high openness facilitates the boosting effect of institutional quality on gender equality in models of GDI (with POS and VAC dimensions) and GII (with COC and REQ dimensions). However, findings have strikingly indicated that high openness could trigger the hampering effect of institutional quality on FLA (with all institutional dimensions).

In the low institutional quality countries, in models with GDI, high openness facilitates the boosting effect of COC dimension, while triggering the hampering effect of POS dimension. In models of GII, high openness consistently triggers the worsening effect of COC, GVE, REQ, ROL, and VAC dimensions. In models with FLA, high openness facilitates the boosting effect of POS and ROL dimensions, while triggering the hindering effect of GVE and VAC dimensions.

7.1.3.5. Moderating effects of institutional quality on gender-liberalization links

In the worldwide aggregated sample, findings have indicated that high GVE, REQ, and VAC facilitate the boosting effect of trade openness on FLA.

In the high openness countries, in models with GDI, high COC facilitates the boosting effect, while high GVE, POS, and REQ trigger the hampering effect of trade openness on GDI. In models with GII, high POS triggers the worsening effect on GII, while high ROL facilitates the mitigating effect on GII. In models with FLA, high GVE and REQ facilitate the boosting effect on FLA, while high COC, POS, ROL, and VAC trigger the hampering effect on FLA.

In the low openness countries, in models with GDI, high COC, GVE, POS, and REQ facilitate the boosting effect on GDI. In models with GII, high GVE triggers the worsening effect on GII, while high POS and VAC facilitate the mitigating effect on GII. In models with FLA, high COC, GVE, REQ, and VAC facilitate the boosting effect, while high ROL triggers the hampering effect on FLA.

7.1.4. Findings on the Openness-based Environmental Kuznets Curve approach to the nexus between environmental quality, trade, and institutional quality

7.1.4.1. Direct effects of trade liberalization on environmental quality

In the worldwide aggregated sample: Findings have consistently explored **the U-shaped relationship** between CO₂ emissions and trade liberalization in the models with current and first-lagged openness variables.

In the high institutional quality countries: Findings have consistently indicated **the inverse U-shaped relationship** between CO₂ emissions and trade liberalization in the models with current and first-lagged openness variables. Most noticeably, **the U-shaped link** between CO₂ emissions and trade liberalization is also significant in the model with second-lagged openness variables.

In the low institutional quality countries: Findings have consistently indicated **the U-shaped link** between CO₂ emissions and trade liberalization in the models with current and second-lagged openness variables.

In the high openness countries: Findings have consistently explored **the inverse U-shaped link** between CO₂ emissions and trade liberalization in the model with first-lagged openness variables.

In the low openness countries: Findings have consistently explored **the U-shaped relationship** between CO₂ emissions and trade liberalization in the model with current openness variables. Noticeably, findings have also documented **the inverse U-shaped link** between CO₂ emissions and trade liberalization in the model with first-lagged openness variables.

7.1.4.2. Direct effects of institutional quality on environmental quality

In the worldwide aggregated sample: Findings have only documented that VAC dimension significantly decreases CO₂ emissions, which consequently exerts the promoting effect on environmental quality.

In the high institutional quality countries: COC, GVE, POS, and VAC dimensions significantly increase CO₂ emissions (deteriorating effect on environmental quality). Meanwhile, ROL dimension significantly decreases CO₂ emissions (promoting effect on environmental quality).

In the low institutional quality countries: COC, POS, and VAC dimensions significantly increase CO₂ emissions (deteriorating effect on environmental quality). Meanwhile, ROL dimension significantly decreases CO₂ emissions (promoting effect on environmental quality).

In the high openness countries: COC and GVE dimensions significantly increase CO₂ emissions (deteriorating effect on environmental quality).

In the low openness countries: COC dimension significantly increases CO₂ emissions (deteriorating effect on environmental quality). Meanwhile, GVE and ROL dimensions significantly decrease CO₂ emissions (promoting effect on environmental quality).

7.1.4.3. Moderating effect of institutional quality on the environment-liberalization link

In the worldwide aggregated sample: Findings have consistently explored that COC, POS, REQ, and ROL dimensions negatively moderate the link between CO₂ emissions and trade liberalization in the earlier stage (original openness variable) and positively moderate that link in the subsequent stage (squared openness variable). Particularly, high COC, POS, REQ, and ROL facilitate the decreasing effect of trade openness on CO₂ emissions (promoting effect on environmental quality) in the earlier stage of liberalization. However, in the subsequent stage of higher liberalization, high COC, POS, REQ, and ROL triggers the increasing effect of trade openness on CO₂ emissions (deteriorating effect on environmental quality).

In the high openness countries: Findings have explored that high COC, GVE, POS, and ROL significantly facilitate the decreasing effect of trade openness on CO₂ emissions (promoting effect on environmental quality) in the earlier stage of

liberalization, and trigger the increasing effect of trade openness on CO₂ emissions (deteriorating effect on environmental quality) in the higher stage of liberalization.

In the low openness countries: Findings have consistently explored that the high level of all six institutional quality indicators significantly facilitates the decreasing effect of trade openness on CO₂ emissions (promoting effect on environmental quality) in the earlier stage of liberalization, and triggers the increasing effect of trade openness on CO₂ emissions (deteriorating effect on environmental quality) in the higher stage of liberalization.

7.2. Policy implications

7.2.1. Implications from the link between bilateral trade, gender equality, and institutional quality

7.2.1.1. Direct effect of gender equality on bilateral trade

Overall, to promote export growth, countries should invest in gender equality and increase welfare for women in all industries, especially in major exporting sectors. From the importing side, mitigating gender inequality may reduce imports, which consequently decreases pressure on the trade balance. Therefore, countries should simultaneously implement gender equality policies and measures to mitigate trade deficits. More importantly, high institutional quality exporting countries should focus on reforming the gender equality policies relevant to gender inequality and female labor force participation in order to boost export, especially when the trading partners are also high institutional quality countries. Regarding low institutional quality countries, policies which enhance gender equality relevant to gender development could boost export and reduce trade deficit when trading partners are also low institutional quality countries. In the case of different institutional quality partners, policies which improving gender development should be shaped implemented to boost export and reduce import.

7.2.1.2. Moderating effect of institutional quality on the link between bilateral trade and gender equality

From the exporting side, policies which improve COC, GVE, and VAC may trigger the hampering effect of GDI on export. In addition, policies which improve COC, REQ, and VAC may trigger the boosting effect of GII on export. Finally, policies which improve the overall IQ may trigger the hampering effect of FLA on export. *From the importing side*, policies which improve COC, GVE, and REQ may trigger the hampering effect of GDI on import, while those improving POS may facilitate the boosting effect of GDI on import. In addition, policies which improve COC and VAC may trigger the boosting effect of GII on import. Finally, policies which improve COC may facilitate the boosting effect of FLA on import, while those improving POS and VAC may trigger the hampering effect of FLA on import.

7.2.2. Implications from the link between bilateral trade, environmental quality, and institutional quality

7.2.2.1. Direct effect of environmental quality on bilateral trade

Since the research findings have consistently indicated that an increase in CO₂ emissions promotes bilateral trade (both export and import), it suggests that policies prioritizing economic incentives over sustainable development goals may drive export and import growth. Consequently, countries, particularly those with export-led growth models, should be cautious to avoid trading off environmental and sustainability objectives for the overheating export growth.

7.2.2.2. Direct effect of institutional quality on bilateral trade (based on consistent findings of Chapter 3 and Chapter 4)

In the high-high institutional trading relationship, policies which improve GVE should be implemented to boost export, while improving VAC could decrease export and increase import which consequently exacerbates the trade deficit. Similarly, policies which improve POS could result in the increase of import and

trade deficit. In terms of GVE, policies should be designed to ensure that export expands at a faster rate than import to maintain a favorable trade balance.

In the low-low institutional trading relationship, policies aimed at enhancing POS and REQ could contribute to a reduction in import and an improvement in the bilateral trade deficit.

In the different institutional trading relationships, policies improving GVE and ROL can drive export growth. Moreover, the improvement of GVE is also associated with reduced import, which contributes to a strengthened trade balance.

7.2.2.3. Moderating effect of institutional quality on the link between bilateral trade and environmental quality

Policies aimed at enhancing COC, GVE, REQ, ROL, and the overall IQ may trigger a positive impact of CO₂ emissions on import. Conversely, improvements in POS may facilitate a negative effect of CO₂ emissions on import. Consequently, efforts to strengthen the former group of institutional quality indicators may cause high-emitting nations to increase their imports, whereas enhancing the latter helps those countries reduce their import dependence.

7.2.3. Implications from the link between gender equality, trade liberalization, and institutional quality

7.2.3.1. Direct effects of trade liberalization on gender equality

In general, trade liberalization should be coupled with gender-specific policies to safeguard female welfare, especially in low-to-middle institutional and trade openness contexts. Evidence suggests that in advanced institutional and highly-open environments, trade liberalization might exacerbate the welfare gap between genders, potentially undermining gender development. However, trade liberalization appears to mitigate gender inequality and improve female labor force participation in both high and low institutional quality countries. In low openness countries, trade liberalization may mitigate gender inequality. Therefore, these findings highlight the

critical role of inclusive trade frameworks that ensure equitable distribution of gains for both genders, especially in those which have the high degree of institutional quality and trade liberalization.

7.2.3.2. *Direct effects of institutional quality on gender equality*

Overall, policies aimed at enhancing various dimensions of institutional quality exert differing impacts on gender equality. Nevertheless, several prominent implications can be drawn as follows:

In the high institutional quality countries, policies which enhance COC, GVE, and ROL may lead to a decline in GDI and exacerbate the disparity between male and female human development indices. In addition, policies which improve COC and REQ may mitigate GII, while those improving ROL may worsen GII. Finally, policies which improve COC and ROL may reduce FLA, while those enhancing POS and VAC may extend FLA.

In the low institutional quality countries, policies which improve GVE and REQ may decrease GDI, while those improving ROL may enhance GDI. In addition, policies which improve COC, GVE, REQ may mitigate GII, while those improving POS may worsen GII. Finally, policies which improve POS, REQ, and ROL may decrease FLA, while those improving COC and VAC may extend FLA.

In the high openness countries, policies which enhance GVE, POS, and ROL may improve GDI, while those improving COC may hinder GDI. In addition, policies which improve COC, GVE, and VAC may hamper GII. Finally, policies which improve COC and VAC may extend FLA, while those enhancing GVE and POS may hinder FLA.

In the low openness countries, policies which enhance GVE and POS may hamper GDI, while those improving ROL and VAC could strengthen GDI. In addition, policies which improve GVE, POS, REQ, ROL, and VAC may alleviate GII. Finally, policies which enhance COC and VAC may extend FLA, while those improving POS, REQ, and ROL may hinder FLA.

7.2.3.3. Moderating effects of trade liberalization on gender-institution links

In the high institutional quality countries, trade liberalization policies should be implemented in tandem with measures to enhance POS, VAC, COC, and REQ to promote gender equality by boosting GDI and hindering GII. However, attention must be paid to the simultaneous decline in FLA as a potential trade-off.

In the low institutional quality countries, trade liberalization policies which are implemented in tandem with enhancements in COC, GVE, POS, REQ, ROL, and VAC should be considered with extreme caution. Such institutional reforms may unintentionally sacrifice gender equality in pursuit of deeper global integration. In other words, improving trade openness may trigger the hindering effect of those institutional dimensions on gender equality.

7.2.3.4. Moderating effects of institutional quality on gender-liberalization links

In the high openness countries, the enhancement of COC may facilitate the boosting effect of trade openness on GDI, while that of GVE, POS, and REQ may hamper GDI. In addition, the improvement of POS may trigger the worsening effect of trade openness on GII, while that of ROL may facilitate the mitigating effect of trade openness on GII. Finally, the enhancement of GVE and REQ may facilitate the boosting effect of trade openness on FLA, while that of COC, POS, ROL, and VAC may trigger the hindering effect of trade openness on FLA.

In the low openness countries, the enhancement of COC, GVE, POS, and REQ may facilitate the boosting effect of trade openness on GDI. In addition, the enhancement of GVE may trigger the worsening effect of trade openness on GII, while that of POS and VAC may facilitate the alleviating effect of trade openness on GII. Finally, the enhancement of COC, GVE, REQ, and VAC may facilitate the boosting effect of trade openness on FLA, while that of ROL may trigger the hampering effect of trade openness on FLA.

7.2.4. Implications from the link between environmental quality, trade liberalization, and institutional quality

7.2.4.1. Direct effects of trade liberalization on environmental quality

In general, particularly for countries with *low institutional quality and low openness*, the U-shaped relationship between CO₂ emissions and trade liberalization implies that governments should not focus solely on trade liberalization. Instead, they must simultaneously implement stringent environmental regulations to prevent an escalation of CO₂ emissions (deteriorating environmental quality) as the scale of trade expands due to deeper global economic integration.

In the high institutional quality and high openness countries, the inverse U-shaped link between CO₂ emissions and trade liberalization has implied that trade openness increases CO₂ emissions in the earlier stage and decreases CO₂ emissions in the subsequent stage. Therefore, trade liberalization policies in these groups of countries should be accompanied by comprehensive institutional quality reforms to swiftly transition through the initial stage where free trade exerts negative impacts on environmental quality.

7.2.4.2. Direct effects of institutional quality on environmental quality

In general, policies which aim at enhancing VAC may reduce CO₂ emissions and improve environmental quality. For example, policies which incentivize free opinion expressing and free media could impose pressure on industrial manufacturers for more environmentally responsible practices and enhance environmental awareness of consumers for more environmentally responsible consumption. *In the high institutional quality countries*, policies which improve COC, GVE, POS, and VAC may increase CO₂ emissions, while those improving ROL may decrease CO₂ emissions. *In the low institutional quality countries*, policies which improve COC, POS, and VAC may increase CO₂ emissions, while those improving ROL may decrease CO₂ emissions. *In the high openness countries*, policies which improve COC and GVE may increase CO₂ emissions. *In the low openness countries*, policies

which improve COC may increase CO₂ emissions, while those improving GVE and ROL may decrease CO₂ emissions. Therefore, improving institutional quality must focus on environmental quality so that the countries could be able to restrict the negative impacts of institutions on environment.

7.2.4.3. Moderating effect of institutional quality on the environment-liberalization link

In high openness countries, in the earlier stage, the governments should implement policies which improve COC, GVE, POS, and ROL, which consequently facilitates the hindering effect of trade openness on CO₂ emissions (promoting effect on environmental quality). However, in the subsequent stage, when improving such institutional dimensions, more stringent environmental policies should be simultaneously implemented to reduce the boosting effect of trade openness on CO₂ emissions (deteriorating effect on environmental quality). Similarly, *in low openness countries*, all institutional quality dimensions should be improved in the earlier stage and more stringent environmental policies should be simultaneously implemented to reduce the boosting effect of trade openness on CO₂ emissions.

7.3. Limitations and future research directions

First, regarding the trade gravity model, although the sample size is substantial with 32,800 observations (41 x 40 x 20), its spatial scope is limited to 41 global nations, representing 1,640 bilateral trade pairs with the highest trade flows. These countries were selected based on their trade values (total exports and imports) during the 2017–2021 period. Future studies could expand this sample to include a broader range of countries. However, it is important to note that such an expansion may increase the incidence of missing observations in the regression analysis due to the zero-trade phenomenon across country pairs over multiple years.

Second, although this dissertation employs CO₂ emissions per capita as the primary proxy for environmental quality, which is consistent with extensive past and contemporary literature, future research could consider alternative indicators such as

PM2.5 concentration, ecological carbon footprint, or other greenhouse gas emissions, etc. However, the availability and completeness of such datasets must be carefully considered. Unlike CO₂ emissions, these alternative metrics are often inconsistently recorded and published across all nations, which may lead to substantial data gaps. Consequently, utilizing these proxies might be more appropriate for regional or group-specific analyses (such as OECD or ASEAN) rather than a global scale study. In addition, although the GDI, GII, and FLA are utilized to capture gender dynamics, each indicator only reflects specific and distinct dimensions of gender equality rather than representing its comprehensive totality. Lastly, the Worldwide Governance Indicators (WGI) used to measure institutional quality are primarily perception-based, constructed from subjective surveys and assessments. Consequently, these indicators may contain inherent measurement errors.

Third, although this dissertation employs DGMM-II and SGMM-II estimation methods to mitigate endogeneity, and includes a comprehensive set of control variables based on prior literature and data availability, omitted variable bias remains an inherent challenge in macroeconomic models, which consequently triggers the significant correlation between included variables and the error term. Future research could use more robust instrumental variables to further address this issue. However, it is crucial to ensure the strict exogeneity of such instruments relative to the error term, as most macroeconomic variables exhibit significant interdependencies, making the identification of purely exogenous instruments particularly difficult.

Fourth, regarding the GKC and OEKC models, subsequent studies could extend the current framework by incorporating additional macroeconomic determinants. Furthermore, future research should aim to estimate specific turning points to identify the exact thresholds at which the relationships change direction. Quantifying these inflection points would provide more precise evidence for policymakers to design interventions that are effectively timely and context-specific.

Fifth, a notable limitation of this dissertation stems from the use of aggregate panel data, which may obscure the underlying micro-level dynamics, introduce potential endogeneity issues, and limit the depth of the findings. While the current dataset provides valuable insights at a broader level, it cannot fully capture the heterogeneous behaviors of individual economic agents. Furthermore, because the analysis relies on a global dataset, the findings inherently provide broad and generalized implications rather than country-specific insights. Consequently, the study cannot offer tailored policy recommendations directly applicable to individual nations, such as Vietnam. Future research could address this limitation by utilizing firm-level, household-level, or region-level data. Access to such granular data would allow researchers to precisely trace the transmission channels and clarify the specific mechanisms through which the independent variables influence the outcomes.

Sixth, given that this dissertation already includes a comprehensive and extensive range of research contents, further statistical expansion regarding the moderating effects was deemed beyond its current scope. Although the multifaceted impacts of institutional quality have been thoroughly discussed using qualitative nuances (e.g., “*triggers the hampering effect of...*” and “*facilitates the boosting effect of...*”), a formal simple slopes analysis was not conducted due to these scope and volume constraints. This methodological addition is therefore reserved as a promising avenue for future research to further elaborate on the visual dynamics of these interaction effects.

7.4. Conclusions

In conclusion, this dissertation has provided a comprehensive understanding of the complex Trade-Gender-Environment-Institution nexus within the framework of the 2030 Agenda for Sustainable Development. By focusing on Goal 5 (Gender Equality), Goal 13 (Climate Action), and Goal 17 (Partnerships through Trade), the dissertation has mapped how international economic integration interacts with social and environmental outcomes. The dissertation utilized three distinct datasets covering

worldwide economies over two decades, employing a rigorous multi-method estimation strategy, including combined fixed effects, system GMM, difference GMM, and PPML, to address issues of heterogeneity and endogeneity. Through the gravitational approach, the dissertation has established that gender equality and environmental quality are critical determinants of national comparative advantage, rather than merely peripheral social or ecological concerns. Simultaneously, the application of the Kuznets Curve approach has confirmed a Gender-driven Kuznets Curve (GKC) and introduced a new Openness-based Environmental Kuznets Curve (OEKC), revealing the non-linear dynamics between trade liberalization, economic growth, and environmental quality. This dissertation delivers three primary contributions to the literature. First, utilizing a gravity model approach, it provides a bilateral analysis of how gender equality and environmental quality influence trade flows from both the exporting and importing perspectives. Second, it investigates potential curvilinear (U-shaped or inverted U-shaped) relationships between trade liberalization and environmental quality. Third, it examines the moderating and contextual factors shaping the nexus between trade, gender equality, environment, and institution. Ultimately, the findings reveal that institutional quality acts as a critical catalyst in harmonizing economic growth with gender and environmental standards, offering valuable insights for policies that promote inclusive and green trade practices.

REFERENCES

- Abid, M., & Sekrafi, H. (2021). Pollution haven or halo effect? A comparative analysis of developing and developed countries. *Energy Reports*, 7, 4862-4871.
- Abreo, C., Bustillo, R., & Rodriguez, C. (2021). The role of institutional quality in the international trade of a Latin American country: evidence from Colombian export performance. *Journal of Economic Structures*, 10, 1-21.
- Achuo, E., & Ojong, N. (2024). Foreign direct investment, economic growth and environmental quality in Africa: revisiting the pollution haven and environmental Kuznets curve hypotheses. *Journal of Economic Studies*. <https://doi.org/10.1108/JES-02-2024-0065>
- Achuo, E., Nkoa, B. E. O., Ndam, N. L., & Forgha, N. G. (2024). Institutional quality, information and communication technologies and gender inclusion nexus: global comparative evidence. *Journal of Economics and Development*, 26(2), 103-122.
- Adebayo, T. S., Akadiri, S. S., Riti, J. S., & Tony Odu, A. (2023). Interaction among geopolitical risk, trade openness, economic growth, carbon emissions and its implication on climate change in India. *Energy & Environment*, 34(5), 1305-1326.
- Afesorgbor, S. K., & Demena, B. A. (2022). Trade Openness and Environmental Emissions: Evidence from a Meta-Analysis. *Environmental and Resource Economics*, 81(2), 287-321.
- Ahmed, K. (2020). Environmental policy stringency, related technological change and emissions inventory in 20 OECD countries. *Journal of Environmental Management*, 274, 111209.
- Akbostanci, E., Tunc, G. I., & Turut-Asik, S. (2023). Virtual water flows of Turkey's agricultural products: A gravity approach. *Journal of Cleaner Production*, 420, 138453.

Akhtar, R., Masud, M. M., Jafrin, N., & Shahabudin, S. M. (2023). Economic growth, gender inequality, openness of trade, and female labour force participation: A nonlinear ARDL approach. *Economic Change and Restructuring*, 56(3), 1725-1752.

Allard, A., Takman, J., Uddin, G. S., & Ahmed, A. (2018). The N-shaped environmental Kuznets curve: An empirical evaluation using a panel quantile regression approach. *Environmental Science and Pollution Research*, 25(6), 5848-5861.

Al-Mulali, U., Ozturk, I., & Solarin, S. A. (2016). Investigating the environmental Kuznets curve hypothesis in seven regions: The role of renewable energy. *Ecological Indicators*, 67, 267-282.

Alonso, J. A., & Garcimartín, C. (2013). The determinants of institutional quality. More on the debate. *Journal of International Development*, 25(2), 206-226.

Álvarez, I. C., Barbero, J., Rodríguez-Pose, A., & Zofío, J. L. (2018). Does institutional quality matter for trade? Institutional conditions in a sectoral trade framework. *World Development*, 103, 72-87.

Amankwa, R. F., Yiadom, E. B., Acheampong, E., & Mawutor, J. K. (2024). Climate change mitigation with Eurobonds: an Environmental Kuznets Curve analysis. *Cogent Economics & Finance*, 12(1), 2312782.

Amin, N., Shabbir, M. S., Song, H., Farrukh, M. U., Iqbal, S., & Abbass, K. (2023). A step towards environmental mitigation: Do green technological innovation and institutional quality make a difference?. *Technological Forecasting and Social Change*, 190, 122413.

Amri, F. (2018). Carbon dioxide emissions, total factor productivity, ICT, trade, financial development, and energy consumption: Testing environmental Kuznets curve hypothesis for Tunisia. *Environmental Science and Pollution Research*, 25(33), 33691-33701.

Anderson, J. E., & Van Wincoop, E. (2003). Gravity with gravitas: A solution to the border puzzle. *American Economic Review*, 93(1), 170-192.

Ansari, M. A., Haider, S., & Khan, N. A. (2020). Does trade openness affects global carbon dioxide emissions: evidence from the top CO2 emitters. *Management of Environmental Quality*, 31(1), 32-53.

Anwar, A., & Malik, S. (2021). Cogitating the role of technological innovation and institutional quality on environmental degradation in G-7 countries. *International Journal of Green Economics*, 15(3), 213-232.

Anwar, A., Chaudhary, A. R., Malik, S., & Bassim, M. (2025). Modelling the macroeconomic determinants of carbon dioxide emissions in the G-7 countries: The roles of technological innovation and institutional quality improvement. *Global Business Review*, 26(3), 823–845.

Anyanwu, J. C. (2016). Analysis of gender equality in youth employment in Africa. *African Development Review*, 28(4), 397-415.

Anyanwu, J. C., & Augustine, D. (2013). Gender equality in employment in Africa: Empirical analysis and policy implications. *African Development Review*, 25(4), 400-420.

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies*, 58(2), 277-297.

Aslam, B., Hu, J., Shahab, S., Ahmad, A., Saleem, M., Shah, S. S. A., ... & Hassan, M. (2021). The nexus of industrialization, GDP per capita and CO2 emission in China. *Environmental Technology & Innovation*, 23, 101674.

Aydin, F. F. (2023). Effect of economic growth, energy use, trade openness and foreign direct investments on carbon dioxide emissions. Evidence from G8 countries. *Environmental Science and Pollution Research*, 30(53), 113538-113552.

Aydin, M., & Turan, Y. E. (2020). The influence of financial openness, trade openness, and energy intensity on ecological footprint: Revisiting the environmental Kuznets curve hypothesis for BRICS countries. *Environmental Science and Pollution Research*, 27(34), 43233-43245.

Azam, M., & Khan, A. Q. (2016). Testing the Environmental Kuznets Curve hypothesis: A comparative empirical study for low, lower middle, upper middle and high income countries. *Renewable and Sustainable Energy Reviews*, 63, 556-567.

Baier, S. L., & Bergstrand, J. H. (2009). Bonus vetus OLS: A simple method for approximating international trade-cost effects using the gravity equation. *Journal of International Economics*, 77(1), 77-85.

Bali moune-Lutz, M. (2007). Globalisation and gender inequality: Is Africa different?. *Journal of African Economies*, 16(2), 301-348.

Balsalobre-Lorente, D., Shahbaz, M., Murshed, M., & Nuta, F. M. (2023). Environmental impact of globalization: The case of central and Eastern European emerging economies. *Journal of Environmental Management*, 341, 118018.

Bandyopadhyay, A., & Rej, S. (2021). Can nuclear energy fuel an environmentally sustainable economic growth? Revisiting the EKC hypothesis for India. *Environmental Science and Pollution Research*, 28(44), 63065-63086.

Barbier, E. B., & Burgess, J. C. (2019). Sustainable development goal indicators: Analyzing trade-offs and complementarities. *World Development*, 122, 295-305.

Barros, L., & Martínez-Zarzoso, I. (2022). Systematic literature review on trade liberalization and sustainable development. *Sustainable Production and Consumption*, 33, 921-931.

Belloc, M. (2006). Institutions and international trade: A reconsideration of comparative advantage. *Journal of Economic Surveys*, 20(1), 3-26.

Ben Jebli, M., Ben Youssef, S., & Apergis, N. (2019). The dynamic linkage between renewable energy, tourism, CO2 emissions, economic growth, foreign direct investment, and trade. *Latin American Economic Review*, 28(1), 1-19.

Berik, G. (2000). Mature export-led growth and gender wage inequality in Taiwan. *Feminist Economics*, 6(3), 1-26.

Bilgili, F., Khan, M., & Awan, A. (2022). Is there a gender dimension of the environmental Kuznets curve? Evidence from Asian countries. *Environment, Development and Sustainability*, 1-32.

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, 87(1), 115-143.

Borrs, L., & Knauth, F. (2021). Trade, technology, and the channels of wage inequality. *European Economic Review*, 131, 103607.

Boujedra, F., & Jebli, M. B. (2025). Unraveling the interaction effect between the educated labor force and patent applications on environmental quality in OECD countries: investigation of N-shaped EKC hypothesis. *Climatic Change*, 178(1), 4.

Branisa, B., Klasen, S., & Ziegler, M. (2013). Gender inequality in social institutions and gendered development outcomes. *World Development*, 45, 252-268.

Braunstein, E. (2017). The gender dynamics of inclusion and exclusion: a macro perspective on employment Chapter IV in: *UNCTAD, Trade and Development Report 2017*, Geneva, UNCTAD.

Buchanan, B. G., Le, Q. V., & Rishi, M. (2012). Foreign direct investment and institutional quality: Some empirical evidence. *International Review of Financial Analysis*, 21, 81-89.

Busse, M., & Spielmann, C. (2006). Gender inequality and trade. *Review of International Economics*, 14(3), 362-379.

Bussmann, M. (2009). The effect of trade openness on women's welfare and work life. *World Development*, 37(6), 1027-1038.

Caporin, M., Cooray, A., Kuziboev, B., & Yusubov, I. (2024). New insights on the environmental Kuznets curve (EKC) for Central Asia. *Empirical Economics*, 66(5), 2335-2354.

Carter, D. B., & Poast, P. (2020). Barriers to trade: How border walls affect trade relations. *International Organization*, 74(1), 165-185.

Chambers, D., & Munemo, J. (2019). Regulations, institutional quality and entrepreneurship. *Journal of Regulatory Economics*, 55(1), 46-66.

Cheng, I. H., & Wall, H. J. (2005). Controlling for heterogeneity in gravity models of trade and integration. *Federal Reserve Bank of St. Louis Review*, 87(1), 49-63.

Chhabra, M., Giri, A. K., & Kumar, A. (2023). Do trade openness and institutional quality contribute to carbon emission reduction? Evidence from BRICS countries. *Environmental Science and Pollution Research*, 30(17), 50986-51002.

Choi, I. (2001). Unit root tests for panel data. *Journal of International Money and Finance*, 20(2), 249-272.

Cialani, C. (2017). CO2 emissions, GDP and trade: a panel cointegration approach. *International Journal of Sustainable Development & World Ecology*, 24(3), 193-204.

Clark, R. (1991). Contrasting Perspectives on Women's Access to Prestigious Occupations: A Cross National Investigation. *Social Science Quarterly*, 72(1), 20-32.

Clark, R., Ramsbey, T. W., & Adler, E. S. (1991). Culture, gender, and labor force participation: A cross-national study. *Gender and Society*, 47-66.

Clemons, E. K., & Row, M. C. (1992). Information technology and industrial cooperation: the changing economics of coordination and ownership. *Journal of Management Information Systems*, 9(2), 9-28.

Conte, M., Cotterlaz, P., & Mayer, T. (2022). The CEPII gravity database. *Working Paper No. 2022-05 – July*, Centre d’Etudes Prospectives et d’Informations Internationales (CEPII), July.

Cooray, A., Dutta, N., & Mallick, S. (2017). Trade openness and labor force participation in Africa: the role of political institutions. *Industrial Relations*, 56(2), 319-350.

Demiral, M., Haykir, O., & Aktekin-Gok, E. D. (2024). Environmental pollution effects of economic, financial, and industrial development in OPEC: comparative evidence from the environmental Kuznets curve perspective. *Environment, Development and Sustainability*, 26(10), 24905-24936.

Dorn, F., Fuest, C., & Potrafke, N. (2022). Trade openness and income inequality: New empirical evidence. *Economic Inquiry*, 60(1), 202-223.

Dou, Y., Zhao, J., Malik, M. N., & Dong, K. (2021). Assessing the impact of trade openness on CO2 emissions: evidence from China-Japan-ROK FTA countries. *Journal of Environmental Management*, 296, 113241.

Dumitrescu, E. I., & Hurlin, C. (2012). Testing for Granger non-causality in heterogeneous panels. *Economic Modelling*, 29(4), 1450-1460.

Eastin, J., & Prakash, A. (2013). Economic development and gender equality: Is there a gender Kuznets curve?. *World Politics*, 65(1), 156-186.

Egger, H., & Kreickemeier, U. (2012). Fairness, trade, and inequality. *Journal of International Economics*, 86(2), 184-196.

Elson, D., Grown, C., & Cagatay, N. (2012). Mainstream, heterodox, and feminist trade theory. In *The Feminist Economics of Trade* (pp. 33-52). Routledge.

Emikonel, M. (2022). The impact of international organizations on Chinese trade as the determiner of trade: the gravity model approach. *Chinese Economy*, 55(1), 26-40.

Ertugrul, H. M., Cetin, M., Seker, F., & Dogan, E. (2016). The impact of trade openness on global carbon dioxide emissions: Evidence from the top ten emitters among developing countries. *Ecological Indicators*, 67, 543-555.

Eshetu, F., & Goshu, D. (2021). Determinants of Ethiopian coffee exports to its major trade partners: A dynamic gravity model approach. *Foreign Trade Review*, 56(2), 185-196.

Fiorini, M., & Hoekman, B. (2018). Services trade policy and sustainable development. *World Development*, 112, 1-12.

Fontana, M. (2016). *Gender equality in Trade Agreements*. Study for the FEMM Committee, Brussels, European Parliament.

Forsythe, N., Korzeniewicz, R. P., & Durrant, V. (2000). Gender inequalities and economic growth: A longitudinal evaluation. *Economic Development and Cultural Change*, 48(3), 573-617.

Fracasso, A., & Marzetti, G. V. (2015). International trade and R&D spillovers. *Journal of International Economics*, 96(1), 138-149.

Galeotti, M., Salini, S., & Verdolini, E. (2020). Measuring environmental policy stringency: Approaches, validity, and impact on environmental innovation and energy efficiency. *Energy Policy*, 136, 111052.

George, C., & Kirkpatrick, C. (2004). Trade and development: Assessing the impact of trade liberalisation on sustainable development. *Journal of World Trade*, 38(3), 441-469.

Ghazalian, P. L. (2012). Assessing the effects of international trade on private R&D expenditures in the food processing sector. *Industry and Innovation*, 19(4), 349-369.

Ghosh, S. (2022). How trade diversification and economic growth affect gender inequality in female labour market participation? The case of India. *Journal of Economics and Development*, 24(2), 127-141.

Gill, A. R., Hassan, S., & Viswanathan, K. K. (2019). Is democracy enough to get early turn of the environmental Kuznets curve in ASEAN countries?. *Energy & Environment*, 30(8), 1491-1505.

Goldin, C. (1990). *Understanding the Gender Gap: An Economic History of American Women*. New York, N.Y.: Oxford University Press.

Golovko, A., & Sahin, H. (2021). Analysis of international trade integration of Eurasian countries: Gravity model approach. *Eurasian Economic Review*, 11(3), 519-548.

Granger, C. W. (1969). Investigating causal relations by econometric models and cross-spectral methods. *Econometrica*, 37(3), 424-438.

Greaney, T. M., & Kiyota, K. (2020). The gravity model and trade in intermediate inputs. *The World Economy*, 43(8), 2034-2049.

Guo, Q., & Mai, Z. (2023). China's potential for trade in renewable energy products in RCEP countries: A gravity model analysis. *International Journal of Energy Research*, 2023(1), 1530969.

Guo, X., & Shahbaz, M. (2024). The existence of environmental Kuznets curve: Critical look and future implications for environmental management. *Journal of Environmental Management*, 351, 119648.

Gupta, S. D., Baudino, M., & Sarkar, S. (2025). Does the environmental Kuznets curve hold across sectors? Evidence from developing and emerging economies. *Renewable and Sustainable Energy Reviews*, 211, 115201.

Gyamfi, B. A., Agozie, D. Q., Bekun, F. V., & Köksal, C. (2024). Beyond the Environmental Kuznets Curve in South Asian economies: accounting for the combined effect of information and communication technology, human development

and urbanization. *Environment, Development and Sustainability*, 26(5), 11263-11288.

Harris, R. D., & Tzavalis, E. (1999). Inference for unit roots in dynamic panels where the time dimension is fixed. *Journal of Econometrics*, 91(2), 201-226.

Hausman, J. A. (1978). Specification tests in econometrics. *Econometrica: Journal of The Econometric Society*, 1251-1271.

Head, K., & Mayer, T. (2014). Gravity equations: Workhorse, toolkit, and cookbook. In *Handbook of International Economics* (Vol. 4, pp. 131-195). Elsevier.

Heckscher, E. F. (1919). The effect of foreign trade on the distribution of income. *Ekonomisk Tidskrift*, 497–512.

Hegre, H., Oneal, J. R., & Russett, B. (2010). Trade does promote peace: New simultaneous estimates of the reciprocal effects of trade and conflict. *Journal of Peace Research*, 47(6), 763-774.

Helpman, E., Itskhoki, O., Muendler, M. A., & Redding, S. J. (2017). Trade and inequality: From theory to estimation. *The Review of Economic Studies*, 84(1), 357-405.

Helpman, E., Melitz, M. J., & Yeaple, S. R. (2004). Export versus FDI with heterogeneous firms. *American Economic Review*, 94(1), 300-316.

Hong, S., Lee, J., Oh, F. D., & Shin, D. (2023). Religion and foreign direct investment. *International Business Review*, 32(1), 102035.

Huang, Y., Rahman, S. U., Meo, M. S., Ali, M. S. E., & Khan, S. (2024). Revisiting the environmental Kuznets curve: Assessing the impact of climate policy uncertainty in the Belt and Road Initiative. *Environmental Science and Pollution Research*, 31(7), 10579-10593.

Ibrahim, R. L., & Ajide, K. B. (2021). Nonrenewable and renewable energy consumption, trade openness, and environmental quality in G-7 countries: the

conditional role of technological progress. *Environmental Science and Pollution Research*, 28(33), 45212-45229.

Im, K. S., Pesaran, M. H., & Shin, Y. (2003). Testing for unit roots in heterogeneous panels. *Journal of Econometrics*, 115(1), 53-74.

Iqbal, A., Hassan, S., Mahmood, H., & Tanveer, M. (2022). Gender equality, education, economic growth and religious tensions nexus in developing countries: A spatial analysis approach. *Heliyon*, 8(11).

Islam, M. M., Sohag, K., Mamman, S. O., & Herdhayinta, H. (2024). Response of Indonesian mineral supply to global renewable energy generation: Analysis based on gravity model approach. *Geoscience Frontiers*, 15(4), 101658.

Iversen, T., & Rosenbluth, F. (2006). The political economy of gender: Explaining cross-national variation in the gender division of labor and the gender voting gap. *American Journal of Political Science*, 50(1), 1-19.

Jamel, L., & Maktouf, S. (2017). The nexus between economic growth, financial development, trade openness, and CO2 emissions in European countries. *Cogent Economics & Finance*, 5(1), 1341456.

Jayadevappa, R., & Chhatre, S. (2000). International trade and environmental quality: a survey. *Ecological Economics*, 32(2), 175-194.

Jiang, R., & Jiang, Z. (2025). Exploring the impact of trade openness on carbon emissions: Do scale, environmental regulations, and structural effects matter?. *Environment, Development and Sustainability*, 1-27.

Jiang, Y., & Khan, H. (2023). The relationship between renewable energy consumption, technological innovations, and carbon dioxide emission: evidence from two-step system GMM. *Environmental Science and Pollution Research*, 30(2), 4187-4202.

Jing, S., Zhihui, L., Jinhua, C., & Zhiyao, S. (2020). China's renewable energy trade potential in the "Belt-and-Road" countries: A gravity model analysis. *Renewable Energy*, 161, 1025-1035.

Juhn, C., Ujhelyi, G., & Villegas-Sanchez, C. (2013). Trade liberalization and gender inequality. *American Economic Review*, 103(3), 269-273.

Juhn, C., Ujhelyi, G., & Villegas-Sanchez, C. (2014). Men, women, and machines: How trade impacts gender inequality. *Journal of Development Economics*, 106, 179-193.

Kabir, M., Salim, R., & Al-Mawali, N. (2017). The gravity model and trade flows: Recent developments in econometric modeling and empirical evidence. *Economic Analysis and Policy*, 56, 60-71.

Kahouli, B. (2016). Regional integration agreements, trade flows and economic crisis: A static and dynamic gravity model. *International Economic Journal*, 30(4), 450-475.

Kaika, D., & Zervas, E. (2013). The Environmental Kuznets Curve (EKC) theory—Part A: Concept, causes and the CO₂ emissions case. *Energy Policy*, 62, 1392-1402.

Kang, Y. Q., Zhao, T., & Yang, Y. Y. (2016). Environmental Kuznets curve for CO₂ emissions in China: A spatial panel data approach. *Ecological Indicators*, 63, 231-239.

Kao, C. (1999). Spurious regression and residual-based tests for cointegration in panel data. *Journal of Econometrics*, 90(1), 1-44.

Khan, M., & Rana, A. T. (2021). Institutional quality and CO₂ emission–output relations: the case of Asian countries. *Journal of Environmental Management*, 279, 111569.

Kim, K., & Kim, Y. (2015). Role of policy in innovation and international trade of renewable energy technology: Empirical study of solar PV and wind power technology. *Renewable and Sustainable Energy Reviews*, 44, 717-727.

Klasen, S., & Lamanna, F. (2009). The impact of gender inequality in education and employment on economic growth: new evidence for a panel of countries. *Feminist Economics*, 15(3), 91-132.

Koc, S., & Bulus, G. C. (2020). Testing validity of the EKC hypothesis in South Korea: role of renewable energy and trade openness. *Environmental Science and Pollution Research*, 27(23), 29043-29054.

Kohler, M. (2013). CO2 emissions, energy consumption, income and foreign trade: A South African perspective. *Energy Policy*, 63, 1042-1050.

Korinek, J., Moisé, E., & Tange, J. (2021). Trade and gender: A Framework of analysis. *OECD Trade Policy Paper No. 246*, Paris: OECD Publishing.

Krugman, P., Obstfeld, M., & Melitz, M. J. (2022). *International Economics: Theory and Policy*. Pearson Education.

Kuznets, S., (1955). Economic growth and income inequality. *The American Economic Review*, 45(1), 1-28.

Le, D. N. (2022). Export, logistics performance, and regional economic integration: Sectoral and sub-sectoral evidence from Vietnam. *Journal of International Logistics and Trade*, 20(1), 37-56.

Le, D. N., & Pham, N. K. (2024). Trade, gender equality and institutional quality: Evidence from the gravitational approach. *International Journal of Development Issues*. <https://doi.org/10.1108/IJDI-02-2024-0029>

Le, H. P., & Ozturk, I. (2020). The impacts of globalization, financial development, government expenditures, and institutional quality on CO2 emissions in the presence of environmental Kuznets curve. *Environmental Science and Pollution Research*, 27(18), 22680-22697.

Levchenko, A. A. (2007). Institutional quality and international trade. *The Review of Economic Studies*, 74(3), 791-819.

Levin, A., Lin, C. F., & Chu, C. S. J. (2002). Unit root tests in panel data: asymptotic and finite-sample properties. *Journal of Econometrics*, 108(1), 1-24.

Li, B., & Haneklaus, N. (2022). Reducing CO₂ emissions in G7 countries: The role of clean energy consumption, trade openness and urbanization. *Energy Reports*, 8, 704-713.

Li, S., Samour, A., Irfan, M., & Ali, M. (2023). Role of renewable energy and fiscal policy on trade adjusted carbon emissions: Evaluating the role of environmental policy stringency. *Renewable Energy*, 205, 156-165.

Lin, J., Flachsbarth, I., & von Cramon-Taubadel, S. (2020). The role of institutional quality on the performance in the export of coconut products. *Agricultural Economics*, 51(2), 237-258.

Liobikiene, G., & Butkus, M. (2019). Scale, composition, and technique effects through which the economic growth, foreign direct investment, urbanization, and trade affect greenhouse gas emissions. *Renewable Energy*, 132, 1310-1322.

Lohani, K. K. (2024). Trade flow of India with BRICS countries: A gravity model approach. *Global Business Review*, 25(1), 22-39.

Magee, C. S. (2008). New measures of trade creation and trade diversion. *Journal of International Economics*, 75(2), 349-362.

Mahadevan, R., & Suardi, S. (2024). Globalisation, tourism and environmental kuznets curve. *Tourism Economics*, 13548166241295799.

Martínez-Martínez, A., Esteve-Pérez, S., Gil-Pareja, S., & Llorca-Vivero, R. (2023). The impact of climate change on international trade: A gravity model estimation. *World Economy*, 46(9), 2624-2653.

Martínez-Navarro, D., Amate-Fortes, I., & Guarnido-Rueda, A. (2020). Inequality and development: Is the Kuznets curve in effect today?. *Economia Politica*, 37, 703-735.

Martínez-Zarzoso, I., Bengochea-Morancho, A., & Morales-Lage, R. (2019). Does environmental policy stringency foster innovation and productivity in OECD countries?. *Energy Policy*, 134, 110982.

McDonald, P. J. (2004). Peace through trade or free trade?. *Journal of Conflict Resolution*, 48(4), 547-572.

Ménard, C. (2011). A new institutional economics perspective on environmental issues. *Environmental Innovation and Societal Transitions*, 1(1), 115-120.

Menon, N., & Van der Meulen Rodgers, Y. (2009). International trade and the gender wage gap: New evidence from India's manufacturing sector. *World Development*, 37(5), 965-981.

Méon, P. G., & Sekkat, K. (2008). Institutional quality and trade: which institutions? Which trade?. *Economic Inquiry*, 46(2), 227-240.

Meschi, E., & Vivarelli, M. (2009). Trade and income inequality in developing countries. *World Development*, 37(2), 287-302.

Mitra, A., Bang, J. T., & Biswas, A. (2015). Gender equality and economic growth: Is it equality of opportunity or equality of outcomes?. *Feminist Economics*, 21(1), 110-135.

Mohammed, A. J. (2017). Can trade deliver the UN's 2030 agenda?. *UNCTAD News*, [online] Available at: <<https://unctad.org/news/can-trade-deliver-uns-2030-agenda>> [Accessed 17 November 2024].

Murad, S. W., Rahman, A., & Mohsin, A. K. M. (2025). From policy to progress: Environmental taxation to mitigate air pollution in OECD countries. *Journal of Environmental Management*, 374, 124143.

Mutascu, M. (2018). A time-frequency analysis of trade openness and CO2 emissions in France. *Energy Policy*, 115, 443-455.

Naanwaab, C. (2022). The Impact of Trade Liberalization on Income Inequality: Does the Direction of Trade Matter?. *International Economic Journal*, 1-32.

Nandan, A., & Mallick, H. (2020). Does gender equality matter for regional growth and income inequality? An empirical analysis for the Indian states. *Journal of International Development*, 32(4), 439-469.

Nam, H. J., Frijns, B., & Ryu, D. (2024). Trade openness and income inequality: The moderating role of institutional quality. *Global Finance Journal*, 60, 100959.

Nam, H. J., Ryu, D., & Szilagyi, P. G. (2025). Gender inequality, institutional quality and economic outcomes in the European Union. *European Financial Management*, 31(1), 463-492.

Nasrullah, M., Chang, L., Khan, K., Rizwanullah, M., Zulfiqar, F., & Ishfaq, M. (2020). Determinants of forest product group trade by gravity model approach: A case study of China. *Forest Policy and Economics*, 113, 102117.

Nathaniel, S., & Khan, S. A. R. (2020). The nexus between urbanization, renewable energy, trade, and ecological footprint in ASEAN countries. *Journal of Cleaner Production*, 272, 122709.

Nawrot, K. A. (2023). Assessing the effects of trade regionalism in East Asia—evidence from augmented gravity models. *Applied Economics*, 55(12), 1285-1297.

Nchofoung, T. N., & Asongu, S. A. (2022). Effects of infrastructures on environmental quality contingent on trade openness and governance dynamics in Africa. *Renewable Energy*, 189, 152-163.

Ngouhouo, I., Nchofoung, T., & Njamen Kengdo, A. A. (2021). Determinants of trade openness in sub-Saharan Africa: do institutions matter?. *International Economic Journal*, 35(1), 96-119.

Nguyen, C. P. (2022). Tourism and gender (in) equality: Global evidence. *Tourism Management Perspectives*, 41, 100933.

Nguyen, C. P., & Nguyen, B. Q. (2023). From natural risk to social justice: The influence of natural threats on gender inequality. *Environmental and Sustainability Indicators*, 19, 100270.

Nguyen, C. P., & Su, T. D. (2021). Does energy poverty matter for gender inequality? Global evidence. *Energy for Sustainable Development*, 64, 35-45.

North, D. C. (1981). *Structure and Change in Economic History*. New York, USA: Norton.

North, D. C. (1990). *Institutions, Institutional Change and Economic Performance*. Cambridge, UK: Cambridge University Press.

Obobisa, E. S., Chen, H., & Mensah, I. A. (2022). The impact of green technological innovation and institutional quality on CO2 emissions in African countries. *Technological Forecasting and Social Change*, 180, 121670.

OECD/CAF/ECLAC. (2018). *Latin American Economic Outlook 2018: Rethinking Institutions for Development*. The OECD Publishing.

Ohlin, B. (1935). *Interregional and international trade*. Harvard University Press, Cambridge.

Okonjo-Iweala, N. (2022a). Global trade a powerful instrument for improving the lives of women. *WTO News*, [online] Available at: <https://www.wto.org/english/news_e/news22_e/dgno_22sep22_e.htm> [Accessed 20 November 2024].

Okonjo-Iweala, N. (2022b). Trade policy must catalyse green transformation, support climate adaptation. *WTO News*, [online] Available at: <https://www.wto.org/english/news_e/news22_e/dgno_19sep22_e.htm> [Accessed 24 November 2024].

Omoke, P. C., & Opuala–Charles, S. (2021). Trade openness and economic growth nexus: Exploring the role of institutional quality in Nigeria. *Cogent Economics & Finance*, 9(1), 1868686.

Omri, A. (2020). Formal versus informal entrepreneurship in emerging economies: The roles of governance and the financial sector. *Journal of Business Research*, 108, 277-290.

Omri, A., & Hadj, T. B. (2020). Foreign investment and air pollution: do good governance and technological innovation matter?. *Environmental Research*, 185, 109469.

Oostendorp, R. H. (2009). Globalization and the gender wage gap. *World Bank Economic Review*, 23(1), 141-161.

Opeloyeru, O. S., Faronbi, T. O., & Raifu, I. A. (2024). The role of institutional quality in health expenditure-labor force participation Nexus in Africa. *Journal of the Knowledge Economy*, 15(1), 2241-2273.

Orkoh, E., Blaauw, D., & Claassen, C. (2022). The trade openness–gender wage differential nexus: Household-level evidence from Ghana. *Review of Development Economics*, 26(1), 156-179.

Osinubi, T., & Simatele, M. (2025). Female economic participation and sustainable development in African countries: The moderating role of governance. *Sustainable Development*, 33(1), 1212-1230.

Ozkan, O., Sharif, A., Mey, L. S., & Tiwari, S. (2023). The dynamic role of green technological innovation, financial development and trade openness on urban

environmental degradation in China: Fresh insights from carbon efficiency. *Urban Climate*, 52, 101679.

Papirakis, E., Covarrubias, A., & Verschoor, A. (2012). Gender and trade aspects of labour markets. *Journal of Development Studies*, 48(1), 81-98.

Pata, U. K., Dam, M. M., & Kaya, F. (2023). How effective are renewable energy, tourism, trade openness, and foreign direct investment on CO2 emissions? An EKC analysis for ASEAN countries. *Environmental Science and Pollution Research*, 30(6), 14821-14837.

Peiró-Palomino, J., Rodríguez-Crespo, E., & Suárez-Varela, M. (2022). Do countries with higher institutional quality transition to cleaner trade?. *Ecological Economics*, 201, 107554.

Pempel, T. J. (2022). Sources of peace in East Asia: interdependence, institutions, and middle powers. *Pacific Review*, 1-18.

Pesaran, M. H. (2004). General diagnostic tests for cross section dependence in panels. Cambridge Working Papers. *Economics*, 1240(1), 1.

Phiri, A., Mhaka, S., & Taonezvi, L. (2024). Too poor to be clean? A quantile ARDL assessment of the environmental Kuznets curve in SADC countries. *Environment, Development and Sustainability*, 26(11), 27301-27323.

Polat, B., & Cil, N. (2025). Investigating the environmental Kuznets curve modified with HDI: Evidence from a panel of eco-innovative countries. *Environment, Development and Sustainability*, 27(7), 16655–16682.

Porter, M.E. (1990). *The Competitive Advantage of Nations*. The Free Press, New York, NY.

Porter, M.E. (1994). The role of location in competition. *International Journal of the Economics of Business*, 1(1), 35-40.

Potrafke, N., & Ursprung, H. W. (2012). Globalization and gender equality in the course of development. *European Journal of Political Economy*, 28(4), 399-413.

Poyhonen, P. (1963). A tentative model for the volume of trade between countries. *Weltwirtschaftliches Archiv*, 90, 93-100.
<https://www.jstor.org/stable/40436776>

Qamruzzaman, M. (2021). Nexus between environmental quality, institutional quality and trade openness through the channel of FDI: An application of common correlated effects estimation (CCEE), NARDL, and asymmetry causality. *Environmental Science and Pollution Research*, 28(37), 52475-52498.

Rahman, M. M. (2021). The dynamic nexus of energy consumption, international trade and economic growth in BRICS and ASEAN countries: A panel causality test. *Energy*, 229, 120679.

Rahman, M. M., & Alam, K. (2022). The roles of globalization, renewable energy and technological innovation in improving air quality: Evidence from the world's 60 most open countries. *Energy Reports*, 8, 9889-9898.

Rahman, M. M., Saidi, K., & Mbarek, M. B. (2020). Economic growth in South Asia: the role of CO₂ emissions, population density and trade openness. *Heliyon*, 6(5), e03903.

Rasheed, M., & Liu, J. (2024). Unraveling the environmental Kuznets curve: interplay between CO₂ emissions, economic development, and energy consumption. *Environmental Science and Pollution Research*, 31(9), 13372-13391.

Roodman, D. (2009). How to do xtabond2: An introduction to difference and system GMM in Stata. *The Stata Journal*, 9(1), 86-136.

Ruiters, M., & Charteris, A. (2020). Gender equality in labour force participation, economic growth and development in South Africa. *Development Southern Africa*, 37(6), 997-1011.

Rybczynski, T. M. (1955). Factor endowment and relative commodity prices. *Economica*, 22(88), 336-341.

Ryu, D., & Nam, H. J. (2024). Impacts of gender inequality on international trade and innovation. *Finance Research Letters*, 63, 105366.

Saha, T., & Singh, P. (2025). Political and institutional dynamics of global female labor force participation: Discovering the role of women political participation. *Sustainable Development*, 33(3), 3791-3817.

Sajid, S., Hassan, S. S. U., Rehman, S. U., Arooj, M., & Sadekin, M. N. (2025). Unlocking trade potential: gender equality, economic complexity and trade openness in the Developing-8 (D-8) countries. *International Journal of Social Economics*, 52(5), 730-746.

Sauré, P., & Zoabi, H. (2014). International trade, the gender wage gap and female labor force participation. *Journal of Development Economics*, 111, 17-33.

Schultz, T. P. (2014). Does the liberalization of trade advance gender equality in schooling and health?. In *The Future of Globalization* (pp. 196-226). Routledge.

Seguino, S. (1997). Gender wage inequality and export-led growth in South Korea. *Journal of Development Studies*, 34(2), 102-132.

Seguino, S. (2000). Accounting for gender in Asian economic growth. *Feminist Economics*, 6(3), 27-58.

Shahbaz, M., Lean, H. H., & Shabbir, M. S. (2012). Environmental Kuznets curve hypothesis in Pakistan: cointegration and Granger causality. *Renewable and Sustainable Energy Reviews*, 16(5), 2947-2953.

Shahbaz, M., Nasreen, S., Abbas, F., & Anis, O. (2015). Does foreign direct investment impede environmental quality in high-, middle-, and low-income countries?. *Energy Economics*, 51, 275-287.

Shan, S., Ahmad, M., Tan, Z., Adebayo, T. S., Li, R. Y. M., & Kirikkaleli, D. (2021). The role of energy prices and non-linear fiscal decentralization in limiting carbon emissions: tracking environmental sustainability. *Energy*, 234, 121243.

Shao, Y., Li, J., & Wang, Y. (2025). Environmental kuznets curve in the iron and steel industry: evidence from 30 major steel-producing countries. *Environment, Development and Sustainability*, 27(5), 12233-12257.

Shittu, I., Abdul Latiff, A. R., & Baharudin, S. A. (2025). Promoting gender equality during uncertainty: which policies and institutional qualities matter?. *International Journal of Social Economics*, 52(5), 679-697.

Siebert, H. (1992). *Economics of the Environment*. Springer-Verlag, New York.

Silva, J. S., & Tenreyro, S. (2006). The log of gravity. *The Review of Economics and Statistics*, 88(4), 641-658.

Song, C. X., Qiao, C. X., & Lee, C. C. (2022). Application of gravity model to explain the effects of diplomatic relations on China's service trade. *Applied Economics Letters*, 29(5), 431-436.

Stern, D. I. (1998). Progress on the environmental Kuznets curve?. *Environment and Development Economics*, 3(2), 173-196.

Stolper, W. F., & Samuelson, P. A. (1941). Protection and real wages. *Review of Economic Studies*, 9(1), 58-73.

Tandra, H., & Suroso, A. I. (2023). The determinant, efficiency, and potential of Indonesian palm oil downstream export to the global market. *Cogent Economics & Finance*, 11(1), 2189671.

Tinbergen, J. (1962). *Shaping the world economy: Suggestions for an international economic policy*. Twentieth Century Fund Press.

Tinker, I., Bramsen, M. B., & Buvinic, M. (Eds.). (1976). *Women and World Development*. Washington, DC: Overseas Development Council.

Udeagha, M. C., & Ngepah, N. (2019). Revisiting trade and environment nexus in South Africa: Fresh evidence from new measure. *Environmental Science and Pollution Research*, 26(28), 29283-29306.

Umar, H. M. B., Seraj, M., & Ozdeser, H. (2025). The role of institutional quality, education and fertility in shaping female labour force participation: evidence from selected Asian countries. *Journal of the Asia Pacific Economy*, 1-19.

United Nations Conference on Trade and Development (UNCTAD). (2020). *Mainstreaming Gender Equality in Investment Promotion*. The United Nations Publications.

United Nations Conference on Trade and Development (UNCTAD). (2021). *Better Trade for Sustainable Development: The role of voluntary sustainability standards*. The United Nations Publications.

United Nations Conference on Trade and Development (UNCTAD). (2023). *Investment Promotion and its Impact on Gender Equality: Moving the needle on SDG 5*. The United Nations Publications.

United Nations Conference on Trade and Development/Division on International Trade in Goods and Services, and Commodities (UNCTAD/DITC). (2016). *Trade and gender linkages: An analysis of COMESA*. The United Nations Publications.

United Nations Conference on Trade and Development/Division on International Trade in Goods and Services, and Commodities (UNCTAD/DITC). (2020). *Trade and Environment Review: Trade-Climate Readiness for Developing Countries*. The United Nations Publications.

United Nations Conference on Trade and Development/Division on International Trade in Goods and Services, and Commodities (UNCTAD/DITC).

(2021). *Trade and gender linkages: An analysis of least developed countries*. The United Nations Publications.

United Nations Conference on Trade and Development/Division on International Trade in Goods and Services, and Commodities (UNCTAD/DITC). (2022). *Linking trade and gender towards sustainable development: an analytical and policy framework*. The United Nations Publications.

United Nations Conference on Trade and Development/UN Women (UNCTAD/UN Women). (2020). *Gender and Trade: Assessing the Impact of Trade Agreements on Gender Equality: Canada-EU Comprehensive Economic and Trade Agreement*. The United Nations Publications.

Usman, M., Khan, N., & Omri, A. (2024). Environmental policy stringency, ICT, and technological innovation for achieving sustainable development: Assessing the importance of governance and infrastructure. *Journal of Environmental Management*, 365, 121581.

Vu, T. T. H., Tian, G., Zhang, B., & Nguyen, T. V. (2020). Determinants of Vietnam's wood products trade: application of the gravity model. *Journal of Sustainable Forestry*, 39(5), 445-460.

Walter, I. (1974). International trade and resource diversion: the case of environmental management. *Review of World Economics*, 110(3), 482-493.

Wamboye, E. F., & Seguino, S. (2015). Gender effects of trade openness in sub-Saharan Africa. *Feminist Economics*, 21(3), 82-113.

Wang, K., Yan, M., Wang, Y., & Chang, C. P. (2020). The impact of environmental policy stringency on air quality. *Atmospheric Environment*, 231, 117522.

Wang, Q., Ren, F., & Li, R. (2024). Exploring the impact of geopolitics on the environmental Kuznets curve research. *Sustainable Development*, 32(3), 1700-1722.

Wang, S., Li, Z., & Zhang, H. (2021). Does female labor share reduce embodied carbon in trade?. *Environmental Science and Pollution Research*, 28(7), 8246-8257.

Wang, Z., Yen-Ku, K., Li, Z., An, N. B., & Abdul-Samad, Z. (2022). The transition of renewable energy and ecological sustainability through environmental policy stringency: Estimations from advance panel estimators. *Renewable Energy*, 188, 70-80.

Weiss, J. A., Ramirez, F. O., & Tracy, T. (1976). Female participation in the occupational system: a comparative institutional analysis. *Social Problems*, 23(5), 593-608.

Wenlong, Z., Tien, N. H., Sibghatullah, A., Asih, D., Soelton, M., & Ramli, Y. (2023). Impact of energy efficiency, technology innovation, institutional quality, and trade openness on greenhouse gas emissions in ten Asian economies. *Environmental Science and Pollution Research*, 30(15), 43024-43039.

Westerlund, J. (2005). New simple tests for panel cointegration. *Econometric Reviews*, 24(3), 297-316.

White, H. (1980). A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity. *Econometrica: Journal of the Econometric Society*, 817-838.

World Bank, & World Trade Organization. (2020). *Women and Trade: The Role of Trade in Promoting Gender Equality*. The World Bank and the World Trade Organization.

World Bank. (2011). *Facilitating Cross-Border Trade between the DRC and Neighbors in the Great Lakes Region of Africa: Improving Conditions for Poor Traders*. The World Bank.

World Bank. (2017). *World Development Report 2017*. International Bank for Reconstruction and Development/ World Bank, Washington, DC.

World Trade Organization. (2022). *Gender equality, women's economic empowerment and sustainable trade*. The World Trade Organization.

World Trade Organization/Economic Research and Statistics Division (WTO/ERSD). (2022). *Small Business and Climate Change*. The World Trade Organization.

Wu, R., Xie, Z., Wang, J., & Wang, S. (2025). Estimating the environmental Kuznets curve and its influencing factors of CO₂ emissions: Insights from development stages and rebound effects. *Applied Geography*, 174, 103475.

Xie, P., Xu, Y., Tan, X., & Tan, Q. (2023). How does environmental policy stringency influence green innovation for environmental managements?. *Journal of Environmental Management*, 338, 117766.

Xu, Z., Li, Y., Chau, S. N., Dietz, T., Li, C., Wan, L., ... & Liu, J. (2020). Impacts of international trade on global sustainable development. *Nature Sustainability*, 3(11), 964-971.

Xue, C., Shahbaz, M., Ahmed, Z., Ahmad, M., & Sinha, A. (2022). Clean energy consumption, economic growth, and environmental sustainability: what is the role of economic policy uncertainty?. *Renewable Energy*, 184, 899-907.

Yahmed, S. B. (2023). Gender wage discrimination with employer prejudice and trade openness. *World Development*, 170, 106319.

Yang, X., Ramos-Meza, C. S., Shabbir, M. S., Ali, S. A., & Jain, V. (2022). The impact of renewable energy consumption, trade openness, CO₂ emissions, income inequality, on economic growth. *Energy Strategy Reviews*, 44, 101003.

Yasmeen, R., Li, Y., Hafeez, M., & Ahmad, H. (2018). The trade-environment nexus in light of governance: A global potential. *Environmental Science and Pollution Research*, 25(34), 34360-34379.

Yigitbasioglu, O. M. (2010). Information sharing with key suppliers: a transaction cost theory perspective. *International Journal of Physical Distribution & Logistics Management*, 40(7), 550-578.

Yu, L., Zhao, D., Niu, H., & Lu, F. (2020). Does the belt and road initiative expand China's export potential to countries along the belt and road?. *China Economic Review*, 60, 101419.

Yusuf, H. A., Afolabi, L. O., Shittu, W. O., Gold, K. L., & Muhammad, M. (2021). Institutional quality and trade flow: Empirical evidence from Malaysia and other OIC member Countries in Africa. *Insight on Africa*, 13(2), 177-191.

Zameer, H., Yasmeen, H., Zafar, M. W., Waheed, A., & Sinha, A. (2020). Analyzing the association between innovation, economic growth, and environment: divulging the importance of FDI and trade openness in India. *Environmental Science and Pollution Research*, 27, 29539-29553.

Zeraibi, A., Radulescu, M., Khan, M. K., Hafeez, M., & Jahanger, A. (2024). Analyzing the linkage between public debt, renewable electricity output, and CO2 emissions in emerging economies: does the N-shaped environmental Kuznets curve exist?. *Energy & Environment*, 35(5), 2407-2430.

Zhou, Y., & Song, L. (2016). International trade and R&D investment: Evidence from Chinese manufacturing firms. *China & World Economy*, 24(1), 63-84.

Zhu, S. C., & Trefler, D. (2005). Trade and inequality in developing countries: a general equilibrium analysis. *Journal of International Economics*, 65(1), 21-48.

Zhuang, Y., Yang, S., Chupradit, S., Nawaz, M. A., Xiong, R., & Koksai, C. (2021). A nexus between macroeconomic dynamics and trade openness: moderating role of institutional quality. *Business Process Management Journal*, 27(6), 1703-1719.

APPENDICES OF VARIABLE MEASUREMENT AND LIST OF COUNTRIES

(APPENDICES A)

Table A.1: Variable measurement for Chapter 3

General model	Specific models ^a	Measurement	Source
Trade _{ijt}	ln(1 + BIT) _{ijt}	Bilateral trade between country <i>i</i> and <i>j</i> in year <i>t</i> (thousand US\$). For solving the zero-trade issue, all values of the dependent variable will be increased by one (Hong et al., 2023).	WTO
Size _{it1} Size _{jt1}	lnGDP _{it} lnGDP _{jt}	Gross domestic product (US\$) of country <i>i</i> and <i>j</i> in year <i>t</i>	WB
Size _{it2} Size _{jt2}	lnPOP _{it} lnPOP _{jt}	Population size (the number of people) of country <i>i</i> and <i>j</i> in year <i>t</i>	WB
Distance _{ij}	lnDIST _{ij}	Geographical distance (kilometers) between country <i>i</i> and <i>j</i>	Conte et al. (2022)
IQ _{it} IQ _{jt}	IQ _{it} IQ _{jt}	The overall level of institutional quality (High = 1 or Low = 0) of country <i>i</i> and <i>j</i> in year <i>t</i> . Institutional quality is measured based on six World Bank Worldwide Governance Indicators (scored -2.50 to +2.50). Each indicator is classified as high if it exceeds the sample median. A binary overall index is then created, equaling 1 only if all six indicators are high, and 0 otherwise.	WB
	COC _{it} COC _{jt}	The quality of control of corruption of country <i>i</i> and <i>j</i> in year <i>t</i> . The score ranges from -2.50 to +2.50 whereby higher scores indicate higher quality. The variable assesses the public perception of how effectively the government prevents the abuse of government power for private gains. This includes daily bribery to higher-level corruption and the influences of powerful interest groups on government decisions.	WB
	GVE _{it} GVE _{jt}	The government effectiveness of country <i>i</i> and <i>j</i> in year <i>t</i> . The score ranges from -2.50 to +2.50 whereby higher scores indicate higher effectiveness. The variable measures the perceived quality of the government's ability to deliver public services and to shape and implement policies, and the extent to which it is not affected by political pressures.	WB
	POS _{it} POS _{jt}	The political stability and absence of violence/terrorism of country <i>i</i> and <i>j</i> in year <i>t</i> . The score ranges from -2.50 to +2.50 whereby higher scores indicate higher stability and security. The variable reflects perceived risks of political instability, violence, and terrorism.	WB

	REQ _{it} REQ _{jt}	The regulatory quality of country <i>i</i> and <i>j</i> in year <i>t</i> . The score ranges from -2.50 to +2.50 whereby higher scores indicate higher quality. The variable demonstrates perceptions of how well a government shapes and implements policies and regulations that boost private sector development.	WB
	ROL _{it} ROL _{jt}	The rule of law of country <i>i</i> and <i>j</i> in year <i>t</i> . The score ranges from -2.50 to +2.50 whereby higher scores indicate higher quality. The variable reflects how much citizens trust and respect the rules of their society. This includes their confidence in the fairness and effectiveness of institutions like the police and courts, the security of their property rights and contracts, and the overall safety from crime and violence.	WB
	VAC _{it} VAC _{jt}	The voice and accountability of country <i>i</i> and <i>j</i> in year <i>t</i> . The score ranges from -2.50 to +2.50 whereby higher scores indicate higher quality. The variable measures how well citizens can participate in the national governance. This includes their ability to choose their leaders through elections, freely express their opinions, form associations, and access information through a free media.	WB
GE _{it} GE _{jt}	lnGDI _{it} lnGDI _{jt}	The annual gender development index of country <i>i</i> and <i>j</i> in year <i>t</i> whereby higher values indicate more gender equality, which reflects enhanced female welfare. This is measured by the ratio of female to male Human Development Index (HDI).	UNCTAD
	lnGII _{it} lnGII _{jt}	The annual gender inequality index of country <i>i</i> and <i>j</i> in year <i>t</i> . The variable ranges from 0 to 1 whereby higher values indicate less gender equality.	UNCTAD
	lnFLA _{it} lnFLA _{jt}	Female labor force participation rate (%) of country <i>i</i> and <i>j</i> in year <i>t</i> , respectively, calculated as the percentage of women in the national workforce. Higher values reflect greater female participation.	WB
(IQ. GE) _{it,jt}	(rIQ*lnGDI) _{it,jt} (rIQ*lnGII) _{it,jt} (rIQ*lnFLA) _{it,jt}	The cross-terms of the overall level of institutional quality and three variables of gender equality of country <i>i</i> and <i>j</i> in year <i>t</i> .	WB
	(rCOC*lnGDI) _{it,jt} (rCOC*lnGII) _{it,jt} (rCOC*lnFLA) _{it,jt}	The cross-terms of the level (high or low) of six Worldwide Governance Indicators (rCOC, rGVE, rPOS, rREQ, rROL, and rVAC) and three variables of gender equality (lnGDI, lnGII, and lnFLA) of country <i>i</i> and <i>j</i> in year <i>t</i> . The level of indicators is high (one) if its value is higher than the specific sample median value, otherwise it is low (zero).	WB
	(rGVE*lnGDI) _{it,jt} (rGVE*lnGII) _{it,jt} (rGVE*lnFLA) _{it,jt}		WB
	(rPOS*lnGDI) _{it,jt}		WB

	(rPOS*lnGII) _{it,jt} (rPOS*lnFLA) _{it,jt}		
	(rREQ*lnGDI) _{it,jt} (rREQ*lnGII) _{it,jt} (rREQ*lnFLA) _{it,jt}		WB
	(rROL*lnGDI) _{it,jt} (rROL*lnGII) _{it,jt} (rROL*lnFLA) _{it,jt}		WB
	(rVAC*lnGDI) _{it,jt} (rVAC*lnGII) _{it,jt} (rVAC*lnFLA) _{it,jt}		WB
MRT _{it} MRT _{jt}	lnREMOTE _{it} lnREMOTE _{jt}	$REMOTE_{it} = \sum_{j=1}^N \frac{DIST_{ij}}{GDP_{jt}}, REMOTE_{jt} = \sum_{i=1}^N \frac{DIST_{ij}}{GDP_{it}}$	SC
Control _{k,i,j,ij,t,ijt}	lnEXG _{jit}	The bilateral exchange rate between country <i>i</i> and <i>j</i> (the number of local currency units (LCU) of country <i>i</i> per local currency unit of country <i>j</i>) in year <i>t</i> .	WB
	lnDIN _{ijt}	The income gap between country <i>i</i> and <i>j</i> in year <i>t</i> , calculated as the absolute difference between gross domestic product per capita (US\$/person) of country <i>i</i> and <i>j</i> in year <i>t</i> , whereby higher values indicate larger income gap: $DIN_{ijt} = GDP_{it} - GDP_{jt} $	WB
	lnESIM _{ijt}	The economic similarity between country <i>i</i> and <i>j</i> in year <i>t</i> , whereby higher values indicate more economic similarity: $ESIM_{ijt} = 1 - \left(\frac{GDP_{it}}{GDP_{it} + GDP_{jt}} \right)^2 - \left(\frac{GDP_{jt}}{GDP_{it} + GDP_{jt}} \right)^2$	WB
	RTA _{ijt}	A dummy variable equaling 1 if countries <i>i</i> and <i>j</i> share a common effective regional trade agreement (RTA) in year <i>t</i> , and 0 otherwise.	WTO
	LLOCK _i LLOCK _j	The binary variables which are equal to one if the countries (<i>i</i> and <i>j</i>) are landlocked, otherwise they are equal to zero.	Conte et al. (2022)
	COMCOL _{ij}	A dummy variable equaling 1 if countries <i>i</i> and <i>j</i> share a common colonial history, and 0 otherwise.	Conte et al. (2022)
	COMLANG _{ij}	A binary variable which equals one if country <i>i</i> and <i>j</i> have a common official language, otherwise equals zero.	Conte et al. (2022)

	$CONTIG_{ij}$	A binary variable which equals one if country i and j share a common land border, otherwise equals zero.	Conte et al. (2022)
	$GEFC_t$	A binary variable for the advent of global economic and financial crisis, which equals one for the 2008-2011 period, otherwise equals zero.	SC
	$COVID_t$	A binary variable for the advent of global COVID-19 pandemic, which equals one if year t is 2020 or 2021, otherwise equals zero.	SC
FE_1	π_j	The exporter-fixed effect	SC
FE_2	θ_j	The importer-fixed effect	SC
FE_3	μ_{ij}	The country pair-fixed effect	SC
FE_4	ω_t	The time-fixed effect	SC

^aThe operator $\ln$ represents the natural logarithm.

Source: The author.

Table A.2: Variable measurement for Chapter 4

General model	Specific model ^a	Measurement	Source
Trade _{ijt}	ln(1 + BIT) _{ijt}	Bilateral trade between country <i>i</i> and <i>j</i> in year <i>t</i> (thousand US\$). For solving the zero-trade issue, all values of the dependent variable will be increased by one (Hong et al., 2023).	WTO
Size _{it1} Size _{jt1}	lnGDP _{it} lnGDP _{jt}	Gross domestic product (US\$) of country <i>i</i> and <i>j</i> in year <i>t</i>	WB
Size _{it2} Size _{jt2}	lnPOP _{it} lnPOP _{jt}	Population size (the number of people) of country <i>i</i> and <i>j</i> in year <i>t</i>	WB
Distance _{ij}	lnDIST _{ij}	Geographical distance (kilometers) between country <i>i</i> and <i>j</i>	Conte et al. (2022)
EQ _{it} EQ _{jt}	lnCEpc _{it} lnCEpc _{jt}	CO ₂ emissions per capita (tonnes/person) of country <i>i</i> and <i>j</i> in year <i>t</i>	OWD
IQ _{it} IQ _{jt}	IQ _{it} IQ _{jt}	The overall level of institutional quality (High = 1 or Low = 0) of country <i>i</i> and <i>j</i> in year <i>t</i> . Institutional quality is measured based on six World Bank Worldwide Governance Indicators (scored -2.50 to +2.50). Each indicator is classified as high if it exceeds the sample median. A binary overall index is then created, equaling 1 only if all six indicators are high, and 0 otherwise.	WB
	COC _{it} COC _{jt}	The quality of control of corruption of country <i>i</i> and <i>j</i> in year <i>t</i> . The score ranges from -2.50 to +2.50 whereby higher scores indicate higher quality. The variable assesses the public perception of how effectively the government prevents the abuse of government power for private gains. This includes daily bribery to higher-level corruption and the influences of powerful interest groups on government decisions.	WB
	GVE _{it} GVE _{jt}	The government effectiveness of country <i>i</i> and <i>j</i> in year <i>t</i> . The score ranges from -2.50 to +2.50 whereby higher scores indicate higher effectiveness. The variable measures the perceived quality of the government's ability to deliver public services and to shape and implement policies, and the extent to which it is not affected by political pressures.	WB
	POS _{it} POS _{jt}	The political stability and absence of violence/terrorism of country <i>i</i> and <i>j</i> in year <i>t</i> . The score ranges from -2.50 to +2.50 whereby higher scores indicate higher stability and security. The variable reflects perceived risks of political instability, violence, and terrorism.	WB
	REQ _{it} REQ _{jt}	The regulatory quality of country <i>i</i> and <i>j</i> in year <i>t</i> . The score ranges from -2.50 to +2.50 whereby higher scores indicate higher quality. The variable demonstrates perceptions of how	WB

		well a government shapes and implements policies and regulations that boost private sector development.	
	ROL _{it} ROL _{jt}	The rule of law of country <i>i</i> and <i>j</i> in year <i>t</i> . The score ranges from -2.50 to +2.50 whereby higher scores indicate higher quality. The variable reflects how much citizens trust and respect the rules of their society. This includes their confidence in the fairness and effectiveness of institutions like the police and courts, the security of their property rights and contracts, and the overall safety from crime and violence.	WB
	VAC _{it} VAC _{jt}	The voice and accountability of country <i>i</i> and <i>j</i> in year <i>t</i> . The score ranges from -2.50 to +2.50 whereby higher scores indicate higher quality. The variable measures how well citizens can participate in the national governance. This includes their ability to choose their leaders through elections, freely express their opinions, form associations, and access information through a free media.	WB
	lnEPS _{it} lnEPS _{jt}	The environmental policy stringency (natural logarithm) of country <i>i</i> and <i>j</i> in year <i>t</i> . The environmental policy stringency (EPS) is a composite index published by The OECD which combines data from various policy instruments and reflects the degree to which environmental policies place a cost on environmentally harmful behaviors. The EPS score ranges from 0 (not stringent) to 6 (highest degree of stringency).	OECD
(IQ. EQ) _{it} (IQ. EQ) _{jt}	(rIQ*lnCEpc) _{it,jt}	The cross-terms of the overall level of institutional quality and environmental quality of country <i>i</i> and <i>j</i> in year <i>t</i> .	WB
	(rCOC*lnCEpc) _{it,jt}	The cross-terms of the level (high or low) of six Worldwide Governance Indicators (rCOC, rGVE, rPOS, rREQ, rROL, and rVAC) and environmental quality (lnCEpc) of country <i>i</i> and <i>j</i> in year <i>t</i> . The level of indicators is high (one) if its value is higher than the specific sample median value, otherwise it is low (zero).	WB
	(rGVE*lnCEpc) _{it,jt}		WB
	(rPOS*lnCEpc) _{it,jt}		WB
	(rREQ*lnCEpc) _{it,jt}		WB
	(rROL*lnCEpc) _{it,jt}		WB
	(rVAC*lnCEpc) _{it,jt}		WB
	(rEPS*lnCEpc) _{it,jt}	The cross-terms between the level of environmental policy stringency and carbon emissions per capita (natural logarithm) of country <i>i</i> and <i>j</i> in year <i>t</i> . The EPS level (rEPS) is high (one) if its value is higher than the specific sample median value, otherwise it is low (zero).	OECD-WB
MRT _{it} MRT _{jt}	lnREMOTE _{it} lnREMOTE _{jt}	$REMOTE_{it} = \sum_{j=1}^N \frac{DIST_{ij}}{GDP_{jt}}$, $REMOTE_{jt} = \sum_{i=1}^N \frac{DIST_{ij}}{GDP_{it}}$	SC
Control _{k,i,j,t,ij,jt}	lnEXG _{jit}	The bilateral exchange rate between country <i>i</i> and <i>j</i> (the number of local currency units (LCU) of country <i>i</i> per local currency unit of country <i>j</i>) in year <i>t</i> .	UNCTAD

	$\ln \text{DIN}_{ijt}$	The income gap between country i and j in year t , calculated as the absolute difference between gross domestic product per capita (US\$/person) of country i and j in year t , whereby higher values indicate larger income gap: $\text{DIN}_{ijt} = \text{GDP}_{it} - \text{GDP}_{jt} $	WB
	$\ln \text{ESIM}_{ijt}$	The economic similarity between country i and j in year t , whereby higher values indicate more economic similarity: $\text{ESIM}_{ijt} = 1 - \left(\frac{\text{GDP}_{it}}{\text{GDP}_{it} + \text{GDP}_{jt}} \right)^2 - \left(\frac{\text{GDP}_{jt}}{\text{GDP}_{it} + \text{GDP}_{jt}} \right)^2$	WB
	RTA_{ijt}	A dummy variable equaling 1 if countries i and j share a common effective regional trade agreement (RTA) in year t , and 0 otherwise.	WTO
	LLOCK_i LLOCK_j	The binary variables which are equal to one if the countries (i and j) are landlocked, otherwise they are equal to zero.	Conte et al. (2022)
	COMCOL_{ij}	A dummy variable equaling 1 if countries i and j share a common colonial history, and 0 otherwise.	Conte et al. (2022)
	COMLANG_{ij}	A binary variable which equals one if country i and j have a common official language, otherwise equals zero.	Conte et al. (2022)
	CONTIG_{ij}	A binary variable which equals one if country i and j share a common land border, otherwise equals zero.	Conte et al. (2022)
	GEFC_t	A binary variable for the advent of global economic and financial crisis, which equals one for the 2008-2011 period, otherwise equals zero.	SC
	COVID_t	A binary variable for the advent of global COVID-19 pandemic, which equals one if year t is 2020 or 2021, otherwise equals zero.	SC
FE_1	π_i	The exporter-fixed effect	SC
FE_2	θ_j	The importer-fixed effect	SC
FE_3	μ_{ij}	The countrypair-fixed effect	SC
FE_4	ω_t	The time-fixed effect	SC

^aThe operator $\ln$ represents the natural logarithm.

Source: The author.

Table A.3: Variable measurement for Chapter 5

General model	Specific model ^a	Measurement	Source
GE _{it}	lnGDI _{it}	The annual gender development index of country <i>i</i> in year <i>t</i> whereby higher values indicate more gender equality, which reflects enhanced female welfare. This is measured by the ratio of female to male Human Development Index (HDI).	UNCTAD
	lnGII _{it}	The annual gender inequality index of country <i>i</i> in year <i>t</i> . The variable ranges from 0 to 1 whereby higher values indicate less gender equality.	UNCTAD
	lnFLA _{it}	Female labor force participation rate (%) of country <i>i</i> in year <i>t</i> , respectively, calculated as the percentage of women in the national workforce. Higher values reflect greater female participation.	WB
Income _{it} Income ² _{it} Income ³ _{it}	lnGDPpc _{it} lnGDPpc ² _{it} lnGDPpc ³ _{it}	Gross domestic product per capita (US\$/person) (original, squared, and cubed terms) of country <i>i</i> in year <i>t</i>	WB
Openness _{it}	lnTOI _{it}	Trade openness of country <i>i</i> in year <i>t</i> , calculated as the ratio of trade revenue (exports and imports) to gross domestic product multiplied by 100. $\text{Trade openness} = \frac{\text{Export} + \text{Import}}{\text{GDP}} \cdot 100$	WB
IQ _{k,it}	COC _{it}	The quality of control of corruption of country <i>i</i> in year <i>t</i> . The score ranges from -2.50 to +2.50 whereby higher scores indicate higher quality. The variable assesses the public perception of how effectively the government prevents the abuse of government power for private gains. This includes daily bribery to higher-level corruption and the influences of powerful interest groups on government decisions.	WB
	GVE _{it}	The government effectiveness of country <i>i</i> in year <i>t</i> . The score ranges from -2.50 to +2.50 whereby higher scores indicate higher effectiveness. The variable measures the perceived quality of the government's ability to deliver public services and to shape and implement policies, and the extent to which it is not affected by political pressures.	WB
	POS _{it}	The political stability and absence of violence/terrorism of country <i>i</i> in year <i>t</i> . The score ranges from -2.50 to +2.50 whereby higher scores indicate higher stability and security. The variable reflects perceived risks of political instability, violence, and terrorism.	WB

	REQ _{it}	The regulatory quality of country <i>i</i> in year <i>t</i> . The score ranges from -2.50 to +2.50 whereby higher scores indicate higher quality. The variable demonstrates perceptions of how well a government shapes and implements policies and regulations that boost private sector development.	WB
	ROL _{it}	The rule of law of country <i>i</i> in year <i>t</i> . The score ranges from -2.50 to +2.50 whereby higher scores indicate higher quality. The variable reflects how much citizens trust and respect the rules of their society. This includes their confidence in the fairness and effectiveness of institutions like the police and courts, the security of their property rights and contracts, and the overall safety from crime and violence.	WB
	VAC _{it}	The voice and accountability of country <i>i</i> in year <i>t</i> . The score ranges from -2.50 to +2.50 whereby higher scores indicate higher quality. The variable measures how well citizens can participate in the national governance. This includes their ability to choose their leaders through elections, freely express their opinions, form associations, and access information through a free media.	WB
(IQ _{LEV,k} · Openness) _{it}	rCOC.lnTOI _{it}	The cross-terms of the level (high or low) of six Worldwide Governance Indicators (rCOC, rGVE, rPOS, rREQ, rROL, and rVAC) and trade openness of country <i>i</i> in year <i>t</i> . The level of indicators is high (one) if its value is higher than the specific sample median value, otherwise it is low (zero).	WB
	rGVE.lnTOI _{it}		WB
	rPOS.lnTOI _{it}		WB
	rREQ.lnTOI _{it}		WB
	rROL.lnTOI _{it}		WB
	rVAC.lnTOI _{it}		WB
(Openness _{LEV} · IQ _k) _{it}	rTOL.COC _{it}	The cross-terms of the six Worldwide Governance Indicators (COC, GVE, POS, REQ, ROL, and VAC) and the level of trade openness of country <i>i</i> in year <i>t</i> . The level of trade openness is high (one) if its value is higher than the specific sample median value, otherwise it is low (zero).	WB
	rTOL.GVE _{it}		WB
	rTOL.POS _{it}		WB
	rTOL.REQ _{it}		WB
	rTOL.ROL _{it}		WB
	rTOL.VAC _{it}		WB
Control _{m,it,t}	lnURB _{it}	Urbanization (%) of country <i>i</i> in year <i>t</i> , calculated as the urban population as the percentage of total population.	WB
	lnIFDI _{it}	Inward stock of foreign direct investment as the percentage of gross domestic product (%) of country <i>i</i> in year <i>t</i>	WB
	lnFER _{it}	Fertility rate (births per woman) of country <i>i</i> in year <i>t</i>	WB
	WTO _{it}	Dummy variable for membership to the WTO, which equals one if country <i>i</i> is the official member of the World Trade Organization in year <i>t</i> and zero otherwise.	WTO

	OECD _{it}	Dummy variable for membership to the OECD, which equals one if country <i>i</i> is the official member of the Organization for Economic Co-operation and Development in year <i>t</i> and zero otherwise.	OECD
	GEFC _t	A binary variable for the advent of global economic and financial crisis, which equals one for the 2008-2011 period, otherwise equals zero.	SC
	COVID _t	Dummy variable for the time of Covid-19 pandemic which equals one for the year 2020 or 2021 and zero otherwise.	SC

^aThe operator *ln* represents the natural logarithm.

Source: The author.

Table A.4: Variable measurement for Chapter 6

General model	Specific model ^a	Measurement	Source
EQ _{it}	lnCEpc _{it}	CO ₂ emissions per capita (tones/person) of country <i>i</i> in year <i>t</i>	OWD
Openness _{it} Openness ² _{it}	lnTOI _{it} lnTOI ² _{it}	Trade openness (original and squared term) of country <i>i</i> in year <i>t</i> , calculated as the ratio of trade revenue (exports and imports) to gross domestic product multiplied by 100. $\text{Trade openness} = \frac{\text{Export} + \text{Import}}{\text{GDP}} \cdot 100$	WB
	COC _{it}	The quality of control of corruption of country <i>i</i> in year <i>t</i> . The score ranges from -2.50 to +2.50 whereby higher scores indicate higher quality. The variable assesses the public perception of how effectively the government prevents the abuse of government power for private gains. This includes daily bribery to higher-level corruption and the influences of powerful interest groups on government decisions.	WB
	GVE _{it}	The government effectiveness of country <i>i</i> in year <i>t</i> . The score ranges from -2.50 to +2.50 whereby higher scores indicate higher effectiveness. The variable measures the perceived quality of the government's ability to deliver public services and to shape and implement policies, and the extent to which it is not affected by political pressures.	WB
	POS _{it}	The political stability and absence of violence/terrorism of country <i>i</i> in year <i>t</i> . The score ranges from -2.50 to +2.50 whereby higher scores indicate higher stability and security. The variable reflects perceived risks of political instability, violence, and terrorism.	WB
	REQ _{it}	The regulatory quality of country <i>i</i> in year <i>t</i> . The score ranges from -2.50 to +2.50 whereby higher scores indicate higher quality. The variable demonstrates perceptions of how well a government shapes and implements policies and regulations that boost private sector development.	WB
	ROL _{it}	The rule of law of country <i>i</i> in year <i>t</i> . The score ranges from -2.50 to +2.50 whereby higher scores indicate higher quality. The variable reflects how much citizens trust and respect the rules of their society. This includes their confidence in the fairness and effectiveness of institutions like the police and courts, the security of their property rights and contracts, and the overall safety from crime and violence.	WB
	VAC _{it}	The voice and accountability of country <i>i</i> in year <i>t</i> . The score ranges from -2.50 to +2.50 whereby higher scores indicate higher quality. The variable measures how well citizens can participate in the national governance. This includes their ability to choose their leaders through elections, freely express their opinions, form associations, and access information through a free media.	WB

$(IQ_{LEV} \cdot Openness)_{it}$ $(IQ_{LEV} \cdot Openness^2)_{it}$	$rCOC. \ln TOI_{it}$ $rCOC. \ln TOI_{it}^2$ $rGVE. \ln TOI_{it}$ $rGVE. \ln TOI_{it}^2$ $rPOS. \ln TOI_{it}$ $rPOS. \ln TOI_{it}^2$ $rREQ. \ln TOI_{it}$ $rREQ. \ln TOI_{it}^2$ $rROL. \ln TOI_{it}$ $rROL. \ln TOI_{it}^2$ $rVAC. \ln TOI_{it}$ $rVAC. \ln TOI_{it}^2$	The cross-terms of the level of institutional quality (six indicators) and trade openness (original and squared term) of country i in year t. The level of a given indicator is high (one) if its value is higher than the specific sample median value, otherwise it is low (zero).	WB
Control _{m,it,t}	$\ln URB_{it}$	Urbanization (%) of country i in year t , calculated as the urban population as the percentage of total population.	WB
	$\ln IFDI_{it}$	Inward stock of foreign direct investment as the percentage of gross domestic product (%) of country i in year t	WB
	$\ln GDPpc_{it}$	Gross domestic product per capita (US\$/person) of country i in year t	WB
	WTO_{it}	Dummy variable for membership to the WTO, which equals one if country i is the official member of the World Trade Organization in year t and zero otherwise.	WTO
	$OECD_{it}$	Dummy variable for membership to the OECD, which equals one if country i is the official member of the Organization for Economic Co-operation and Development in year t and zero otherwise.	OECD
	$GEFC_t$	A binary variable for the advent of global economic and financial crisis, which equals one for the 2008-2011 period, otherwise equals zero.	SC
	$COVID_t$	Dummy variable for the time of Covid-19 pandemic which equals one for the year 2020 and zero otherwise.	SC

^aThe operator $\ln$ represents the natural logarithm.

Source: The author.

Table A.5: List of selected bilateral trading partners for Chapter 3 & 4

Code	Country	Code	Country
ARE	United Arab Emirates	JPN	Japan
AUS	Australia	KOR	South Korea
AUT	Austria	MEX	Mexico
BEL	Belgium	MYS	Malaysia
BRA	Brazil	NLD	Netherlands
CAN	Canada	NOR	Norway
CHE	Switzerland	PHL	Philippines
CHL	Chile	POL	Poland
CHN	People's Republic of China	PRT	Portugal
CZE	Czech Republic	ROU	Romania
DEU	Germany	RUS	Russia
DNK	Denmark	SAU	Saudi Arabia
ESP	Spain	SGP	Singapore
FIN	Finland	SVK	Slovakia
FRA	France	SWE	Sweden
GBR	United Kingdom	THA	Thailand
HUN	Hungary	TUR	Turkey
IDN	Indonesia	USA	United States of America
IND	India	VNM	Vietnam
IRL	Ireland	ZAF	South Africa
ITA	Italy		

Source: The author.

Table A.6: List of 113 worldwide countries for Chapter 5 & 6

Code	Country	Code	Country	Code	Country	Code	Country
AGO	Angola	DZA	Algeria	LTU	Lithuania	SDN	Sudan
ALB	Albania	EGY	Egypt	LUX	Luxembourg	SEN	Senegal
ARG	Argentina	ESP	Spain	LVA	Latvia	SGP	Singapore
ARM	Armenia	EST	Estonia	MAR	Morocco	SLE	Sierra Leone
AUS	Australia	FIN	Finland	MDA	Moldova	SLV	El Salvador
AUT	Austria	FRA	France	MDG	Madagascar	SVK	Slovakia
AZE	Azerbaijan	GBR	United Kingdom	MEX	Mexico	SVN	Slovenia
BDI	Burundi	GEO	Georgia	MLI	Mali	SWE	Sweden
BEN	Benin	GHA	Ghana	MLT	Malta	TCD	Chad
BGD	Bangladesh	GMB	Gambia	MNG	Mongolia	TGO	Togo
BGR	Bulgaria	GRC	Greece	MOZ	Mozambique	THA	Thailand
BLR	Belarus	GTM	Guatemala	MRT	Mauritania	TUN	Tunisia
BOL	Bolivia	HND	Honduras	MYS	Malaysia	TUR	Turkey
BRA	Brazil	HRV	Croatia	NAM	Namibia	TZA	Tanzania
BWA	Botswana	HUN	Hungary	NER	Niger	UGA	Uganda
CAF	Central African Republic	IDN	Indonesia	NIC	Nicaragua	UKR	Ukraine
CAN	Canada	IND	India	NLD	Netherlands	URY	Uruguay
CHE	Switzerland	IRL	Ireland	NOR	Norway	USA	United States of America
CHL	Chile	IRN	Iran	NPL	Nepal	UZB	Uzbekistan
CHN	China	ISL	Iceland	NZL	New Zealand	VNM	Viet Nam
CIV	Côte d'Ivoire	ISR	Israel	PAK	Pakistan	ZAF	South Africa
CMR	Cameroon	ITA	Italy	PAN	Panama	ZMB	Zambia
COG	Congo	JAM	Jamaica	PER	Peru	ZWE	Zimbabwe
COL	Colombia	JOR	Jordan	PHL	Philippines		
CRI	Costa Rica	JPN	Japan	POL	Poland		
CYP	Cyprus	KAZ	Kazakhstan	PRT	Portugal		

CZE	Czech Republic	KEN	Kenya	PRY	Paraguay
DEU	Germany	KGZ	Kyrgyzstan	ROU	Romania
DNK	Denmark	KHM	Cambodia	RUS	Russian Federation
DOM	Dominican Republic	KOR	South Korea	RWA	Rwanda

Source: The author.

**APPENDICES OF CROSS-SECTIONAL DEPENDENCE, PANEL UNIT-ROOT, AND PANEL COINTEGRATION
TESTS (APPENDICES B)**

Table B.1: Preliminary results of cross-sectional dependence (CD) tests, panel unit-root tests, and panel cointegration tests

Variables	CD tests	Unit-root tests	Unit-root test type	Stationarity status	Models
$\ln(1 + \text{BIT})_{ijt}$	2,974.14 ^c	CIPS* = -2.273	Pesaran	To be tested in the first generation tests in Table B.2	Gravity models
$\ln \text{GDP}_{it,jt}$	4,515.29 ^c	CIPS* = -2.302	Pesaran		
$\ln \text{POP}_{it,jt}$	2,625.82 ^c	CIPS* = -1.818	Pesaran		
$\ln \text{EXG}_{jit}$	-2.94 ^c	CIPS* = -1.015	Pesaran		
$\ln \text{DIN}_{ijt}$	1,781.40 ^c	CIPS* = -1.714	Pesaran		
$\ln \text{ESIM}_{ijt}$	280.08 ^c	CIPS* = -2.070	Pesaran		
$\ln \text{GDI}_{it,jt}$	1,462.06 ^c	Unbalanced panel	Pesaran		
$\ln \text{GII}_{it,jt}$	4,207.54 ^c	Unbalanced panel	Pesaran		
$\ln \text{FLA}_{it,jt}$	770.88 ^c	CIPS* = -1.680	Pesaran		
$\ln \text{CEpc}_{it,jt}$	776.51 ^c	CIPS* = -1.455	Pesaran		
$\text{COC}_{it,jt}$	59.02 ^c	CIPS* = -1.863	Pesaran		
$\text{GVE}_{it,jt}$	148.22 ^c	CIPS* = -1.622	Pesaran		
$\text{POS}_{it,jt}$	849.66 ^c	CIPS* = -2.178	Pesaran		
$\text{REQ}_{it,jt}$	120.72 ^c	CIPS* = -1.848	Pesaran		
$\text{ROL}_{it,jt}$	462.21 ^c	CIPS* = -1.757	Pesaran		
$\text{VAC}_{it,jt}$	1,112.92 ^c	CIPS* = -1.379	Pesaran		
For $\ln(1 + \text{BIT})_{ijt}$, $\ln \text{GDI}_{it}$, $\ln \text{GDI}_{jt}$, and the other continuous variables		MDF t = -11.362 ^c DF t = -15.436 ^c ADF t = -1.640 ^a UMDF t = -35.958 ^c UDF t = -28.409 ^c	Kao	Rejected no-cointegration	Gravity models (all levels)

For $\ln(1 + \text{BIT})_{ijt}$, $\ln \text{GII}_{it}$, $\ln \text{GII}_{jt}$, and the other continuous variables		MDF $t = -10.965^c$ DF $t = -13.192^c$ ADF $t = -2.537^c$ UMDF $t = -33.884^c$ UDF $t = -25.426^c$	Kao	Rejected no-cointegration	Gravity models (all levels)
For $\ln(1 + \text{BIT})_{ijt}$, $\ln \text{FLA}_{it}$, $\ln \text{FLA}_{jt}$, and the other continuous variables		MDF $t = -10.803^c$ DF $t = -15.143^c$ ADF $t = -1.636^a$ UMDF $t = -35.872^c$ UDF $t = -28.465^c$	Kao	Rejected no-cointegration	Gravity models (all levels)
For $\ln(1 + \text{BIT})_{ijt}$, $\ln \text{CEpc}_{it}$, $\ln \text{CEpc}_{jt}$, and the other continuous variables		MDF $t = -10.879^c$ DF $t = -15.226^c$ ADF $t = -1.729^b$ UMDF $t = -36.182^c$ UDF $t = -28.649^c$	Kao	Rejected no-cointegration	Gravity models (all levels)
For $\ln(1 + \text{BIT})_{ijt}$, $\ln \text{GDI}_{it}$, $\ln \text{GDI}_{jt}$, $\ln \text{GDP}_{it}$, $\ln \text{GDP}_{jt}$, $\ln \text{POP}_{it}$, $\ln \text{POP}_{jt}$, and $\ln \text{EXG}_{jit}$		Variance ratio = -14.169 ^c	Westerlund	Rejected no-cointegration	Gravity models (all levels)
For $\ln(1 + \text{BIT})_{ijt}$, $\ln \text{GII}_{it}$, $\ln \text{GII}_{jt}$, $\ln \text{GDP}_{it}$, $\ln \text{GDP}_{jt}$, $\ln \text{POP}_{it}$, $\ln \text{POP}_{jt}$, and $\ln \text{EXG}_{jit}$		Variance ratio = -12.937 ^c	Westerlund	Rejected no-cointegration	Gravity models (all levels)
For $\ln(1 + \text{BIT})_{ijt}$, $\ln \text{FLA}_{it}$, $\ln \text{FLA}_{jt}$, $\ln \text{GDP}_{it}$, $\ln \text{GDP}_{jt}$, $\ln \text{POP}_{it}$, $\ln \text{POP}_{jt}$, and $\ln \text{EXG}_{jit}$		Variance ratio = -13.026 ^c	Westerlund	Rejected no-cointegration	Gravity models (all levels)
For $\ln(1 + \text{BIT})_{ijt}$, $\ln \text{CEpc}_{it}$, $\ln \text{CEpc}_{jt}$, $\ln \text{GDP}_{it}$, $\ln \text{GDP}_{jt}$, $\ln \text{POP}_{it}$, $\ln \text{POP}_{jt}$, and $\ln \text{EXG}_{jit}$		Variance ratio = -12.422 ^c	Westerlund	Rejected no-cointegration	Gravity models (all levels)
$\ln \text{GDI}_{it}$	132.52 ^c	Unbalanced panel	Pesaran	To be tested in the first generation tests in Table B.3	
$\ln \text{GII}_{it}$	286.95 ^c	CIPS* = -2.020 ^a	Pesaran		
$\ln \text{FLA}_{it}$	25.27 ^c	CIPS* = -1.424	Pesaran	Non-stationary	
$\ln \text{GDPpc}_{it}$	281.78 ^c	CIPS* = -2.262 ^c	Pesaran	EKC	
$\ln \text{GDPpc}_{it}$	287.75 ^c	CIPS* = -2.310 ^c	Pesaran	GKC	

$\ln \text{GDPpc}_{it}^2$	285.16 ^c	CIPS* = -2.189 ^c	Pesaran		GKC
$\ln \text{GDPpc}_{it}^3$	282.45 ^c	CIPS* = -2.079 ^b	Pesaran		GKC
$\ln \text{CEpc}_{it}$	20.53 ^c	CIPS* = -2.115 ^b	Pesaran		EKC
$\ln \text{TOI}_{it}$	43.98 ^c	CIPS* = -1.383	Pesaran	Non-stationary	GKC
$\ln \text{TOI}_{it}$	45.09 ^c	CIPS* = -1.296	Pesaran	Non-stationary	EKC
$\ln \text{TOI}_{it}^2$	44.50 ^c	CIPS* = -1.268	Pesaran	Non-stationary	EKC
$\ln \text{URB}_{it}$	240.84 ^c	CIPS* = 0.033	Pesaran	Non-stationary	GKC
$\ln \text{URB}_{it}$	230.61 ^c	CIPS* = -0.047	Pesaran	Non-stationary	EKC
$\ln \text{IFDI}_{it}$	154.30 ^c	CIPS* = -2.095 ^b	Pesaran		GKC
$\ln \text{IFDI}_{it}$	149.12 ^c	CIPS* = -2.040 ^b	Pesaran		EKC
$\ln \text{FER}_{it}$	79.61 ^c	CIPS* = -1.141	Pesaran	Non-stationary	GKC
COC_{it}	-0.61	Z-t-tilde-bar = -2.433 ^c	Im-Pesaran-Shin		GKC
COC_{it}	-0.40	Z-t-tilde-bar = -2.603 ^c	Im-Pesaran-Shin		EKC
GVE_{it}	-0.19	Z-t-tilde-bar = -3.472 ^c	Im-Pesaran-Shin		GKC
GVE_{it}	0.36	Z-t-tilde-bar = -4.063 ^c	Im-Pesaran-Shin		EKC
POS_{it}	6.47 ^c	CIPS* = -2.138 ^b	Pesaran		GKC
POS_{it}	6.82 ^c	CIPS* = -2.110 ^b	Pesaran		EKC
REQ_{it}	7.85 ^c	CIPS* = -2.008 ^a	Pesaran		GKC
REQ_{it}	8.02 ^c	CIPS* = -2.043 ^b	Pesaran		EKC
ROL_{it}	19.07 ^c	CIPS* = -2.243 ^c	Pesaran		GKC
ROL_{it}	20.50 ^c	CIPS* = -2.240 ^c	Pesaran		EKC
VAC_{it}	3.87 ^c	CIPS* = -1.697	Pesaran	Non-stationary	GKC
VAC_{it}	4.13 ^c	CIPS* = -1.737	Pesaran	Non-stationary	EKC
For $\ln \text{FLA}_{it}$ and non-stationary variables		Variance ratio = -1.208	Westerlund (trend)	No-cointegration	GKC (differences)
For $\ln \text{GDI}_{it}$ and non-stationary variables		Variance ratio = -4.448 ^c	Westerlund (trend)	Rejected no-cointegration	GKC (all levels)
For $\ln \text{GII}_{it}$ and non-stationary variables		Variance ratio = -1.575 ^a	Westerlund (trend)	Rejected no-cointegration	GKC (all levels)
For $\ln \text{CEpc}_{it}$, $\ln \text{TOI}_{it}$, $\ln \text{TOI}_{it}^2$, and $\ln \text{URB}_{it}$		Variance ratio = -2.230 ^b	Westerlund (trend)	Rejected no-cointegration	EKC (all levels)
For $\ln \text{CEpc}_{it}$ and $\ln \text{URB}_{it}$		Variance ratio = -6.343 ^c	Westerlund (trend)	Rejected no-cointegration	EKC (all levels)

For $\ln CE_{pcit}$, $\ln TOI_{it}$, $\ln TOI^2_{it}$, $\ln URB_{it}$, and VAC_{it}	Variance ratio = -1.783 ^b	Westerlund (trend)	Rejected no-cointegration	EKC (only difference of VAC_{it})

Note: The tests are conducted only on the aggregated sample due to the fact that sub-samples contain gaps which makes the Pesaran tests unable to be conducted. The Westerlund test of panel cointegration is only conducted for $\ln FLA_{it}$ and non-stationary explanatory variables because the other dependent variables are stationary which makes the test unnecessary. Letters a, b, and c indicate the significance levels of 10%, 5%, and 1% respectively. The Westerlund test allows the maximum number of seven variables to be included.

Source: The author.

Table B.2: Panel unit-root tests of the first generation for gravity model (with the assumption of no cross-sectional dependence)

Variables	Test(s)	Statistics	Results
$\ln(1 + \text{BIT}_{ijt})$	Levin-Lin-Chu	Adjusted $t^* = -50.2661^c$	Reject H_0
$\ln \text{GDP}_{it}$ $\ln \text{GDP}_{jt}$	Levin-Lin-Chu	Adjusted $t^* = -57.2836^c$	Reject H_0
$\ln \text{POP}_{it}$ $\ln \text{POP}_{jt}$	Levin-Lin-Chu	Adjusted $t^* = -40.9053^c$	Reject H_0
$\ln \text{DIST}_{ij}$	Harris-Tzavalis	$z = -230^c$ $P = 3,905.0241^c$	Reject H_0
$\ln \text{EXG}_{jit}$	Fisher-type (ADF)	$Z = -2.5025^c$ $L^* = -3.4198^c$ $P_m = 7.7169^c$	Reject H_0
$\ln \text{REMOTE}_{it}$ $\ln \text{REMOTE}_{jt}$	Levin-Lin-Chu	Adjusted $t^* = -98.5647^c$	Reject H_0
$\ln \text{DIN}_{ijt}$	Levin-Lin-Chu	Adjusted $t^* = -26.8544^c$	Reject H_0
$\ln \text{ESIM}_{ijt}$	Levin-Lin-Chu	Adjusted $t^* = -41.5302^c$ $P = 4,427.9409^c$	Reject H_0
$\ln \text{GDI}_{it}$ $\ln \text{GDI}_{jt}$	Fisher-type (ADF)	$Z = -6.3917^c$ $L^* = -7.5508^c$ $P_m = 14.1732^c$	Reject H_0
$\ln \text{GII}_{it}$ $\ln \text{GII}_{jt}$	Im-Pesaran-Shin	$Z\text{-t-tilde-bar} = -18.261^c$	Reject H_0
$\ln \text{FLA}_{it}$ $\ln \text{FLA}_{jt}$	Levin-Lin-Chu	Adjusted $t^* = -20.7430^c$	Reject H_0
$\ln \text{CEpc}_{it}$ $\ln \text{CEpc}_{jt}$	Levin-Lin-Chu	Adjusted $t^* = -2.8987^c$	Reject H_0
COC_{it} COC_{jt}	Levin-Lin-Chu	Adjusted $t^* = -8.1694^c$	Reject H_0

GVE _{it} GVE _{jt}	Levin-Lin-Chu	Adjusted $t^* = -14.3225^c$	Reject H_0
POS _{it} POS _{jt}	Levin-Lin-Chu	Adjusted $t^* = -22.5856^c$	Reject H_0
REQ _{it} REQ _{jt}	Levin-Lin-Chu	Adjusted $t^* = -9.6276^c$	Reject H_0
ROL _{it} ROL _{jt}	Levin-Lin-Chu	Adjusted $t^* = -9.2079^c$	Reject H_0
VAC _{it} VAC _{jt}	Levin-Lin-Chu	Adjusted $t^* = -32.9907^c$	Reject H_0

a , b , and c denote the significance levels of 10%, 5%, and 1%, respectively. The null hypothesis indicates that the panels are not stationary.

Source: The author.

Table B.3: Panel unit-root tests of the first generation for GKC and EKC models (with the assumption of no cross-sectional dependence)

Variables	Test(s)	Statistics	Results
lnGDI _{it}	Fisher-type unit-root test	P = 366.247 ^c Z = -1.548 ^a L* = -2.563 ^c P _m = 6.597 ^c	Reject H ₀
lnGII _{it}	Levin-Lin-Chu unit-root test	Adjusted t* = -4.430 ^c	Reject H ₀
lnFLA _{it}	Levin-Lin-Chu unit-root test	Adjusted t* = -4.274 ^c	Reject H ₀
lnGDPpc _{it}	Levin-Lin-Chu unit-root test	Adjusted t* = -14.721 ^c	Reject H ₀
lnGDPpc _{it} ²	Levin-Lin-Chu unit-root test	Adjusted t* = -13.582 ^c	Reject H ₀
lnGDPpc _{it} ³	Levin-Lin-Chu unit-root test	Adjusted t* = -12.419 ^c	Reject H ₀
lnCEpc _{it}	Levin-Lin-Chu unit-root test	Adjusted t* = -2.507 ^c	Reject H ₀
lnTOI _{it}	Levin-Lin-Chu unit-root test	Adjusted t* = -7.359 ^c	Reject H ₀
lnTOI _{it} ²	Levin-Lin-Chu unit-root test	Adjusted t* = -5.722 ^c	Reject H ₀
lnTOI _{it} ³	Levin-Lin-Chu unit-root test	Adjusted t* = -5.719 ^c	Reject H ₀
COC _{it}	Levin-Lin-Chu unit-root test	Adjusted t* = -1.915 ^b	Reject H ₀
GVE _{it}	Levin-Lin-Chu unit-root test	Adjusted t* = -4.622 ^c	Reject H ₀
POS _{it}	Levin-Lin-Chu unit-root test	Adjusted t* = -7.324 ^c	Reject H ₀
REQ _{it}	Levin-Lin-Chu unit-root test	Adjusted t* = -3.958 ^c	Reject H ₀
ROL _{it}	Levin-Lin-Chu unit-root test	Adjusted t* = -6.679 ^c	Reject H ₀
VAC _{it}	Levin-Lin-Chu unit-root test	Adjusted t* = -5.962 ^c	Reject H ₀
lnURB _{it}	Levin-Lin-Chu unit-root test	Adjusted t* = -15.570 ^c	Reject H ₀
lnIFDI _{it}	Levin-Lin-Chu unit-root test	Adjusted t* = -10.908 ^c	Reject H ₀
lnFER _{it}	Levin-Lin-Chu unit-root test	Adjusted t* = -14.423 ^c	Reject H ₀

a, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. The null hypothesis indicates that the panels are not stationary.

Source: The author.

APPENDICES OF CHAPTER 2

Table C2.1: Trade gravity model in the most recent studies

Author(s)	Countries/Industries	Time period	Explanatory variables (other than the original variables of economic size and geographic distance)	Estimation methods
Le and Pham (2024)	Vietnam and 40 major trading partners	2002-2021	Population; Institutional quality (based on 06 WGs); Gender equality; Income difference; Economic similarity; Regional trade agreements; Bilateral exchange rate; Multilateral trade resistances ($REMOTE_{it}$ and $REMOTE_{jt}$)	Fixed effect; Random effect; Poisson Pseudo-Maximum Likelihood (PPML); System GMM
Lohani (2024)	BRICs and major trading partners of India	2001-2016	GDP per capita; Common colonial history; Common official language; Common border; Landlockedness; Trade creation and diversion	Pooled ordinary least squares (OLS); Fixed effect; Poisson Pseudo-Maximum Likelihood (PPML)
Islam et al. (2024)	Indonesia and 18 clean energy-generating countries, minerals	1990-2020	Renewable energy contribution to energy production; Price of minerals (average); Price of oil; Real exchange rate; GDP per capita	Poisson Pseudo-Maximum Likelihood (PPML); Driscoll-Kraay Robust standard error estimation
Akbostanci et al. (2023)	Turkey and 192 traing partners, agricultural products	2002-2019	GDP per capita; Population; Water availability; Water pressure; Agricultural contribution and land; Common border; Common religion; Common colonial background	Poisson Pseudo-Maximum Likelihood (PPML)
Guo and Mai (2023)	14 RCEP countries excluding China, renewable energy products	2010-2020	Particulate emission damage; Carbon dioxide emission damage; Natural resources depletion; Renewable energy consumption; Electricity consumption; Renewable energy generation and capacity;	Pooled OLS; Fixed effect; Random effect
Martínez-Martínez et al. (2023)	67 countries	1986-2016	Trade agreements; WTO membership; Globalization; Annual temperature; Extreme weather events.	Fixed effects; Poisson Pseudo-Maximum Likelihood (PPML)

Nawrot (2023)	East Asian countries (15)	1995-2018	GDP difference; Income difference; Common border; Common official language; Common colonial background; Regional and multilateral trade integration	Least-squares method with correction of standard deviations of White (1980)
Tandra & Suroso (2023)	Indonesia and 115 palm oil importing countries	2012-2020	GDP per capita; Bilateral exchange rate; Common membership to free trade agreements and WTO; Landlockedness; Common border; Common colonial background	Fixed effects; Poisson Pseudo-Maximum Likelihood (PPML); Stochastic frontier estimation (SFE)
Emikonel (2022)	China, ASEAN, APEC, and OPEC countries	2008-2019	GDP per capita; Population; Common border; Dummy variables for the membership of ASEAN, APEC, and OPEC.	Difference Generalized Method of Moments (GMM); System GMM; Poisson Pseudo-Maximum Likelihood (PPML)
Le (2022)	Vietnam and 96 seafood importing countries, seafood products	2007-2018	GDP per capita; Income difference; Economic similarity; Bilateral exchange rate; Regional trade agreements; Landlockedness; Common border; Logistics performance	Pooled Ordinary Least Squares (OLS); Poisson Pseudo-Maximum Likelihood (PPML); Heckman Sample Selection; System GMM
Song et al. (2022)	China and 45 trading partners	2003-2016	GDP per capita; Land area; Common border; Trade dependence; Common membership to WTO and trade agreements; Diplomatic events.	Fixed effects
Eshetu & Goshu (2021)	Ethiopia and 31 trading partners of coffee	1998-2016	GDP per capita; Real exchange rate; Consumer price index; Population; Trade openness; Foreign direct investment; Institutional quality (based on 06 WGs);	System GMM
Golovko and Sahin (2021)	86 Eurasian countries	1994-2018	GDP per capita; Common official language; Common border; Landlockedness; Infrastructure quality; WTO membership; Trade agreement; Trade restriction; Trade freedom; Quality of institutions (corruption control, rule of law, and regulatory	Poisson Pseudo-Maximum Likelihood (PPML)

			quality); Integration; Multilateral trade resistances (MRT_i and MRT_j) addressed by fixed-effects	
Greaney and Kiyota (2020)	63 economies (35 OECD members and 28 non-OECD economies)	1995-2011	Common language; Common colonial history; Common border; Common membership to regional trade agreements.	Fixed effect; Poisson Pseudo-Maximum Likelihood (PPML)
Jing et al. (2020)	China and 65 BRI countries, 81 renewable energy products	2007-2017	Population; Renewable power generated; Total energy consumption; WTO and APEC membership; Common border	Pooled ordinary least squares (OLS)
Nasrullah et al. (2020)	Top 50 countries in terms of trade flows of forest products	2001-2018	Population; Foreign direct investment; Exchange rate; Forest area; Global financial crisis; Trade remedies; OECD and APEC membership; Common official language	Pooled ordinary least squares (OLS); Fixed effect; Random effect
Vu et al. (2020)	Vietnam and major trading partners (53), wood products	2001-2016	Income difference; Real effective exchange rate; Trade openness; Population; Wood production; Common border; Common FTA membership; Dummy variables of APEC and WTO membership; Policy restriction.	Pooled ordinary least squares (OLS); Fixed effect; Random effect; Least Squares Dummy Variables (LSDV)

Source: The author.

Table C2.2: EKC model in the most recent studies

Author(s)	Countries/Industries	Time period	Dependent and major explanatory variables	Estimation methods
Gupta et al. (2025)	43 emerging and developing countries	1998-2019	CO ₂ emission (sectoral); GDP and GDP ² (sectoral); Activity index and the squared (sectoral); Efficiency index and the squared (sectoral)	System GMM; Difference GMM; Fixed effect; Pooled OLS
Murad et al. (2025)	38 OECD countries	1994-2022	CO ₂ emission; GDP and GDP ² ; Industry employment; Population; Air pollution-related tax	Panel autoregressive distributed lag (ARDL)
Wu et al. (2025)	Cities in the Pearl River Delta Region (China)	2000-2020	CO ₂ emission per capita; Per capita GDP and the quadratic and cubic terms; Trade openness; Urbanization; Energy intensity; Technological intensity	Panel quantile regression
Achuo & Ojong (2024)	46 African countries	1996-2022	CO ₂ emission; Per capita GDP and the quadratic and cubic terms; FDI inflows	Panel quantile regression
Amankwa et al. (2024)	17 African countries	2007-2018	CO ₂ emission; Level of Eurobond issuance and the squared term (in value); Urbanization; Trade openness; Domestic investment; GDP growth; Public spending on education; Rule of Law; Foreign direct investment	Pooled OLS; Fixed effect; Random effect
Caporin et al. (2024)	Central Asian countries (Uzbekistan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan)	1995-2018	CO ₂ emission; GDP; Ecological footprint; Global Adaptation Initiative Index (to climate change); Energy consumption	Panel Vector Error Correction Model (Panel VECM)
Demiral et al. (2024)	10 OPEC countries	1980-2019	CO ₂ emission per capita; GDP per capita and the squared; Financial developmen; Industrial development; Trade globalization; Financial globalization; Social globalization; Political globalization	Cross-Sectional Augmented Autoregressive Distributed Lag (CS-ARDL)
Gyamfi et al. (2024)	05 South Asian countries (Bangladesh, India, Nepal, Pakistan, Sri Lanka)	1990-2016	CO ₂ emission per capita; GDP and GDP ² ; Renewable energy consumption; Human development index; Import and Export of ICT products; Urbanization	Pool mean group-ARDL; Dumitrescu and Hurlin test of panel causality

Huang et al. (2024)	47 countries in the Belt and Road Initiatives (BRI)	1998-2021	CO ₂ emission per capita; Ecological footprint per capita; GDP and GDP ² ; Climate policy uncertainty; Industrialization; Trade openness; Financial development; Institutional quality	Pooled OLS; Fixed effect; System GMM
Mahadevan & Suardi (2024)	117 worldwide countries	1990-2019	CO ₂ emission per capita; Ecological footprint per capita; GDP per capita; Energy consumption per capita; Urbanization; International tourist arrivals; International tourism receipts; Financial globalization; Trade globalization;	Fixed effect
Phiri et al. (2024)	16 member countries in the South African development community (SADC)	1990-2020	CO ₂ , N ₂ O, and CH ₄ emissions; GDP per capita and the squared; Foreign direct investment; Urban population; Agricultural land	Pooled Mean Group (PMG); Panel ARDL; Quantile ARDL
Polat & Cil (2024)	39 countries	1993-2018	CO ₂ and CH ₄ emissions; Human development index (HDI) and the squared; Environmental related patents; Energy consumption; Population; Financial development index	Fixed effect; Random effect; Driscoll–Kraay estimation; Panel corrected standard errors (PCSE)
Rasheed & Liu (2024)	China (time series data)	1990-2022	CO ₂ emission; Energy consumption; GDP	AutoRegressive Distributed Lag; Vector Error Correction Model; AutoRegressive Integrated Moving Average
Zeraibi et al. (2024)	22 emerging countries	1990-2020	CO ₂ emission; GDP per capita and the quadratic and cubic terms; Public debt; Renewables in electricity production	Augmented Mean Group (AMG); Fully Modified Ordinary Least Square (FMOLS); Dynamic Ordinary Least Square (DOLS)

Source: The author.

Table C2.3: GKC model in relevant empirical studies

Author(s)	Countries/Industries	Time period	Dependent and major explanatory variables	Estimation methods	Major findings
Shittu et al. (2025)	45 developing countries	2005-2021	Gender equality; Uncertainty; Public policies; Institutional qualities	GMM methods	Confirming the existence of the GKC; Institutional quality moderates the link between gender equality and uncertainty
Nguyen & Nguyen (2023)	130 countries (divided into sub-samples based on income levels)	2011-2019	Gender equality (employment, health, education, rights); Real GDP per capita and the squared term; Agriculture; Urbanization; Trade openness; FDI inflows; Human capital; Institutional quality (average of 06 WGs); Colony; Socialism; Law system; Religion; Languages	Feasible generalized least squares (FGLS) estimate with year-fixed effects	Inverse U-shaped and U-shaped relationships between income and gender equality exist in full and certain subordinate samples; Institutional quality enhances gender equality in most samples
Ghosh (2022)	India (annual time series data)	1991-2019	Gender equality (in the labour market); GDP and the squared term; Economic growth (GDP per capita) and the squared term; Trade diversification and the squared term	Simultaneous equation model (SEM)	Gender equality improves export diversification Significant U-shaped relationship between female labour force participation and economic growth (GDP per capita)
Iqbal et al. (2022)	59 developing countries	1995-2015	Gender equality index; Religious tensions index; Education (Secondary schools enrolment); Bureaucracy quality; GDP per capita	Non-spatial regression: Pooled OLS; Fixed effect; Random effect Spatial regression: Fixed effect; Random effect	Non-spatial regression: GDP per capita increases gender equality Spatial regression: GDP per capita increases gender equality in home

					countries and reduces the gaps between home and neighbouring countries
Nguyen (2022)	111 countries	1995-2017	Gender equality (employment, health, education, rights); Tourism (Spending; Number of tourists; Number of arrivals); GDP per capita and the squared term; Economic structure; Human capital; Trade openness; FDI inflows; Law system; Socialism; Colonial history; Inflation; Oil prices; Remittance; Urbanization; Internet usage; Domestic uncertainty; UNESCO heritage sites; World income, inflation, and uncertainty	Seemingly unrelated regressions (SUR) for system of equations	The inverse U-shaped and U-shaped relationships exist in specific models with different gender equality indicators
Nguyen & Su (2021)	51 developing countries	2002-2017	Gender inequality (employment, health, education, and women's rights); Income (real GDP per capita) and the squared term; Industrial value added; Individual Internet users; Trade openness; FDI inflows; Institutional quality (the average of 06 WGs)	System GMM	Inverse U-shaped relationship (confirming the existence of the GKC model)
Ruiters & Charteris (2020)	South Africa	2008-2018 (quarterly basis)	Female labor force participation; Real GDP; Real GDP growth	ARDL estimation	Economic development increases female labor force participation
Anyanwu (2016)	48 African countries	1991-2011	Gender equality in youth employment (the ratio of the female to male employment for the age group 15–24 over the period (in percentage)); Real GDP per capita and the squared term; Democracy; Domestic investment; FDI;	Pooled OLS with year, sub-regional, and oil fixed-effects	The U-shaped relationship exists in the overall sample of Africa and the sub-sample of Sub-Saharan Africa

			Education (primary and secondary); Urban population; Population; Trade openness; Political globalization; Public spending		
Anyanwu & Augustine (2013)	48 African countries	1991-2019	Gender equality in employment (the ratio of the female to male employment for the age group 15–64 over the period (in percentage)); Real GDP per capita and the squared term; Democracy; Domestic investment; FDI; Education (primary and secondary); Urban population; Sex population	Pooled OLS with country-fixed effect	The U-shaped relationship exists in the North African sub-sample

Source: The author.

APPENDICES OF CHAPTER 3

Table C3.1: Estimation results of COC models (aggregated sample)

ln(1 + BIT _{ijt})	GDI			GII			FLA		
	(1) FE-I	(2) FE-II	(3) SGMM-II	(4) FE-I	(5) FE-II	(6) SGMM-II	(7) FE-I	(8) FE-II	(9) SGMM-II
L1.ln(1 + BIT _{ijt})			0.470 ^c (0.002)			0.173 (0.723)			0.219 ^a (0.075)
L1.lnGDP _{it}			0.047 (0.910)			-0.690 (0.453)			-0.462 (0.279)
L2.lnGDP _{it}						-0.029 (0.918)			-0.230 (0.351)
L1.lnGDP _{jt}			0.235 (0.598)			-0.701 (0.803)			-0.363 (0.508)
L2.lnGDP _{jt}						0.424 (0.248)			0.092 (0.704)
L1.lnEXG _{jit}			0.181 (0.364)			0.084 (0.887)			-0.013 (0.965)
L2.lnEXG _{jit}						-0.145 (0.587)			-0.110 (0.533)
lnGDP _{it}	0.772 ^c (0.000)	0.718 ^c (0.000)		0.781 ^c (0.000)	0.722 ^c (0.000)		0.849 ^c (0.000)	0.804 ^c (0.000)	
lnGDP _{jt}	0.753 ^c (0.000)	0.699 ^c (0.000)		0.759 ^c (0.000)	0.708 ^c (0.000)		0.798 ^c (0.000)	0.756 ^c (0.000)	
lnPOP _{it}	0.306 ^a (0.057)	0.316 (0.524)	5.199 (0.153)	0.753 ^c (0.000)	0.814 ^b (0.033)	16.795 (0.375)	0.334 ^b (0.016)	0.349 (0.327)	9.099 ^b (0.021)
lnPOP _{jt}	-0.270 ^a (0.087)	-0.258 (0.133)	4.053 (0.410)	0.106 (0.496)	0.180 (0.252)	12.716 (0.564)	-0.257 ^a (0.051)	-0.242 ^a (0.073)	6.038 (0.144)
lnDIST _{ij}	omitted	-1.153 ^c (0.000)	-26.803 (0.439)	omitted	-1.154 ^c (0.000)	-34.834 (0.798)	omitted	-1.159 ^c (0.000)	-34.672 ^a (0.076)
COC _{it}	-0.036 (0.431)	-0.024 (0.847)	-0.831 (0.511)	0.082 ^a (0.091)	0.100 (0.429)	0.205 (0.940)	0.037 (0.468)	0.045 (0.742)	-0.042 (0.948)

COC _{jt}	-0.075 (0.109)	-0.063 (0.227)	-0.623 (0.645)	-0.013 (0.810)	-0.001 (0.980)	0.243 (0.926)	-0.053 (0.294)	-0.047 (0.362)	0.022 (0.972)
lnGDI _{it}	5.142 ^c (0.000)	5.200 ^c (0.010)	-35.094 (0.221)						
lnGDI _{jt}	3.385 ^c (0.001)	3.487 ^c (0.002)	-36.395 (0.161)						
(rCOC*lnGDI) _{it}	-5.196 ^c (0.000)	-5.194 ^a (0.082)	-2.551 (0.925)						
(rCOC*lnGDI) _{jt}	-4.338 ^c (0.001)	-4.400 ^c (0.005)	13.191 (0.654)						
lnGII _{it}				0.080 ^a (0.066)	0.092 (0.350)	-2.353 (0.475)			
lnGII _{jt}				0.117 ^b (0.012)	0.128 ^b (0.019)	-2.582 (0.614)			
(rCOC*lnGII) _{it}				0.158 ^c (0.000)	0.164 ^c (0.001)	-0.812 (0.585)			
(rCOC*lnGII) _{jt}				0.050 ^b (0.044)	0.057 ^b (0.031)	-0.819 (0.722)			
lnFLA _{it}							0.122 (0.321)	0.167 (0.599)	5.840 (0.111)
lnFLA _{jt}							0.105 (0.566)	0.151 (0.415)	6.209 ^a (0.088)
(rCOC*lnFLA) _{it}							-0.058 ^c (0.000)	-0.060 ^c (0.009)	0.563 ^b (0.035)
(rCOC*lnFLA) _{jt}							0.003 (0.761)	0.001 (0.904)	0.614 ^b (0.020)
lnREMOTE _{it}	-1.255 ^c (0.000)	-1.198 ^c (0.002)	1.294 (0.706)	-1.224 ^c (0.000)	-1.184 ^c (0.001)	-2.876 (0.448)	-1.015 ^c (0.000)	-0.976 ^b (0.016)	-1.187 (0.686)
lnREMOTE _{jt}	-0.449 ^c (0.001)	-0.396 ^b (0.020)	1.092 (0.798)	-0.458 ^c (0.001)	-0.413 ^b (0.033)	-3.446 (0.339)	-0.293 ^b (0.021)	-0.253 (0.152)	-1.528 (0.604)
lnEXG _{jit}	0.071 (0.130)	0.071 (0.331)		0.071 ^a (0.061)	0.068 (0.317)		0.095 ^b (0.013)	0.095 (0.186)	
lnDIN _{ijt}	-0.010	0.057 ^c	-0.185	-0.011	0.055 ^b	0.107	-0.013	0.056 ^b	0.824 ^a

lnESIM _{ijt}	(0.263) 0.171 ^c	(0.010) -0.061	(0.774) 0.128	(0.220) 0.139 ^c	(0.011) -0.065	(0.895) -1.737	(0.181) 0.139 ^c	(0.011) -0.066	(0.066) -1.464
RTA _{ijt}	(0.000) 0.056 ^b	(0.292) 0.174 ^b	(0.931) -0.640	(0.000) 0.046 ^a	(0.262) 0.168 ^b	(0.790) 0.074	(0.000) 0.010	(0.253) 0.159 ^b	(0.278) 1.306
LLOCK _i	(0.044) omitted	(0.016) omitted	(0.615) -84.309	(0.092) omitted	(0.018) omitted	(0.994) -129.718	(0.727) omitted	(0.026) omitted	(0.195) -87.134
LLOCK _j	omitted	-2.562 ^c	-97.006	omitted	-2.568 ^c	-153.899	omitted	-2.573 ^c	-109.617
COMCOL _{ij}	omitted	0.556	-288.334	omitted	0.563	-628.316	omitted	0.557	omitted
COMLANG _{ij}	omitted	0.190 ^a	-111.885	omitted	0.193 ^a	-185.512	omitted	0.189 ^a	-132.170
CONTIG _{ij}	omitted	0.213	omitted	omitted	0.212	omitted	omitted	0.212	omitted
GEFC _t	-2.183 ^c	-1.991 ^c	omitted	-2.074 ^c	-1.910 ^c	omitted	-1.765 ^c	-1.636 ^c	omitted
COVID _t	-2.741 ^c	-2.522 ^c	-0.137	-2.489 ^c	-2.297 ^c	omitted	-2.209 ^c	-2.071 ^c	omitted
Constant	-49.959 ^c	-37.004 ^c	133.622	-64.193 ^c	-52.573 ^c	-237.834	-49.745 ^c	-37.989 ^c	omitted
Observations	32,720	32,720	31,160	32,720	32,720	29,520	32,800	32,800	29,520
Groups	1,640	41	1,640	1,640	41	1,640	1,640	41	1,640
Instruments	-	-	81	-	-	81	-	-	77
R-squared	0.482	0.728	-	0.483	0.730	-	0.479	0.726	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dyad-fixed	Y	N	-	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-	N	Y	-
Importer-fixed	N	Y	-	N	Y	-	N	Y	-
Vce clustered	Y	Y	-	Y	Y	-	Y	Y	-
F tests ¹	145.06 ^c	298.66 ^c	-	151.21 ^c	286.26 ^c	-	140.53 ^c	236.91 ^c	-
Hausman tests ² (chi2)	1,152.3 ^c	742.83 ^c	-	736.88 ^c	2,716.75 ^c	-	749.31 ^c	2,536.57 ^c	-
AR(1) (z)	-	-	-2.59 ^c	-	-	1.70 ^a	-	-	-1.78 ^a

AR(1) (p)	-	-	0.010	-	-	0.090	-	-	0.076
AR(2) (z)	-	-	1.61	-	-	1.35	-	-	0.52
AR(2) (p)	-	-	0.108	-	-	0.178	-	-	0.600
Hansen test (chi2)	-	-	35.05	-	-	38.79	-	-	37.48
Hansen test (p)	-	-	0.650	-	-	0.389	-	-	0.271

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C3.2: Estimation results of GVE models (aggregated sample)

ln(1 + BIT _{ijt})	GDI			GII			FLA		
	(1) FE-I	(2) FE-II	(3) SGMM-II	(4) FE-I	(5) FE-II	(6) SGMM-II	(7) FE-I	(8) FE-II	(9) SGMM-II
L1.ln(1 + BIT _{ijt})			0.491 ^c (0.003)			0.567 ^c (0.006)			0.583 ^c (0.000)
L2.ln(1 + BIT _{ijt})			0.010 (0.819)			-0.100 (0.439)			0.026 (0.617)
L1.lnGDP _{it}			-0.411 (0.564)						-0.973 ^a (0.060)
L2.lnGDP _{it}			0.148 (0.806)			0.234 (0.748)			1.018 (0.165)
L1.lnGDP _{jt}			-0.197 (0.797)						-0.707 (0.387)
L2.lnGDP _{jt}			0.383 (0.544)			0.766 (0.289)			1.386 (0.148)
L1.lnEXG _{jit}			0.016 (0.968)						-0.122 (0.762)
L2.lnEXG _{jit}			-0.030 (0.939)			-0.149 (0.598)			-0.235 (0.637)
lnGDP _{it}	0.713 ^c (0.000)	0.664 ^c (0.000)		0.685 ^c (0.000)	0.626 ^c (0.000)		0.775 ^c (0.000)	0.731 ^c (0.000)	
lnGDP _{jt}	0.749 ^c (0.000)	0.701 ^c (0.000)		0.729 ^c (0.000)	0.678 ^c (0.000)		0.779 ^c (0.000)	0.738 ^c (0.000)	
lnPOP _{it}	0.238 (0.104)	0.254 (0.511)	5.849 (0.129)	0.651 ^c (0.000)	0.709 ^b (0.038)	4.598 (0.260)	0.179 (0.189)	0.198 (0.522)	5.549 (0.123)
lnPOP _{jt}	-0.227 (0.144)	-0.209 (0.215)	2.430 (0.661)	0.072 (0.627)	0.144 (0.334)	0.496 (0.918)	-0.275 ^b (0.033)	-0.257 ^a (0.056)	2.355 (0.690)
lnDIST _{ij}	omitted	-1.156 ^c (0.000)	-21.865 (0.435)	omitted	-1.156 ^c (0.000)	-21.657 (0.358)	omitted	-1.160 ^c (0.000)	-23.767 (0.277)
GVE _{it}	0.231 ^c (0.000)	0.235 ^b (0.012)	-0.809 (0.389)	0.352 ^c (0.000)	0.365 ^c (0.001)	0.354 (0.766)	0.270 ^c (0.000)	0.276 ^c (0.010)	-1.357 (0.211)

GVE _{jt}	-0.011 (0.783)	-0.005 (0.913)	-0.904 (0.309)	0.067 (0.152)	0.077 (0.124)	0.273 (0.817)	0.019 (0.672)	0.023 (0.633)	-1.530 (0.187)
lnGDI _{it}	5.056 ^c (0.000)	5.111 ^c (0.002)	-19.603 (0.319)						
lnGDI _{jt}	3.033 ^c (0.000)	3.136 ^c (0.002)	-15.522 (0.415)						
(rGVE*lnGDI) _{it}	-3.443 ^c (0.000)	-3.336 ^b (0.011)	-6.671 (0.453)						
(rGVE*lnGDI) _{jt}	-1.796 ^c (0.000)	-1.755 ^c (0.001)	-6.223 (0.462)						
lnGII _{it}				0.244 ^c (0.000)	0.256 ^c (0.007)	0.168 (0.910)			
lnGII _{jt}				0.156 ^c (0.000)	0.169 ^c (0.001)	0.012 (0.993)			
(rGVE*lnGII) _{it}				0.012 (0.289)	0.018 (0.546)	0.226 (0.461)			
(rGVE*lnGII) _{jt}				0.011 (0.480)	0.015 (0.380)	0.254 (0.377)			
lnFLA _{it}							0.109 (0.366)	0.151 (0.592)	3.714 (0.190)
lnFLA _{jt}							0.100 (0.578)	0.144 (0.433)	4.120 (0.176)
(rGVE*lnFLA) _{it}							0.020 ^c (0.004)	0.019 (0.249)	0.015 (0.912)
(rGVE*lnFLA) _{jt}							0.006 (0.370)	0.005 (0.486)	0.001 (0.994)
lnREMOTE _{it}	-1.309 ^c (0.000)	-1.269 ^c (0.001)	1.245 (0.762)	-1.314 ^c (0.000)	-1.281 ^c (0.000)	-3.600 (0.377)	-1.064 ^c (0.000)	-1.032 ^c (0.009)	-4.722 (0.357)
lnREMOTE _{jt}	-0.451 ^c (0.001)	-0.414 ^b (0.019)	0.744 (0.855)	-0.462 ^c (0.001)	-0.423 ^b (0.035)	-4.430 (0.293)	-0.289 ^b (0.022)	-0.255 (0.153)	-5.215 (0.301)
lnEXG _{jit}	0.068 (0.147)	0.067 (0.350)		0.065 (0.115)	0.062 (0.417)		0.086 ^b (0.035)	0.086 (0.274)	
lnDIN _{ijt}	-0.008	0.058 ^c	0.134	-0.009	0.056 ^b	-0.508	-0.009	0.057 ^b	0.215

lnESIM _{ijt}	(0.400) 0.163 ^c (0.000)	(0.009) -0.062 (0.277)	(0.824) -1.017 (0.651)	(0.331) 0.140 ^c (0.000)	(0.010) -0.065 (0.258)	(0.692) -2.080 (0.368)	(0.325) 0.140 ^c (0.000)	(0.011) -0.066 (0.248)	(0.820) -3.382 (0.100)
RTA _{ijt}	0.024 (0.393)	0.166 ^b (0.019)	-0.227 (0.847)	0.031 (0.248)	0.165 ^b (0.020)	-1.245 (0.538)	-0.006 (0.842)	0.155 ^b (0.028)	0.672 (0.688)
LLOCK _i	omitted	omitted	-22.283 (0.839)	omitted	omitted	-77.644 (0.444)	omitted	omitted	-71.998 (0.407)
LLOCK _j	omitted	-2.684 ^c (0.000)	-58.527 (0.653)	omitted	-2.500 ^c (0.000)	-110.600 (0.265)	omitted	-2.532 ^c (0.000)	-90.410 (0.459)
COMCOL _{ij}	omitted	0.556 (0.241)	omitted	omitted	0.562 (0.235)	omitted	omitted	0.556 (0.241)	omitted
COMLANG _{ij}	omitted	0.189 ^a (0.084)	-46.312 (0.832)	omitted	0.193 ^a (0.080)	-150.404 (0.333)	omitted	0.189 ^a (0.085)	-106.898 (0.583)
CONTIG _{ij}	omitted	0.212 (0.109)	omitted	omitted	0.211 (0.109)	omitted	omitted	0.211 (0.109)	omitted
GEFC _t	-2.194 ^c (0.000)	-2.052 ^c (0.000)	omitted	-2.028 ^c (0.000)	-1.878 ^c (0.001)	omitted	-1.712 ^c (0.000)	-1.599 ^c (0.008)	
COVID _t	-2.758 ^c (0.000)	-2.604 ^c (0.000)	0.944 (0.872)	-2.367 ^c (0.000)	-2.191 ^c (0.001)	-5.368 (0.361)	-2.124 ^c (0.000)	-2.006 ^c (0.007)	-7.974 (0.266)
Constant	-48.904 ^c (0.000)	-36.598 ^c (0.001)	88.825 (0.702)	-59.998 ^c (0.000)	-48.575 ^c (0.000)	omitted	-45.291 ^c (0.000)	-33.890 ^c (0.001)	-95.085 (0.754)
Observations	32,720	32,720	29,520	32,720	32,720	29,520	32,800	32,800	29,520
Groups	1,640	41	1,640	1,640	41	1,640	1,640	41	1,640
Instruments	-	-	75	-	-	73	-	-	75
R-squared	0.488	0.728	-	0.485	0.730	-	0.484	0.727	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dyad-fixed	Y	N	-	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-	N	Y	-
Importer-fixed	N	Y	-	N	Y	-	N	Y	-
Vce clustered	Y	Y	-	Y	Y	-	Y	Y	-
F tests ¹	139.25 ^c	223.36 ^c	-	147.98 ^c	267.73 ^c	-	138.80 ^c	219.23 ^c	-
Hausman tests ² (chi2)	1,048.21 ^c	2,629.63 ^c	-	683.01 ^c	2,360.65 ^c	-	668.22 ^c	3,002.80 ^c	-
AR(1) (z)	-	-	-2.75 ^c	-	-	-2.31 ^b	-	-	-1.99 ^b

AR(1) (p)	-	-	0.006	-	-	0.021	-	-	0.046
AR(2) (z)	-	-	1.64	-	-	0.60	-	-	0.56
AR(2) (p)	-	-	0.101	-	-	0.551	-	-	0.574
Hansen test (chi2)	-	-	37.31	-	-	39.95	-	-	28.42
Hansen test (p)	-	-	0.168	-	-	0.130	-	-	0.548

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C3.3: Estimation results of POS models (aggregated sample)

ln(1 + BIT_{ijt})	GDI			GII			FLA		
	(1) FE-I	(2) FE-II	(3) SGMM-II	(4) FE-I	(5) FE-II	(6) SGMM-II	(7) FE-I	(8) FE-II	(9) SGMM-II
L1.ln(1 + BIT _{ijt})			0.426 ^c (0.000)			0.528 ^c (0.001)			0.408 ^c (0.001)
L2.ln(1 + BIT _{ijt})									
L1.lnGDP _{it}			-0.069 (0.848)			-0.405 (0.491)			-0.343 (0.343)
L2.lnGDP _{it}						0.447 (0.580)			
L1.lnGDP _{jt}			0.006 (0.987)			-0.706 (0.313)			-0.079 (0.839)
L2.lnGDP _{jt}						1.215 (0.271)			
L1.lnEXG _{jit}			0.096 (0.592)			0.182 (0.653)			-0.164 (0.366)
L2.lnEXG _{jit}						-0.430 (0.312)			
lnGDP _{it}	0.790 ^c (0.000)	0.739 ^c (0.000)		0.805 ^c (0.000)	0.746 ^c (0.000)		0.863 ^c (0.000)	0.817 ^c (0.000)	
lnGDP _{jt}	0.763 ^c (0.000)	0.713 ^c (0.000)		0.760 ^c (0.000)	0.708 ^c (0.000)		0.793 ^c (0.000)	0.749 ^c (0.000)	
lnPOP _{it}	0.367 ^b (0.017)	0.386 (0.418)	5.036 ^a (0.084)	0.628 ^c (0.000)	0.693 ^a (0.077)	4.421 (0.390)	0.280 ^b (0.043)	0.297 (0.411)	5.323 ^a (0.088)
lnPOP _{jt}	-0.203 (0.196)	-0.181 (0.280)	3.697 (0.220)	0.044 (0.764)	0.123 (0.389)	2.560 (0.617)	-0.268 ^b (0.038)	-0.251 ^a (0.060)	3.673 (0.366)
lnDIST _{ij}	omitted	-1.155 ^c (0.000)	-13.644 (0.302)	omitted	-1.155 ^c (0.000)	-19.445 (0.278)	omitted	-1.159 ^c (0.000)	-14.344 (0.387)
POS _{it}	-0.057 ^b (0.045)	-0.047 (0.598)	0.334 (0.160)	-0.043 (0.133)	-0.028 (0.757)	0.131 (0.755)	-0.070 ^b (0.026)	-0.056 (0.547)	0.438 (0.119)

POS _{it}	-0.064 ^b (0.015)	-0.053 ^a (0.085)	0.205 (0.368)	-0.055 ^b (0.035)	-0.041 (0.166)	0.082 (0.831)	-0.060 ^b (0.025)	-0.047 (0.114)	0.349 (0.251)
lnGDI _{it}	4.677 ^c (0.000)	4.738 ^b (0.012)	-24.988 ^c (0.006)						
lnGDI _{jt}	2.591 ^c (0.005)	2.693 ^c (0.010)	-18.682 ^b (0.019)						
(rPOS*lnGDI) _{it}	-2.922 ^c (0.000)	-2.785 ^a (0.074)	12.782 ^b (0.029)						
(rPOS*lnGDI) _{jt}	-0.671 (0.316)	-0.585 (0.404)	12.351 ^b (0.038)						
lnGII _{it}				0.202 ^c (0.000)	0.213 ^b (0.028)	0.271 (0.881)			
lnGII _{jt}				0.146 ^c (0.001)	0.158 ^c (0.002)	-0.007 (0.997)			
(rPOS*lnGII) _{it}				-0.005 (0.616)	0.001 (0.978)	0.109 (0.233)			
(rPOS*lnGII) _{jt}				0.009 (0.374)	0.015 (0.135)	0.103 (0.318)			
lnFLA _{it}							0.108 (0.396)	0.162 (0.616)	0.910 (0.695)
lnFLA _{jt}							0.061 (0.740)	0.115 (0.528)	1.494 (0.493)
(rPOS*lnFLA) _{it}							0.020 ^c (0.000)	0.019 (0.259)	-0.093 ^b (0.030)
(rPOS*lnFLA) _{jt}							-0.003 (0.574)	-0.004 (0.439)	-0.095 ^b (0.035)
lnREMOTE _{it}	-1.259 ^c (0.000)	-1.217 ^c (0.002)	3.623 (0.178)	-1.181 ^c (0.000)	-1.146 ^c (0.002)	-1.770 (0.634)	-1.010 ^c (0.000)	-0.975 ^b (0.017)	1.143 (0.604)
lnREMOTE _{jt}	-0.426 ^c (0.002)	-0.389 ^b (0.026)	3.665 (0.192)	-0.411 ^c (0.002)	-0.371 ^a (0.059)	-2.617 (0.488)	-0.262 ^b (0.039)	-0.226 (0.204)	0.449 (0.842)
lnEXG _{jit}	0.060 (0.213)	0.060 (0.411)		0.072 ^a (0.071)	0.069 (0.324)		0.081 ^b (0.044)	0.081 (0.249)	
lnDIN _{ijt}	-0.013	0.057 ^c	-0.040	-0.014	0.054 ^b	-0.635	-0.013	0.056 ^b	0.002

lnESIM _{ijt}	(0.164) 0.164 ^c (0.000)	(0.010) -0.062 (0.280)	(0.919) 0.974 (0.387)	(0.119) 0.144 ^c (0.000)	(0.012) -0.065 (0.263)	(0.372) -1.384 (0.402)	(0.163) 0.146 ^c (0.000)	(0.012) -0.066 (0.255)	(0.997) 0.323 (0.782)
RTA _{ijt}	0.036 (0.193)	0.169 ^b (0.019)	-1.031 (0.306)	0.032 (0.253)	0.165 ^b (0.021)	-1.025 (0.394)	0.003 (0.906)	0.157 ^b (0.027)	-0.694 (0.517)
LLOCK _i	omitted	omitted	-37.523 (0.419)	omitted	omitted	-55.818 (0.420)	omitted	omitted	-4.152 (0.946)
LLOCK _j	omitted	-2.651 ^c (0.000)	-49.092 (0.324)	omitted	-2.470 ^c (0.000)	-67.608 (0.466)	omitted	-2.510 ^c (0.000)	-15.392 (0.765)
COMCOL _{ij}	omitted	0.557 (0.240)	-318.035 (0.305)	omitted	0.563 (0.235)	omitted	omitted	0.557 (0.240)	omitted
COMLANG _{ij}	omitted	0.189 ^a (0.084)	-39.503 (0.561)	omitted	0.193 ^a (0.080)	-74.033 (0.540)	omitted	0.189 ^a (0.085)	9.713 (0.891)
CONTIG _{ij}	omitted	0.212 (0.108)	omitted	omitted	0.211 (0.109)	omitted	omitted	0.212 (0.109)	omitted
GEFC _t	-2.203 ^c (0.000)	-2.054 ^c (0.000)	omitted	-2.005 ^c (0.000)	-1.851 ^c (0.002)	omitted	-1.755 ^c (0.000)	-1.628 ^c (0.009)	omitted
COVID _t	-2.796 ^c (0.000)	-2.633 ^c (0.000)	5.469 (0.215)	-2.364 ^c (0.000)	-2.184 ^c (0.002)	-3.372 (0.512)	-2.180 ^c (0.000)	-2.044 ^c (0.007)	0.643 (0.860)
Constant	-52.626 ^c (0.000)	-40.306 ^c (0.001)	90.079 (0.514)	-60.203 ^c (0.000)	-48.985 ^c (0.000)	omitted	-48.179 ^c (0.000)	-36.623 ^c (0.001)	omitted
Observations	32,720	32,720	31,160	32,720	32,720	29,520	32,800	32,800	31,160
Groups	1,640	41	1,640	1,640	41	1,640	1,640	41	1,640
Instruments	-	-	81	-	-	73	-	-	74
R-squared	0.481	0.727	-	0.479	0.729	-	0.479	0.726	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dyad-fixed	Y	N	-	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-	N	Y	-
Importer-fixed	N	Y	-	N	Y	-	N	Y	-
Vce clustered	Y	Y	-	Y	Y	-	Y	Y	-
F tests ¹	143.82 ^c	298.19 ^c	-	149.03 ^c	281.71 ^c	-	141.02 ^c	248.93 ^c	-
Hausman tests ² (chi2)	971.33 ^c	844.16 ^c	-	1,130.88 ^c	385.80 ^c	-	815.85 ^c	1,393.23 ^c	-
AR(1) (z)	-	-	-3.29 ^c	-	-	-2.45 ^b	-	-	-2.74 ^c

AR(1) (p)	-	-	0.001	-	-	0.014	-	-	0.006
AR(2) (z)	-	-	1.53	-	-	-0.65	-	-	0.69
AR(2) (p)	-	-	0.127	-	-	0.516	-	-	0.492
Hansen test (chi2)	-	-	49.51	-	-	27.64	-	-	39.70
Hansen test (p)	-	-	0.121	-	-	0.537	-	-	0.164

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C3.4: Estimation results of REQ models (aggregated sample)

ln(1 + BIT _{ijt})	GDI			GII			FLA		
	(1) FE-I	(2) FE-II	(3) SGMM-II	(4) FE-I	(5) FE-II	(6) SGMM-II	(7) FE-I	(8) FE-II	(9) SGMM-II
L1.ln(1 + BIT _{ijt})			0.277 (0.154)			0.693 ^c (0.000)			0.612 ^c (0.000)
L2.ln(1 + BIT _{ijt})						-0.254 (0.159)			-0.209 (0.234)
L1.lnGDP _{it}			0.230 (0.646)			-0.576 (0.256)			
L2.lnGDP _{it}			0.295 (0.582)			1.282 ^a (0.064)			1.100 ^a (0.058)
L1.lnGDP _{jt}			0.248 (0.567)			-0.445 (0.573)			
L2.lnGDP _{jt}			0.676 (0.150)			1.801 ^b (0.031)			1.499 ^b (0.030)
L1.lnEXG _{jit}			0.032 (0.905)			0.175 (0.699)			
L2.lnEXG _{jit}			0.096 (0.737)			-0.140 (0.781)			-0.100 (0.674)
lnGDP _{it}	0.829 ^c (0.000)	0.773 ^c (0.000)		0.812 ^c (0.000)	0.749 ^c (0.000)		0.879 ^c (0.000)	0.831 ^c (0.000)	
lnGDP _{jt}	0.785 ^c (0.000)	0.730 ^c (0.000)		0.776 ^c (0.000)	0.720 ^c (0.000)		0.816 ^c (0.000)	0.770 ^c (0.000)	
lnPOP _{it}	0.469 ^c (0.002)	0.477 (0.329)	2.968 (0.354)	0.575 ^c (0.000)	0.631 ^a (0.088)	5.973 (0.414)	0.300 ^b (0.029)	0.309 (0.382)	1.557 (0.724)
lnPOP _{jt}	-0.142 (0.381)	-0.130 (0.468)	1.125 (0.838)	0.049 (0.736)	0.119 (0.391)	2.277 (0.779)	-0.254 ^b (0.048)	-0.245 ^a (0.067)	-1.840 (0.762)
lnDIST _{ij}	omitted	-1.154 ^c (0.000)	-1.893 (0.930)	omitted	-1.153 ^c (0.000)	-31.057 (0.344)	omitted	-1.157 ^c (0.000)	-12.869 (0.566)
REQ _{it}	-0.227 ^c (0.000)	-0.213 ^b (0.030)	-0.478 (0.148)	-0.058 (0.163)	-0.036 (0.749)	-0.478 (0.177)	-0.156 ^c (0.000)	-0.149 (0.177)	-0.780 ^b (0.050)

REQ _{it}	-0.153 ^c (0.001)	-0.139 ^b (0.014)	-0.501 (0.133)	-0.087 ^b (0.033)	-0.068 (0.110)	-0.640 ^a (0.088)	-0.142 ^c (0.001)	-0.135 ^c (0.007)	-0.783 ^b (0.035)
lnGDI _{it}	4.659 ^c (0.000)	4.679 ^b (0.011)	-30.575 ^b (0.025)						
lnGDI _{jt}	2.830 ^c (0.002)	2.890 ^c (0.006)	-30.303 ^b (0.035)						
(rREQ*lnGDI) _{it}	-2.271 ^c (0.002)	-2.028 (0.229)	4.733 (0.703)						
(rREQ*lnGDI) _{jt}	-1.487 ^b (0.023)	-1.312 ^a (0.064)	7.692 (0.556)						
lnGII _{it}				0.128 ^c (0.003)	0.142 (0.132)	-0.128 (0.944)			
lnGII _{jt}				0.138 ^c (0.001)	0.153 ^c (0.001)	-0.470 (0.802)			
(rREQ*lnGII) _{it}				0.072 ^c (0.000)	0.077 ^c (0.002)	-0.074 (0.677)			
(rREQ*lnGII) _{jt}				0.004 (0.761)	0.007 (0.548)	-0.068 (0.703)			
lnFLA _{it}							0.145 (0.242)	0.198 (0.546)	2.564 (0.317)
lnFLA _{jt}							0.110 (0.552)	0.164 (0.389)	2.815 (0.259)
(rREQ*lnFLA) _{it}							-0.009 (0.184)	-0.009 (0.492)	0.031 (0.681)
(rREQ*lnFLA) _{jt}							0.008 (0.177)	0.008 (0.144)	0.020 (0.787)
lnREMOTE _{it}	-1.297 ^c (0.000)	-1.233 ^c (0.002)	3.588 (0.293)	-1.085 ^c (0.000)	-1.035 ^c (0.006)	-4.032 (0.348)	-0.962 ^c (0.000)	-0.910 ^b (0.027)	-2.122 (0.556)
lnREMOTE _{jt}	-0.478 ^c (0.001)	-0.420 ^b (0.017)	3.275 (0.364)	-0.421 ^c (0.001)	-0.366 ^b (0.050)	-4.352 (0.322)	-0.287 ^b (0.023)	-0.235 (0.175)	-2.319 (0.524)
lnEXG _{jit}	0.060 (0.212)	0.060 (0.436)		0.065 (0.102)	0.062 (0.392)		0.079 ^b (0.050)	0.079 (0.282)	
lnDIN _{ijt}	-0.013	0.057 ^c	0.169	-0.013	0.055 ^b	-0.641	-0.013	0.056 ^b	-0.120

lnESIM _{ijt}	(0.163) 0.182 ^c (0.000)	(0.010) -0.060 (0.301)	(0.719) 0.637 (0.712)	(0.154) 0.158 ^c (0.000)	(0.011) -0.063 (0.282)	(0.265) -2.585 (0.137)	(0.157) 0.157 ^c (0.000)	(0.011) -0.064 (0.272)	(0.813) -1.502 (0.295)
RTA _{ijt}	0.054 ^b (0.049)	0.173 ^b (0.016)	0.368 (0.744)	0.058 ^b (0.037)	0.171 ^b (0.017)	-0.548 (0.692)	0.026 (0.352)	0.163 ^b (0.023)	0.166 (0.863)
LLOCK _i	omitted	omitted	47.188 (0.618)	omitted	omitted	-105.590 (0.395)	omitted	omitted	-54.645 (0.567)
LLOCK _j	omitted	-2.637 ^c (0.000)	27.031 (0.714)	omitted	-2.437 ^c (0.000)	-142.290 (0.244)	omitted	-2.475 ^c (0.000)	-85.853 (0.366)
COMCOL _{ij}	omitted	0.557 (0.240)	omitted	omitted	0.563 (0.235)	omitted	omitted	0.557 (0.240)	omitted
COMLANG _{ij}	omitted	0.190 ^a (0.084)	69.681 (0.516)	omitted	0.193 ^a (0.079)	-258.667 (0.229)	omitted	0.189 ^a (0.085)	-174.028 (0.341)
CONTIG _{ij}	omitted	0.213 (0.107)	omitted	omitted	0.212 (0.108)	omitted	omitted	0.212 (0.107)	omitted
GEFC _t	-2.339 ^c (0.000)	-2.134 ^c (0.000)	omitted	-1.911 ^c (0.000)	-1.716 ^c (0.003)	omitted	-1.733 ^c (0.000)	-1.567 ^b (0.011)	omitted
COVID _t	-2.974 ^c (0.000)	-2.739 ^c (0.000)	-0.656 ^b (0.032)	-2.272 ^c (0.000)	-2.039 ^c (0.004)	-0.229 (0.705)	-2.166 ^c (0.000)	-1.981 ^c (0.008)	-4.458 (0.371)
Constant	-57.973 ^c (0.000)	-44.388 ^c (0.001)	omitted	-58.845 ^c (0.000)	-46.750 ^c (0.000)	omitted	-49.612 ^c (0.000)	-37.232 ^c (0.001)	omitted
Observations	32,720	32,720	29,520	32,720	32,720	29,520	32,800	32,800	29,520
Groups	1,640	41	1,640	1,640	41	1,640	1,640	41	1,640
Instruments	-	-	70	-	-	73	-	-	73
R-squared	0.483	0.728	-	0.482	0.729	-	0.480	0.727	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dyad-fixed	Y	N	-	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-	N	Y	-
Importer-fixed	N	Y	-	N	Y	-	N	Y	-
Vce clustered	Y	Y	-	Y	Y	-	Y	Y	-
F tests ¹	148.46 ^c	299.09 ^c	-	151.18 ^c	290.01 ^c	-	141.59 ^c	243.08 ^c	-
Hausman tests ² (chi2)	1,026.77 ^c	3,369.97 ^c	-	118.88 ^c	2,461.77 ^c	-	865.63 ^c	2,154.67 ^c	-
AR(1) (z)	-	-	-1.97 ^b	-	-	-2.74 ^c	-	-	-2.83 ^c

AR(1) (p)	-	-	0.049	-	-	0.006	-	-	0.005
AR(2) (z)	-	-	1.41	-	-	0.90	-	-	1.01
AR(2) (p)	-	-	0.159	-	-	0.368	-	-	0.313
Hansen test (chi2)	-	-	35.44	-	-	23.20	-	-	27.41
Hansen test (p)	-	-	0.102	-	-	0.723	-	-	0.651

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C3.5: Estimation results of ROL models (aggregated sample)

ln(1 + BIT _{ijt})	GDI			GII			FLA		
	(1) FE-I	(2) FE-II	(3) SGMM-II	(4) FE-I	(5) FE-II	(6) SGMM-II	(7) FE-I	(8) FE-II	(9) SGMM-II
L1.ln(1 + BIT _{ijt})			0.259 (0.106)			0.514 ^b (0.029)			0.443 ^c (0.001)
L2.ln(1 + BIT _{ijt})						-0.022 (0.884)			
L1.lnGDP _{it}			0.224 (0.632)						-0.508 (0.317)
L2.lnGDP _{it}						1.135 (0.331)			
L1.lnGDP _{jt}			0.572 (0.158)						-0.149 (0.798)
L2.lnGDP _{jt}						1.685 (0.175)			
L1.lnEXG _{jit}			0.023 (0.895)						0.046 (0.824)
L2.lnEXG _{jit}						-0.214 (0.365)			
lnGDP _{it}	0.744 ^c (0.000)	0.690 ^c (0.000)		0.752 ^c (0.000)	0.692 ^c (0.000)		0.829 ^c (0.000)	0.780 ^c (0.000)	
lnGDP _{jt}	0.754 ^c (0.000)	0.699 ^c (0.000)		0.749 ^c (0.000)	0.697 ^c (0.000)		0.798 ^c (0.000)	0.751 ^c (0.000)	
lnPOP _{it}	0.518 ^c (0.001)	0.534 (0.244)	3.812 (0.196)	0.651 ^c (0.000)	0.701 ^a (0.056)	-0.049 (0.994)	0.345 ^b (0.013)	0.363 (0.286)	8.051 (0.207)
lnPOP _{jt}	-0.150 (0.367)	-0.128 (0.473)	1.825 (0.663)	0.056 (0.702)	0.122 (0.360)	-3.507 (0.647)	-0.259 ^b (0.050)	-0.242 ^a (0.067)	4.403 (0.470)
lnDIST _{ij}	omitted	-1.156 ^c (0.000)	2.388 (0.898)	omitted	-1.155 ^c (0.000)	-10.405 (0.681)	omitted	-1.160 ^c (0.000)	-31.891 (0.379)
ROL _{it}	0.163 ^c (0.001)	0.191 (0.160)	0.133 (0.723)	0.185 ^c (0.000)	0.217 (0.130)	0.781 (0.378)	0.091 ^a (0.059)	0.119 (0.412)	0.135 (0.792)

ROL _{jt}	-0.026 (0.565)	0.004 (0.934)	-0.066 (0.875)	-0.013 (0.778)	0.017 (0.721)	0.649 (0.469)	-0.073 (0.112)	-0.046 (0.338)	-0.063 (0.904)
lnGDI _{it}	4.881 ^c (0.000)	4.990 ^c (0.006)	-37.866 ^a (0.076)						
lnGDI _{jt}	2.664 ^c (0.004)	2.819 ^c (0.006)	-35.354 ^a (0.094)						
(rROL*lnGDI) _{it}	-3.517 ^c (0.000)	-3.236 (0.159)	13.921 (0.115)						
(rROL*lnGDI) _{jt}	-1.245 ^a (0.095)	-1.063 ^a (0.097)	17.751 ^a (0.096)						
lnGII _{it}				0.183 ^c (0.000)	0.193 ^a (0.063)	1.392 (0.556)			
lnGII _{jt}				0.148 ^c (0.000)	0.159 ^c (0.001)	1.231 (0.585)			
(rROL*lnGII) _{it}				0.044 ^c (0.005)	0.055 (0.241)	0.045 (0.871)			
(rROL*lnGII) _{jt}				0.017 (0.297)	0.027 ^a (0.080)	0.115 (0.678)			
lnFLA _{it}							0.124 (0.320)	0.167 (0.614)	1.756 (0.592)
lnFLA _{jt}							0.105 (0.570)	0.149 (0.429)	3.822 (0.212)
(rROL*lnFLA) _{it}							0.035 ^c (0.002)	0.030 (0.334)	0.148 (0.157)
(rROL*lnFLA) _{jt}							0.013 (0.174)	0.008 (0.268)	0.089 (0.422)
lnREMOTE _{it}	-1.340 ^c (0.000)	-1.300 ^c (0.001)	5.833 ^a (0.092)	-1.219 ^c (0.000)	-1.187 ^c (0.001)	-3.915 (0.427)	-1.033 ^c (0.000)	-0.998 ^b (0.013)	-1.149 (0.753)
lnREMOTE _{jt}	-0.464 ^c (0.001)	-0.429 ^b (0.015)	5.832 (0.138)	-0.441 ^c (0.001)	-0.403 ^b (0.037)	-4.910 (0.343)	-0.283 ^b (0.026)	-0.247 (0.163)	-1.464 (0.701)
lnEXG _{jit}	0.077 (0.104)	0.077 (0.307)		0.079 ^b (0.050)	0.076 (0.316)		0.098 ^b (0.016)	0.098 (0.200)	
lnDIN _{ijt}	-0.010	0.057 ^c	0.675	-0.011	0.055 ^b	-0.651	-0.012	0.056 ^b	-0.165

lnESIM _{ijt}	(0.296) 0.160 ^c (0.000)	(0.010) -0.063 (0.272)	(0.171) 1.532 (0.287)	(0.212) 0.130 ^c (0.000)	(0.011) -0.067 (0.249)	(0.325) -2.417 (0.347)	(0.193) 0.144 ^c (0.000)	(0.012) -0.066 (0.250)	(0.784) -0.743 (0.563)
RTA _{ijt}	0.032 (0.251)	0.167 ^b (0.019)	0.058 (0.948)	0.041 (0.137)	0.167 ^b (0.019)	-0.360 (0.747)	-0.001 (0.979)	0.156 ^b (0.028)	-0.025 (0.985)
LLOCK _i	omitted	omitted	105.597 (0.232)	omitted	omitted	-83.845 (0.422)	omitted	omitted	-78.656 (0.510)
LLOCK _j	omitted	-2.730 ^c (0.000)	82.682 (0.314)	omitted	-2.508 ^c (0.000)	-107.630 (0.336)	omitted	-2.550 ^c (0.000)	-111.299 (0.387)
COMCOL _{ij}	omitted	0.556 (0.241)	omitted	omitted	0.562 (0.235)	omitted	omitted	0.557 (0.240)	omitted
COMLANG _{ij}	omitted	0.189 ^a (0.084)	156.973 (0.198)	omitted	0.193 ^a (0.080)	-167.977 (0.340)	omitted	0.189 ^a (0.085)	-149.386 (0.434)
CONTIG _{ij}	omitted	0.212 (0.108)	omitted	omitted	0.212 (0.108)	omitted	omitted	0.211 (0.109)	omitted
GEFC _t	-2.299 ^c (0.000)	-2.153 ^c (0.000)	omitted	-1.996 ^c (0.000)	-1.845 ^c (0.001)	omitted	-1.766 ^c (0.000)	-1.639 ^c (0.007)	omitted
COVID _t	-2.901 ^c (0.000)	-2.743 ^c (0.000)	-0.703 ^a (0.065)	-2.354 ^c (0.000)	-2.177 ^c (0.002)	-5.030 (0.392)	-2.189 ^c (0.000)	-2.055 ^c (0.006)	-2.932 (0.643)
Constant	-56.492 ^c (0.000)	-43.861 ^c (0.001)	omitted	-60.298 ^c (0.000)	-48.636 ^c (0.000)	omitted	-49.677 ^c (0.000)	-37.920 ^c (0.001)	54.907 (0.804)
Observations	32,720	32,720	31,160	32,720	32,720	29,520	32,800	32,800	31,160
Groups	1,640	41	1,640	1,640	41	1,640	1,640	41	1,640
Instruments	-	-	77	-	-	73	-	-	80
R-squared	0.482	0.728	-	0.480	0.729	-	0.479	0.726	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dyad-fixed	Y	N	-	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-	N	Y	-
Importer-fixed	N	Y	-	N	Y	-	N	Y	-
Vce clustered	Y	Y	-	Y	Y	-	Y	Y	-
F tests ¹	146.87 ^c	284.97 ^c	-	149.64 ^c	290.04 ^c	-	140.17 ^c	241.16 ^c	-
Hausman tests ² (chi2)	1,012.37 ^c	7,250.82 ^c	-	1,001.38 ^c	2,022.86 ^c	-	1,331.66 ^c	1,467.53 ^c	-
AR(1) (z)	-	-	-3.21 ^c	-	-	-1.67 ^a	-	-	-2.12 ^b

AR(1) (p)	-	-	0.001	-	-	0.096	-	-	0.034
AR(2) (z)	-	-	-0.21	-	-	0.09	-	-	1.14
AR(2) (p)	-	-	0.833	-	-	0.930	-	-	0.253
Hansen test (chi2)	-	-	45.00	-	-	36.09	-	-	47.38
Hansen test (p)	-	-	0.120	-	-	0.242	-	-	0.141

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C3.6: Estimation results of VAC models (aggregated sample)

ln(1 + BIT _{ijt})	GDI			GII			FLA		
	(1) FE-I	(2) FE-II	(3) SGMM-II	(4) FE-I	(5) FE-II	(6) SGMM-II	(7) FE-I	(8) FE-II	(9) SGMM-II
L1.ln(1 + BIT _{ijt})			0.341 ^b (0.024)			0.461 ^c (0.000)			
L2.ln(1 + BIT _{ijt})			0.002 (0.967)			-0.040 (0.348)			-0.081 ^c (0.004)
L1.lnGDP _{it}						-0.565 (0.223)			
L2.lnGDP _{it}			-0.091 (0.565)			0.625 (0.298)			-0.180 (0.196)
L1.lnGDP _{jt}						-0.879 (0.202)			
L2.lnGDP _{jt}			0.059 (0.730)			1.474 ^a (0.085)			0.181 (0.272)
L1.lnEXG _{jit}						0.340 (0.359)			
L2.lnEXG _{jit}			-0.018 (0.897)			-0.323 (0.398)			-0.098 (0.330)
lnGDP _{it}	0.801 ^c (0.000)	0.752 ^c (0.000)		0.813 ^c (0.000)	0.755 ^c (0.000)		0.865 ^c (0.000)	0.732 ^c (0.000)	
lnGDP _{jt}	0.769 ^c (0.000)	0.721 ^c (0.000)		0.759 ^c (0.000)	0.708 ^c (0.000)		0.796 ^c (0.000)	0.923 ^c (0.000)	
lnPOP _{it}	0.391 ^c (0.010)	0.403 (0.396)	0.771 (0.442)	0.548 ^c (0.000)	0.606 (0.106)	7.410 (0.219)	0.268 ^b (0.050)	0.055 (0.287)	6.779 (0.132)
lnPOP _{jt}	-0.175 (0.281)	-0.159 (0.362)	0.437 (0.637)	0.019 (0.897)	0.091 (0.513)	4.373 (0.435)	-0.252 ^a (0.051)	-0.129 ^c (0.000)	3.921 (0.477)
lnDIST _{ij}	omitted	-1.155 ^c (0.000)	-3.414 (0.692)	omitted	-1.154 ^c (0.000)	-32.414 (0.289)	omitted	-1.115 ^c (0.000)	-15.418 (0.545)
VAC _{it}	-0.293 ^c (0.000)	-0.287 ^c (0.007)	0.329 (0.714)	-0.222 ^c (0.000)	-0.214 ^b (0.046)	0.465 (0.587)	-0.289 ^c (0.000)	-0.217 ^c (0.000)	1.184 (0.175)

VAC _{jt}	-0.083 (0.102)	-0.078 (0.132)	0.213 (0.821)	-0.038 (0.443)	-0.031 (0.501)	0.605 (0.491)	-0.078 (0.114)	-0.195 ^c (0.000)	0.980 (0.269)
lnGDI _{it}	4.293 ^c (0.000)	4.337 ^b (0.029)	-41.361 ^c (0.005)						
lnGDI _{jt}	2.220 ^b (0.016)	2.297 ^b (0.026)	-34.688 ^b (0.021)						
(rVAC*lnGDI) _{it}	-2.445 ^b (0.013)	-2.129 (0.432)	-15.401 ^a (0.075)						
(rVAC*lnGDI) _{jt}	1.653 ^b (0.042)	1.936 ^b (0.028)	-15.284 ^a (0.077)						
lnGII _{it}				0.145 ^c (0.001)	0.160 (0.101)	-0.451 (0.756)			
lnGII _{jt}				0.119 ^c (0.004)	0.135 ^c (0.007)	-0.733 (0.638)			
(rVAC*lnGII) _{it}				0.043 ^c (0.000)	0.044 ^a (0.093)	0.031 (0.780)			
(rVAC*lnGII) _{jt}				0.036 ^c (0.001)	0.036 ^c (0.000)	0.016 (0.892)			
lnFLA _{it}							0.114 (0.360)	0.330 ^c (0.000)	-2.430 (0.256)
lnFLA _{jt}							0.089 (0.631)	0.264 ^c (0.000)	-2.014 (0.384)
(rVAC*lnFLA) _{it}							0.004 (0.391)	0.004 (0.619)	-0.005 (0.892)
(rVAC*lnFLA) _{jt}							-0.013 ^b (0.015)	-0.036 ^c (0.000)	0.003 (0.937)
lnREMOTE _{it}	-1.273 ^c (0.000)	-1.222 ^c (0.003)	6.918 ^b (0.026)	-1.167 ^c (0.000)	-1.124 ^c (0.002)	-3.424 (0.478)	-1.002 ^c (0.000)	-0.366 ^c (0.000)	1.237 (0.744)
lnREMOTE _{jt}	-0.427 ^c (0.002)	-0.380 ^b (0.029)	6.730 ^a (0.066)	-0.444 ^c (0.001)	-0.395 ^b (0.038)	-3.981 (0.405)	-0.290 ^b (0.021)	0.756 ^c (0.000)	0.535 (0.889)
lnEXG _{jit}	0.039 (0.424)	0.038 (0.617)		0.051 (0.194)	0.048 (0.491)		0.059 (0.144)	0.016 ^c (0.000)	
lnDIN _{ijt}	-0.013	0.057 ^b	0.597	-0.014	0.055 ^b	-0.531	-0.013	0.045 ^c	0.892 ^a

lnESIM _{ijt}	(0.146) 0.161 ^c (0.000)	(0.011) -0.063 (0.277)	(0.264) 2.220 (0.122)	(0.118) 0.150 ^c (0.000)	(0.011) -0.064 (0.271)	(0.473) -2.150 (0.269)	(0.169) 0.151 ^c (0.000)	(0.000) -0.048 ^c (0.000)	(0.094) -1.334 (0.327)
RTA _{ijt}	0.044 (0.112)	0.170 ^b (0.017)	0.337 (0.684)	0.046 ^a (0.098)	0.168 ^b (0.018)	-0.449 (0.735)	0.021 (0.470)	0.224 ^c (0.000)	0.893 (0.357)
LLOCK _i	omitted	omitted	1.154 (0.877)	omitted	omitted	-106.676 (0.320)	omitted	-0.267 (0.266)	-15.693 (0.867)
LLOCK _j	omitted	-2.464 ^c (0.000)	-0.996 (0.888)	omitted	-2.397 ^c (0.000)	-136.290 (0.261)	omitted	-0.375 ^c (0.000)	-41.490 (0.643)
COMCOL _{ij}	omitted	0.557 (0.240)	-48.526 (0.400)	omitted	0.563 (0.235)	omitted	omitted	1.106 ^c (0.000)	omitted
COMLANG _{ij}	omitted	0.189 ^a (0.084)	-8.770 (0.610)	omitted	0.193 ^a (0.079)	-183.691 (0.318)	omitted	0.342 ^c (0.000)	-34.648 (0.810)
CONTIG _{ij}	omitted	0.213 (0.108)	31.348 (0.814)	omitted	0.211 (0.108)	omitted	omitted	0.195 ^c (0.000)	omitted
GEFC _t	-2.234 ^c (0.000)	-2.072 ^c (0.001)	omitted	-2.034 ^c (0.000)	-1.864 ^c (0.001)	omitted	-1.781 ^c (0.000)	-0.002 (0.889)	omitted
COVID _t	-2.842 ^c (0.000)	-2.661 ^c (0.000)	9.480 ^b (0.027)	-2.424 ^c (0.000)	-2.222 ^c (0.002)	-6.746 (0.342)	-2.228 ^c (0.000)	-0.065 ^c (0.001)	-0.369 (0.289)
Constant	-53.987 ^c (0.000)	-41.380 ^c (0.001)	200.530 ^a (0.085)	-58.782 ^c (0.000)	-47.275 ^c (0.000)	omitted	-48.569 ^c (0.000)	-17.327 ^c (0.000)	omitted
Observations	32,720	32,720	29,520	32,720	32,720	29,520	32,800	32,800	29,520
Groups	1,640	41	1,640	1,640	41	1,640	1,640	41	1,640
Instruments	-	-	85	-	-	74	-	-	77
R-squared	0.483	0.728	-	0.482	0.729	-	0.481	0.668	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	N	Y
Dyad-fixed	Y	N	-	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-	N	N	-
Importer-fixed	N	Y	-	N	Y	-	N	N	-
Vce clustered	Y	Y	-	Y	Y	-	Y	N	-
F tests ¹	147.70 ^c	336.41 ^c	-	144.30 ^c	273.59 ^c	-	136.91 ^c	248.90 ^c	-
Hausman tests ² (chi2)	1,338.37 ^c	622.40 ^c	-	1,092.21 ^c	2,010.31 ^c	-	976.65 ^c	11.76	-
AR(1) (z)	-	-	-3.60 ^c	-	-	-1.93 ^a	-	-	-1.93 ^a

AR(1) (p)	-	-	0.000	-	-	0.054	-	-	0.054
AR(2) (z)	-	-	1.55	-	-	0.55	-	-	-0.53
AR(2) (p)	-	-	0.121	-	-	0.580	-	-	0.597
Hansen test (chi2)	-	-	24.82	-	-	29.01	-	-	42.86
Hansen test (p)	-	-	0.988	-	-	0.465	-	-	0.201

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C3.7: Estimation results of IQ (overall) models (aggregated sample)

ln(1 + BIT _{ijt})	GDI			GII			FLA		
	(1) FE-I	(2) FE-II	(3) SGMM-II	(4) FE-I	(5) FE-II	(6) SGMM-II	(7) FE-I	(8) FE-II	(9) SGMM-II
L1.ln(1 + BIT _{ijt})			0.421 ^c (0.008)			0.625 ^c (0.002)			0.475 ^c (0.001)
L2.ln(1 + BIT _{ijt})						-0.164 (0.229)			
L1.lnGDP _{it}			0.569 (0.536)			-1.417 ^b (0.013)			-0.471 (0.310)
L2.lnGDP _{it}						1.190 ^a (0.095)			
L1.lnGDP _{jt}			0.700 (0.417)			-1.654 ^b (0.028)			-0.363 (0.399)
L2.lnGDP _{jt}						1.972 ^b (0.044)			
L1.lnEXG _{jit}			0.174 (0.312)			0.327 (0.407)			0.154 (0.506)
L2.lnEXG _{jit}						-0.317 (0.455)			
lnGDP _{it}	0.782 ^c (0.000)	0.736 ^c (0.000)		0.811 ^c (0.000)	0.755 ^c (0.000)		0.857 ^c (0.000)	0.813 ^c (0.000)	
lnGDP _{jt}	0.748 ^c (0.000)	0.704 ^c (0.000)		0.758 ^c (0.000)	0.709 ^c (0.000)		0.788 ^c (0.000)	0.746 ^c (0.000)	
lnPOP _{it}	0.443 ^c (0.004)	0.454 (0.360)	1.909 (0.737)	0.576 ^c (0.000)	0.620 ^a (0.079)	8.915 ^a (0.099)	0.248 ^a (0.074)	0.256 (0.471)	3.675 (0.482)
lnPOP _{jt}	-0.164 (0.313)	-0.148 (0.397)	1.735 (0.660)	0.070 (0.628)	0.128 (0.369)	5.675 (0.273)	-0.253 ^b (0.050)	-0.244 ^a (0.062)	1.572 (0.821)
lnDIST _{ij}	omitted	-1.156 ^c (0.000)	16.490 (0.859)	omitted	-1.152 ^c (0.000)	-38.964 (0.190)	omitted	-1.158 ^c (0.000)	-6.355 (0.811)
IQ _{it}	4.190 ^c (0.010)	3.807 (0.331)	0.156 (0.997)	-0.463 ^c (0.000)	-0.477 ^c (0.009)	0.543 (0.176)	4.835 ^c (0.000)	4.942 ^c (0.010)	22.025 (0.561)

IQ _{it}	-4.762 ^c (0.008)	-4.988 ^c (0.008)	7.995 (0.822)	-0.079 (0.117)	-0.102 ^b (0.041)	0.814 ^a (0.063)	0.252 (0.794)	0.319 (0.718)	33.350 (0.424)
lnGDI _{it}	4.399 ^c (0.000)	4.460 ^b (0.015)	-29.419 ^a (0.053)						
lnGDI _{jt}	2.285 ^b (0.013)	2.385 ^b (0.020)	-23.419 (0.108)						
(rIQ*lnGDI) _{it}	-6.089 ^c (0.010)	-5.513 (0.336)	0.095 (0.999)						
(rIQ*lnGDI) _{jt}	6.986 ^c (0.008)	7.331 ^c (0.008)	-11.413 (0.826)						
lnGII _{it}				0.130 ^c (0.003)	0.139 (0.129)	-0.034 (0.975)			
lnGII _{jt}				0.148 ^c (0.000)	0.157 ^c (0.002)	-0.379 (0.761)			
(rIQ*lnGII) _{it}				3.039 ^c (0.000)	3.162 ^c (0.003)	-4.284 ^a (0.077)			
(rIQ*lnGII) _{jt}				0.383 (0.230)	0.550 ^a (0.096)	-5.696 ^b (0.015)			
lnFLA _{it}							0.269 ^b (0.040)	0.323 (0.347)	0.658 (0.772)
lnFLA _{jt}							0.100 (0.612)	0.153 (0.455)	1.783 (0.427)
(rIQ*lnFLA) _{it}							-1.220 ^c (0.000)	-1.245 ^b (0.011)	-5.623 (0.558)
(rIQ*lnFLA) _{jt}							-0.066 (0.786)	-0.082 (0.714)	-8.489 (0.422)
lnREMOTE _{it}	-1.290 ^c (0.000)	-1.255 ^c (0.002)	2.641 (0.328)	-1.262 ^c (0.000)	-1.212 ^c (0.001)	-4.582 (0.403)	-1.050 ^c (0.000)	-1.006 ^b (0.013)	0.780 (0.792)
lnREMOTE _{jt}	-0.423 ^c (0.002)	-0.392 ^b (0.026)	2.331 (0.402)	-0.466 ^c (0.000)	-0.411 ^b (0.035)	-4.896 (0.367)	-0.301 ^b (0.018)	-0.255 (0.152)	0.903 (0.756)
lnEXG _{jit}	0.062 (0.195)	0.062 (0.397)		0.055 (0.166)	0.052 (0.448)		0.073 ^a (0.078)	0.073 (0.313)	
lnDIN _{ijt}	-0.014	0.056 ^b	-0.164	-0.011	0.055 ^c	-0.791	-0.012	0.056 ^b	-0.245

	(0.134)	(0.011)	(0.755)	(0.219)	(0.010)	(0.349)	(0.186)	(0.011)	(0.703)
lnESIM _{ijt}	0.144 ^c	-0.065	-0.080	0.144 ^c	-0.064	-2.142	0.146 ^c	-0.065	0.019
	(0.000)	(0.262)	(0.941)	(0.000)	(0.261)	(0.315)	(0.000)	(0.255)	(0.989)
RTA _{ijt}	0.031	0.167 ^b	-0.025	0.073 ^c	0.176 ^b	-1.144	0.024	0.163 ^b	-0.314
	(0.258)	(0.021)	(0.984)	(0.007)	(0.014)	(0.273)	(0.396)	(0.023)	(0.764)
LLOCK _i	omitted	omitted	8.596	omitted	omitted	-111.352	omitted	omitted	33.326
			(0.793)			(0.365)			(0.716)
LLOCK _j	omitted	-2.674 ^c	1.966	omitted	-2.461 ^c	-146.760	omitted	-2.520 ^c	9.301
		(0.000)	(0.921)		(0.000)	(0.274)		(0.000)	(0.899)
COMCOL _{ij}	omitted	0.557	-45.773	omitted	0.562	omitted	omitted	0.557	omitted
		(0.240)	(0.819)		(0.236)			(0.241)	
COMLANG _{ij}	omitted	0.189 ^a	-44.682	omitted	0.193 ^a	-198.986	omitted	0.189 ^a	53.149
		(0.085)	(0.833)		(0.079)	(0.358)		(0.085)	(0.628)
CONTIG _{ij}	omitted	0.212	383.614	omitted	0.213	omitted	omitted	0.212	omitted
		(0.108)	(0.821)		(0.106)			(0.107)	
GEFC _t	-2.200 ^c	-2.081 ^c	omitted	-2.109 ^c	-1.922 ^c	omitted	-1.789 ^c	-1.646 ^c	omitted
	(0.000)	(0.001)		(0.000)	(0.001)		(0.000)	(0.008)	
COVID _t	-2.792 ^c	-2.663 ^c	3.599	-2.495 ^c	-2.274 ^c	-7.722	-2.223 ^c	-2.065 ^c	1.679
	(0.000)	(0.000)	(0.407)	(0.000)	(0.001)	(0.332)	(0.000)	(0.006)	(0.741)
Constant	-54.456 ^c	-42.248 ^c	-177.583	-61.881 ^c	-49.701 ^c	omitted	-49.497 ^c	-37.488 ^c	omitted
	(0.000)	(0.001)	(0.859)	(0.000)	(0.000)		(0.000)	(0.001)	
Observations	32,720	32,720	31,160	32,720	32,720	29,520	32,800	32,800	31,160
Groups	1,640	41	1,640	1,640	41	1,640	1,640	41	1,640
Instruments	-	-	85	-	-	73	-	-	77
R-squared	0.480	0.727	-	0.485	0.730	-	0.480	0.727	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dyad-fixed	Y	N	-	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-	N	Y	-
Importer-fixed	N	Y	-	N	Y	-	N	Y	-
Vce clustered	Y	Y	-	Y	Y	-	Y	Y	-
F tests ¹	148.24 ^c	326.59 ^c	-	150.58 ^c	287.93 ^c	-	137.73 ^c	223.42 ^c	-
Hausman tests ² (chi2)	856.63 ^c	2,291.01 ^c	-	856.14 ^c	2,950.18 ^c	-	830.13 ^c	1,027.72 ^c	-
AR(1) (z)	-	-	-2.27 ^b	-	-	-2.03 ^b	-	-	-2.53 ^b

AR(1) (p)	-	-	0.023	-	-	0.043	-	-	0.011
AR(2) (z)	-	-	0.72	-	-	0.63	-	-	-0.40
AR(2) (p)	-	-	0.472	-	-	0.527	-	-	0.692
Hansen test (chi2)	-	-	49.80	-	-	28.20	-	-	45.16
Hansen test (p)	-	-	0.221	-	-	0.454	-	-	0.117

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C3.8: Estimation results of high-high COC models

ln(1 + BIT _{ijt})	GDI			GII			FLA		
	(1) FE-I	(2) FE-II	(3) SGMM-II	(4) FE-I	(5) FE-II	(6) SGMM-II	(7) FE-I	(8) FE-II	(9) SGMM-II
L1.ln(1 + BIT _{ijt})						0.457 ^c (0.003)			0.439 ^c (0.006)
L2.ln(1 + BIT _{ijt})			-0.077 ^a (0.053)						
L1.lnGDP _{it}			-0.170 (0.776)			-0.400 (0.351)			-0.117 (0.809)
L2.lnGDP _{it}									
L1.lnGDP _{jt}			0.702 (0.178)			0.305 (0.581)			0.131 (0.796)
L2.lnGDP _{jt}									
L1.lnEXG _{jit}			-0.468 (0.135)			-0.331 (0.307)			-0.136 (0.599)
L2.lnEXG _{jit}									
lnGDP _{it}	0.333 ^c (0.001)	0.255 ^c (0.000)		0.422 ^c (0.000)	0.354 ^c (0.000)		0.389 ^c (0.000)	0.330 ^c (0.000)	
lnGDP _{jt}	0.649 ^c (0.000)	0.588 ^c (0.000)		0.718 ^c (0.000)	0.666 ^c (0.000)		0.671 ^c (0.000)	0.621 ^c (0.000)	
lnPOP _{it}	1.052 ^c (0.000)	1.267 ^c (0.000)	1.166 (0.367)	0.805 ^c (0.000)	0.970 ^c (0.000)	-0.225 (0.854)	0.655 ^c (0.001)	0.869 ^c (0.000)	1.243 (0.257)
lnPOP _{jt}	0.153 (0.454)	0.328 (0.153)	0.647 (0.644)	-0.072 (0.728)	0.053 (0.814)	-0.696 (0.605)	-0.147 (0.408)	0.019 (0.921)	1.474 (0.232)
lnDIST _{ij}	omitted	-0.650 ^c (0.000)	0.884 (0.696)	omitted	-0.648 ^c (0.000)	-1.216 (0.518)	omitted	-0.650 ^c (0.000)	2.014 (0.270)
COC _{it}	-0.061 (0.248)	-0.076 (0.444)	-0.035 (0.951)	-0.063 (0.239)	-0.078 (0.434)	0.237 (0.572)	-0.079 (0.129)	-0.090 (0.357)	0.064 (0.887)

COC _{jt}	0.057 (0.310)	0.058 (0.336)	-0.076 (0.896)	0.053 (0.354)	0.054 (0.357)	0.173 (0.691)	0.040 (0.478)	0.042 (0.471)	0.067 (0.880)
lnGDI _{it}	4.294 ^c (0.002)	4.720 ^c (0.001)	-9.676 (0.260)						
lnGDI _{jt}	2.660 ^a (0.085)	2.964 (0.115)	-5.642 (0.524)						
lnGII _{it}				0.022 (0.702)	0.006 (0.954)	-0.594 ^b (0.047)			
lnGII _{jt}				-0.022 (0.663)	-0.043 (0.426)	-0.459 (0.128)			
lnFLA _{it}							0.594 ^b (0.048)	0.447 (0.311)	-0.696 (0.576)
lnFLA _{jt}							0.624 ^b (0.011)	0.567 ^b (0.048)	0.461 (0.728)
lnREMOTE _{it}	-1.193 ^c (0.000)	-1.160 ^c (0.000)	-0.960 (0.505)	-1.131 ^c (0.000)	-1.057 ^c (0.000)	0.198 (0.865)	-1.115 ^c (0.000)	-1.071 ^c (0.000)	-1.016 (0.465)
lnREMOTE _{jt}	-0.268 (0.151)	-0.296 ^a (0.098)	-0.091 (0.946)	-0.214 (0.285)	-0.201 (0.242)	1.266 (0.354)	-0.228 (0.227)	-0.254 (0.132)	0.218 (0.886)
lnEXG _{jit}	-0.112 (0.302)	-0.107 (0.386)		-0.128 (0.249)	-0.124 (0.378)		-0.119 (0.279)	-0.113 (0.368)	
lnDIN _{ijt}	-0.005 (0.506)	-0.001 (0.980)	-0.369 (0.171)	-0.007 (0.394)	-0.001 (0.969)	-0.328 (0.120)	-0.004 (0.600)	-0.000 (0.994)	-0.505 ^b (0.015)
lnESIM _{ijt}	0.184 ^b (0.033)	-0.101 (0.280)	-1.112 (0.457)	0.237 ^c (0.008)	-0.098 (0.292)	-1.294 (0.388)	0.170 ^a (0.052)	-0.101 (0.281)	-1.149 (0.498)
RTA _{ijt}	0.111 ^c (0.006)	0.534 ^c (0.000)	0.401 (0.454)	0.117 ^c (0.005)	0.541 ^c (0.000)	-0.370 (0.304)	0.107 ^c (0.009)	0.534 ^c (0.000)	-0.307 (0.350)
LLOCK _i	omitted	omitted	-3.503 (0.477)	omitted	omitted	-1.727 (0.704)	omitted	omitted	-6.030 (0.220)
LLOCK _j	omitted	-0.887 ^c (0.001)	0.237 (0.957)	omitted	-0.853 ^c (0.003)	2.361 (0.581)	omitted	-0.968 ^c (0.000)	-4.898 (0.241)
COMCOL _{ij}	omitted	1.686 ^b (0.017)	omitted	omitted	1.686 ^b (0.017)	omitted	omitted	1.688 ^b (0.017)	omitted
COMLANG _{ij}	omitted	0.265 ^b	omitted	omitted	0.264 ^b	omitted	omitted	0.266 ^b	omitted

CONTIG _{ij}	omitted	(0.029) 0.475 ^b	omitted	omitted	(0.029) 0.478 ^b	omitted	omitted	(0.028) 0.475 ^b	omitted
GEFC _t	-1.800 ^c (0.000)	-1.754 ^c (0.000)	omitted	-1.726 ^c (0.000)	-1.597 ^c (0.000)	omitted	-1.705 ^c (0.000)	-1.655 ^c (0.000)	omitted
COVID _t	-2.521 ^c (0.000)	-2.558 ^c (0.000)	omitted	-2.359 ^c (0.000)	-2.308 ^c (0.000)	omitted	-2.329 ^c (0.000)	-2.355 ^c (0.000)	omitted
Constant	-51.165 ^c (0.000)	-48.225 ^c (0.000)	-49.437 (0.544)	-46.143 ^c (0.000)	-41.434 ^c (0.000)	54.121 (0.461)	-45.089 ^c (0.000)	-42.067 ^c (0.000)	-59.650 (0.438)
Observations	8,006	8,006	7,166	8,006	8,006	7,586	8,006	8,006	7,586
Groups	460	22	460	460	22	460	460	22	460
Instruments	-	-	77	-	-	77	-	-	77
R-squared	0.347	0.776	-	0.343	0.775	-	0.346	0.776	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dyad-fixed	Y	N	-	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-	N	Y	-
Importer-fixed	N	Y	-	N	Y	-	N	Y	-
Vce clustered	Y	Y	-	Y	Y	-	Y	Y	-
F tests ¹	138.72 ^c	94.05 ^c	-	143.96 ^c	94.66 ^c	-	140.93 ^c	93.25 ^c	-
Hausman tests ² (chi2)	659.92 ^c	1,068.41 ^c	-	313.22 ^c	1,303.14 ^c	-	366.84 ^c	1,518.17 ^c	-
AR(1) (z)	-	-	-2.65 ^c	-	-	-3.62 ^c	-	-	-4.26 ^c
AR(1) (p)	-	-	0.008	-	-	0.000	-	-	0.000
AR(2) (z)	-	-	-1.26	-	-	-1.08	-	-	-1.58
AR(2) (p)	-	-	0.206	-	-	0.278	-	-	0.113
Hansen test (chi2)	-	-	35.23	-	-	28.61	-	-	32.86
Hansen test (p)	-	-	0.598	-	-	0.837	-	-	0.663

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C3.9: Estimation results of high-high GVE models

ln(1 + BIT _{ijt})	GDI			GII			FLA		
	(1) FE-I	(2) FE-II	(3) SGMM-II	(4) FE-I	(5) FE-II	(6) SGMM-II	(7) FE-I	(8) FE-II	(9) SGMM-II
L1.ln(1 + BIT _{ijt})						0.111 (0.529)			0.144 (0.368)
L2.ln(1 + BIT _{ijt})			-0.073 ^a (0.080)			-0.056 (0.393)			-0.071 (0.193)
L1.lnGDP _{it}			0.076 (0.889)			0.296 (0.534)			0.230 (0.691)
L2.lnGDP _{it}									
L1.lnGDP _{jt}			1.059 ^a (0.067)			1.384 ^c (0.009)			0.824 (0.170)
L2.lnGDP _{jt}									
L1.lnEXG _{jit}			-0.312 (0.445)			-0.419 (0.210)			-0.103 (0.817)
L2.lnEXG _{jit}									
lnGDP _{it}	0.589 ^c (0.000)	0.500 ^c (0.000)		0.646 ^c (0.000)	0.597 ^c (0.000)		0.624 ^c (0.000)	0.561 ^c (0.000)	
lnGDP _{jt}	0.705 ^c (0.000)	0.617 ^c (0.000)		0.748 ^c (0.000)	0.714 ^c (0.000)		0.702 ^c (0.000)	0.634 ^c (0.000)	
lnPOP _{it}	-0.856 ^b (0.020)	-0.110 (0.826)	0.190 (0.971)	-0.825 ^b (0.021)	-0.108 (0.861)	-3.537 (0.381)	-0.877 ^b (0.018)	-0.150 (0.797)	-4.418 (0.330)
lnPOP _{jt}	-0.891 ^c (0.004)	-0.090 (0.779)	-2.256 (0.640)	-1.004 ^c (0.002)	-0.301 (0.338)	-5.050 (0.220)	-0.909 ^c (0.003)	-0.124 (0.695)	-5.673 (0.186)
lnDIST _{ij}	omitted	-0.770 ^c (0.000)	-3.040 (0.897)	omitted	-0.768 ^c (0.000)	0.483 (0.949)	omitted	-0.770 ^c (0.000)	-10.045 (0.872)
GVE _{it}	-0.028 (0.557)	0.007 (0.922)	0.756 ^b (0.026)	0.025 (0.573)	0.087 (0.223)	0.522 (0.131)	0.025 (0.617)	0.088 (0.200)	0.839 ^b (0.014)

GVE _{jt}	0.087 (0.128)	0.089 (0.119)	0.681 ^a (0.052)	0.091 ^b (0.046)	0.116 ^c (0.008)	0.525 (0.139)	0.105 ^b (0.033)	0.139 ^c (0.004)	0.807 ^b (0.035)
lnGDI _{it}	4.791 ^c (0.000)	7.211 ^c (0.000)	-9.739 (0.269)						
lnGDI _{jt}	1.412 (0.352)	4.140 ^a (0.096)	-8.334 (0.348)						
lnGII _{it}				0.024 (0.637)	0.017 (0.857)	-0.463 ^a (0.085)			
lnGII _{jt}				-0.028 (0.525)	-0.059 (0.162)	-0.022 (0.937)			
lnFLA _{it}							0.473 ^a (0.092)	0.669 (0.149)	1.149 (0.505)
lnFLA _{jt}							0.454 ^b (0.044)	0.764 ^a (0.059)	2.441 (0.259)
lnREMOTE _{it}	-1.106 ^c (0.000)	-1.154 ^c (0.000)	-1.135 (0.498)	-1.058 ^c (0.000)	-1.043 ^c (0.003)	-0.488 (0.708)	-1.051 ^c (0.000)	-1.073 ^c (0.002)	-0.104 (0.932)
lnREMOTE _{jt}	-0.147 (0.319)	-0.157 (0.485)	-0.359 (0.795)	-0.108 (0.489)	-0.025 (0.923)	-0.615 (0.609)	-0.149 (0.325)	-0.136 (0.550)	0.227 (0.864)
lnEXG _{jit}	-0.081 (0.392)	-0.050 (0.783)		-0.113 (0.241)	-0.088 (0.639)		-0.100 (0.300)	-0.067 (0.715)	
lnDIN _{ijt}	-0.005 (0.498)	0.015 (0.530)	-0.357 ^a (0.071)	-0.005 (0.506)	0.016 (0.512)	-0.333 ^b (0.024)	-0.003 (0.684)	0.017 (0.488)	-0.232 (0.125)
lnESIM _{ijt}	0.138 ^a (0.099)	-0.071 (0.340)	-1.593 (0.268)	0.190 ^b (0.032)	-0.067 (0.363)	-1.912 ^a (0.095)	0.132 (0.126)	-0.071 (0.343)	-1.217 (0.241)
RTA _{ijt}	0.102 ^c (0.002)	0.394 ^c (0.000)	-0.301 (0.383)	0.101 ^c (0.003)	0.397 ^c (0.000)	-0.528 (0.263)	0.098 ^c (0.004)	0.393 ^c (0.000)	-0.468 (0.290)
LLOCK _i	omitted	omitted	15.535 (0.823)	omitted	omitted	12.886 (0.716)	omitted	omitted	-11.373 (0.946)
LLOCK _j	omitted	-1.673 ^c (0.000)	28.272 (0.772)	omitted	-1.359 ^c (0.002)	22.229 (0.566)	omitted	-1.507 ^c (0.000)	-36.010 (0.877)
COMCOL _{ij}	omitted	0.589 (0.321)	omitted	omitted	0.611 (0.308)	omitted	omitted	0.608 (0.309)	omitted
COMLANG _{ij}	omitted	0.222 ^b	omitted	omitted	0.222 ^b	omitted	omitted	0.223 ^b	omitted

CONTIG _{ij}	omitted	(0.034) 0.372 ^b (0.045)	-126.687 (0.822)	omitted	(0.034) 0.373 ^b (0.045)	omitted	omitted	(0.034) 0.371 ^b (0.046)	4.190 (0.996)
GEFC _t	-1.578 ^c (0.000)	-1.685 ^c (0.001)	omitted	-1.523 ^c (0.000)	-1.495 ^c (0.010)	omitted	-1.553 ^c (0.000)	-1.634 ^c (0.005)	omitted
COVID _t	-2.087 ^c (0.000)	-2.381 ^c (0.000)	omitted	-1.969 ^c (0.000)	-2.075 ^c (0.005)	omitted	-2.015 ^c (0.000)	-2.243 ^c (0.003)	omitted
Constant	-7.667 (0.419)	-22.904 (0.142)	26.163 (0.919)	-8.067 (0.388)	-22.257 (0.208)	85.014 (0.586)	-11.179 (0.254)	-28.731 (0.109)	229.846 (0.697)
Observations	8,014	8,014	7,252	8,014	8,014	7,252	8,014	8,014	7,252
Groups	552	24	552	552	24	552	552	24	552
Instruments	-	-	78	-	-	77	-	-	78
R-squared	0.303	0.785	-	0.298	0.785	-	0.300	0.785	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dyad-fixed	Y	N	-	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-	N	Y	-
Importer-fixed	N	Y	-	N	Y	-	N	Y	-
Vce clustered	Y	Y	-	Y	Y	-	Y	Y	-
F tests ¹	137.24 ^c	98.06 ^c	-	141.08 ^c	104.45 ^c	-	139.95 ^c	101.96 ^c	-
Hausman tests ² (chi2)	560.34 ^c	2,957.60 ^c	-	309.58 ^c	921.46 ^c	-	447.51 ^c	122.18 ^c	-
AR(1) (z)	-	-	-3.33 ^c	-	-	-2.73 ^c	-	-	-2.75 ^c
AR(1) (p)	-	-	0.001	-	-	0.006	-	-	0.006
AR(2) (z)	-	-	-0.61	-	-	-0.41	-	-	0.84
AR(2) (p)	-	-	0.543	-	-	0.681	-	-	0.402
Hansen test (chi2)	-	-	36.71	-	-	32.26	-	-	33.18
Hansen test (p)	-	-	0.575	-	-	0.691	-	-	0.692

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C3.10: Estimation results of high-high POS models

ln(1 + BIT _{ijt})	GDI			GII			FLA		
	(1) FE-I	(2) FE-II	(3) SGMM-II	(4) FE-I	(5) FE-II	(6) SGMM-II	(7) FE-I	(8) FE-II	(9) SGMM-II
L1.ln(1 + BIT _{ijt})									
L2.ln(1 + BIT _{ijt})			0.244 (0.454)			0.047 (0.791)			0.278 (0.207)
L1.lnGDP _{it}			0.311 (0.554)			0.360 (0.381)			0.351 (0.577)
L2.lnGDP _{it}									
L1.lnGDP _{jt}			0.237 (0.606)			0.128 (0.723)			0.177 (0.740)
L2.lnGDP _{jt}									
L1.lnEXG _{jit}			0.154 (0.346)			0.272 (0.155)			0.218 (0.593)
L2.lnEXG _{jit}									
lnGDP _{it}	0.721 ^c (0.000)	0.685 ^c (0.005)		0.664 ^c (0.000)	0.651 ^c (0.001)		0.713 ^c (0.000)	0.698 ^c (0.002)	
lnGDP _{jt}	0.704 ^c (0.000)	0.846 ^c (0.000)		0.635 ^c (0.000)	0.784 ^c (0.000)		0.702 ^c (0.000)	0.860 ^c (0.000)	
lnPOP _{it}	0.521 ^b (0.026)	0.742 (0.170)	-0.215 (0.929)	0.771 ^c (0.001)	0.897 ^c (0.010)	0.910 (0.482)	0.169 (0.386)	0.258 (0.488)	-0.440 (0.859)
lnPOP _{jt}	-0.289 (0.146)	-0.261 (0.303)	-0.579 (0.808)	0.111 (0.604)	0.113 (0.616)	0.565 (0.646)	-0.284 (0.125)	-0.390 (0.112)	-0.882 (0.733)
lnDIST _{ij}	omitted	-1.050 ^c (0.000)	-2.386 (0.683)	omitted	-1.049 ^c (0.000)	1.156 (0.666)	omitted	-1.050 ^c (0.000)	-3.477 (0.479)
POS _{it}	0.331 ^c (0.000)	0.332 ^c (0.009)	-0.372 (0.169)	0.386 ^c (0.000)	0.409 ^c (0.003)	-0.216 (0.346)	0.381 ^c (0.000)	0.399 ^c (0.003)	-0.030 (0.937)

POS _{jt}	0.298 ^c (0.000)	0.333 ^c (0.010)	-0.330 (0.218)	0.282 ^c (0.000)	0.335 ^b (0.014)	-0.132 (0.605)	0.280 ^c (0.000)	0.327 ^b (0.016)	-0.018 (0.952)
lnGDI _{it}	3.381 (0.106)	4.895 ^b (0.027)	-13.019 (0.124)						
lnGDI _{jt}	-1.561 (0.266)	-0.375 (0.807)	-15.259 ^a (0.075)						
lnGII _{it}				0.200 ^c (0.004)	0.190 (0.168)	-1.034 ^b (0.012)			
lnGII _{jt}				0.172 ^c (0.005)	0.188 ^b (0.024)	-0.765 ^a (0.074)			
lnFLA _{it}							1.045 ^c (0.001)	1.307 ^c (0.010)	-3.093 (0.214)
lnFLA _{jt}							0.216 (0.537)	0.563 (0.191)	-1.762 (0.375)
lnREMOTE _{it}	-1.757 ^c (0.000)	-1.923 ^c (0.000)	-0.544 (0.863)	-1.745 ^c (0.000)	-1.879 ^c (0.000)	-1.025 (0.545)	-1.787 ^c (0.000)	-1.953 ^c (0.000)	0.475 (0.811)
lnREMOTE _{jt}	-0.513 ^b (0.021)	-0.794 ^c (0.004)	0.369 (0.917)	-0.543 ^b (0.015)	-0.807 ^c (0.006)	-0.271 (0.867)	-0.514 ^b (0.019)	-0.807 ^c (0.005)	1.988 (0.536)
lnEXG _{jit}	0.056 (0.566)	-0.014 (0.934)		-0.024 (0.808)	-0.094 (0.552)		-0.046 (0.646)	-0.121 (0.441)	
lnDIN _{ijt}	-0.019 ^a (0.094)	-0.096 ^b (0.020)	-0.373 ^b (0.017)	-0.019 ^a (0.074)	-0.097 ^b (0.018)	-0.279 ^b (0.044)	-0.017 (0.114)	-0.097 ^b (0.020)	-0.275 (0.112)
lnESIM _{ijt}	0.302 ^b (0.017)	-0.047 (0.674)	0.676 (0.630)	0.311 ^b (0.011)	-0.047 (0.678)	-0.322 (0.701)	0.263 ^b (0.033)	-0.050 (0.658)	0.105 (0.924)
RTA _{ijt}	0.047 (0.293)	0.333 ^c (0.002)	0.530 (0.146)	0.040 (0.379)	0.333 ^c (0.002)	0.122 (0.681)	0.046 (0.288)	0.333 ^c (0.002)	0.186 (0.552)
LLOCK _i	omitted	omitted	2.113 (0.582)	omitted	omitted	5.579 ^a (0.097)	omitted	omitted	1.566 (0.629)
LLOCK _j	omitted	-2.250 ^c (0.000)	-2.042 (0.721)	omitted	-2.134 ^c (0.000)	0.859 (0.774)	omitted	-2.236 ^c (0.000)	-3.720 (0.596)
COMCOL _{ij}	omitted	1.413 ^b (0.045)	omitted	omitted	1.411 ^b (0.046)	omitted	omitted	1.415 ^b (0.045)	omitted
COMLANG _{ij}	omitted	0.023	7.117	omitted	0.022	omitted	omitted	0.021	8.594

CONTIG _{ij}	omitted	(0.858) 0.435 ^b (0.050)	(0.714) omitted	omitted	(0.864) 0.438 ^b (0.049)	omitted	omitted	(0.869) 0.437 ^b (0.049)	(0.697) omitted
GEFC _t	-2.674 ^c (0.000)	-3.243 ^c (0.000)	omitted	-2.507 ^c (0.000)	-3.012 ^c (0.000)	omitted	-2.705 ^c (0.000)	-3.306 ^c (0.000)	omitted
COVID _t	-3.329 ^c (0.000)	-4.095 ^c (0.000)	omitted	-2.911 ^c (0.000)	-3.574 ^c (0.000)	omitted	-3.377 ^c (0.000)	-4.174 ^c (0.000)	omitted
Constant	-58.569 ^c (0.000)	-62.122 ^c (0.000)	28.700 (0.894)	-65.435 ^c (0.000)	-67.244 ^c (0.000)	-54.018 (0.582)	-58.178 ^c (0.000)	-60.944 ^c (0.000)	102.539 (0.567)
Observations	8,046	8,046	7,074	8,046	8,046	7,074	8,046	8,046	7,074
Groups	714	28	704	714	28	704	714	28	704
Instruments	-	-	79	-	-	76	-	-	79
R-squared	0.469	0.749	-	0.474	0.749	-	0.471	0.749	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dyad-fixed	Y	N	-	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-	N	Y	-
Importer-fixed	N	Y	-	N	Y	-	N	Y	-
Vce clustered	Y	Y	-	Y	Y	-	Y	Y	-
F tests ¹	118.65 ^c	87.10 ^c	-	121.67 ^c	88.09 ^c	-	120.12 ^c	90.31 ^c	-
Hausman tests ² (chi2)	519.15 ^c	434.66 ^c	-	449.14 ^c	208.18 ^c	-	540.58 ^c	2,030.63 ^c	-
AR(1) (z)	-	-	-3.00 ^c	-	-	-2.67 ^c	-	-	-2.99 ^c
AR(1) (p)	-	-	0.003	-	-	0.008	-	-	0.003
AR(2) (z)	-	-	-1.15	-	-	-0.70	-	-	-1.57
AR(2) (p)	-	-	0.248	-	-	0.487	-	-	0.116
Hansen test (chi2)	-	-	29.46	-	-	28.45	-	-	35.28
Hansen test (p)	-	-	0.890	-	-	0.842	-	-	0.683

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C3.11: Estimation results of high-high REQ models

ln(1 + BIT _{ijt})	GDI			GII			FLA		
	(1) FE-I	(2) FE-II	(3) SGMM-II	(4) FE-I	(5) FE-II	(6) SGMM-II	(7) FE-I	(8) FE-II	(9) SGMM-II
L1.ln(1 + BIT _{ijt})			0.587 ^c (0.002)			0.512 ^b (0.032)			0.461 ^c (0.010)
L2.ln(1 + BIT _{ijt})									
L1.lnGDP _{it}			0.162 (0.768)			0.382 (0.329)			0.506 (0.254)
L2.lnGDP _{it}									
L1.lnGDP _{jt}			0.085 (0.880)			0.585 (0.227)			0.626 (0.238)
L2.lnGDP _{jt}									
L1.lnEXG _{jit}			0.212 (0.490)			0.071 (0.767)			0.149 (0.697)
L2.lnEXG _{jit}									
lnGDP _{it}	0.518 ^c (0.000)	0.603 ^c (0.000)		0.576 ^c (0.000)	0.653 ^c (0.000)		0.616 ^c (0.000)	0.700 ^c (0.000)	
lnGDP _{jt}	0.694 ^c (0.000)	0.631 ^c (0.000)		0.807 ^c (0.000)	0.749 ^c (0.000)		0.745 ^c (0.000)	0.695 ^c (0.000)	
lnPOP _{it}	0.542 ^a (0.054)	1.054 ^a (0.074)	5.439 (0.203)	0.655 ^b (0.019)	1.147 ^a (0.052)	0.393 (0.792)	0.237 (0.396)	0.818 (0.162)	0.323 (0.761)
lnPOP _{jt}	-0.270 (0.243)	-0.019 (0.929)	4.551 (0.263)	-0.585 ^c (0.010)	-0.388 ^a (0.081)	0.006 (0.997)	-0.577 ^c (0.004)	-0.280 (0.156)	-0.160 (0.889)
lnDIST _{ij}	omitted	-0.803 ^c (0.000)	-22.786 (0.159)	omitted	-0.801 ^c (0.000)	-6.691 (0.544)	omitted	-0.801 ^c (0.000)	-4.384 (0.549)
REQ _{it}	-0.083 (0.182)	-0.140 (0.214)	-0.153 (0.684)	-0.067 (0.252)	-0.124 (0.207)	-0.015 (0.964)	-0.086 (0.165)	-0.142 (0.211)	-0.065 (0.855)

lxx

REQ _{it}	0.066 (0.379)	0.007 (0.941)	-0.415 (0.271)	0.060 (0.422)	-0.003 (0.977)	-0.306 (0.323)	0.063 (0.406)	0.005 (0.958)	-0.370 (0.297)
lnGDI _{it}	5.047 ^c (0.001)	4.176 ^a (0.094)	-5.101 (0.640)						
lnGDI _{jt}	4.255 ^b (0.019)	3.986 (0.119)	3.400 (0.735)						
lnGII _{it}				0.165 ^c (0.006)	0.140 (0.166)	-0.273 (0.561)			
lnGII _{jt}				-0.038 (0.440)	-0.065 (0.235)	-0.040 (0.942)			
lnFLA _{it}							0.272 (0.414)	0.036 (0.945)	-1.234 (0.640)
lnFLA _{jt}							0.635 ^b (0.016)	0.366 (0.285)	-1.181 (0.723)
lnREMOTE _{it}	-1.341 ^c (0.000)	-0.690 ^b (0.017)	-1.686 (0.230)	-1.372 ^c (0.000)	-0.698 ^b (0.035)	-1.071 (0.316)	-1.274 ^c (0.000)	-0.619 ^a (0.054)	-1.008 (0.328)
lnREMOTE _{jt}	-0.197 (0.227)	0.332 (0.281)	-0.506 (0.721)	-0.129 (0.445)	0.438 (0.149)	-0.040 (0.973)	-0.169 (0.312)	0.378 (0.216)	0.429 (0.687)
lnEXG _{jit}	-0.152 (0.177)	-0.054 (0.678)		-0.183 (0.113)	-0.084 (0.569)		-0.141 (0.222)	-0.042 (0.771)	
lnDIN _{ijt}	-0.006 (0.479)	0.034 (0.305)	-0.270 (0.111)	-0.008 (0.327)	0.034 (0.302)	-0.270 ^b (0.043)	-0.006 (0.481)	0.035 (0.300)	-0.300 ^a (0.071)
lnESIM _{ijt}	0.172 ^a (0.059)	-0.059 (0.462)	-4.659 ^b (0.039)	0.251 ^c (0.009)	-0.056 (0.480)	-3.690 ^a (0.069)	0.199 ^b (0.029)	-0.057 (0.480)	-3.494 ^a (0.084)
RTA _{ijt}	0.079 ^b (0.032)	0.348 ^c (0.001)	-0.189 (0.524)	0.085 ^b (0.021)	0.354 ^c (0.001)	-0.077 (0.820)	0.081 ^b (0.029)	0.353 ^c (0.001)	-0.052 (0.839)
LLOCK _i	omitted	omitted	7.322 (0.434)	omitted	omitted	-0.314 (0.922)	omitted	omitted	-0.135 (0.961)
LLOCK _j	omitted	-2.489 ^c (0.000)	2.785 (0.828)	omitted	-2.156 ^c (0.000)	-1.238 (0.768)	omitted	-2.336 ^c (0.000)	-1.934 (0.504)
COMCOL _{ij}	omitted	1.385 ^a (0.055)	omitted	omitted	1.370 ^a (0.060)	194.593 (0.462)	omitted	1.371 ^a (0.058)	209.984 (0.421)
COMLANG _{ij}	omitted	0.280 ^c	31.010	omitted	0.279 ^c	-0.533	omitted	0.280 ^c	-1.977

CONTIG _{ij}	omitted	(0.010) 0.416 ^b (0.015)	(0.507) -248.376 (0.160)	omitted	(0.010) 0.419 ^b (0.014)	(0.974) -69.844 (0.411)	omitted	(0.010) 0.418 ^b (0.014)	(0.874) -52.167 (0.358)
GEFC _t	-1.948 ^c (0.000)	-0.684 (0.202)	omitted	-1.942 ^c (0.000)	-0.616 (0.257)	omitted	-1.914 ^c (0.000)	-0.620 (0.271)	omitted
COVID _t	-2.653 ^c (0.000)	-1.181 ^a (0.070)	omitted	-2.514 ^c (0.000)	-0.997 (0.128)	omitted	-2.538 ^c (0.000)	-1.036 (0.130)	omitted
Constant	-42.757 ^c (0.000)	-33.734 ^c (0.002)	omitted	-43.400 ^c (0.000)	-32.799 ^c (0.005)	16.966 (0.808)	-39.104 ^c (0.000)	-30.309 ^c (0.008)	15.495 (0.811)
Observations	8,038	8,038	7,618	8,038	8,038	7,618	8,038	8,038	7,618
Groups	672	27	666	672	27	666	672	27	666
Instruments	-	-	78	-	-	85	-	-	85
R-squared	0.369	0.795	-	0.367	0.794	-	0.366	0.794	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dyad-fixed	Y	N	-	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-	N	Y	-
Importer-fixed	N	Y	-	N	Y	-	N	Y	-
Vce clustered	Y	Y	-	Y	Y	-	Y	Y	-
F tests ¹	98.76 ^c	80.80 ^c	-	99.77 ^c	85.97 ^c	-	97.65 ^c	80.33 ^c	-
Hausman tests ² (chi2)	805.91 ^c	537.81 ^c	-	336.33 ^c	10,203.10 ^c	-	370.63 ^c	498.22 ^c	-
AR(1) (z)	-	-	-1.73 ^a	-	-	-2.11 ^b	-	-	-2.36 ^b
AR(1) (p)	-	-	0.083	-	-	0.034	-	-	0.018
AR(2) (z)	-	-	-0.51	-	-	-1.21	-	-	-1.32
AR(2) (p)	-	-	0.610	-	-	0.226	-	-	0.187
Hansen test (chi2)	-	-	22.31	-	-	29.03	-	-	32.31
Hansen test (p)	-	-	0.980	-	-	0.969	-	-	0.922

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C3.12: Estimation results of high-high ROL models

ln(1 + BIT _{ijt})	GDI			GII			FLA		
	(1) FE-I	(2) FE-II	(3) SGMM-II	(4) FE-I	(5) FE-II	(6) SGMM-II	(7) FE-I	(8) FE-II	(9) SGMM-II
L1.ln(1 + BIT _{ijt})			0.277 (0.213)						0.140 (0.538)
L2.ln(1 + BIT _{ijt})			0.005 (0.934)			-0.054 ^a (0.090)			-0.041 (0.454)
L1.lnGDP _{it}			-0.197 (0.649)			-0.101 (0.827)			-0.167 (0.685)
L2.lnGDP _{it}									
L1.lnGDP _{jt}			0.372 (0.419)			0.722 ^a (0.057)			0.127 (0.759)
L2.lnGDP _{jt}									
L1.lnEXG _{jit}			-0.106 (0.745)			-0.264 (0.374)			0.037 (0.917)
L2.lnEXG _{jit}									
lnGDP _{it}	0.561 ^c (0.000)	0.407 ^c (0.004)		0.643 ^c (0.000)	0.515 ^c (0.000)		0.623 ^c (0.000)	0.475 ^c (0.002)	
lnGDP _{jt}	0.731 ^c (0.000)	0.771 ^c (0.000)		0.807 ^c (0.000)	0.857 ^c (0.000)		0.760 ^c (0.000)	0.806 ^c (0.000)	
lnPOP _{it}	-1.010 ^c (0.009)	-0.342 (0.490)	4.728 (0.203)	-1.021 ^c (0.008)	-0.466 (0.398)	3.921 (0.170)	-1.156 ^c (0.003)	-0.511 (0.377)	2.396 (0.469)
lnPOP _{jt}	-1.046 ^c (0.003)	-0.708 ^c (0.010)	2.037 (0.571)	-1.234 ^c (0.000)	-0.965 ^c (0.000)	2.290 (0.436)	-1.139 ^c (0.001)	-0.811 ^c (0.001)	-0.125 (0.966)
lnDIST _{ij}	omitted	-0.760 ^c (0.000)	2.254 (0.844)	omitted	-0.757 ^c (0.000)	2.594 (0.815)	omitted	-0.758 ^c (0.000)	-1.511 (0.909)
ROL _{it}	0.066 (0.413)	0.055 (0.708)	-0.082 (0.843)	0.111 (0.169)	0.106 (0.484)	-0.250 (0.600)	0.088 (0.298)	0.083 (0.586)	0.163 (0.651)

ROL _{jt}	0.171 (0.195)	0.151 (0.280)	-0.328 (0.439)	0.181 (0.142)	0.160 (0.209)	-0.395 (0.377)	0.179 (0.158)	0.163 (0.231)	-0.180 (0.631)
lnGDI _{it}	5.835 ^c (0.000)	6.824 ^c (0.000)	-11.984 (0.244)						
lnGDI _{jt}	3.484 ^a (0.071)	3.545 (0.145)	-0.233 (0.981)						
lnGII _{it}				0.062 (0.256)	0.022 (0.825)	-1.087 ^a (0.076)			
lnGII _{jt}				-0.030 (0.524)	-0.062 (0.198)	-0.405 (0.500)			
lnFLA _{it}							0.444 (0.155)	0.582 (0.295)	0.674 (0.765)
lnFLA _{jt}							0.437 ^a (0.093)	0.435 (0.124)	2.864 (0.214)
lnREMOTE _{it}	-1.100 ^c (0.000)	-1.177 ^c (0.000)	-1.821 (0.125)	-1.091 ^c (0.000)	-1.098 ^c (0.002)	-1.394 (0.228)	-1.039 ^c (0.000)	-1.098 ^c (0.002)	-1.687 (0.104)
lnREMOTE _{jt}	-0.131 (0.408)	-0.461 ^b (0.049)	-1.345 (0.297)	-0.083 (0.631)	-0.363 (0.114)	-1.030 (0.396)	-0.105 (0.531)	-0.424 ^a (0.072)	-0.542 (0.644)
lnEXG _{jit}	-0.115 (0.264)	-0.227 ^b (0.029)		-0.138 (0.194)	-0.252 ^b (0.038)		-0.124 (0.245)	-0.243 ^a (0.060)	
lnDIN _{ijt}	-0.010 (0.221)	0.016 (0.515)	-0.323 ^a (0.055)	-0.011 (0.195)	0.017 (0.502)	-0.186 ^a (0.072)	-0.009 (0.299)	0.017 (0.492)	-0.216 ^a (0.072)
lnESIM _{ijt}	0.120 (0.156)	0.001 (0.992)	-2.075 ^b (0.043)	0.195 ^b (0.028)	0.004 (0.953)	-2.254 ^b (0.016)	0.142 (0.100)	0.002 (0.981)	-1.712 ^b (0.042)
RTA _{ijt}	0.077 ^b (0.018)	0.393 ^c (0.000)	-0.168 (0.474)	0.086 ^c (0.008)	0.402 ^c (0.000)	-0.249 (0.469)	0.084 ^c (0.009)	0.398 ^c (0.000)	0.002 (0.990)
LLOCK _i	omitted	omitted	-5.015 (0.893)	omitted	omitted	10.837 (0.778)	omitted	omitted	-7.749 (0.860)
LLOCK _j	omitted	-2.733 ^c (0.000)	-2.503 (0.960)	omitted	-2.657 ^c (0.000)	-1.815 (0.967)	omitted	-2.628 ^c (0.000)	-10.398 (0.850)
COMCOL _{ij}	omitted	omitted	omitted	omitted	omitted	omitted	omitted	omitted	omitted
COMLANG _{ij}	omitted	0.308 ^c	omitted	omitted	0.306 ^c	omitted	omitted	0.308 ^c	omitted

CONTIG _{ij}	omitted	(0.006) 0.404 ^b (0.023)	omitted	omitted	(0.006) 0.409 ^b (0.022)	omitted	omitted	(0.006) 0.406 ^b (0.023)	omitted
GEFC _t	-1.569 ^c (0.000)	-2.075 ^c (0.000)	omitted	-1.565 ^c (0.000)	-1.959 ^c (0.001)	omitted	-1.528 ^c (0.000)	-2.007 ^c (0.001)	omitted
COVID _t	-2.024 ^c (0.000)	-2.751 ^c (0.000)	omitted	-1.938 ^c (0.000)	-2.555 ^c (0.001)	omitted	-1.917 ^c (0.000)	-2.604 ^c (0.001)	omitted
Constant	-2.314 (0.803)	-14.468 (0.293)	-169.766 (0.313)	-2.698 (0.773)	-11.560 (0.406)	-168.756 (0.269)	-3.421 (0.719)	-15.661 (0.304)	-56.674 (0.724)
Observations	8,006	8,006	7,246	8,006	8,006	7,246	8,006	8,006	7,246
Groups	462	22	462	462	22	462	462	22	462
Instruments	-	-	77	-	-	77	-	-	77
R-squared	0.315	0.796	-	0.308	0.796	-	0.310	0.796	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dyad-fixed	Y	N	-	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-	N	Y	-
Importer-fixed	N	Y	-	N	Y	-	N	Y	-
Vce clustered	Y	Y	-	Y	Y	-	Y	Y	-
F tests ¹	153.73 ^c	117.76 ^c	-	153.44 ^c	125.80 ^c	-	154.36 ^c	123.57 ^c	-
Hausman tests ² (chi2)	308.14 ^c	9,756.96 ^c	-	429.79 ^c	120.83 ^c	-	540.13 ^c	551.56 ^c	-
AR(1) (z)	-	-	-2.52 ^b	-	-	-1.83 ^a	-	-	-1.74 ^a
AR(1) (p)	-	-	0.012	-	-	0.067	-	-	0.081
AR(2) (z)	-	-	-1.60	-	-	0.57	-	-	-1.34
AR(2) (p)	-	-	0.109	-	-	0.568	-	-	0.181
Hansen test (chi2)	-	-	30.62	-	-	29.85	-	-	34.61
Hansen test (p)	-	-	0.797	-	-	0.854	-	-	0.627

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C3.13: Estimation results of high-high VAC models

ln(1 + BIT _{ijt})	GDI			GII			FLA		
	(1) FE-I	(2) FE-II	(3) SGMM-II	(4) FE-I	(5) FE-II	(6) SGMM-II	(7) FE-I	(8) FE-II	(9) SGMM-II
L1.ln(1 + BIT _{ijt})			0.509 ^c (0.008)			0.400 ^b (0.045)			0.298 (0.118)
L2.ln(1 + BIT _{ijt})									-0.026 (0.511)
L1.lnGDP _{it}			-0.066 (0.814)			-0.231 (0.444)			-0.133 (0.569)
L2.lnGDP _{it}									
L1.lnGDP _{jt}			-0.057 (0.833)			-0.190 (0.513)			-0.001 (0.997)
L2.lnGDP _{jt}									
L1.lnEXG _{jit}			-0.090 (0.584)			-0.122 (0.466)			-0.099 (0.494)
L2.lnEXG _{jit}									
lnGDP _{it}	0.712 ^c (0.000)	0.715 ^c (0.000)		0.768 ^c (0.000)	0.777 ^c (0.000)		0.803 ^c (0.000)	0.801 ^c (0.000)	
lnGDP _{jt}	0.865 ^c (0.000)	0.817 ^c (0.000)		0.959 ^c (0.000)	0.907 ^c (0.000)		0.931 ^c (0.000)	0.881 ^c (0.000)	
lnPOP _{it}	-2.235 ^c (0.000)	-1.707 ^b (0.028)	2.150 (0.272)	-2.396 ^c (0.000)	-1.922 ^c (0.008)	3.594 (0.147)	-2.596 ^c (0.000)	-2.014 ^c (0.008)	1.006 (0.604)
lnPOP _{jt}	-1.280 ^c (0.000)	-0.908 ^b (0.037)	2.770 (0.192)	-1.609 ^c (0.000)	-1.243 ^c (0.002)	4.880 (0.104)	-1.580 ^c (0.000)	-1.178 ^c (0.002)	1.110 (0.502)
lnDIST _{ij}	omitted	-0.800 ^c (0.000)	1.711 (0.390)	omitted	-0.796 ^c (0.000)	2.818 (0.306)	omitted	-0.796 ^c (0.000)	1.393 (0.815)
VAC _{it}	-0.310 ^c (0.001)	-0.295 ^a (0.099)	-0.598 (0.276)	-0.318 ^c (0.001)	-0.313 (0.101)	-0.591 (0.268)	-0.345 ^c (0.000)	-0.331 ^a (0.087)	-0.797 ^a (0.093)

VAC _{jt}	0.267 ^c (0.001)	0.250 ^c (0.006)	0.045 (0.933)	0.226 ^c (0.006)	0.209 ^b (0.013)	0.152 (0.764)	0.246 ^c (0.002)	0.228 ^b (0.014)	-0.292 (0.503)
lnGDI _{it}	5.891 ^c (0.000)	4.859 ^b (0.043)	-4.549 (0.501)						
lnGDI _{jt}	4.850 ^b (0.012)	4.193 ^a (0.098)	-3.541 (0.577)						
lnGII _{it}				0.106 ^b (0.020)	0.050 (0.581)	0.121 (0.657)			
lnGII _{jt}				-0.018 (0.697)	-0.036 (0.480)	0.248 (0.430)			
lnFLA _{it}							0.126 (0.666)	-0.038 (0.948)	-2.060 (0.171)
lnFLA _{jt}							0.264 (0.226)	0.148 (0.486)	-2.256 ^a (0.099)
lnREMOTE _{it}	-1.115 ^c (0.000)	-1.067 ^c (0.003)	-0.663 (0.224)	-1.246 ^c (0.000)	-1.123 ^c (0.002)	-0.733 (0.170)	-1.143 ^c (0.000)	-1.077 ^c (0.003)	-0.179 (0.794)
lnREMOTE _{jt}	0.166 (0.250)	0.194 (0.373)	0.390 (0.544)	0.145 (0.365)	0.214 (0.344)	0.402 (0.525)	0.135 (0.380)	0.181 (0.403)	1.134 ^a (0.100)
lnEXG _{jit}	-0.153 (0.129)	-0.107 (0.261)		-0.178 ^a (0.091)	-0.124 (0.274)		-0.153 (0.141)	-0.105 (0.369)	
lnDIN _{ijt}	-0.024 ^b (0.012)	0.013 (0.731)	-0.083 (0.485)	-0.025 ^c (0.008)	0.013 (0.733)	-0.089 (0.435)	-0.025 ^c (0.010)	0.013 (0.732)	-0.060 (0.570)
lnESIM _{ijt}	0.081 (0.354)	0.008 (0.914)	-0.426 (0.616)	0.145 (0.111)	0.011 (0.889)	-0.560 (0.452)	0.127 (0.159)	0.010 (0.892)	-0.376 (0.608)
RTA _{ijt}	0.115 ^c (0.005)	0.339 ^c (0.005)	-0.067 (0.712)	0.138 ^c (0.001)	0.351 ^c (0.003)	-0.038 (0.844)	0.135 ^c (0.001)	0.350 ^c (0.004)	0.161 (0.284)
LLOCK _i	omitted	omitted	-3.819 (0.458)	omitted	omitted	-5.449 (0.526)	omitted	omitted	-1.799 (0.716)
LLOCK _j	omitted	-2.064 ^c (0.006)	-3.657 (0.542)	omitted	-2.057 ^c (0.008)	-3.687 (0.700)	omitted	-1.971 ^b (0.014)	-0.832 (0.896)
COMCOL _{ij}	omitted	omitted	omitted	omitted	omitted	omitted	omitted	omitted	omitted
COMLANG _{ij}	omitted	0.285 ^c	omitted	omitted	0.285 ^c	omitted	omitted	0.285 ^c	-39.245

CONTIG _{ij}	omitted	(0.010) 0.443 ^c (0.002)	omitted	omitted	(0.010) 0.446 ^c (0.002)	omitted	omitted	(0.010) 0.446 ^c (0.002)	(0.722) omitted
GEFC _t	-1.298 ^c (0.000)	-1.262 ^b (0.022)	omitted	-1.485 ^c (0.000)	-1.336 ^b (0.014)	omitted	-1.417 ^c (0.000)	-1.327 ^b (0.015)	omitted
COVID _t	-1.615 ^c (0.000)	-1.642 ^b (0.018)	omitted	-1.728 ^c (0.000)	-1.660 ^b (0.015)	omitted	-1.690 ^c (0.000)	-1.657 ^b (0.015)	-0.091 (0.553)
Constant	18.744 ^b (0.035)	12.276 (0.392)	-87.214 (0.244)	20.931 ^b (0.017)	16.724 (0.221)	-145.473 (0.118)	23.098 ^c (0.009)	16.933 (0.225)	6.390 (0.937)
Observations	8,056	8,056	7,550	8,056	8,056	7,550	8,056	8,056	7,044
Groups	506	23	506	506	23	506	506	23	506
Instruments	-	-	77	-	-	77	-	-	78
R-squared	0.437	0.806	-	0.432	0.806	-	0.431	0.806	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dyad-fixed	Y	N	-	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-	N	Y	-
Importer-fixed	N	Y	-	N	Y	-	N	Y	-
Vce clustered	Y	Y	-	Y	Y	-	Y	Y	-
F tests ¹	127.64 ^c	60.72 ^c	-	128.42 ^c	64.76 ^c	-	126.77 ^c	56.87 ^c	-
Hausman tests ² (chi2)	887.63 ^c	357.55 ^c	-	597.70 ^c	459.10 ^c	-	721.65 ^c	2,119.24 ^c	-
AR(1) (z)	-	-	-2.95 ^c	-	-	-2.24 ^b	-	-	-2.25 ^b
AR(1) (p)	-	-	0.003	-	-	0.025	-	-	0.025
AR(2) (z)	-	-	-1.08	-	-	-1.07	-	-	-1.12
AR(2) (p)	-	-	0.282	-	-	0.285	-	-	0.264
Hansen test (chi2)	-	-	43.83	-	-	43.47	-	-	50.60
Hansen test (p)	-	-	0.238	-	-	0.250	-	-	0.101

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C3.14: Estimation results of high-high overall IQ models

ln(1 + BIT _{ijt})	GDI			GII			FLA		
	(1) FE-I	(2) FE-II	(3) SGMM-II	(4) FE-I	(5) FE-II	(6) SGMM-II	(7) FE-I	(8) FE-II	(9) SGMM-II
L1.ln(1 + BIT _{ijt})			0.327 ^b (0.049)			0.242 (0.161)			0.323 ^a (0.059)
L2.ln(1 + BIT _{ijt})									
L1.lnGDP _{it}									
L2.lnGDP _{it}			0.169 (0.332)			0.122 (0.486)			0.118 (0.551)
L1.lnGDP _{jt}									
L2.lnGDP _{jt}			-0.511 ^b (0.012)			-0.432 ^b (0.022)			-0.490 ^b (0.012)
L1.lnEXG _{jit}									
L2.lnEXG _{jit}			0.493 ^b (0.016)			0.489 ^c (0.007)			0.477 ^b (0.017)
lnGDP _{it}	0.673 ^c (0.000)	0.617 ^b (0.013)		0.729 ^c (0.000)	0.674 ^c (0.005)		0.699 ^c (0.000)	0.631 ^c (0.004)	
lnGDP _{jt}	0.479 ^c (0.000)	0.487 ^c (0.004)		0.598 ^c (0.000)	0.642 ^c (0.000)		0.515 ^c (0.000)	0.516 ^c (0.003)	
lnPOP _{it}	-1.177 ^c (0.009)	-0.875 (0.137)	1.040 (0.637)	-1.356 ^c (0.003)	-1.119 ^b (0.046)	1.527 (0.395)	-1.377 ^c (0.002)	-1.006 ^a (0.067)	1.531 (0.450)
lnPOP _{jt}	-0.351 (0.545)	0.107 (0.868)	2.723 (0.285)	-0.846 (0.116)	-0.661 (0.235)	3.563 (0.139)	-0.623 (0.264)	-0.182 (0.756)	3.489 (0.139)
lnDIST _{ij}	omitted	-0.792 ^c (0.000)	-5.247 (0.584)	omitted	-0.777 ^c (0.000)	-8.458 (0.339)	omitted	-0.784 ^c (0.000)	-7.177 (0.477)
lnGDI _{it}	6.560 ^c (0.000)	5.613 ^b (0.012)	-2.766 (0.674)						

lnGDI _{jt}	8.201 ^c (0.000)	9.447 ^b (0.014)	-7.401 (0.224)						
lnGII _{it}				0.084 (0.224)	0.063 (0.425)	-0.146 (0.609)			
lnGII _{jt}				-0.028 (0.648)	-0.088 (0.158)	-0.363 (0.223)			
lnFLA _{it}							1.044 ^c (0.007)	1.116 ^b (0.036)	0.908 (0.664)
lnFLA _{jt}							1.153 ^c (0.004)	1.414 ^b (0.032)	-0.990 (0.689)
lnREMOTE _{it}	-1.212 ^c (0.003)	-1.270 ^c (0.000)	-0.877 (0.295)	-1.356 ^c (0.001)	-1.373 ^c (0.000)	-1.286 (0.168)	-1.246 ^c (0.003)	-1.292 ^c (0.000)	-0.818 (0.350)
lnREMOTE _{jt}	0.089 (0.609)	0.065 (0.840)	0.834 (0.205)	0.059 (0.752)	0.113 (0.728)	0.939 (0.156)	0.046 (0.807)	0.028 (0.931)	0.857 (0.246)
lnEXG _{jit}	-0.084 (0.534)	-0.183 (0.171)		-0.086 (0.539)	-0.174 (0.315)		-0.072 (0.599)	-0.154 (0.359)	
lnDIN _{ijt}	-0.015 (0.196)	0.003 (0.923)	-0.087 (0.297)	-0.015 (0.195)	0.005 (0.867)	-0.111 (0.195)	-0.011 (0.352)	0.006 (0.839)	-0.105 (0.265)
lnESIM _{ijt}	0.239 (0.186)	0.133 (0.233)	-0.418 (0.654)	0.352 ^a (0.066)	0.140 (0.212)	-1.054 (0.192)	0.237 (0.211)	0.135 (0.228)	-0.824 (0.333)
RTA _{ijt}	0.039 (0.526)	0.223 (0.178)	-0.034 (0.841)	0.075 (0.239)	0.253 (0.126)	-0.197 (0.246)	0.071 (0.251)	0.241 (0.149)	-0.105 (0.479)
LLOCK _i	omitted	omitted	5.147 (0.464)	omitted	omitted	5.724 (0.464)	omitted	omitted	4.641 (0.567)
LLOCK _j	omitted	-0.994 (0.243)	omitted	omitted	-1.770 ^b (0.033)	omitted	omitted	-1.433 ^a (0.073)	omitted
COMCOL _{ij}	omitted	omitted	omitted	omitted	omitted	omitted	omitted	omitted	omitted
COMLANG _{ij}	omitted	0.292 ^a (0.082)	2.218 (0.935)	omitted	0.290 ^a (0.085)	7.485 (0.788)	omitted	0.289 ^a (0.086)	-4.848 (0.889)
CONTIG _{ij}	omitted	0.359 (0.178)	-30.013 (0.620)	omitted	0.375 (0.164)	-52.764 (0.359)	omitted	0.368 (0.171)	-44.729 (0.465)
GEFC _t	-1.386 ^c	-1.528 ^b	omitted	-1.614 ^c	-1.650 ^b	omitted	-1.538 ^c	-1.660 ^b	omitted

COVID _t	(0.009) -1.751 ^c (0.010)	(0.031) -2.004 ^b (0.024)	-0.057 (0.963)	(0.004) -1.921 ^c (0.007)	(0.021) -2.069 ^b (0.022)	-0.916 (0.550)	(0.006) -1.912 ^c (0.007)	(0.022) -2.147 ^b (0.021)	-0.119 (0.934)
Constant	-5.681 (0.710)	-11.264 (0.555)	omitted	-1.792 (0.906)	-1.493 (0.935)	omitted	-9.829 (0.526)	-16.948 (0.427)	omitted
Observations	3,412	3,412	2,992	3,412	3,412	2,992	3,412	3,412	2,992
Groups	298	18	294	298	18	294	298	18	294
Instruments	-	-	77	-	-	77	-	-	77
R-squared	0.503	0.808	-	0.484	0.807	-	0.493	0.808	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dyad-fixed	Y	N	-	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-	N	Y	-
Importer-fixed	N	Y	-	N	Y	-	N	Y	-
Vce clustered	Y	Y	-	Y	Y	-	Y	Y	-
F tests ¹	180.80 ^c	37.28 ^c	-	167.14 ^c	36.93 ^c	-	175.16 ^c	35.00 ^c	-
Hausman tests ² (chi2)	70.59 ^c	234.69 ^c	-	381.40 ^c	142.86 ^c	-	664.54 ^c	207.72 ^c	-
AR(1) (z)	-	-	-2.37 ^b			-1.78 ^a			-2.27 ^b
AR(1) (p)	-	-	0.018			0.075			0.023
AR(2) (z)	-	-	-0.37	-	-	-0.43	-	-	-0.51
AR(2) (p)	-	-	0.714	-	-	0.668	-	-	0.610
Hansen test (chi2)	-	-	44.57	-	-	40.96	-	-	45.33
Hansen test (p)	-	-	0.324	-	-	0.472	-	-	0.296

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C3.15: Estimation results of low-low COC models

ln(1 + BIT _{ijt})	GDI			GII			FLA		
	(1) FE-I	(2) FE-II	(3) SGMM-II	(4) FE-I	(5) FE-II	(6) SGMM-II	(7) FE-I	(8) FE-II	(9) SGMM-II
L1.ln(1 + BIT _{ijt})			0.269 ^a (0.059)			0.388 ^c (0.001)			0.234 ^b (0.049)
L2.ln(1 + BIT _{ijt})						0.041 (0.414)			
L1.lnGDP _{it}			-1.057 (0.627)			-0.430 (0.295)			-0.758 (0.652)
L2.lnGDP _{it}			0.189 (0.824)						-0.045 (0.947)
L1.lnGDP _{jt}			-1.739 (0.466)			-0.707 (0.201)			-1.252 (0.521)
L2.lnGDP _{jt}			0.600 (0.491)						0.461 (0.563)
L1.lnEXG _{jit}			0.215 (0.765)						0.219 (0.648)
L2.lnEXG _{jit}			-0.161 (0.668)			-0.023 (0.922)			-0.260 (0.344)
lnGDP _{it}	0.777 ^c (0.000)	0.797 ^c (0.004)		0.709 ^c (0.000)	0.703 ^c (0.007)		0.744 ^c (0.000)	0.767 ^c (0.004)	
lnGDP _{jt}	0.677 ^c (0.000)	0.650 ^c (0.000)		0.652 ^c (0.000)	0.619 ^c (0.000)		0.659 ^c (0.000)	0.637 ^c (0.000)	
lnPOP _{it}	1.533 ^b (0.028)	1.516 (0.247)	3.040 (0.845)	1.484 ^c (0.003)	1.568 (0.143)	4.955 (0.242)	1.676 ^c (0.003)	1.690 (0.109)	9.485 (0.331)
lnPOP _{jt}	0.845 (0.431)	0.789 (0.521)	2.148 (0.870)	1.018 (0.214)	1.087 (0.284)	4.659 (0.192)	0.753 (0.360)	0.680 (0.498)	1.197 (0.902)
lnDIST _{ij}	omitted	-1.532 ^c (0.000)	5.408 (0.936)	omitted	-1.529 ^c (0.000)	-11.567 (0.202)	omitted	-1.534 ^c (0.000)	-13.379 (0.757)
COC _{it}	-0.121 (0.304)	-0.118 (0.400)	0.281 (0.836)	-0.048 (0.662)	-0.022 (0.874)	0.180 (0.760)	-0.100 (0.399)	-0.102 (0.438)	0.511 (0.656)

COC _{jt}	-0.126 (0.278)	-0.109 (0.331)	0.324 (0.822)	-0.102 (0.266)	-0.090 (0.294)	0.608 (0.284)	-0.122 (0.261)	-0.116 (0.251)	0.775 (0.459)
lnGDI _{it}	0.338 (0.849)	0.571 (0.850)	-10.477 (0.757)						
lnGDI _{jt}	-0.376 (0.762)	-0.304 (0.811)	-3.950 (0.906)						
lnGII _{it}				0.154 (0.181)	0.162 (0.546)	-0.743 (0.293)			
lnGII _{jt}				0.119 (0.605)	0.107 (0.616)	-0.243 (0.749)			
lnFLA _{it}							-0.122 (0.544)	-0.031 (0.917)	0.379 (0.815)
lnFLA _{jt}							0.064 (0.842)	0.151 (0.682)	0.289 (0.903)
lnREMOTE _{it}	-1.636 ^c (0.000)	-1.763 ^b (0.017)	1.637 (0.840)	-1.564 ^c (0.000)	-1.652 ^c (0.006)	0.679 (0.886)	-1.628 ^c (0.000)	-1.721 ^b (0.012)	0.668 (0.889)
lnREMOTE _{jt}	-1.087 ^b (0.030)	-1.131 ^b (0.046)	2.978 (0.716)	-1.145 ^c (0.006)	-1.141 ^b (0.020)	1.104 (0.832)	-1.026 ^b (0.017)	-1.034 ^b (0.033)	1.120 (0.804)
lnEXG _{jit}	0.116 (0.235)	0.126 (0.345)		0.115 (0.197)	0.123 (0.340)		0.111 (0.215)	0.120 (0.360)	
lnDIN _{ijt}	0.030 ^a (0.096)	0.052 (0.480)	-0.602 (0.425)	0.026 (0.151)	0.046 (0.507)	-0.352 (0.400)	0.030 (0.101)	0.053 (0.475)	-0.245 (0.623)
lnESIM _{ijt}	0.221 ^b (0.012)	0.162 (0.138)	1.085 (0.651)	0.240 ^c (0.004)	0.165 (0.130)	0.763 (0.511)	0.221 ^b (0.012)	0.160 (0.143)	0.300 (0.839)
RTA _{ijt}	0.107 (0.179)	-0.017 (0.907)	-0.710 (0.616)	0.110 (0.163)	-0.012 (0.930)	-0.608 (0.448)	0.110 (0.171)	-0.018 (0.902)	-0.276 (0.783)
LLOCK _i	omitted	omitted	3.735 (0.965)	omitted	omitted	14.824 (0.329)	omitted	omitted	45.323 (0.390)
LLOCK _j	omitted	-0.150 (0.971)	-0.045 (1.000)	omitted	0.934 (0.780)	13.814 (0.341)	omitted	-0.466 (0.895)	-0.275 (0.996)
COMCOL _{ij}	omitted	0.429 ^a (0.058)	omitted	omitted	0.445 ^b (0.043)	99.800 (0.887)	omitted	0.425 ^a (0.062)	omitted
COMLANG _{ij}	omitted	0.350	omitted	omitted	0.361	-8.458	omitted	0.350	omitted

CONTIG _{ij}	omitted	(0.117) 0.262	-39.257 (0.169) (0.896)	omitted	(0.103) 0.258 (0.167) (0.256)	(0.933) -95.953 (0.256)	omitted	(0.116) 0.260 (0.170) (0.655)	-93.793 (0.655)
GEFC _t	-2.965 ^c (0.000)	-3.151 ^b (0.022)	omitted	-2.879 ^c (0.000)	-2.947 ^b (0.015)	omitted	-2.873 ^c (0.000)	-2.991 ^b (0.018)	omitted
COVID _t	-3.667 ^c (0.000)	-3.886 ^b (0.022)	omitted	-3.500 ^c (0.000)	-3.586 ^b (0.018)	omitted	-3.552 ^c (0.000)	-3.689 ^b (0.018)	omitted
Constant	-104.854 ^c (0.002)	-92.576 ^b (0.044)	omitted	-104.003 ^c (0.000)	-94.197 ^b (0.011)	-6.043 (0.974)	-103.285 ^c (0.000)	-91.131 ^b (0.014)	omitted
Observations	7,968	7,968	7,246	7,968	7,968	7,246	8,006	8,006	7,246
Groups	462	22	462	462	22	462	462	22	462
Instruments	-	-	77	-	-	85	-	-	77
R-squared	0.574	0.704	-	0.575	0.710	-	0.577	0.704	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dyad-fixed	Y	N	-	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-	N	Y	-
Importer-fixed	N	Y	-	N	Y	-	N	Y	-
Vce clustered	Y	Y	-	Y	Y	-	Y	Y	-
F tests ¹	116.97 ^c	127.77 ^c	-	116.57 ^c	116.91 ^c	-	108.11 ^c	82.04 ^c	-
Hausman tests ² (chi2)	373.15 ^c	1,036.53 ^c	-	208.44 ^c	835.04 ^c	-	343.01 ^c	557.38 ^c	-
AR(1) (z)	-	-	-1.86 ^a	-	-	-2.18 ^b	-	-	-1.85 ^a
AR(1) (p)	-	-	0.063	-	-	0.030	-	-	0.065
AR(2) (z)	-	-	-0.54	-	-	-0.16	-	-	0.49
AR(2) (p)	-	-	0.588	-	-	0.875	-	-	0.621
Hansen test (chi2)	-	-	20.51	-	-	26.65	-	-	29.87
Hansen test (p)	-	-	0.976	-	-	0.987	-	-	0.714

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C3.16: Estimation results of low-low GVE models

ln(1 + BIT _{ijt})	GDI			GII			FLA		
	(1) FE-I	(2) FE-II	(3) SGMM-II	(4) FE-I	(5) FE-II	(6) SGMM-II	(7) FE-I	(8) FE-II	(9) SGMM-II
L1.ln(1 + BIT _{ijt})			0.347 ^a (0.057)			0.306 ^a (0.073)			0.358 ^c (0.002)
L2.ln(1 + BIT _{ijt})						-0.032 (0.611)			
L1.lnGDP _{it}			-0.438 (0.832)			-0.008 (0.988)			-0.366 (0.811)
L2.lnGDP _{it}									-0.084 (0.893)
L1.lnGDP _{jt}			-0.104 (0.966)			0.712 (0.178)			0.250 (0.890)
L2.lnGDP _{jt}									0.051 (0.949)
L1.lnEXG _{jit}			-0.137 (0.799)			-0.404 (0.142)			-0.279 (0.529)
L2.lnEXG _{jit}									-0.038 (0.885)
lnGDP _{it}	0.561 ^c (0.000)	0.573 ^b (0.045)		0.520 ^c (0.000)	0.511 ^a (0.068)		0.548 ^c (0.000)	0.563 ^b (0.044)	
lnGDP _{jt}	0.719 ^c (0.000)	0.730 ^c (0.000)		0.693 ^c (0.000)	0.715 ^c (0.000)		0.707 ^c (0.000)	0.724 ^c (0.000)	
lnPOP _{it}	0.632 ^b (0.024)	0.353 (0.474)	0.072 (0.991)	0.906 ^c (0.002)	0.633 (0.241)	3.054 (0.592)	0.622 ^b (0.020)	0.423 (0.416)	1.681 (0.703)
lnPOP _{jt}	0.533 (0.237)	0.489 (0.308)	-1.257 (0.837)	0.830 ^c (0.008)	0.614 (0.127)	0.683 (0.902)	0.488 (0.116)	0.534 (0.142)	-0.774 (0.857)
lnDIST _{ij}	omitted	-1.604 ^c (0.000)	17.008 (0.653)	omitted	-1.601 ^c (0.000)	-10.875 (0.746)	omitted	-1.606 ^c (0.000)	9.458 (0.754)
GVE _{it}	0.217 ^b (0.014)	0.242 (0.178)	-0.473 (0.520)	0.265 ^c (0.001)	0.304 (0.110)	-0.934 ^a (0.087)	0.226 ^c (0.008)	0.256 (0.153)	-0.489 (0.383)

GVE _{jt}	-0.214 ^a (0.066)	-0.096 (0.587)	-0.854 (0.222)	-0.161 ^a (0.070)	-0.072 (0.595)	-1.144 ^b (0.049)	-0.208 ^b (0.048)	-0.095 (0.575)	-0.717 (0.234)
lnGDI _{it}	1.882 (0.171)	2.805 (0.218)	-33.244 (0.141)						
lnGDI _{jt}	0.802 (0.608)	1.356 (0.508)	-13.777 (0.527)						
lnGII _{it}				0.265 ^b (0.013)	0.216 (0.326)	-1.161 (0.196)			
lnGII _{jt}				0.189 (0.262)	-0.002 (0.994)	-0.919 (0.353)			
lnFLA _{it}							0.053 (0.805)	0.045 (0.897)	-1.378 (0.561)
lnFLA _{jt}							0.131 (0.755)	0.031 (0.949)	-1.376 (0.613)
lnREMOTE _{it}	-0.968 ^c (0.001)	-1.066 (0.140)	4.752 (0.429)	-1.004 ^c (0.000)	-0.943 ^a (0.095)	0.267 (0.957)	-0.762 ^c (0.006)	-0.809 (0.264)	3.986 (0.581)
lnREMOTE _{jt}	-1.015 ^c (0.004)	-1.284 ^a (0.064)	2.576 (0.710)	-1.097 ^c (0.000)	-1.080 (0.177)	-1.707 (0.748)	-0.865 ^c (0.002)	-1.146 ^a (0.093)	1.925 (0.784)
lnEXG _{jit}	0.096 (0.393)	0.064 (0.656)		0.088 (0.326)	0.047 (0.725)		0.096 (0.320)	0.065 (0.632)	
lnDIN _{ijt}	0.032 (0.136)	0.092 (0.222)	-0.005 (0.986)	0.027 (0.207)	0.087 (0.218)	0.122 (0.743)	0.035 (0.114)	0.093 (0.216)	0.243 (0.401)
lnESIM _{ijt}	0.219 ^c (0.008)	0.095 (0.416)	1.057 (0.566)	0.244 ^c (0.002)	0.095 (0.415)	-0.706 (0.632)	0.208 ^b (0.011)	0.091 (0.429)	-0.292 (0.888)
RTA _{ijt}	0.083 (0.311)	-0.029 (0.791)	-0.213 (0.845)	0.071 (0.394)	-0.030 (0.782)	-0.563 (0.690)	0.069 (0.412)	-0.032 (0.768)	-0.409 (0.746)
LLOCK _i	omitted	omitted	9.360 (0.829)	omitted	omitted	1.940 (0.919)	omitted	omitted	17.524 (0.697)
LLOCK _j	omitted	-2.562 ^c (0.000)	2.551 (0.952)	omitted	-2.425 ^c (0.000)	-6.182 (0.828)	omitted	-2.481 ^c (0.000)	10.533 (0.726)
COMCOL _{ij}	omitted	0.881 ^b (0.028)	omitted	omitted	0.887 ^b (0.024)	omitted	omitted	0.867 ^b (0.029)	omitted
COMLANG _{ij}	omitted	0.446 ^b	omitted	omitted	0.455 ^b	omitted	omitted	0.449 ^b	omitted

CONTIG _{ij}	omitted	(0.020) 0.289 ^a (0.096)	92.716 (0.753)	omitted	(0.018) 0.283 ^a (0.097)	-98.980 (0.724)	omitted	(0.020) 0.287 ^a (0.095)	42.647 (0.846)
GEFC _t	-1.971 ^c (0.000)	-2.444 ^a (0.064)	omitted	-2.014 ^c (0.000)	-1.978 (0.141)	omitted	-1.526 ^c (0.004)	-1.950 (0.149)	omitted
COVID _t	-2.426 ^c (0.000)	-2.994 ^a (0.060)	omitted	-2.359 ^c (0.000)	-2.348 (0.144)	omitted	-1.857 ^c (0.004)	-2.360 (0.148)	omitted
Constant	-68.575 ^c (0.000)	-53.395 ^b (0.020)	omitted	-78.147 ^c (0.000)	-53.892 ^b (0.013)	omitted	-63.083 ^c (0.000)	-50.205 ^b (0.014)	omitted
Observations	7,972	7,972	7,552	7,972	7,972	7,172	8,014	8,014	7,172
Groups	592	25	552	592	25	552	594	25	552
Instruments	-	-	77	-	-	77	-	-	77
R-squared	0.552	0.681	-	0.554	0.686	-	0.555	0.680	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dyad-fixed	Y	N	-	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-	N	Y	-
Importer-fixed	N	Y	-	N	Y	-	N	Y	-
Vce clustered	Y	Y	-	Y	Y	-	Y	Y	-
F tests ¹	86.39 ^c	59.70 ^c	-	92.24 ^c	83.17 ^c	-	83.06 ^c	41.93 ^c	-
Hausman tests ² (chi2)	316.40 ^c	524.56 ^c	-	289.88 ^c	567.36 ^c	-	261.04 ^c	685.01 ^c	-
AR(1) (z)	-	-	-1.88 ^a	-	-	-1.86 ^a	-	-	-2.74 ^c
AR(1) (p)	-	-	0.061	-	-	0.063	-	-	0.006
AR(2) (z)	-	-	-0.15	-	-	0.28	-	-	-0.39
AR(2) (p)	-	-	0.881	-	-	0.777	-	-	0.696
Hansen test (chi2)	-	-	28.73	-	-	35.28	-	-	40.82
Hansen test (p)	-	-	0.833	-	-	0.550	-	-	0.230

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C3.17: Estimation results of low-low POS models

ln(1 + BIT _{ijt})	GDI			GII			FLA		
	(1) FE-I	(2) FE-II	(3) SGMM-II	(4) FE-I	(5) FE-II	(6) SGMM-II	(7) FE-I	(8) FE-II	(9) SGMM-II
L1.ln(1 + BIT _{ijt})			0.472 ^b (0.018)			0.581 ^c (0.000)			0.412 ^b (0.034)
L2.ln(1 + BIT _{ijt})						0.094 ^a (0.070)			0.018 (0.803)
L1.lnGDP _{it}			0.133 (0.875)			-0.179 (0.681)			-0.001 (0.997)
L2.lnGDP _{it}									
L1.lnGDP _{jt}			0.597 (0.422)			0.410 (0.223)			0.471 (0.150)
L2.lnGDP _{jt}									
L1.lnEXG _{jit}			-0.020 (0.958)			-0.121 (0.603)			0.052 (0.771)
L2.lnEXG _{jit}									
lnGDP _{it}	0.805 ^c (0.000)	0.781 ^c (0.004)		0.798 ^c (0.000)	0.775 ^c (0.002)		0.806 ^c (0.000)	0.795 ^c (0.001)	
lnGDP _{jt}	0.723 ^c (0.000)	0.675 ^c (0.000)		0.722 ^c (0.000)	0.667 ^c (0.000)		0.724 ^c (0.000)	0.673 ^c (0.000)	
lnPOP _{it}	0.187 (0.727)	-0.132 (0.874)	3.439 (0.434)	0.429 (0.322)	0.420 (0.565)	2.298 (0.614)	0.416 (0.354)	0.283 (0.722)	3.779 (0.629)
lnPOP _{jt}	0.707 (0.493)	0.568 (0.641)	3.401 (0.500)	0.749 (0.311)	0.628 (0.499)	-0.893 (0.929)	0.706 (0.368)	0.606 (0.536)	2.506 (0.615)
lnDIST _{ij}	omitted	-1.215 ^c (0.000)	-23.698 (0.367)	omitted	-1.215 ^c (0.000)	-14.052 (0.664)	omitted	-1.216 ^c (0.000)	-23.749 (0.258)
POS _{it}	-0.206 ^c (0.001)	-0.205 ^a (0.076)	0.708 ^a (0.096)	-0.196 ^c (0.000)	-0.185 ^a (0.071)	0.393 (0.261)	-0.212 ^c (0.000)	-0.210 ^a (0.055)	0.250 (0.486)

POS _{jt}	-0.145 ^c (0.000)	-0.147 ^c (0.001)	0.593 (0.175)	-0.144 ^c (0.001)	-0.144 ^c (0.003)	0.354 (0.290)	-0.142 ^c (0.000)	-0.144 ^c (0.000)	0.171 (0.590)
lnGDI _{it}	0.918 (0.573)	1.884 (0.330)	-18.185 (0.263)						
lnGDI _{jt}	0.458 (0.695)	0.568 (0.623)	-16.168 (0.245)						
lnGII _{it}				0.169 (0.269)	0.245 (0.287)	-0.486 (0.597)			
lnGII _{jt}				-0.015 (0.957)	-0.062 (0.832)	-0.534 (0.560)			
lnFLA _{it}							-0.124 (0.522)	-0.106 (0.589)	-2.201 (0.204)
lnFLA _{jt}							0.072 (0.829)	0.074 (0.842)	0.415 (0.890)
lnREMOTE _{it}	-0.798 ^c (0.007)	-0.801 (0.203)	-2.446 (0.587)	-0.967 ^c (0.000)	-1.063 ^b (0.035)	-2.736 (0.400)	-0.804 ^c (0.002)	-0.800 (0.218)	-3.382 (0.251)
lnREMOTE _{jt}	-0.388 (0.406)	-0.255 (0.608)	-2.767 (0.576)	-0.339 (0.206)	-0.106 (0.762)	-3.810 (0.268)	-0.338 (0.367)	-0.201 (0.633)	-3.587 (0.326)
lnEXG _{jit}	0.110 (0.307)	0.116 (0.346)		0.098 (0.186)	0.100 (0.283)		0.108 (0.264)	0.118 (0.309)	
lnDIN _{ijt}	0.017 (0.391)	0.084 ^b (0.012)	0.450 ^a (0.067)	0.015 (0.462)	0.082 ^b (0.012)	0.579 ^b (0.011)	0.016 (0.421)	0.083 ^b (0.013)	0.278 (0.225)
lnESIM _{ijt}	0.144 ^b (0.016)	-0.123 ^a (0.082)	0.827 (0.565)	0.136 ^b (0.023)	-0.127 ^a (0.072)	0.223 (0.873)	0.140 ^b (0.019)	-0.125 ^a (0.076)	0.629 (0.524)
RTA _{ijt}	-0.025 (0.694)	0.145 ^a (0.074)	-1.823 (0.336)	-0.025 (0.692)	0.143 ^a (0.075)	-0.791 (0.697)	-0.027 (0.669)	0.142 ^a (0.079)	-2.479 (0.217)
LLOCK _i	omitted	omitted	19.607 (0.532)	omitted	omitted	21.116 (0.898)	omitted	omitted	16.051 (0.881)
LLOCK _j	omitted	-2.814 ^c (0.001)	16.220 (0.613)	omitted	-2.637 ^c (0.004)	omitted	omitted	-2.744 ^c (0.001)	omitted
COMCOL _{ij}	omitted	0.234 (0.201)	omitted	omitted	0.241 (0.186)	omitted	omitted	0.233 (0.203)	omitted
COMLANG _{ij}	omitted	0.441 ^c	-11.785	omitted	0.447 ^c	-43.563	omitted	0.442 ^c	-3.266

CONTIG _{ij}	omitted	(0.001) 0.098 (0.592)	(0.776) -193.699 (0.429)	omitted	(0.001) 0.107 (0.559)	(0.681) -79.776 (0.818)	omitted	(0.001) 0.104 (0.573)	(0.958) -171.030 (0.526)
GEFC _t	-1.617 ^b (0.016)	-1.406 (0.213)	omitted	-1.735 ^c (0.001)	-1.507 (0.119)	omitted	-1.582 ^c (0.008)	-1.362 (0.227)	omitted
COVID _t	-1.967 ^b (0.017)	-1.694 (0.223)	-0.841 (0.461)	-2.069 ^c (0.002)	-1.777 (0.138)	0.269 (0.451)	-1.920 ^c (0.009)	-1.638 (0.237)	0.262 (0.503)
Constant	-59.449 ^b (0.039)	-35.802 (0.315)	omitted	-65.907 ^c (0.001)	-47.886 ^a (0.062)	omitted	-62.989 ^c (0.004)	-43.610 (0.154)	omitted
Observations	8,014	8,014	7,774	8,014	8,014	7,394	8,046	8,046	7,394
Groups	630	26	630	630	26	630	630	26	630
Instruments	-	-	80	-	-	77	-	-	77
R-squared	0.554	0.706	-	0.554	0.709	-	0.558	0.706	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dyad-fixed	Y	N	-	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-	N	Y	-
Importer-fixed	N	Y	-	N	Y	-	N	Y	-
Vce clustered	Y	Y	-	Y	Y	-	Y	Y	-
F tests ¹	79.07 ^c	123.54 ^c	-	73.64 ^c	92.37 ^c	-	74.49 ^c	98.76 ^c	-
Hausman tests ² (chi2)	265.43 ^c	716.32 ^c	-	252.40 ^c	40.15 ^c	-	257.70 ^c	189.67 ^c	-
AR(1) (z)	-	-	-2.30 ^b	-	-	-2.93 ^c	-	-	-2.11 ^b
AR(1) (p)	-	-	0.022	-	-	0.003	-	-	0.035
AR(2) (z)	-	-	1.12	-	-	-0.83	-	-	0.83
AR(2) (p)	-	-	0.262	-	-	0.408	-	-	0.408
Hansen test (chi2)	-	-	36.27	-	-	40.77	-	-	37.97
Hansen test (p)	-	-	0.639	-	-	0.308	-	-	0.425

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C3.18: Estimation results of low-low REQ models

ln(1 + BIT _{ijt})	GDI			GII			FLA		
	(1) FE-I	(2) FE-II	(3) SGMM-II	(4) FE-I	(5) FE-II	(6) SGMM-II	(7) FE-I	(8) FE-II	(9) SGMM-II
L1.ln(1 + BIT _{ijt})			0.306 (0.102)			0.425 ^c (0.001)			0.464 ^c (0.003)
L2.ln(1 + BIT _{ijt})									
L1.lnGDP _{it}			1.324 (0.598)						-1.846 (0.340)
L2.lnGDP _{it}			-0.265 (0.706)			-0.114 (0.636)			0.392 (0.478)
L1.lnGDP _{jt}			1.050 (0.692)						-2.311 (0.318)
L2.lnGDP _{jt}			0.271 (0.721)			0.326 (0.148)			0.838 (0.209)
L1.lnEXG _{jit}			0.098 (0.892)						0.195 (0.729)
L2.lnEXG _{jit}			-0.164 (0.647)			-0.115 (0.471)			-0.091 (0.759)
lnGDP _{it}	0.720 ^c (0.000)	0.768 ^c (0.009)		0.683 ^c (0.000)	0.693 ^b (0.018)		0.680 ^c (0.000)	0.716 ^b (0.016)	
lnGDP _{jt}	0.678 ^c (0.000)	0.649 ^c (0.000)		0.646 ^c (0.000)	0.608 ^c (0.000)		0.672 ^c (0.000)	0.631 ^c (0.000)	
lnPOP _{it}	0.850 ^c (0.000)	0.224 (0.353)	3.495 (0.744)	0.853 ^c (0.001)	0.350 (0.342)	7.041 (0.141)	0.895 ^c (0.000)	0.326 (0.198)	1.428 (0.852)
lnPOP _{jt}	0.229 (0.552)	0.129 (0.774)	1.251 (0.919)	0.527 ^b (0.037)	0.399 (0.154)	3.488 (0.407)	0.135 (0.565)	0.113 (0.676)	2.608 (0.715)
lnDIST _{ij}	omitted	-1.562 ^c (0.000)	-22.382 (0.706)	omitted	-1.563 ^c (0.000)	-25.187 (0.113)	omitted	-1.563 ^c (0.000)	11.916 (0.730)
REQ _{it}	0.003 (0.969)	0.004 (0.982)	-0.962 (0.371)	0.045 (0.553)	0.088 (0.647)	-0.599 (0.314)	0.036 (0.655)	0.057 (0.755)	-0.369 (0.604)

xc_i

REQ _{it}	-0.205 ^b (0.011)	-0.145 ^a (0.095)	-1.172 (0.266)	-0.157 ^b (0.037)	-0.102 (0.182)	-0.802 (0.183)	-0.183 ^b (0.022)	-0.122 (0.164)	-0.473 (0.557)
lnGDI _{it}	0.547 (0.669)	1.316 (0.478)	-42.047 (0.158)						
lnGDI _{jt}	1.314 (0.454)	1.408 (0.501)	-48.206 (0.121)						
lnGII _{it}				0.032 (0.764)	0.103 (0.560)	-0.852 (0.150)			
lnGII _{jt}				0.200 (0.149)	0.148 (0.283)	-1.114 ^a (0.070)			
lnFLA _{it}							-0.118 (0.575)	-0.191 (0.502)	-1.304 (0.707)
lnFLA _{jt}							0.154 (0.713)	0.032 (0.946)	0.430 (0.900)
lnREMOTE _{it}	-1.337 ^c (0.000)	-1.370 ^b (0.025)	-1.722 (0.792)	-1.252 ^c (0.000)	-1.256 ^b (0.011)	-0.351 (0.897)	-1.278 ^c (0.000)	-1.255 ^b (0.040)	3.232 (0.441)
lnREMOTE _{jt}	-1.082 ^c (0.008)	-1.386 ^b (0.017)	-1.625 (0.793)	-1.179 ^c (0.000)	-1.338 ^b (0.017)	-1.140 (0.601)	-0.899 ^c (0.003)	-1.211 ^b (0.022)	2.966 (0.493)
lnEXG _{jit}	0.115 (0.308)	0.129 (0.359)		0.121 (0.149)	0.128 (0.269)		0.102 (0.271)	0.121 (0.319)	
lnDIN _{ijt}	0.015 (0.435)	0.029 (0.527)	-0.023 (0.955)	0.013 (0.490)	0.028 (0.522)	0.097 (0.769)	0.016 (0.431)	0.029 (0.518)	0.087 (0.795)
lnESIM _{ijt}	0.280 ^c (0.001)	0.109 (0.243)	1.527 (0.419)	0.278 ^c (0.001)	0.105 (0.263)	0.287 (0.811)	0.270 ^c (0.002)	0.107 (0.248)	0.528 (0.702)
RTA _{ijt}	0.017 (0.802)	-0.077 (0.514)	-0.337 (0.733)	0.018 (0.798)	-0.077 (0.511)	-0.720 (0.328)	0.013 (0.852)	-0.078 (0.512)	-1.114 (0.362)
LLOCK _i	omitted	omitted	29.109 (0.688)	omitted	omitted	50.828 (0.343)	omitted	omitted	11.831 (0.841)
LLOCK _j	omitted	-2.614 ^c (0.000)	18.861 (0.843)	omitted	-2.503 ^c (0.000)	13.835 (0.762)	omitted	-2.502 ^c (0.000)	20.422 (0.692)
COMCOL _{ij}	omitted	0.962 ^b (0.017)	omitted	omitted	0.968 ^b (0.016)	omitted	omitted	0.962 ^b (0.016)	omitted
COMLANG _{ij}	omitted	0.371 ^b	-54.626	omitted	0.371 ^b	-86.446	omitted	0.371 ^b	74.671

CONTIG _{ij}	omitted	(0.033) 0.096 (0.586)	(0.876) omitted	omitted	(0.031) 0.099 (0.572)	(0.728) omitted	omitted	(0.032) 0.100 (0.571)	(0.730) omitted
GEFC _t	-2.497 ^c (0.000)	-2.794 ^b (0.015)	omitted	-2.438 ^c (0.000)	-2.503 ^b (0.021)	omitted	-2.177 ^c (0.000)	-2.410 ^b (0.040)	omitted
COVID _t	-3.062 ^c (0.000)	-3.407 ^b (0.014)	omitted	-2.902 ^c (0.000)	-2.950 ^b (0.026)	omitted	-2.642 ^c (0.000)	-2.898 ^b (0.043)	omitted
Constant	-75.615 ^c (0.000)	-53.873 ^c (0.007)	omitted	-79.169 ^c (0.000)	-55.039 ^c (0.002)	omitted	-70.586 ^c (0.000)	-49.286 ^c (0.008)	omitted
Observations	8,000	8,000	7,316	8,000	8,000	7,316	8,038	8,038	7,316
Groups	628	26	592	628	26	592	630	26	592
Instruments	-	-	77	-	-	77	-	-	77
R-squared	0.581	0.686	-	0.581	0.689	-	0.584	0.685	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dyad-fixed	Y	N	-	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-	N	Y	-
Importer-fixed	N	Y	-	N	Y	-	N	Y	-
Vce clustered	Y	Y	-	Y	Y	-	Y	Y	-
F tests ¹	103.59 ^c	102.83 ^c	-	100.41 ^c	99.35 ^c	-	96.35 ^c	73.49 ^c	-
Hausman tests ² (chi2)	309.25 ^c	629.09 ^c	-	173.61 ^c	504.62 ^c	-	292.34 ^c	642.91 ^c	-
AR(1) (z)	-	-	-1.82 ^a	-	-	-2.06 ^b	-	-	-2.36 ^b
AR(1) (p)	-	-	0.069	-	-	0.039	-	-	0.018
AR(2) (z)	-	-	1.24	-	-	1.54	-	-	1.37
AR(2) (p)	-	-	0.215	-	-	0.123	-	-	0.170
Hansen test (chi2)	-	-	22.15	-	-	43.44	-	-	28.47
Hansen test (p)	-	-	0.955	-	-	0.251	-	-	0.774

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C3.19: Estimation results of low-low ROL models

ln(1 + BIT _{ijt})	GDI			GII			FLA		
	(1) FE-I	(2) FE-II	(3) SGMM-II	(4) FE-I	(5) FE-II	(6) SGMM-II	(7) FE-I	(8) FE-II	(9) SGMM-II
L1.ln(1 + BIT _{ijt})			0.228 (0.165)			0.297 ^b (0.016)			0.335 (0.271)
L2.ln(1 + BIT _{ijt})						-0.040 (0.489)			
L1.lnGDP _{it}						-0.261 (0.717)			-0.601 (0.897)
L2.lnGDP _{it}			-0.038 (0.936)						
L1.lnGDP _{jt}						0.174 (0.818)			-0.397 (0.892)
L2.lnGDP _{jt}			0.188 (0.615)						
L1.lnEXG _{jit}						-0.159 (0.551)			0.027 (0.970)
L2.lnEXG _{jit}			-0.050 (0.815)						
lnGDP _{it}	0.608 ^c (0.000)	0.656 ^b (0.032)		0.608 ^c (0.000)	0.650 ^b (0.031)		0.600 ^c (0.000)	0.668 ^b (0.027)	
lnGDP _{jt}	0.581 ^c (0.000)	0.555 ^c (0.000)		0.584 ^c (0.000)	0.583 ^c (0.000)		0.592 ^c (0.000)	0.585 ^c (0.000)	
lnPOP _{it}	0.936 ^c (0.000)	0.873 ^b (0.013)	0.696 (0.964)	1.003 ^c (0.000)	0.925 ^b (0.034)	6.007 (0.547)	0.916 ^c (0.000)	0.830 ^b (0.021)	36.518 (0.465)
lnPOP _{jt}	0.121 (0.718)	0.161 (0.665)	0.420 (0.975)	0.558 ^b (0.014)	0.291 (0.347)	3.581 (0.608)	0.041 (0.845)	0.098 (0.704)	33.784 (0.515)
lnDIST _{ij}	omitted	-1.613 ^c (0.000)	0.916 (0.986)	omitted	-1.610 ^c (0.000)	-30.729 (0.237)	omitted	-1.616 ^c (0.000)	-107.691 (0.598)
ROL _{it}	0.228 ^c (0.009)	0.195 (0.200)	0.184 (0.876)	0.205 ^b (0.020)	0.139 (0.341)	0.077 (0.942)	0.209 ^b (0.021)	0.142 (0.309)	2.169 (0.461)

ROL _{jt}	0.029 (0.739)	0.080 (0.319)	0.231 (0.850)	0.030 (0.714)	0.027 (0.738)	0.196 (0.851)	0.001 (0.991)	0.021 (0.807)	1.754 (0.499)
lnGDI _{it}	1.754 (0.172)	2.967 (0.171)	-38.074 ^a (0.070)						
lnGDI _{jt}	1.435 (0.424)	2.558 (0.250)	-31.144 (0.177)						
lnGII _{it}				0.092 (0.392)	0.085 (0.629)	0.761 (0.648)			
lnGII _{jt}				0.256 ^a (0.057)	0.070 (0.707)	0.814 (0.646)			
lnFLA _{it}							-0.063 (0.781)	0.020 (0.955)	-7.195 (0.553)
lnFLA _{jt}							0.093 (0.821)	0.050 (0.915)	-7.143 (0.630)
lnREMOTE _{it}	-1.203 ^c (0.000)	-1.380 ^a (0.064)	1.237 (0.829)	-1.105 ^c (0.000)	-1.139 ^a (0.061)	-3.192 (0.500)	-1.032 ^c (0.000)	-1.095 (0.139)	8.852 (0.431)
lnREMOTE _{jt}	-1.019 ^c (0.010)	-0.669 (0.134)	0.353 (0.944)	-1.173 ^c (0.000)	-0.476 (0.411)	-4.781 (0.261)	-0.845 ^c (0.004)	-0.429 (0.333)	7.066 (0.526)
lnEXG _{jit}	0.098 (0.386)	0.080 (0.559)		0.100 (0.265)	0.064 (0.620)		0.093 (0.333)	0.075 (0.558)	
lnDIN _{ijt}	0.029 (0.152)	0.079 (0.267)	-0.055 (0.796)	0.026 (0.189)	0.073 (0.266)	0.213 (0.513)	0.031 (0.142)	0.080 (0.262)	0.134 (0.779)
lnESIM _{ijt}	0.242 ^c (0.007)	0.097 (0.384)	1.287 (0.345)	0.260 ^c (0.002)	0.097 (0.385)	-0.511 (0.581)	0.235 ^c (0.008)	0.094 (0.397)	-0.132 (0.923)
RTA _{ijt}	0.049 (0.537)	-0.133 (0.319)	-1.053 (0.324)	0.043 (0.595)	-0.134 (0.313)	-0.663 (0.411)	0.039 (0.637)	-0.137 (0.304)	-1.086 (0.488)
LLOCK _i	omitted	omitted	-0.295 (0.995)	omitted	omitted	36.316 (0.669)	omitted	omitted	185.724 (0.665)
LLOCK _j	omitted	-2.589 ^c (0.000)	-2.292 (0.943)	omitted	-2.298 ^c (0.000)	21.142 (0.768)	omitted	-2.360 ^c (0.000)	165.088 (0.733)
COMCOL _{ij}	omitted	0.884 ^b (0.032)	omitted	omitted	0.898 ^b (0.029)	omitted	omitted	0.883 ^b (0.033)	omitted
COMLANG _{ij}	omitted	0.293 ^a	-29.488	omitted	0.299 ^a	omitted	omitted	0.297 ^a	omitted

XCV

CONTIG _{ij}	omitted	(0.099) 0.213 (0.255)	(0.497) 0.354 (0.999)	omitted	(0.094) 0.209 (0.255)	-252.005 (0.384)	omitted	(0.095) 0.212 (0.252)	-1,143.478 (0.589)
GEFC _t	-2.106 ^c (0.000)	-2.027 ^a (0.093)	omitted	-2.158 ^c (0.000)	-1.520 (0.231)	omitted	-1.687 ^c (0.002)	-1.409 (0.276)	omitted
COVID _t	-2.622 ^c (0.000)	-2.531 ^a (0.085)	3.084 (0.593)	-2.565 ^c (0.000)	-1.806 (0.240)	-4.466 (0.369)	-2.067 ^c (0.002)	-1.709 (0.279)	omitted
Constant	-67.295 ^c (0.000)	-51.075 ^b (0.015)	omitted	-76.809 ^c (0.000)	-48.830 ^b (0.027)	omitted	-61.288 ^c (0.000)	-43.927 ^b (0.037)	omitted
Observations	7,966	7,966	7,166	7,966	7,966	7,166	8,006	8,006	7,586
Groups	542	24	542	542	24	542	542	24	542
Instruments	-	-	78	-	-	77	-	-	77
R-squared	0.575	0.687	-	0.577	0.691	-	0.577	0.686	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dyad-fixed	Y	N	-	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-	N	Y	-
Importer-fixed	N	Y	-	N	Y	-	N	Y	-
Vce clustered	Y	Y	-	Y	Y	-	Y	Y	-
F tests ¹	108.83 ^c	89.98 ^c	-	110.40 ^c	96.39 ^c	-	101.78 ^c	57.44 ^c	-
Hausman tests ² (chi2)	338.59 ^c	451.89 ^c	-	170.68 ^c	934.09 ^c	-	289.15 ^c	782.04 ^c	-
AR(1) (z)	-	-	-1.93 ^a	-	-	-2.59 ^c	-	-	0.59
AR(1) (p)	-	-	0.053	-	-	0.009	-	-	0.556
AR(2) (z)	-	-	0.59	-	-	0.57	-	-	0.71
AR(2) (p)	-	-	0.553	-	-	0.565	-	-	0.480
Hansen test (chi2)	-	-	26.04	-	-	42.14	-	-	30.56
Hansen test (p)	-	-	0.944	-	-	0.258	-	-	0.764

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C3.20: Estimation results of low-low VAC models

ln(1 + BIT _{ijt})	GDI			GII			FLA		
	(1) FE-I	(2) FE-II	(3) SGMM-II	(4) FE-I	(5) FE-II	(6) SGMM-II	(7) FE-I	(8) FE-II	(9) SGMM-II
L1.ln(1 + BIT _{ijt})			0.303 ^b (0.030)			0.400 ^b (0.014)			0.429 ^c (0.000)
L2.ln(1 + BIT _{ijt})			-0.027 (0.573)			-0.038 (0.407)			-0.032 (0.571)
L1.lnGDP _{it}						-1.127 ^a (0.074)			
L2.lnGDP _{it}			-0.153 (0.358)			0.211 (0.614)			-0.177 (0.171)
L1.lnGDP _{jt}						-0.712 (0.324)			
L2.lnGDP _{jt}			0.283 ^b (0.043)			0.518 ^a (0.064)			0.310 ^b (0.021)
L1.lnEXG _{jit}						0.010 (0.982)			
L2.lnEXG _{jit}			-0.114 (0.383)			-0.121 (0.730)			-0.167 (0.133)
lnGDP _{it}	0.740 ^c (0.000)	0.676 ^b (0.028)		0.727 ^c (0.000)	0.648 ^b (0.025)		0.711 ^c (0.000)	0.637 ^b (0.037)	
lnGDP _{jt}	0.625 ^c (0.000)	0.523 ^c (0.000)		0.613 ^c (0.000)	0.510 ^c (0.000)		0.629 ^c (0.000)	0.529 ^c (0.000)	
lnPOP _{it}	0.790 ^c (0.000)	0.428 ^b (0.027)	-0.821 (0.895)	0.913 ^c (0.000)	0.700 ^b (0.032)	1.331 (0.910)	0.886 ^c (0.000)	0.593 ^b (0.017)	-0.635 (0.933)
lnPOP _{jt}	0.038 (0.910)	-0.031 (0.937)	-2.932 (0.606)	0.525 ^b (0.033)	0.431 (0.116)	-1.726 (0.652)	0.023 (0.917)	-0.047 (0.835)	-3.313 (0.631)
lnDIST _{ij}	omitted	-1.404 ^c (0.000)	11.134 (0.759)	omitted	-1.405 ^c (0.000)	3.622 (0.933)	omitted	-1.405 ^c (0.000)	6.424 (0.875)
VAC _{it}	-0.092 (0.213)	-0.112 (0.322)	0.137 (0.814)	-0.072 (0.294)	-0.096 (0.407)	0.320 (0.603)	-0.068 (0.365)	-0.089 (0.417)	0.165 (0.801)

VAC _{jt}	0.147 (0.154)	0.173 ^a (0.098)	-0.504 (0.550)	0.129 (0.196)	0.154 (0.115)	-0.355 (0.702)	0.147 (0.118)	0.167 ^a (0.068)	-0.309 (0.667)
lnGDI _{it}	1.278 (0.308)	0.819 (0.667)	-24.145 ^b (0.033)						
lnGDI _{jt}	1.649 (0.346)	1.383 (0.514)	-19.077 ^a (0.099)						
lnGII _{it}				0.075 (0.508)	0.123 (0.405)	-0.439 (0.688)			
lnGII _{jt}				0.288 ^c (0.009)	0.248 ^b (0.031)	-0.409 (0.800)			
lnFLA _{it}							-0.234 (0.266)	-0.252 (0.333)	0.476 (0.901)
lnFLA _{jt}							-0.033 (0.930)	0.030 (0.946)	-0.577 (0.902)
lnREMOTE _{it}	-1.835 ^c (0.000)	-1.429 ^c (0.003)	0.944 (0.633)	-1.738 ^c (0.000)	-1.373 ^c (0.001)	0.462 (0.752)	-1.778 ^c (0.000)	-1.402 ^c (0.002)	-0.067 (0.977)
lnREMOTE _{jt}	-1.794 ^c (0.000)	-1.469 ^c (0.010)	-1.382 (0.496)	-1.826 ^c (0.000)	-1.441 ^c (0.007)	-2.178 (0.237)	-1.666 ^c (0.000)	-1.337 ^b (0.011)	-2.777 (0.373)
lnEXG _{jit}	0.081 (0.450)	0.088 (0.507)		0.100 (0.223)	0.095 (0.385)		0.071 (0.410)	0.074 (0.521)	
lnDIN _{ijt}	-0.015 (0.400)	-0.022 (0.675)	-0.173 (0.615)	-0.012 (0.524)	-0.023 (0.661)	-0.095 (0.773)	-0.014 (0.431)	-0.022 (0.672)	-0.036 (0.939)
lnESIM _{ijt}	0.434 ^c (0.000)	0.049 (0.630)	1.447 ^a (0.090)	0.420 ^c (0.000)	0.047 (0.646)	1.233 (0.305)	0.431 ^c (0.000)	0.048 (0.638)	0.897 (0.503)
RTA _{ijt}	-0.021 (0.735)	0.004 (0.977)	-0.934 (0.478)	0.003 (0.956)	0.007 (0.960)	-0.337 (0.738)	-0.017 (0.801)	0.003 (0.986)	-0.216 (0.816)
LLOCK _i	omitted	omitted	-75.069 (0.775)	omitted	omitted	-16.933 (0.954)	omitted	omitted	-58.444 (0.841)
LLOCK _j	omitted	-3.453 ^c (0.000)	-85.582 (0.740)	omitted	-3.242 ^c (0.000)	-33.951 (0.882)	omitted	-3.300 ^c (0.000)	-68.758 (0.816)
COMCOL _{ij}	omitted	0.534 (0.232)	omitted	omitted	0.539 (0.228)	omitted	omitted	0.534 (0.233)	omitted
COMLANG _{ij}	omitted	0.051	-156.103	omitted	0.055	-57.491	omitted	0.050	-112.954

CONTIG _{ij}	omitted	(0.761) 0.123 (0.630)	(0.755) omitted	omitted	(0.744) 0.122 (0.631)	(0.873) omitted	omitted	(0.767) 0.124 (0.629)	(0.847) omitted
GEFC _t	-3.652 ^c (0.000)	-2.601 ^b (0.015)	omitted	-3.546 ^c (0.000)	-2.470 ^b (0.021)	omitted	-3.403 ^c (0.000)	-2.394 ^b (0.026)	omitted
COVID _t	-4.556 ^c (0.000)	-3.251 ^b (0.012)	omitted	-4.305 ^c (0.000)	-2.983 ^b (0.021)	omitted	-4.209 ^c (0.000)	-2.968 ^b (0.023)	omitted
Constant	-85.478 ^c (0.000)	-51.853 ^c (0.006)	omitted	-94.660 ^c (0.000)	-61.377 ^c (0.002)	omitted	-82.961 ^c (0.000)	-50.788 ^c (0.005)	omitted
Observations	8,022	8,022	7,444	8,022	8,022	7,444	8,056	8,056	7,444
Groups	600	25	600	600	25	600	600	25	600
Instruments	-	-	77	-	-	77	-	-	77
R-squared	0.546	0.683	-	0.545	0.685	-	0.549	0.683	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dyad-fixed	Y	N	-	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-	N	Y	-
Importer-fixed	N	Y	-	N	Y	-	N	Y	-
Vce clustered	Y	Y	-	Y	Y	-	Y	Y	-
F tests ¹	100.75 ^c	118.26 ^c	-	90.11 ^c	81.78 ^c	-	91.50 ^c	77.92 ^c	-
Hausman tests ² (chi2)	407.90 ^c	1,478.31 ^c	-	391.05 ^c	713.63 ^c	-	9,137.32 ^c	988.20 ^c	-
AR(1) (z)	-	-	-2.33 ^b	-	-	-2.45 ^b	-	-	-2.95 ^c
AR(1) (p)	-	-	0.020	-	-	0.014	-	-	0.003
AR(2) (z)	-	-	1.18	-	-	1.11	-	-	1.21
AR(2) (p)	-	-	0.238	-	-	0.266	-	-	0.226
Hansen test (chi2)	-	-	29.92	-	-	36.24	-	-	39.21
Hansen test (p)	-	-	0.789	-	-	0.364	-	-	0.371

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C3.21: Estimation results of low-low overall IQ models

ln(1 + BIT _{ijt})	GDI			GII			FLA		
	(1) FE-I	(2) FE-II	(3) SGMM-II	(4) FE-I	(5) FE-II	(6) SGMM-II	(7) FE-I	(8) FE-II	(9) SGMM-II
L1.ln(1 + BIT _{ijt})			0.439 ^b (0.017)			0.443 ^b (0.015)			0.447 ^c (0.001)
L2.ln(1 + BIT _{ijt})									-0.036 (0.419)
L1.lnGDP _{it}			-0.268 (0.606)			-0.286 (0.675)			-0.166 (0.730)
L2.lnGDP _{it}									
L1.lnGDP _{jt}			-0.542 (0.335)			-0.620 (0.305)			0.299 (0.509)
L2.lnGDP _{jt}									
L1.lnEXG _{jit}			0.440 (0.125)			0.526 (0.141)			0.013 (0.946)
L2.lnEXG _{jit}									
lnGDP _{it}	0.762 ^c (0.000)	0.742 ^c (0.002)		0.739 ^c (0.000)	0.705 ^c (0.002)		0.761 ^c (0.000)	0.745 ^c (0.002)	
lnGDP _{jt}	0.729 ^c (0.000)	0.700 ^c (0.000)		0.699 ^c (0.000)	0.670 ^c (0.000)		0.734 ^c (0.000)	0.708 ^c (0.000)	
lnPOP _{it}	0.701 ^c (0.000)	0.634 ^b (0.037)	0.394 (0.956)	0.916 ^c (0.000)	0.890 ^c (0.005)	-3.792 (0.543)	0.694 ^c (0.000)	0.658 ^b (0.011)	5.063 (0.290)
lnPOP _{jt}	-0.023 (0.925)	0.004 (0.988)	0.591 (0.932)	0.396 ^b (0.048)	0.393 (0.104)	-3.328 (0.565)	-0.065 (0.710)	-0.006 (0.976)	2.911 (0.569)
lnDIST _{ij}	omitted	-1.349 ^c (0.000)	-9.829 (0.703)	omitted	-1.347 ^c (0.000)	-0.547 (0.984)	omitted	-1.351 ^c (0.000)	-27.495 (0.256)
lnGDI _{it}	2.009 ^b (0.034)	2.576 ^a (0.096)	-16.490 (0.275)						

C

lnGDI _{jt}	1.419 (0.275)	1.830 (0.229)	-13.397 (0.359)						
lnGII _{it}				0.171 ^b (0.036)	0.185 (0.200)	0.115 (0.894)			
lnGII _{jt}				0.248 ^c (0.001)	0.214 ^b (0.037)	-0.056 (0.951)			
lnFLA _{it}							-0.055 (0.750)	-0.061 (0.836)	0.829 (0.817)
lnFLA _{jt}							0.042 (0.881)	0.007 (0.982)	1.838 (0.603)
lnREMOTE _{it}	-1.483 ^c (0.000)	-1.493 ^c (0.003)	-3.633 (0.469)	-1.414 ^c (0.000)	-1.358 ^c (0.002)	-5.843 (0.277)	-1.327 ^c (0.000)	-1.306 ^c (0.008)	-2.956 (0.447)
lnREMOTE _{jt}	-0.875 ^c (0.001)	-0.840 ^b (0.033)	-2.818 (0.522)	-0.919 ^c (0.000)	-0.785 ^a (0.065)	-4.687 (0.380)	-0.751 ^c (0.000)	-0.700 ^a (0.072)	-3.692 (0.318)
lnEXG _{jit}	0.057 (0.436)	0.060 (0.542)		0.063 (0.272)	0.057 (0.509)		0.056 (0.356)	0.059 (0.515)	
lnDIN _{ijt}	0.019 (0.224)	0.053 (0.193)	0.143 (0.700)	0.018 (0.231)	0.050 (0.195)	0.503 (0.261)	0.020 (0.201)	0.053 (0.191)	0.223 (0.584)
lnESIM _{ijt}	0.056 (0.324)	-0.080 (0.290)	0.834 (0.421)	0.067 (0.221)	-0.080 (0.293)	0.912 (0.506)	0.050 (0.381)	-0.082 (0.279)	0.286 (0.718)
RTA _{ijt}	0.050 (0.284)	0.107 (0.247)	-0.749 (0.632)	0.077 ^a (0.085)	0.110 (0.236)	-0.375 (0.804)	0.039 (0.420)	0.104 (0.263)	-0.739 (0.604)
LLOCK _i	omitted	omitted	23.877 (0.525)	omitted	omitted	8.809 (0.863)	omitted	omitted	-7.647 (0.884)
LLOCK _j	omitted	-2.663 ^c (0.000)	3.188 (0.919)	omitted	-2.484 ^c (0.000)	-11.945 (0.767)	omitted	-2.511 ^c (0.000)	-18.631 (0.659)
COMCOL _{ij}	omitted	0.492 (0.354)	omitted	omitted	0.498 (0.348)	omitted	omitted	0.491 (0.356)	omitted
COMLANG _{ij}	omitted	0.388 ^c (0.010)	omitted	omitted	0.395 ^c (0.008)	omitted	omitted	0.388 ^c (0.010)	omitted
CONTIG _{ij}	omitted	0.387 ^b (0.046)	-25.269 (0.939)	omitted	0.388 ^b (0.044)	174.618 (0.589)	omitted	0.389 ^b (0.044)	-159.243 (0.581)
GEFC _t	-2.631 ^c	-2.574 ^c	omitted	-2.517 ^c	-2.253 ^b	omitted	-2.285 ^c	-2.172 ^b	omitted

COVID _t	(0.000) -3.315 ^c	(0.005) -3.257 ^c	omitted	(0.000) -3.023 ^c	(0.015) -2.707 ^b	omitted	(0.000) -2.851 ^c	(0.023) -2.717 ^b	omitted
Constant	(0.000) -69.937 ^c	(0.004) -55.910 ^c	omitted	(0.000) -79.033 ^c	(0.015) -61.914 ^c	omitted	(0.000) -65.597 ^c	(0.019) -52.102 ^c	omitted
	(0.000)	(0.001)		(0.000)	(0.000)		(0.000)	(0.001)	
Observations	14,562	14,562	13,962	14,562	14,562	13,962	14,612	14,612	13,312
Groups	870	30	870	870	30	870	870	30	870
Instruments	-	-	77	-	-	77	-	-	77
R-squared	0.507	0.709	-	0.509	0.712	-	0.509	0.708	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dyad-fixed	Y	N	-	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-	N	Y	-
Importer-fixed	N	Y	-	N	Y	-	N	Y	-
Vce clustered	Y	Y	-	Y	Y	-	Y	Y	-
F tests ¹	121.27 ^c	180.53 ^c	-	117.49 ^c	136.33 ^c	-	112.83 ^c	125.90 ^c	-
Hausman tests ² (chi2)	469.37 ^c	1,568.91 ^c	-	409.02 ^c	1,240.54 ^c	-	470.82 ^c	1,252.05 ^c	-
AR(1) (z)	-	-	-2.01 ^b	-	-	-2.00 ^b	-	-	-2.45 ^b
AR(1) (p)	-	-	0.044	-	-	0.045	-	-	0.014
AR(2) (z)	-	-	0.73	-	-	0.66	-	-	1.26
AR(2) (p)	-	-	0.463	-	-	0.510	-	-	0.208
Hansen test (chi2)	-	-	46.93	-	-	39.86	-	-	46.17
Hansen test (p)	-	-	0.179	-	-	0.432	-	-	0.200

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C3.22: Estimation results of low-high and high-low COC models

ln(1 + BIT _{ijt})	GDI			GII			FLA		
	(1) FE-I	(2) FE-II	(3) SGMM-II	(4) FE-I	(5) FE-II	(6) SGMM-II	(7) FE-I	(8) FE-II	(9) SGMM-II
L1.ln(1 + BIT _{ijt})			0.390 ^c (0.000)			0.508 ^b (0.012)			0.350 ^c (0.008)
L2.ln(1 + BIT _{ijt})			-0.023 (0.590)						-0.050 (0.298)
L1.lnGDP _{it}			0.704 (0.179)			-0.023 (0.978)			-0.136 (0.768)
L2.lnGDP _{it}						0.892 (0.514)			
L1.lnGDP _{jt}			0.916 ^a (0.087)			-0.027 (0.976)			0.027 (0.947)
L2.lnGDP _{jt}						1.184 (0.383)			
L1.lnEXG _{jit}			0.107 (0.358)			0.168 (0.634)			0.144 (0.371)
L2.lnEXG _{jit}						-0.111 (0.726)			
lnGDP _{it}	0.675 ^c (0.000)	0.602 ^c (0.002)		0.684 ^c (0.000)	0.607 ^c (0.001)		0.692 ^c (0.000)	0.623 ^c (0.001)	
lnGDP _{jt}	0.644 ^c (0.000)	0.582 ^c (0.000)		0.662 ^c (0.000)	0.592 ^c (0.000)		0.634 ^c (0.000)	0.568 ^c (0.000)	
lnPOP _{it}	0.733 ^c (0.001)	0.627 (0.273)	0.407 (0.882)	0.646 ^c (0.002)	0.617 (0.230)	-0.333 (0.951)	0.708 ^c (0.000)	0.615 (0.236)	4.114 ^a (0.095)
lnPOP _{jt}	0.089 (0.617)	0.142 (0.347)	-1.174 (0.648)	-0.045 (0.807)	0.105 (0.507)	-1.470 (0.863)	0.152 (0.424)	0.250 (0.142)	3.334 (0.190)
lnDIST _{ij}	omitted	-1.309 ^c (0.000)	-15.741 (0.315)	omitted	-1.312 ^c (0.000)	29.262 (0.790)	omitted	-1.311 ^c (0.000)	-14.301 (0.737)
COC _{it}	0.143 ^b (0.029)	0.130 (0.354)	-0.748 (0.124)	0.148 ^b (0.021)	0.143 (0.304)	-0.514 (0.748)	0.153 ^b (0.020)	0.138 (0.322)	0.014 (0.977)

COC _{jt}	-0.020 (0.763)	0.080 (0.178)	-0.883 ^a (0.082)	-0.024 (0.713)	0.080 (0.141)	-0.594 (0.669)	-0.008 (0.901)	0.088 (0.152)	-0.042 (0.933)
lnGDI _{it}	2.070 ^b (0.011)	2.104 (0.151)	-29.403 ^c (0.001)						
lnGDI _{jt}	0.875 (0.308)	0.620 (0.339)	-23.049 ^c (0.005)						
lnGII _{it}				-0.035 (0.535)	0.012 (0.894)	0.055 (0.966)			
lnGII _{jt}				-0.103 ^a (0.064)	-0.055 (0.381)	-0.110 (0.936)			
lnFLA _{it}							0.020 (0.879)	0.036 (0.851)	1.301 (0.679)
lnFLA _{jt}							-0.147 (0.354)	-0.219 (0.199)	0.618 (0.860)
lnREMOTE _{it}	-1.443 ^c (0.000)	-1.386 ^c (0.001)	-3.874 (0.406)	-1.309 ^c (0.000)	-1.278 ^c (0.002)	0.533 (0.985)	-1.338 ^c (0.000)	-1.281 ^c (0.002)	-5.752 (0.357)
lnREMOTE _{jt}	-0.606 ^c (0.001)	-0.462 ^a (0.054)	-4.780 (0.318)	-0.496 ^c (0.005)	-0.388 (0.118)	0.399 (0.989)	-0.584 ^c (0.001)	-0.461 ^a (0.055)	-5.184 (0.378)
lnEXG _{jit}	0.087 ^b (0.038)	0.069 (0.274)		0.077 ^a (0.068)	0.062 (0.336)		0.097 ^b (0.013)	0.082 (0.209)	
lnDIN _{ijt}	-0.059 ^b (0.045)	0.097 (0.196)	0.120 (0.732)	-0.051 ^a (0.083)	0.101 (0.181)	0.217 (0.747)	-0.051 ^a (0.095)	0.101 (0.183)	0.030 (0.962)
lnESIM _{ijt}	0.143 ^c (0.002)	-0.131 ^a (0.079)	-0.202 (0.763)	0.162 ^c (0.000)	-0.130 ^a (0.082)	-0.924 (0.694)	0.151 ^c (0.001)	-0.130 ^a (0.080)	-1.306 (0.241)
RTA _{ijt}	0.085 ^b (0.029)	0.280 ^c (0.003)	-0.612 (0.227)	0.075 ^a (0.057)	0.273 ^c (0.004)	-0.509 (0.593)	0.080 ^b (0.040)	0.276 ^c (0.003)	-0.489 (0.497)
LLOCK _i	omitted	omitted	-32.673 (0.678)	omitted	omitted	2.841 (0.925)	omitted	omitted	6.601 (0.966)
LLOCK _j	omitted	-3.080 ^c (0.000)	-61.540 (0.427)	omitted	-2.996 ^c (0.000)	-7.140 (0.873)	omitted	-3.005 ^c (0.000)	-29.675 (0.831)
COMCOL _{ij}	omitted	0.176 (0.701)	omitted	omitted	0.177 (0.698)	-221.846 (0.729)	omitted	0.175 (0.703)	omitted
COMLANG _{ij}	omitted	0.181	35.240	omitted	0.184	-154.949	omitted	0.181	76.113

CONTIG _{ij}	omitted	(0.151) 0.069 (0.687)	(0.743) omitted	omitted	(0.143) 0.069 (0.681)	(0.763) 59.793 (0.831)	omitted	(0.152) 0.072 (0.671)	(0.679) omitted
GEFC _t	-2.370 ^c (0.000)	-2.076 ^c (0.001)	omitted	-2.114 ^c (0.000)	-1.869 ^c (0.003)	omitted	-2.206 ^c (0.000)	-1.940 ^c (0.002)	omitted
COVID _t	-3.026 ^c (0.000)	-2.674 ^c (0.001)	omitted	-2.736 ^c (0.000)	-2.413 ^c (0.002)	-0.611 (0.986)	-2.801 ^c (0.000)	-2.486 ^c (0.001)	omitted
Constant	-62.652 ^c (0.000)	-45.544 ^c (0.002)	omitted	-56.692 ^c (0.000)	-42.961 ^c (0.002)	-244.747 (0.859)	-61.504 ^c (0.000)	-45.338 ^c (0.001)	-156.479 (0.742)
Observations	16,746	16,746	15,108	16,746	16,746	15,108	16,788	16,788	15,108
Groups	956	41	956	956	41	956	956	41	956
Instruments	-	-	77	-	-	79	-	-	78
R-squared	0.475	0.782	-	0.475	0.782	-	0.477	0.781	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dyad-fixed	Y	N	-	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-	N	Y	-
Importer-fixed	N	Y	-	N	Y	-	N	Y	-
Vce clustered	Y	Y	-	Y	Y	-	Y	Y	-
F tests ¹	141.82 ^c	248.46 ^c	-	142.50 ^c	237.37 ^c	-	136.71 ^c	203.98 ^c	-
Hausman tests ² (chi2)	1,493.52 ^c	607.88 ^c	-	981.52 ^c	628.40 ^c	-	1,031.73 ^c	609.19 ^c	-
AR(1) (z)	-	-	-3.37 ^c	-	-	-2.68 ^c	-	-	-1.87 ^a
AR(1) (p)	-	-	0.001	-	-	0.007	-	-	0.061
AR(2) (z)	-	-	1.19	-	-	-0.66	-	-	0.82
AR(2) (p)	-	-	0.233	-	-	0.511	-	-	0.410
Hansen test (chi2)	-	-	35.12	-	-	45.72	-	-	48.88
Hansen test (p)	-	-	0.557	-	-	0.154	-	-	0.111

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C3.23: Estimation results of low-high and high-low GVE models

ln(1 + BIT _{ijt})	GDI			GII			FLA		
	(1) FE-I	(2) FE-II	(3) SGMM-II	(4) FE-I	(5) FE-II	(6) SGMM-II	(7) FE-I	(8) FE-II	(9) SGMM-II
L1.ln(1 + BIT _{ijt})			0.349 ^b (0.034)			0.332 (0.144)			0.303 (0.175)
L2.ln(1 + BIT _{ijt})									
L1.lnGDP _{it}			0.237 (0.748)						-0.075 (0.926)
L2.lnGDP _{it}						0.148 (0.798)			-0.163 (0.821)
L1.lnGDP _{jt}			0.270 (0.770)						0.052 (0.957)
L2.lnGDP _{jt}						0.287 (0.656)			0.160 (0.795)
L1.lnEXG _{jit}			0.243 (0.239)						0.099 (0.762)
L2.lnEXG _{jit}						0.095 (0.771)			0.055 (0.863)
lnGDP _{it}	0.588 ^c (0.000)	0.544 ^c (0.000)		0.621 ^c (0.000)	0.559 ^c (0.000)		0.634 ^c (0.000)	0.585 ^c (0.000)	
lnGDP _{jt}	0.651 ^c (0.000)	0.642 ^c (0.000)		0.663 ^c (0.000)	0.645 ^c (0.000)		0.650 ^c (0.000)	0.657 ^c (0.000)	
lnPOP _{it}	0.164 (0.379)	0.243 (0.483)	3.667 (0.355)	0.154 (0.395)	0.314 (0.289)	4.656 (0.371)	0.116 (0.489)	0.112 (0.697)	4.798 (0.221)
lnPOP _{jt}	-0.314 ^b (0.029)	-0.366 ^a (0.066)	4.177 (0.288)	-0.307 ^b (0.047)	-0.192 (0.360)	3.073 (0.615)	-0.277 ^a (0.055)	-0.381 ^a (0.084)	3.316 (0.374)
lnDIST _{ij}	omitted	-1.246 ^c (0.000)	-0.633 (0.994)	omitted	-1.248 ^c (0.000)	-18.655 (0.785)	omitted	-1.249 ^c (0.000)	-20.568 (0.592)
GVE _{it}	0.194 ^c (0.000)	0.204 ^b (0.021)	0.068 (0.927)	0.201 ^c (0.000)	0.224 ^b (0.016)	-0.035 (0.957)	0.204 ^c (0.000)	0.206 ^b (0.020)	-0.130 (0.869)

GVE _{jt}	-0.087 ^b (0.023)	-0.120 ^a (0.084)	0.038 (0.966)	-0.087 ^b (0.019)	-0.094 (0.150)	-0.223 (0.802)	-0.084 ^b (0.029)	-0.118 ^a (0.087)	-0.494 (0.476)
lnGDI _{it}	3.563 ^c (0.000)	2.626 ^a (0.054)	-14.795 (0.130)						
lnGDI _{jt}	1.394 ^b (0.039)	1.929 ^b (0.041)	-16.353 ^b (0.032)						
lnGII _{it}				0.008 (0.871)	0.087 (0.315)	-0.926 (0.409)			
lnGII _{jt}				-0.030 (0.493)	0.100 ^a (0.091)	-0.856 (0.521)			
lnFLA _{it}							0.170 (0.188)	0.258 (0.240)	0.830 (0.811)
lnFLA _{jt}							-0.032 (0.779)	0.014 (0.916)	1.000 (0.793)
lnREMOTE _{it}	-1.319 ^c (0.000)	-1.347 ^c (0.000)	-3.652 (0.656)	-1.143 ^c (0.000)	-1.278 ^c (0.000)	-1.132 (0.959)	-1.127 ^c (0.000)	-1.188 ^c (0.000)	-1.224 (0.882)
lnREMOTE _{jt}	-0.444 ^c (0.006)	-0.625 ^c (0.009)	-3.247 (0.659)	-0.358 ^b (0.024)	-0.614 ^b (0.024)	-1.036 (0.960)	-0.374 ^b (0.016)	-0.518 ^b (0.036)	-1.529 (0.866)
lnEXG _{jit}	0.084 ^b (0.018)	0.095 ^a (0.081)		0.089 ^b (0.014)	0.100 ^a (0.091)		0.103 ^c (0.003)	0.103 ^a (0.071)	
lnDIN _{ijt}	-0.058 ^c (0.002)	0.064 ^b (0.035)	-0.467 (0.562)	-0.057 ^c (0.002)	0.060 ^a (0.053)	-0.252 (0.669)	-0.060 ^c (0.002)	0.058 ^a (0.063)	-0.160 (0.849)
lnESIM _{ijt}	0.123 ^c (0.004)	-0.075 (0.169)	-0.882 (0.479)	0.125 ^c (0.003)	-0.077 (0.157)	-2.034 (0.478)	0.117 ^c (0.007)	-0.077 (0.159)	-0.880 (0.608)
RTA _{ijt}	0.115 ^c (0.003)	0.254 ^c (0.003)	-0.068 (0.897)	0.108 ^c (0.006)	0.249 ^c (0.004)	-0.843 (0.575)	0.105 ^c (0.008)	0.247 ^c (0.004)	-0.183 (0.820)
LLOCK _i	omitted	omitted	-21.142 (0.801)	omitted	omitted	-21.658 (0.760)	omitted	omitted	7.205 (0.930)
LLOCK _j	omitted	-3.285 ^c (0.000)	-23.744 (0.689)	omitted	-3.141 ^c (0.000)	-37.986 (0.729)	omitted	-3.159 ^c (0.000)	-14.912 (0.886)
COMCOL _{ij}	omitted	0.554 (0.203)	-32.115 (0.965)	omitted	0.558 (0.201)	-154.572 (0.677)	omitted	0.560 (0.200)	12.076 (0.979)
COMLANG _{ij}	omitted	0.238 ^b	-38.692	omitted	0.240 ^b	21.130	omitted	0.236 ^b	49.196

CONTIG _{ij}	omitted	(0.037) 0.201 (0.210)	(0.907) 9.496 (0.989)	omitted	(0.035) 0.200 (0.208)	(0.965) -157.068 (0.772)	omitted	(0.038) 0.202 (0.206)	(0.826) -107.253 (0.782)
GEFC _t	-1.941 ^c (0.000)	-2.225 ^c (0.000)	omitted	-1.645 ^c (0.000)	-2.080 ^c (0.001)	omitted	-1.634 ^c (0.000)	-1.920 ^c (0.001)	0.958 (0.754)
COVID _t	-2.437 ^c (0.000)	-2.748 ^c (0.000)	omitted	-2.042 ^c (0.000)	-2.462 ^c (0.001)	omitted	-2.022 ^c (0.000)	-2.335 ^c (0.001)	omitted
Constant	-39.887 ^c (0.000)	-32.279 ^c (0.004)	-226.132 (0.741)	-37.765 ^c (0.000)	-35.654 ^c (0.001)	omitted	-38.131 ^c (0.000)	-28.981 ^c (0.006)	omitted
Observations	16,734	16,734	15,936	16,734	16,734	15,096	16,772	16,772	15,096
Groups	1,128	41	1,096	1,128	41	1,096	1,128	41	1,096
Instruments	-	-	85	-	-	78	-	-	73
R-squared	0.499	0.785	-	0.496	0.785	-	0.498	0.784	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dyad-fixed	Y	N	-	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-	N	Y	-
Importer-fixed	N	Y	-	N	Y	-	N	Y	-
Vce clustered	Y	Y	-	Y	Y	-	Y	Y	-
F tests ¹	129.89 ^c	214.41 ^c	-	133.32 ^c	226.05 ^c	-	125.73 ^c	184.29 ^c	-
Hausman tests ² (chi2)	1,013.95 ^c	1,994.50 ^c	-	857.20 ^c	2,091.08 ^c	-	804.24 ^c	2,217.64 ^c	-
AR(1) (z)	-	-	-1.71 ^a	-	-	-1.34	-	-	-1.34
AR(1) (p)	-	-	0.088	-	-	0.180	-	-	0.181
AR(2) (z)	-	-	0.61	-	-	0.74	-	-	0.86
AR(2) (p)	-	-	0.539	-	-	0.458	-	-	0.390
Hansen test (chi2)	-	-	53.72	-	-	48.28	-	-	40.37
Hansen test (p)	-	-	0.175	-	-	0.146	-	-	0.121

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C3.24: Estimation results of low-high and high-low POS models

ln(1 + BIT _{ijt})	GDI			GII			FLA		
	(1) FE-I	(2) FE-II	(3) SGMM-II	(4) FE-I	(5) FE-II	(6) SGMM-II	(7) FE-I	(8) FE-II	(9) SGMM-II
L1.ln(1 + BIT _{ijt})			0.306 ^c (0.003)			0.562 ^b (0.011)			0.273 ^b (0.041)
L2.ln(1 + BIT _{ijt})						-0.266 (0.124)			-0.015 (0.721)
L1.lnGDP _{it}			0.414 (0.689)			-0.371 (0.456)			-0.763 ^b (0.045)
L2.lnGDP _{it}									
L1.lnGDP _{jt}			0.383 (0.681)			-0.097 (0.837)			-0.528 (0.152)
L2.lnGDP _{jt}									
L1.lnEXG _{jit}			0.162 (0.473)			-0.001 (0.993)			-0.046 (0.806)
L2.lnEXG _{jit}									
lnGDP _{it}	0.723 ^c (0.000)	0.625 ^c (0.001)		0.741 ^c (0.000)	0.617 ^c (0.001)		0.782 ^c (0.000)	0.661 ^c (0.001)	
lnGDP _{jt}	0.738 ^c (0.000)	0.638 ^c (0.000)		0.734 ^c (0.000)	0.623 ^c (0.000)		0.736 ^c (0.000)	0.635 ^c (0.000)	
lnPOP _{it}	0.715 ^c (0.002)	0.483 (0.452)	1.821 (0.732)	0.813 ^c (0.000)	0.670 (0.242)	2.994 (0.630)	0.561 ^c (0.007)	0.416 (0.425)	5.852 (0.215)
lnPOP _{jt}	-0.239 (0.206)	-0.168 (0.368)	-0.047 (0.994)	-0.031 (0.875)	0.078 (0.695)	2.357 (0.695)	-0.186 (0.331)	-0.138 (0.478)	4.451 (0.338)
lnDIST _{ij}	omitted	-1.179 ^c (0.000)	-3.285 (0.925)	omitted	-1.184 ^c (0.000)	-10.451 (0.371)	omitted	-1.183 ^c (0.000)	-13.745 (0.202)
POS _{it}	-0.045 (0.248)	-0.030 (0.776)	0.136 (0.733)	-0.042 (0.271)	-0.024 (0.810)	0.007 (0.989)	-0.045 (0.248)	-0.030 (0.775)	-0.138 (0.762)

cix

POS _{jt}	-0.035 (0.365)	-0.036 (0.421)	-0.003 (0.995)	-0.035 (0.358)	-0.031 (0.503)	-0.070 (0.877)	-0.046 (0.246)	-0.042 (0.354)	-0.273 (0.555)
lnGDI _{it}	4.190 ^c (0.000)	2.955 (0.123)	-37.178 ^a (0.088)						
lnGDI _{jt}	1.756 ^a (0.055)	0.984 (0.206)	-30.504 (0.102)						
lnGII _{it}				0.136 ^c (0.009)	0.158 (0.122)	2.091 (0.149)			
lnGII _{jt}				0.098 (0.107)	0.087 (0.335)	2.090 (0.151)			
lnFLA _{it}							0.240 (0.181)	0.160 (0.688)	0.123 (0.976)
lnFLA _{jt}							-0.154 (0.314)	-0.015 (0.923)	0.999 (0.806)
lnREMOTE _{it}	-1.419 ^c (0.000)	-1.216 ^c (0.006)	6.806 (0.552)	-1.306 ^c (0.000)	-1.157 ^c (0.006)	-2.519 (0.776)	-1.201 ^c (0.000)	-1.052 ^b (0.015)	4.153 (0.546)
lnREMOTE _{jt}	-0.696 ^c (0.000)	-0.476 ^a (0.055)	5.743 (0.600)	-0.711 ^c (0.000)	-0.482 (0.101)	-2.731 (0.753)	-0.641 ^c (0.000)	-0.432 ^a (0.099)	4.083 (0.554)
lnEXG _{jit}	0.037 (0.391)	0.075 (0.258)		0.042 (0.336)	0.069 (0.360)		0.063 (0.126)	0.093 (0.188)	
lnDIN _{ijt}	-0.032 ^a (0.090)	0.116 ^c (0.007)	0.205 (0.743)	-0.031 ^a (0.083)	0.111 ^c (0.007)	0.355 (0.402)	-0.028 (0.139)	0.117 ^c (0.007)	0.589 ^b (0.044)
lnESIM _{ijt}	0.098 ^a (0.056)	-0.133 ^a (0.056)	0.989 (0.639)	0.102 ^b (0.045)	-0.132 ^a (0.056)	-2.971 (0.139)	0.095 ^a (0.078)	-0.134 ^a (0.052)	-1.349 (0.382)
RTA _{ijt}	0.080 ^b (0.039)	0.152 (0.175)	0.089 (0.937)	0.080 ^b (0.036)	0.145 (0.188)	-0.226 (0.851)	0.070 ^a (0.075)	0.145 (0.192)	0.354 (0.765)
LLOCK _i	omitted	omitted	40.218 (0.899)	omitted	omitted	1.920 (0.964)	omitted	omitted	8.852 (0.822)
LLOCK _j	omitted	-2.716 ^c (0.000)	16.323 (0.957)	omitted	-2.597 ^c (0.000)	-5.417 (0.812)	omitted	-2.661 ^c (0.000)	-4.147 (0.898)
COMCOL _{ij}	omitted	0.399 (0.386)	omitted	omitted	0.402 (0.382)	omitted	omitted	0.398 (0.389)	omitted
COMLANG _{ij}	omitted	0.222	25.659	omitted	0.227	omitted	omitted	0.224	omitted

CX

CONTIG _{ij}	omitted	(0.122) 0.181 (0.334)	(0.967) omitted	omitted	(0.114) 0.171 (0.350)	omitted	omitted	(0.119) 0.182 (0.328)	omitted
GEFC _t	-2.535 ^c (0.000)	-1.915 ^c (0.008)	omitted	-2.364 ^c (0.000)	-1.790 ^b (0.013)	-1.525 (0.846)	-2.210 ^c (0.000)	-1.674 ^b (0.020)	3.954 (0.529)
COVID _t	-3.297 ^c (0.000)	-2.466 ^c (0.006)	omitted	-2.946 ^c (0.000)	-2.190 ^b (0.012)	-1.062 (0.938)	-2.846 ^c (0.000)	-2.137 ^b (0.016)	5.978 (0.593)
Constant	-61.440 ^c (0.000)	-39.075 ^b (0.018)	146.053 (0.761)	-65.688 ^c (0.000)	-44.592 ^c (0.006)	-53.942 (0.880)	-58.196 ^c (0.000)	-37.260 ^b (0.012)	84.240 (0.782)
Observations	16,660	16,660	15,892	16,660	16,660	15,052	16,708	16,708	15,052
Groups	1,274	41	1,272	1,274	41	1,272	1,274	41	1,272
Instruments	-	-	78	-	-	76	-	-	77
R-squared	0.445	0.740	-	0.442	0.742	-	0.444	0.740	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dyad-fixed	Y	N	-	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-	N	Y	-
Importer-fixed	N	Y	-	N	Y	-	N	Y	-
Vce clustered	Y	Y	-	Y	Y	-	Y	Y	-
F tests ¹	95.26 ^c	205.37 ^c	-	96.43 ^c	192.94 ^c	-	89.90 ^c	158.35 ^c	-
Hausman tests ² (chi2)	700.47 ^c	1,691.31 ^c	-	573.88 ^c	1,851.91 ^c	-	530.50 ^c	45,561.62 ^c	-
AR(1) (z)	-	-	-1.96 ^a	-	-	-1.95 ^a	-	-	-2.20 ^b
AR(1) (p)	-	-	0.051	-	-	0.051	-	-	0.028
AR(2) (z)	-	-	0.61	-	-	1.35	-	-	0.89
AR(2) (p)	-	-	0.540	-	-	0.177	-	-	0.373
Hansen test (chi2)	-	-	23.13	-	-	22.71	-	-	31.27
Hansen test (p)	-	-	0.973	-	-	0.959	-	-	0.734

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C3.25: Estimation results of low-high and high-low REQ models

ln(1 + BIT _{ijt})	GDI			GII			FLA		
	(1) FE-I	(2) FE-II	(3) SGMM-II	(4) FE-I	(5) FE-II	(6) SGMM-II	(7) FE-I	(8) FE-II	(9) SGMM-II
L1.ln(1 + BIT _{ijt})			0.246 ^a (0.079)			0.275 ^a (0.053)			0.064 (0.823)
L2.ln(1 + BIT _{ijt})						0.010 (0.742)			0.171 (0.157)
L1.lnGDP _{it}			1.035 ^a (0.086)			-0.599 ^a (0.056)			0.272 (0.767)
L2.lnGDP _{it}									0.310 (0.698)
L1.lnGDP _{jt}			1.281 ^b (0.046)			-0.438 (0.227)			0.704 (0.426)
L2.lnGDP _{jt}									0.453 (0.549)
L1.lnEXG _{jit}			0.042 (0.842)			0.118 (0.515)			0.157 (0.536)
L2.lnEXG _{jit}									0.280 (0.498)
lnGDP _{it}	0.682 ^c (0.000)	0.579 ^c (0.001)		0.711 ^c (0.000)	0.614 ^c (0.000)		0.724 ^c (0.000)	0.635 ^c (0.000)	
lnGDP _{jt}	0.658 ^c (0.000)	0.688 ^c (0.000)		0.656 ^c (0.000)	0.676 ^c (0.000)		0.652 ^c (0.000)	0.679 ^c (0.000)	
lnPOP _{it}	0.369 ^b (0.030)	0.473 (0.322)	0.740 (0.775)	0.250 (0.141)	0.362 (0.370)	1.383 (0.528)	0.242 (0.115)	0.326 (0.347)	-1.945 (0.561)
lnPOP _{jt}	-0.256 ^a (0.060)	-0.065 (0.707)	0.597 (0.833)	-0.285 ^a (0.063)	0.061 (0.701)	1.314 (0.620)	-0.264 ^a (0.066)	0.002 (0.991)	-7.692 (0.354)
lnDIST _{ij}	omitted	-1.266 ^c (0.000)	-1.264 (0.970)	omitted	-1.271 ^c (0.000)	-15.540 (0.649)	omitted	-1.270 ^c (0.000)	-11.674 (0.553)
REQ _{it}	-0.102 ^b (0.036)	-0.165 (0.143)	0.017 (0.962)	-0.077 (0.120)	-0.141 (0.209)	0.439 (0.178)	-0.075 (0.127)	-0.141 (0.206)	-0.098 (0.896)

REQ _{it}	0.024 (0.633)	0.075 (0.276)	-0.131 (0.723)	0.044 (0.381)	0.109 ^a (0.078)	0.296 (0.307)	0.040 (0.434)	0.095 (0.186)	-0.344 (0.677)
lnGDI _{it}	3.558 ^c (0.000)	3.755 ^b (0.046)	-45.011 ^c (0.005)						
lnGDI _{jt}	1.170 (0.122)	1.175 (0.166)	-40.453 ^c (0.008)						
lnGII _{it}				0.004 (0.932)	0.015 (0.895)	-0.206 (0.762)			
lnGII _{jt}				-0.020 (0.679)	0.044 (0.535)	-0.152 (0.795)			
lnFLA _{it}							0.143 (0.353)	0.241 (0.499)	3.689 (0.304)
lnFLA _{jt}							-0.018 (0.893)	-0.163 (0.311)	3.406 (0.291)
lnREMOTE _{it}	-1.463 ^c (0.000)	-1.413 ^c (0.002)	2.391 (0.808)	-1.272 ^c (0.000)	-1.215 ^c (0.004)	4.053 (0.254)	-1.272 ^c (0.000)	-1.219 ^c (0.004)	26.585 ^a (0.078)
lnREMOTE _{jt}	-0.668 ^c (0.000)	-0.567 ^b (0.043)	2.032 (0.832)	-0.602 ^c (0.000)	-0.556 ^a (0.068)	4.249 (0.247)	-0.616 ^c (0.000)	-0.538 ^a (0.060)	26.610 ^a (0.064)
lnEXG _{jit}	0.079 ^a (0.054)	0.030 (0.661)		0.086 ^b (0.030)	0.049 (0.460)		0.101 ^c (0.007)	0.056 (0.393)	
lnDIN _{ijt}	0.002 (0.902)	0.041 (0.416)	-0.536 (0.364)	0.006 (0.731)	0.034 (0.476)	0.181 (0.617)	0.006 (0.763)	0.040 (0.429)	0.802 (0.150)
lnESIM _{ijt}	0.136 ^c (0.002)	-0.100 (0.112)	0.781 (0.467)	0.135 ^c (0.002)	-0.100 (0.110)	-0.826 (0.400)	0.126 ^c (0.005)	-0.101 (0.106)	2.816 (0.113)
RTA _{ijt}	0.149 ^c (0.000)	0.322 ^c (0.001)	-0.108 (0.902)	0.138 ^c (0.000)	0.313 ^c (0.001)	-0.158 (0.803)	0.136 ^c (0.000)	0.313 ^c (0.001)	-0.169 (0.854)
LLOCK _i	omitted	omitted	14.057 (0.828)	omitted	omitted	-6.983 (0.867)	omitted	omitted	134.138 (0.454)
LLOCK _j	omitted	-3.135 ^c (0.000)	11.391 (0.857)	omitted	-3.084 ^c (0.000)	-9.636 (0.812)	omitted	-3.070 ^c (0.000)	63.244 (0.561)
COMCOL _{ij}	omitted	0.109 (0.850)	omitted	omitted	0.112 (0.847)	125.282 (0.732)	omitted	0.109 (0.851)	omitted
COMLANG _{ij}	omitted	0.185	omitted	omitted	0.192	5.650	omitted	0.187	154.772

CONTIG _{ij}	omitted	(0.126) 0.348 ^b (0.047)	omitted	omitted	(0.111) 0.343 ^b (0.049)	(0.973) -109.481 (0.666)	omitted	(0.125) 0.346 ^b (0.047)	(0.588) omitted
GEFC _t	-2.463 ^c (0.000)	-2.284 ^c (0.002)	omitted	-2.159 ^c (0.000)	-2.020 ^c (0.006)	omitted	-2.165 ^c (0.000)	-2.018 ^c (0.006)	-8.946 ^a (0.092)
COVID _t	-3.109 ^c (0.000)	-2.913 ^c (0.002)	omitted	-2.694 ^c (0.000)	-2.520 ^c (0.005)	omitted	-2.700 ^c (0.000)	-2.544 ^c (0.005)	omitted
Constant	-52.487 ^c (0.000)	-42.604 ^c (0.004)	omitted	-47.509 ^c (0.000)	-40.615 ^c (0.003)	245.734 (0.364)	-48.649 ^c (0.000)	-40.029 ^c (0.002)	943.082 (0.119)
Observations	16,682	16,682	15,884	16,682	16,682	15,048	16,724	16,724	15,048
Groups	1,248	41	1,218	1,248	41	1,218	1,248	41	1,218
Instruments	-	-	73	-	-	85	-	-	71
R-squared	0.472	0.770	-	0.470	0.772	-	0.471	0.769	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dyad-fixed	Y	N	-	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-	N	Y	-
Importer-fixed	N	Y	-	N	Y	-	N	Y	-
Vce clustered	Y	Y	-	Y	Y	-	Y	Y	-
F tests ¹	112.06 ^c	243.38 ^c	-	113.72 ^c	228.92 ^c	-	105.75 ^c	187.52 ^c	-
Hausman tests ² (chi2)	922.33 ^c	1,065.73 ^c	-	875.38 ^c	1,111.28 ^c	-	770.49 ^c	1,249.46 ^c	-
AR(1) (z)	-	-	-2.15 ^b	-	-	-2.12 ^b	-	-	1.80 ^a
AR(1) (p)	-	-	0.032	-	-	0.034	-	-	0.071
AR(2) (z)	-	-	0.30	-	-	-0.41	-	-	1.64 ^a
AR(2) (p)	-	-	0.761	-	-	0.682	-	-	0.100
Hansen test (chi2)	-	-	25.98	-	-	56.61	-	-	37.57
Hansen test (p)	-	-	0.803	-	-	0.115	-	-	0.107

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C3.26: Estimation results of low-high and high-low ROL models

ln(1 + BIT _{ijt})	GDI			GII			FLA		
	(1) FE-I	(2) FE-II	(3) SGMM-II	(4) FE-I	(5) FE-II	(6) SGMM-II	(7) FE-I	(8) FE-II	(9) SGMM-II
L1.ln(1 + BIT _{ijt})			0.273 ^b (0.020)			0.432 ^b (0.016)			0.337 ^c (0.005)
L2.ln(1 + BIT _{ijt})									
L1.lnGDP _{it}						-1.466 (0.153)			-1.299 (0.191)
L2.lnGDP _{it}			-0.197 (0.334)			1.010 (0.278)			0.906 (0.206)
L1.lnGDP _{jt}						-1.012 (0.325)			-0.921 (0.333)
L2.lnGDP _{jt}			-0.001 (0.995)			1.108 (0.256)			1.037 (0.156)
L1.lnEXG _{jit}						-0.132 (0.704)			-0.164 (0.550)
L2.lnEXG _{jit}			0.003 (0.971)			0.241 (0.397)			0.158 (0.525)
lnGDP _{it}	0.645 ^c (0.000)	0.561 ^c (0.000)		0.690 ^c (0.000)	0.590 ^c (0.000)		0.695 ^c (0.000)	0.609 ^c (0.000)	
lnGDP _{jt}	0.654 ^c (0.000)	0.606 ^c (0.000)		0.668 ^c (0.000)	0.598 ^c (0.000)		0.656 ^c (0.000)	0.609 ^c (0.000)	
lnPOP _{it}	0.256 (0.145)	0.215 (0.541)	4.632 (0.116)	0.091 (0.604)	0.225 (0.478)	6.262 (0.239)	0.127 (0.420)	0.074 (0.804)	5.762 (0.268)
lnPOP _{jt}	-0.341 ^b (0.023)	-0.390 ^b (0.022)	4.300 ^a (0.091)	-0.408 ^b (0.014)	-0.238 (0.176)	3.129 (0.489)	-0.331 ^b (0.034)	-0.413 ^b (0.026)	3.609 (0.287)
lnDIST _{ij}	omitted	-1.238 ^c (0.000)	23.886 (0.204)	omitted	-1.240 ^c (0.000)	-3.184 (0.953)	omitted	-1.241 ^c (0.000)	-8.424 (0.907)
ROL _{it}	0.163 ^c (0.008)	0.209 ^a (0.057)	0.405 (0.685)	0.109 ^a (0.063)	0.182 (0.114)	2.543 ^a (0.075)	0.117 ^b (0.049)	0.171 (0.129)	2.032 (0.108)

ROL _{jt}	-0.019 (0.731)	0.024 (0.773)	0.042 (0.967)	-0.038 (0.488)	0.029 (0.729)	2.214 (0.145)	-0.036 (0.519)	0.008 (0.925)	1.666 (0.234)
lnGDI _{it}	3.180 ^c (0.000)	2.452 ^a (0.080)	-31.056 ^b (0.026)						
lnGDI _{jt}	1.195 ^a (0.100)	0.626 (0.439)	-28.075 ^b (0.015)						
lnGII _{it}				-0.032 (0.528)	0.054 (0.517)	0.285 (0.820)			
lnGII _{jt}				-0.038 (0.428)	0.071 (0.279)	0.209 (0.868)			
lnFLA _{it}							0.140 (0.346)	0.218 (0.367)	1.439 (0.716)
lnFLA _{jt}							-0.089 (0.480)	0.040 (0.767)	2.356 (0.585)
lnREMOTE _{it}	-1.455 ^c (0.000)	-1.494 ^c (0.000)	3.452 (0.738)	-1.227 ^c (0.000)	-1.387 ^c (0.000)	3.849 (0.793)	-1.253 ^c (0.000)	-1.335 ^c (0.000)	3.249 (0.877)
lnREMOTE _{jt}	-0.613 ^c (0.000)	-0.829 ^c (0.001)	3.223 (0.752)	-0.520 ^c (0.002)	-0.849 ^c (0.003)	3.474 (0.819)	-0.549 ^c (0.001)	-0.780 ^c (0.003)	2.846 (0.895)
lnEXG _{jit}	0.114 ^c (0.002)	0.098 (0.109)		0.123 ^c (0.001)	0.110 ^a (0.081)		0.131 ^c (0.000)	0.113 ^a (0.057)	
lnDIN _{ijt}	-0.037 ^a (0.077)	0.012 (0.805)	-0.256 (0.431)	-0.036 ^a (0.072)	0.011 (0.812)	-0.732 ^a (0.053)	-0.039 ^a (0.076)	0.010 (0.828)	-0.541 (0.177)
lnESIM _{ijt}	0.140 ^c (0.002)	-0.085 (0.173)	0.290 (0.864)	0.151 ^c (0.001)	-0.086 (0.166)	-3.067 (0.283)	0.140 ^c (0.002)	-0.086 (0.168)	-1.964 (0.555)
RTA _{ijt}	0.132 ^c (0.001)	0.325 ^c (0.001)	-0.719 (0.169)	0.122 ^c (0.002)	0.321 ^c (0.001)	-0.202 (0.859)	0.124 ^c (0.002)	0.319 ^c (0.001)	-0.755 (0.419)
LLOCK _i	omitted	omitted	3.215 (0.915)	omitted	omitted	-5.944 (0.963)	omitted	omitted	17.475 (0.904)
LLOCK _j	omitted	-3.329 ^c (0.000)	2.588 (0.934)	omitted	-3.293 ^c (0.000)	-41.061 (0.792)	omitted	-3.312 ^c (0.000)	-8.577 (0.964)
COMCOL _{ij}	omitted	0.187 (0.747)	-218.645 (0.251)	omitted	0.189 (0.745)	omitted	omitted	0.186 (0.749)	omitted
COMLANG _{ij}	omitted	0.237 ^b	-97.310	omitted	0.239 ^b	-86.365	omitted	0.236 ^b	omitted

CONTIG _{ij}	omitted	(0.048) 0.238	(0.105) 108.432	omitted	(0.045) 0.236	(0.694) 5.925	omitted	(0.049) 0.240	-25.446
GEFC _t	-2.347 ^c (0.000)	-2.481 ^c (0.000)	omitted	-2.000 ^c (0.000)	-2.357 ^c (0.000)	omitted	-2.041 ^c (0.000)	-2.256 ^c (0.000)	omitted
COVID _t	-2.942 ^c (0.000)	-3.103 ^c (0.000)	omitted	-2.498 ^c (0.000)	-2.878 ^c (0.000)	omitted	-2.526 ^c (0.000)	-2.797 ^c (0.000)	omitted
Constant	-46.890 ^c (0.000)	-35.454 ^c (0.001)	-242.435 (0.439)	-40.382 ^c (0.000)	-37.342 ^c (0.001)	omitted	-43.010 ^c (0.000)	-32.299 ^c (0.002)	omitted
Observations	16,748	16,748	15,108	16,748	16,748	15,108	16,788	16,788	15,108
Groups	1,026	41	1,026	1,026	41	1,026	1,026	41	1,026
Instruments	-	-	83	-	-	72	-	-	74
R-squared	0.478	0.771	-	0.476	0.771	-	0.478	0.770	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dyad-fixed	Y	N	-	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-	N	Y	-
Importer-fixed	N	Y	-	N	Y	-	N	Y	-
Vce clustered	Y	Y	-	Y	Y	-	Y	Y	-
F tests ¹	139.09 ^c	248.81 ^c	-	140.18 ^c	241.86 ^c	-	131.59 ^c	199.04 ^c	-
Hausman tests ² (chi2)	1,673.83 ^c	1,142.98 ^c	-	982.34 ^c	1,011.42 ^c	-	723.80 ^c	1,345.57 ^c	-
AR(1) (z)	-	-	-1.65 ^a	-	-	-1.84 ^a	-	-	-1.70 ^a
AR(1) (p)	-	-	0.098	-	-	0.065	-	-	0.088
AR(2) (z)	-	-	1.38	-	-	0.96	-	-	0.79
AR(2) (p)	-	-	0.168	-	-	0.339	-	-	0.431
Hansen test (chi2)	-	-	32.61	-	-	22.30	-	-	28.75
Hansen test (p)	-	-	0.897	-	-	0.843	-	-	0.632

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C3.27: Estimation results of low-high and high-low VAC models

ln(1 + BIT _{ijt})	GDI			GII			FLA		
	(1) FE-I	(2) FE-II	(3) SGMM-II	(4) FE-I	(5) FE-II	(6) SGMM-II	(7) FE-I	(8) FE-II	(9) SGMM-II
L1.ln(1 + BIT _{ijt})						0.393 ^c (0.006)			0.452 ^b (0.023)
L2.ln(1 + BIT _{ijt})			-0.041 (0.117)			0.007 (0.832)			-0.129 (0.370)
L1.lnGDP _{it}			0.010 (0.978)			-0.979 ^c (0.010)			-0.519 (0.160)
L2.lnGDP _{it}									
L1.lnGDP _{jt}			0.117 (0.754)			-0.796 ^b (0.045)			-0.377 (0.420)
L2.lnGDP _{jt}									
L1.lnEXG _{jit}			0.153 (0.307)			0.058 (0.723)			0.041 (0.781)
L2.lnEXG _{jit}									
lnGDP _{it}	0.706 ^c (0.000)	0.661 ^c (0.001)		0.717 ^c (0.000)	0.658 ^c (0.000)		0.744 ^c (0.000)	0.698 ^c (0.000)	
lnGDP _{jt}	0.616 ^c (0.000)	0.568 ^c (0.000)		0.635 ^c (0.000)	0.595 ^c (0.000)		0.616 ^c (0.000)	0.580 ^c (0.000)	
lnPOP _{it}	0.125 (0.501)	0.274 (0.581)	0.905 (0.543)	0.081 (0.667)	0.320 (0.452)	1.328 (0.490)	-0.020 (0.902)	0.103 (0.777)	2.052 (0.355)
lnPOP _{jt}	-0.310 ^b (0.042)	-0.195 (0.284)	1.345 (0.370)	-0.441 ^c (0.009)	-0.288 ^a (0.055)	1.836 (0.369)	-0.320 ^b (0.045)	-0.218 (0.266)	2.433 (0.269)
lnDIST _{ij}	omitted	-1.354 ^c (0.000)	-4.318 (0.180)	omitted	-1.358 ^c (0.000)	-6.003 (0.112)	omitted	-1.358 ^c (0.000)	-4.750 (0.272)
VAC _{it}	-0.150 ^c (0.006)	-0.222 ^a (0.078)	0.891 (0.236)	-0.144 ^c (0.010)	-0.206 (0.122)	1.913 ^a (0.052)	-0.138 ^b (0.013)	-0.200 (0.126)	1.089 (0.187)

VAC _{jt}	0.010 (0.857)	0.088 (0.310)	0.890 (0.252)	0.009 (0.860)	0.093 (0.239)	2.064 ^b (0.035)	0.009 (0.863)	0.089 (0.293)	1.382 (0.112)
lnGDI _{it}	3.502 ^c (0.000)	3.685 ^a (0.088)	-37.154 ^b (0.032)						
lnGDI _{jt}	1.548 ^b (0.045)	2.183 ^b (0.023)	-37.708 ^a (0.052)						
lnGII _{it}				0.061 (0.232)	0.111 (0.260)	1.536 (0.159)			
lnGII _{jt}				-0.066 (0.209)	-0.047 (0.472)	1.377 (0.174)			
lnFLA _{it}							0.146 (0.365)	0.245 (0.551)	-5.768 ^b (0.028)
lnFLA _{jt}							-0.093 (0.486)	-0.073 (0.619)	-4.023 ^a (0.087)
lnREMOTE _{it}	-1.699 ^c (0.000)	-1.721 ^c (0.000)	5.969 (0.363)	-1.548 ^c (0.000)	-1.583 ^c (0.000)	6.139 (0.477)	-1.502 ^c (0.000)	-1.503 ^c (0.000)	5.664 (0.438)
lnREMOTE _{jt}	-0.755 ^c (0.000)	-0.630 ^b (0.019)	6.226 (0.340)	-0.620 ^c (0.000)	-0.466 (0.111)	6.239 (0.463)	-0.688 ^c (0.000)	-0.536 ^a (0.058)	5.522 (0.479)
lnEXG _{jit}	0.072 ^a (0.064)	0.074 (0.295)		0.053 (0.184)	0.045 (0.532)		0.089 ^b (0.018)	0.085 (0.209)	
lnDIN _{ijt}	0.003 (0.848)	-0.016 (0.594)	-0.969 ^a (0.074)	0.005 (0.764)	-0.023 (0.421)	-1.150 ^b (0.015)	0.006 (0.729)	-0.016 (0.574)	-0.228 (0.683)
lnESIM _{ijt}	0.135 ^c (0.001)	-0.083 (0.230)	-1.424 (0.106)	0.139 ^c (0.001)	-0.081 (0.231)	-1.841 (0.147)	0.131 ^c (0.003)	-0.084 (0.222)	-2.180 ^a (0.063)
RTA _{ijt}	0.094 ^b (0.011)	0.271 ^c (0.004)	0.791 (0.255)	0.076 ^b (0.038)	0.261 ^c (0.005)	-0.376 (0.682)	0.075 ^b (0.045)	0.260 ^c (0.005)	-0.815 (0.487)
LLOCK _i	omitted	omitted	-6.128 (0.282)	omitted	omitted	-8.500 (0.179)	omitted	omitted	-6.921 (0.347)
LLOCK _j	omitted	-3.526 ^c (0.000)	-8.369 (0.108)	omitted	-3.307 ^c (0.000)	-10.025 ^a (0.077)	omitted	-3.377 ^c (0.000)	-9.758 (0.150)
COMCOL _{ij}	omitted	omitted	omitted	omitted	omitted	omitted	omitted	omitted	omitted
COMLANG _{ij}	omitted	0.385 ^c	-9.705	omitted	0.390 ^c	-5.563	omitted	0.387 ^c	-6.569

CONTIG _{ij}	omitted	(0.000) 0.433 ^b (0.025)	(0.532) 11.447 (0.666)	omitted	(0.000) 0.427 ^b (0.025)	(0.755) 4.278 (0.897)	omitted	(0.000) 0.435 ^b (0.023)	(0.730) 21.976 (0.513)
GEFC _t	-2.796 ^c (0.000)	-2.615 ^c (0.000)	omitted	-2.455 ^c (0.000)	-2.236 ^c (0.001)	omitted	-2.463 ^c (0.000)	-2.232 ^c (0.002)	omitted
COVID _t	-3.512 ^c (0.000)	-3.278 ^c (0.000)	omitted	-3.040 ^c (0.000)	-2.729 ^c (0.001)	omitted	-3.054 ^c (0.000)	-2.754 ^c (0.002)	omitted
Constant	-51.221 ^c (0.000)	-39.770 ^c (0.005)	182.277 (0.430)	-45.377 ^c (0.000)	-35.742 ^c (0.003)	236.841 (0.444)	-46.465 ^c (0.000)	-34.563 ^c (0.003)	188.654 (0.526)
Observations	16,642	16,642	15,032	16,642	16,642	15,032	16,688	16,688	15,032
Groups	1,094	41	1,094	1,094	41	1,094	1,094	41	1,094
Instruments	-	-	85	-	-	85	-	-	83
R-squared	0.487	0.764	-	0.487	0.766	-	0.486	0.763	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dyad-fixed	Y	N	-	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-	N	Y	-
Importer-fixed	N	Y	-	N	Y	-	N	Y	-
Vce clustered	Y	Y	-	Y	Y	-	Y	-	-
F tests ¹	116.60 ^c	336.21 ^c	-	118.60 ^c	290.18 ^c	-	107.43 ^c	242.09 ^c	-
Hausman tests ² (chi2)	870.67 ^c	2,422.37 ^c	-	700.99 ^c	129.81 ^c	-	888.46 ^c	2,454.42 ^c	-
AR(1) (z)	-	-	-2.57 ^c	-	-	-2.55 ^b	-	-	-1.94 ^a
AR(1) (p)	-	-	0.010	-	-	0.011	-	-	0.052
AR(2) (z)	-	-	-0.44	-	-	-1.49	-	-	1.03
AR(2) (p)	-	-	0.657	-	-	0.136	-	-	0.302
Hansen test (chi2)	-	-	27.90	-	-	26.82	-	-	35.62
Hansen test (p)	-	-	0.988	-	-	0.989	-	-	0.812

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C3.28: Estimation results of low-high and high-low overall IQ models

ln(1 + BIT _{ijt})	GDI			GII			FLA		
	(1) FE-I	(2) FE-II	(3) SGMM-II	(4) FE-I	(5) FE-II	(6) SGMM-II	(7) FE-I	(8) FE-II	(9) SGMM-II
L1.ln(1 + BIT _{ijt})			0.217 (0.190)			0.233 ^b (0.022)			0.208 (0.265)
L2.ln(1 + BIT _{ijt})			-0.009 (0.794)						-0.017 (0.672)
L1.lnGDP _{it}			0.006 (0.980)			-0.147 (0.748)			-0.287 (0.205)
L2.lnGDP _{it}						-0.176 (0.321)			
L1.lnGDP _{jt}			-0.053 (0.841)			-0.475 (0.352)			-0.227 (0.387)
L2.lnGDP _{jt}						0.096 (0.616)			
L1.lnEXG _{jit}			0.237 (0.128)			0.342 (0.181)			0.192 (0.279)
L2.lnEXG _{jit}						-0.073 (0.621)			
lnGDP _{it}	0.714 ^c (0.000)	0.683 ^c (0.000)		0.749 ^c (0.000)	0.712 ^c (0.000)		0.780 ^c (0.000)	0.740 ^c (0.000)	
lnGDP _{jt}	0.646 ^c (0.000)	0.673 ^c (0.000)		0.675 ^c (0.000)	0.690 ^c (0.000)		0.647 ^c (0.000)	0.679 ^c (0.000)	
lnPOP _{it}	0.175 (0.440)	0.126 (0.811)	2.577 (0.269)	0.215 (0.332)	0.127 (0.800)	4.414 (0.230)	0.038 (0.855)	-0.044 (0.920)	3.903 (0.193)
lnPOP _{jt}	-0.215 (0.221)	-0.218 (0.264)	3.649 (0.109)	-0.322 ^a (0.088)	-0.245 (0.173)	5.029 (0.126)	-0.154 (0.383)	-0.230 (0.287)	4.366 (0.113)
lnDIST _{ij}	omitted	-1.094 ^c (0.000)	-7.147 ^a (0.053)	omitted	-1.098 ^c (0.000)	-9.797 ^a (0.084)	omitted	-1.098 ^c (0.000)	-8.610 ^a (0.052)
lnGDI _{it}	3.830 ^c (0.000)	3.017 ^a (0.086)	-19.149 ^a (0.059)						

lnGDI _{jt}	1.471 ^a (0.099)	1.017 (0.281)	-9.636 (0.289)						
lnGII _{it}				0.089 ^a (0.074)	0.062 (0.448)	0.571 (0.239)			
lnGII _{jt}				-0.052 (0.226)	-0.019 (0.689)	0.768 (0.148)			
lnFLA _{it}							0.138 (0.401)	0.275 (0.309)	-1.914 (0.325)
lnFLA _{jt}							-0.240 ^a (0.065)	-0.012 (0.947)	-2.227 (0.318)
lnREMOTE _{it}	-1.416 ^c (0.000)	-1.243 ^c (0.001)	1.005 (0.670)	-1.345 ^c (0.000)	-1.157 ^c (0.003)	0.873 (0.742)	-1.271 ^c (0.000)	-1.094 ^c (0.005)	1.912 (0.475)
lnREMOTE _{jt}	-0.462 ^c (0.006)	-0.273 (0.239)	0.801 (0.712)	-0.367 ^b (0.020)	-0.213 (0.388)	0.796 (0.770)	-0.434 ^c (0.007)	-0.226 (0.343)	1.985 (0.422)
lnEXG _{jit}	0.105 ^b (0.021)	0.113 ^a (0.066)		0.093 ^b (0.049)	0.110 ^a (0.078)		0.129 ^c (0.004)	0.132 ^b (0.033)	
lnDIN _{ijt}	-0.032 ^b (0.014)	0.132 ^c (0.000)	0.230 (0.450)	-0.035 ^c (0.007)	0.131 ^c (0.000)	0.028 (0.928)	-0.036 ^c (0.008)	0.131 ^c (0.000)	0.477 (0.225)
lnESIM _{ijt}	0.204 ^c (0.000)	-0.071 (0.171)	-0.764 (0.415)	0.209 ^c (0.000)	-0.071 (0.172)	-0.880 (0.492)	0.213 ^c (0.000)	-0.073 (0.166)	-0.776 (0.473)
RTA _{ijt}	0.100 ^c (0.007)	0.289 ^c (0.001)	0.670 (0.466)	0.094 ^b (0.011)	0.281 ^c (0.001)	0.585 (0.406)	0.093 ^b (0.012)	0.281 ^c (0.001)	0.635 (0.529)
LLOCK _i	omitted	omitted	-12.635 (0.270)	omitted	omitted	-10.857 (0.405)	omitted	omitted	-12.300 (0.363)
LLOCK _j	omitted	-3.150 ^c (0.000)	-14.076 (0.318)	omitted	-3.058 ^c (0.000)	-16.093 (0.404)	omitted	-3.104 ^c (0.000)	-15.996 (0.371)
COMCOL _{ij}	omitted	omitted	omitted	omitted	omitted	omitted	omitted	omitted	omitted
COMLANG _{ij}	omitted	0.239 ^a (0.083)	omitted	omitted	0.244 ^a (0.078)	omitted	omitted	0.242 ^a (0.081)	omitted
CONTIG _{ij}	omitted	0.065 (0.677)	omitted	omitted	0.062 (0.689)	omitted	omitted	0.065 (0.677)	omitted
GEFC _t	-2.294 ^c	-1.933 ^c	omitted	-2.101 ^c	-1.766 ^c	1.475	-2.093 ^c	-1.725 ^c	omitted

COVID _t	(0.000) -2.910 ^c (0.000)	(0.002) -2.509 ^c (0.001)	omitted	(0.000) -2.615 ^c (0.000)	(0.005) -2.252 ^c (0.004)	(0.679) omitted	(0.000) -2.622 ^c (0.000)	(0.006) -2.221 ^c (0.004)	omitted
Constant	-46.504 ^c (0.000)	-32.792 ^b (0.016)	-10.364 (0.916)	-44.945 ^c (0.000)	-31.709 ^b (0.017)	-22.381 (0.861)	-44.426 ^c (0.000)	-29.974 ^b (0.015)	23.591 (0.835)
Observations	14,746	14,746	13,216	14,746	14,746	13,216	14,776	14,776	13,216
Groups	1,024	41	1,024	1,024	41	1,024	1,024	41	1,024
Instruments	-	-	77	-	-	77	-	-	77
R-squared	0.454	0.782	-	0.450	0.783	-	0.452	0.782	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dyad-fixed	Y	N	-	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-	N	Y	-
Importer-fixed	N	Y	-	N	Y	-	N	Y	-
Vce clustered	Y	Y	-	Y	Y	-	Y	Y	-
F tests ¹	121.29 ^c	266.21 ^c	-	120.30 ^c	240.08 ^c	-	111.08 ^c	204.70 ^c	-
Hausman tests ² (chi2)	616.51 ^c	12,852.16 ^c	-	470.17 ^c	6,047.54 ^c	-	13,179.44 ^c	1987.96 ^c	-
AR(1) (z)	-	-	-2.23 ^b	-	-	-2.74 ^c	-	-	-1.86 ^a
AR(1) (p)	-	-	0.025	-	-	0.006	-	-	0.063
AR(2) (z)	-	-	0.76	-	-	0.43	-	-	0.37
AR(2) (p)	-	-	0.445	-	-	0.665	-	-	0.713
Hansen test (chi2)	-	-	43.72	-	-	35.55	-	-	36.38
Hansen test (p)	-	-	0.316	-	-	0.583	-	-	0.634

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C3.29: PPML estimation results for aggregated samples of GDI models (for robustness check)

BIT _{ijt}	GDI models						
	COC	GVE	POS	REQ	ROL	VAC	IQ
lnGDP _{it}	0.652*** (0.000)	0.507*** (0.000)	0.507*** (0.000)	0.649*** (0.000)	0.684*** (0.000)	0.781*** (0.000)	0.610*** (0.000)
lnGDP _{jt}	0.772*** (0.000)	0.700*** (0.000)	0.722*** (0.000)	0.684*** (0.000)	0.760*** (0.000)	0.814*** (0.000)	0.735*** (0.000)
lnPOP _{it}	0.116*** (0.000)	0.269*** (0.000)	0.294*** (0.000)	0.097*** (0.000)	0.069*** (0.004)	-0.066*** (0.000)	0.156*** (0.000)
lnPOP _{jt}	-0.020 (0.250)	0.054*** (0.002)	0.033* (0.065)	0.071*** (0.000)	-0.016 (0.381)	-0.081*** (0.000)	0.009 (0.459)
lnDIST _{ij}	-0.592*** (0.000)	-0.565*** (0.000)	-0.571*** (0.000)	-0.581*** (0.000)	-0.588*** (0.000)	-0.597*** (0.000)	-0.577*** (0.000)
COC _{it}	-0.165*** (0.000)						
COC _{jt}	-0.147*** (0.000)						
(rCOC*lnGDI) _{it}	-13.693*** (0.000)						
(rCOC*lnGDI) _{jt}	-7.399*** (0.000)						
GVE _{it}		0.017 (0.572)					
GVE _{jt}		-0.034 (0.114)					
(rGVE*lnGDI) _{it}		-12.211*** (0.000)					
(rGVE*lnGDI) _{jt}		-5.410*** (0.000)					
POS _{it}			0.069*** (0.010)				
POS _{jt}			-0.081***				

	(0.000)			
(rPOS*lnGDI) _{it}	-13.210***			
	(0.000)			
(rPOS*lnGDI) _{jt}	-5.883***			
	(0.000)			
REQ _{it}		-0.193***		
		(0.000)		
REQ _{jt}		-0.052*		
		(0.061)		
(rREQ*lnGDI) _{it}		-11.268***		
		(0.000)		
(rREQ*lnGDI) _{jt}		-1.698**		
		(0.018)		
ROL _{it}			-0.225***	
			(0.000)	
ROL _{jt}			-0.072***	
			(0.001)	
(rROL*lnGDI) _{it}			-12.609***	
			(0.000)	
(rROL*lnGDI) _{jt}			-2.916***	
			(0.000)	
VAC _{it}			-0.299***	
			(0.000)	
VAC _{jt}			-0.139***	
			(0.000)	
(rVAC*lnGDI) _{it}			-9.079***	
			(0.000)	
(rVAC*lnGDI) _{jt}			-0.261	
			(0.705)	
IQ _{it}				22.466***
				(0.000)
IQ _{it}				10.708***
				(0.000)

(rIQ*lnGDI) _{it}							-32.816*** (0.000)
(rIQ*lnGDI) _{jt}							-15.864*** (0.000)
lnGDI _{it}	3.731*** (0.000)	4.901*** (0.000)	4.940*** (0.000)	3.490*** (0.000)	3.219*** (0.000)	1.920*** (0.000)	3.808*** (0.000)
lnGDI _{jt}	1.331*** (0.000)	1.730*** (0.000)	1.960*** (0.000)	1.231*** (0.000)	0.849*** (0.000)	0.447** (0.042)	1.047*** (0.000)
lnREMOTE _{it}	0.059** (0.014)	0.019 (0.469)	0.005 (0.836)	0.067*** (0.006)	0.062*** (0.008)	0.144*** (0.000)	0.044* (0.058)
lnREMOTE _{jt}	0.267*** (0.000)	0.235*** (0.000)	0.232*** (0.000)	0.235*** (0.000)	0.253*** (0.000)	0.298*** (0.000)	0.252*** (0.000)
lnEXG _{jit}	0.018*** (0.000)	0.012*** (0.000)	0.012*** (0.000)	0.009*** (0.009)	0.008** (0.016)	0.023*** (0.000)	0.020*** (0.000)
lnDIN _{ijt}	0.087*** (0.000)	0.086*** (0.000)	0.087*** (0.000)	0.080*** (0.000)	0.074*** (0.000)	0.070*** (0.000)	0.080*** (0.000)
lnESIM _{ijt}	-0.118*** (0.000)	-0.112*** (0.000)	-0.101*** (0.000)	-0.115*** (0.000)	-0.133*** (0.000)	-0.088*** (0.000)	-0.116*** (0.000)
RTA _{ijt}	0.419*** (0.000)	0.366*** (0.000)	0.423*** (0.000)	0.351*** (0.000)	0.349*** (0.000)	0.432*** (0.000)	0.376*** (0.000)
LLOCK _i	-0.123*** (0.000)	-0.084*** (0.004)	-0.206*** (0.000)	-0.143*** (0.000)	-0.106*** (0.000)	-0.105*** (0.000)	-0.194*** (0.000)
LLOCK _j	-0.150*** (0.000)	-0.121*** (0.000)	-0.149*** (0.000)	-0.112*** (0.000)	-0.125*** (0.000)	-0.076** (0.016)	-0.163*** (0.000)
COMCOL _{ij}	1.517*** (0.000)	1.500*** (0.000)	1.523*** (0.000)	1.610*** (0.000)	1.660*** (0.000)	1.320*** (0.000)	1.574*** (0.000)
COMLANG _{ij}	0.071*** (0.004)	0.048* (0.077)	0.079*** (0.006)	0.040 (0.135)	0.064*** (0.009)	0.030 (0.269)	0.066** (0.016)
CONTIG _{ij}	0.529*** (0.000)	0.602*** (0.000)	0.521*** (0.000)	0.577*** (0.000)	0.573*** (0.000)	0.542*** (0.000)	0.541*** (0.000)
GEFC _t	0.004 (0.837)	0.040* (0.053)	0.032 (0.112)	0.040** (0.047)	0.014 (0.469)	0.024 (0.222)	0.046** (0.026)
COVID _t	0.014	0.001	-0.073**	-0.005	-0.014	-0.053*	-0.036

	(0.665)	(0.984)	(0.026)	(0.867)	(0.661)	(0.091)	(0.261)
Constant	-17.185***	-16.625***	-17.457***	-16.314***	-17.008***	-15.627***	-16.689***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	32,720	32,720	32,720	32,720	32,720	32,720	32,720
R-squared	0.758	0.747	0.751	0.751	0.757	0.769	0.751

Note: The dependent variable of PPML models is BIT_{ijt} ; *, **, and *** denote the significance levels of 10%, 5%, and 1%, respectively.

Source: The author.

Table C3.30: PPML estimation results for aggregated samples of GII models (for robustness check)

BIT _{ijt}	GII models						
	COC	GVE	POS	REQ	ROL	VAC	IQ
lnGDP _{it}	0.675*** (0.000)	0.609*** (0.000)	0.560*** (0.000)	0.668*** (0.000)	0.721*** (0.000)	0.730*** (0.000)	0.561*** (0.000)
lnGDP _{jt}	0.788*** (0.000)	0.734*** (0.000)	0.749*** (0.000)	0.723*** (0.000)	0.776*** (0.000)	0.832*** (0.000)	0.741*** (0.000)
lnPOP _{it}	0.115*** (0.000)	0.188*** (0.000)	0.251*** (0.000)	0.119*** (0.000)	0.073*** (0.001)	0.020 (0.190)	0.233*** (0.000)
lnPOP _{jt}	-0.060*** (0.004)	-0.003 (0.884)	-0.010 (0.637)	0.020 (0.324)	-0.044** (0.020)	-0.120*** (0.000)	-0.014 (0.458)
lnDIST _{ij}	-0.608*** (0.000)	-0.594*** (0.000)	-0.590*** (0.000)	-0.600*** (0.000)	-0.608*** (0.000)	-0.612*** (0.000)	-0.594*** (0.000)
COC _{it}	-0.156*** (0.000)						
COC _{jt}	-0.039 (0.145)						
(rCOC*lnGII) _{it}	0.021 (0.191)						
(rCOC*lnGII) _{jt}	0.022 (0.156)						
GVE _{it}		-0.005 (0.900)					
GVE _{jt}		0.089*** (0.004)					
(rGVE*lnGII) _{it}		0.059*** (0.000)					
(rGVE*lnGII) _{jt}		0.041*** (0.002)					
POS _{it}			0.089*** (0.002)				
POS _{jt}			0.039				

	(0.110)			
(rPOS*lnGII) _{it}	-0.036***			
	(0.000)			
(rPOS*lnGII) _{jt}	-0.009			
	(0.402)			
REQ _{it}		-0.129***		
		(0.000)		
REQ _{jt}		0.128***		
		(0.000)		
(rREQ*lnGII) _{it}		0.051***		
		(0.000)		
(rREQ*lnGII) _{jt}		0.072***		
		(0.000)		
ROL _{it}			-0.227***	
			(0.000)	
ROL _{jt}			-0.002	
			(0.925)	
(rROL*lnGII) _{it}			0.022	
			(0.102)	
(rROL*lnGII) _{jt}			0.059***	
			(0.000)	
VAC _{it}				-0.221***
				(0.000)
VAC _{jt}				-0.083***
				(0.000)
(rVAC*lnGII) _{it}				0.082***
				(0.000)
(rVAC*lnGII) _{jt}				0.074***
				(0.000)
IQ _{it}				-0.171***
				(0.000)
IQ _{it}				-0.246***
				(0.000)

(rIQ*lnGII) _{it}							1.570*** (0.000)
(rIQ*lnGII) _{jt}							1.496*** (0.001)
lnGII _{it}	-0.389*** (0.000)	-0.362*** (0.000)	-0.226*** (0.000)	-0.365*** (0.000)	-0.388*** (0.000)	-0.382*** (0.000)	-0.359*** (0.000)
lnGII _{jt}	0.022 (0.373)	0.050** (0.049)	0.080*** (0.003)	0.010 (0.677)	-0.009 (0.721)	-0.014 (0.546)	-0.021 (0.404)
lnREMOTE _{it}	0.282*** (0.000)	0.234*** (0.000)	0.176*** (0.000)	0.257*** (0.000)	0.276*** (0.000)	0.272*** (0.000)	0.213*** (0.000)
lnREMOTE _{jt}	0.246*** (0.000)	0.191*** (0.000)	0.196*** (0.000)	0.210*** (0.000)	0.253*** (0.000)	0.290*** (0.000)	0.224*** (0.000)
lnEXG _{jit}	0.014*** (0.000)	0.016*** (0.000)	0.015*** (0.000)	0.013*** (0.000)	0.016*** (0.000)	0.018*** (0.000)	0.016*** (0.000)
lnDIN _{ijt}	0.056*** (0.000)	0.064*** (0.000)	0.068*** (0.000)	0.061*** (0.000)	0.055*** (0.000)	0.046*** (0.000)	0.068*** (0.000)
lnESIM _{ijt}	-0.135*** (0.000)	-0.130*** (0.000)	-0.127*** (0.000)	-0.132*** (0.000)	-0.140*** (0.000)	-0.093*** (0.000)	-0.130*** (0.000)
RTA _{ijt}	0.309*** (0.000)	0.310*** (0.000)	0.327*** (0.000)	0.316*** (0.000)	0.327*** (0.000)	0.363*** (0.000)	0.310*** (0.000)
LLOCK _i	-0.045 (0.129)	-0.032 (0.266)	-0.078*** (0.010)	-0.030 (0.311)	-0.012 (0.693)	-0.020 (0.490)	-0.022 (0.471)
LLOCK _j	-0.125*** (0.000)	-0.135*** (0.000)	-0.131*** (0.000)	-0.098*** (0.001)	-0.115*** (0.000)	-0.080*** (0.010)	-0.098*** (0.001)
COMCOL _{ij}	1.499*** (0.000)	1.444*** (0.000)	1.415*** (0.000)	1.450*** (0.000)	1.493*** (0.000)	1.094*** (0.000)	1.400*** (0.000)
COMLANG _{ij}	0.038 (0.178)	0.009 (0.771)	-0.012 (0.680)	0.022 (0.442)	0.048* (0.083)	0.011 (0.701)	-0.004 (0.891)
CONTIG _{ij}	0.548*** (0.000)	0.571*** (0.000)	0.563*** (0.000)	0.563*** (0.000)	0.534*** (0.000)	0.573*** (0.000)	0.585*** (0.000)
GEFC _t	0.078*** (0.000)	0.064*** (0.002)	0.051** (0.017)	0.071*** (0.001)	0.078*** (0.000)	0.084*** (0.000)	0.074*** (0.000)
COVID _t	-0.076**	-0.049	-0.042	-0.059*	-0.085**	-0.112***	-0.047

	(0.032)	(0.174)	(0.246)	(0.087)	(0.014)	(0.001)	(0.181)
Constant	-14.828***	-15.554***	-16.256***	-15.362***	-15.301***	-14.070***	-15.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	32,720	32,720	32,720	32,720	32,720	32,720	32,720
R-squared	0.747	0.742	0.737	0.747	0.755	0.757	0.743

Note: The dependent variable of PPML models is BIT_{ijt} ; *, **, and *** denote the significance levels of 10%, 5%, and 1%, respectively.

Source: The author.

Table C3.31: PPML estimation results for aggregated samples of FLA models (for robustness check)

BIT _{ijt}	FLA models						
	COC	GVE	POS	REQ	ROL	VAC	IQ
lnGDP _{it}	0.702*** (0.000)	0.640*** (0.000)	0.570*** (0.000)	0.694*** (0.000)	0.740*** (0.000)	0.780*** (0.000)	0.614*** (0.000)
lnGDP _{jt}	0.758*** (0.000)	0.713*** (0.000)	0.721*** (0.000)	0.697*** (0.000)	0.754*** (0.000)	0.812*** (0.000)	0.742*** (0.000)
lnPOP _{it}	0.038* (0.057)	0.105*** (0.000)	0.198*** (0.000)	0.049** (0.014)	-0.005 (0.787)	-0.078*** (0.000)	0.121*** (0.000)
lnPOP _{jt}	-0.033* (0.053)	0.024 (0.131)	0.013 (0.460)	0.056*** (0.001)	-0.015 (0.331)	-0.093*** (0.000)	-0.009 (0.443)
lnDIST _{ij}	-0.593*** (0.000)	-0.582*** (0.000)	-0.575*** (0.000)	-0.591*** (0.000)	-0.596*** (0.000)	-0.607*** (0.000)	-0.551*** (0.000)
COC _{it}	0.046 (0.185)						
COC _{jt}	-0.087*** (0.002)						
(rCOC*lnFLA) _{it}	-0.081*** (0.000)						
(rCOC*lnFLA) _{jt}	0.007 (0.531)						
GVE _{it}		0.131*** (0.001)					
GVE _{jt}		0.007 (0.821)					
(rGVE*lnFLA) _{it}		-0.063*** (0.000)					
(rGVE*lnFLA) _{jt}		-0.008 (0.339)					
POS _{it}			0.032 (0.302)				
POS _{jt}			-0.038				

	(0.144)			
(rPOS*lnFLA) _{it}	0.050***			
	(0.000)			
(rPOS*lnFLA) _{jt}	0.006			
	(0.382)			
REQ _{it}		0.032		
		(0.316)		
REQ _{jt}		-0.152***		
		(0.000)		
(rREQ*lnFLA) _{it}		-0.066***		
		(0.000)		
(rREQ*lnFLA) _{jt}		-0.053***		
		(0.000)		
ROL _{it}			-0.061*	
			(0.077)	
ROL _{jt}			0.023	
			(0.390)	
(rROL*lnFLA) _{it}			-0.054***	
			(0.000)	
(rROL*lnFLA) _{jt}			-0.044***	
			(0.000)	
VAC _{it}			-0.170***	
			(0.000)	
VAC _{jt}			-0.080***	
			(0.000)	
(rVAC*lnFLA) _{it}			-0.039***	
			(0.000)	
(rVAC*lnFLA) _{jt}			-0.039***	
			(0.000)	
IQ _{it}				10.038***
				(0.000)
IQ _{jt}				5.671***
				(0.000)

(rIQ*lnFLA) _{it}							-2.493*** (0.000)
(rIQ*lnFLA) _{jt}							-1.444*** (0.000)
lnFLA _{it}	1.004*** (0.000)	0.961*** (0.000)	0.900*** (0.000)	1.006*** (0.000)	1.013*** (0.000)	0.783*** (0.000)	1.160*** (0.000)
lnFLA _{jt}	0.294*** (0.000)	0.294*** (0.000)	0.292*** (0.000)	0.320*** (0.000)	0.328*** (0.000)	0.234*** (0.000)	0.428*** (0.000)
lnREMOTE _{it}	0.047* (0.072)	0.009 (0.734)	-0.005 (0.847)	0.033 (0.206)	0.044* (0.089)	0.087*** (0.001)	-0.003 (0.915)
lnREMOTE _{jt}	0.299*** (0.000)	0.285*** (0.000)	0.276*** (0.000)	0.290*** (0.000)	0.311*** (0.000)	0.338*** (0.000)	0.254*** (0.000)
lnEXG _{jit}	0.019*** (0.000)	0.022*** (0.000)	0.018*** (0.000)	0.020*** (0.000)	0.020*** (0.000)	0.021*** (0.000)	0.018*** (0.000)
lnDIN _{ijt}	0.058*** (0.000)	0.063*** (0.000)	0.068*** (0.000)	0.059*** (0.000)	0.058*** (0.000)	0.048*** (0.000)	0.083*** (0.000)
lnESIM _{ijt}	-0.076*** (0.000)	-0.075*** (0.000)	-0.078*** (0.000)	-0.076*** (0.000)	-0.075*** (0.000)	-0.051*** (0.000)	-0.065*** (0.000)
RTA _{ijt}	0.337*** (0.000)	0.341*** (0.000)	0.363*** (0.000)	0.338*** (0.000)	0.359*** (0.000)	0.383*** (0.000)	0.400*** (0.000)
LLOCK _i	-0.157*** (0.000)	-0.151*** (0.000)	-0.167*** (0.000)	-0.109*** (0.000)	-0.132*** (0.000)	-0.107*** (0.000)	-0.088*** (0.001)
LLOCK _j	-0.096*** (0.002)	-0.083*** (0.008)	-0.081*** (0.008)	-0.057* (0.068)	-0.088*** (0.005)	-0.059* (0.061)	-0.065** (0.026)
COMCOL _{ij}	1.633*** (0.000)	1.602*** (0.000)	1.615*** (0.000)	1.580*** (0.000)	1.600*** (0.000)	1.251*** (0.000)	1.612*** (0.000)
COMLANG _{ij}	0.007 (0.806)	-0.010 (0.743)	-0.023 (0.451)	-0.004 (0.901)	0.007 (0.804)	-0.016 (0.591)	0.046* (0.089)
CONTIG _{ij}	0.572*** (0.000)	0.580*** (0.000)	0.568*** (0.000)	0.574*** (0.000)	0.555*** (0.000)	0.565*** (0.000)	0.622*** (0.000)
GEFC _t	0.034* (0.095)	0.031 (0.136)	0.022 (0.285)	0.034* (0.093)	0.032 (0.118)	0.041** (0.040)	0.031 (0.118)
COVID _t	-0.035	-0.023	-0.022	-0.021	-0.035	-0.077**	-0.016

	(0.281)	(0.483)	(0.507)	(0.530)	(0.286)	(0.019)	(0.613)
Constant	-20.938***	-21.055***	-21.135***	-21.407***	-21.442***	-18.893***	-23.279***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	32,800	32,800	32,800	32,800	32,800	32,800	32,800
R-squared	0.753	0.751	0.749	0.750	0.753	0.754	0.771

Note: The dependent variable of PPML models is BIT_{ijt} ; *, **, and *** denote the significance levels of 10%, 5%, and 1%, respectively.

Source: The author.

Table C3.32: PPML estimation results for high-high samples of GDI models (for robustness check)

BIT _{ijt}	GDI models						
	COC	GVE	POS	REQ	ROL	VAC	IQ
lnGDP _{it}	1.022*** (0.000)	0.714*** (0.000)	0.470*** (0.000)	0.752*** (0.000)	0.913*** (0.000)	0.651*** (0.000)	0.692*** (0.000)
lnGDP _{jt}	0.816*** (0.000)	0.606*** (0.000)	0.496*** (0.000)	0.596*** (0.000)	0.757*** (0.000)	0.527*** (0.000)	0.455*** (0.000)
lnPOP _{it}	-0.345*** (0.000)	-0.029 (0.557)	0.230*** (0.000)	-0.079* (0.073)	-0.248*** (0.000)	0.038 (0.368)	0.011 (0.889)
lnPOP _{jt}	-0.112*** (0.007)	0.128*** (0.000)	0.222*** (0.000)	0.120*** (0.001)	-0.047 (0.286)	0.218*** (0.000)	0.297*** (0.000)
lnDIST _{ij}	-0.507*** (0.000)	-0.492*** (0.000)	-0.538*** (0.000)	-0.510*** (0.000)	-0.511*** (0.000)	-0.591*** (0.000)	-0.659*** (0.000)
COC _{it}	0.034 (0.348)						
COC _{jt}	-0.063** (0.039)						
GVE _{it}		0.217*** (0.000)					
GVE _{jt}		0.209*** (0.000)					
POS _{it}			0.130** (0.038)				
POS _{jt}			-0.016 (0.811)				
REQ _{it}				0.163*** (0.000)			
REQ _{jt}				0.120*** (0.006)			
ROL _{it}					-0.056 (0.273)		
ROL _{jt}					-0.149***		

					(0.002)		
VAC _{it}						0.096	
						(0.214)	
VAC _{jt}						0.030	
						(0.685)	
lnGDI _{it}	-13.052***	-11.672***	-7.491***	-10.146***	-10.908***	-10.498***	-6.742***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lnGDI _{jt}	-8.438***	-8.694***	-4.430***	-6.039***	-6.608***	-2.759***	2.020*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.080)
lnREMOTE _{it}	-0.084***	-0.157***	-0.284***	-0.143***	-0.103***	-0.208***	-0.234***
	(0.006)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
lnREMOTE _{jt}	0.339***	0.231***	0.109***	0.279***	0.302***	0.254***	0.164***
	(0.000)	(0.000)	(0.003)	(0.000)	(0.000)	(0.000)	(0.000)
lnEXG _{jit}	0.037***	0.023***	0.013*	0.037***	0.033***	0.048***	0.022**
	(0.000)	(0.000)	(0.055)	(0.000)	(0.000)	(0.000)	(0.033)
lnDIN _{ijt}	0.012*	0.033***	-0.021*	0.023***	0.015**	0.030***	0.020*
	(0.084)	(0.000)	(0.058)	(0.002)	(0.034)	(0.000)	(0.084)
lnESIM _{ijt}	-0.082***	-0.143***	-0.134***	-0.116***	-0.110***	-0.050***	0.048*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.003)	(0.081)
RTA _{ijt}	0.249***	0.228***	0.295***	0.199***	0.248***	0.155***	-0.064
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.221)
LLOCK _i	-0.587***	-0.489***	-0.226***	-0.355***	-0.402***	-0.420***	-0.420***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LLOCK _j	-0.220***	-0.201***	-0.013	-0.094**	-0.115**	-0.026	0.100*
	(0.000)	(0.000)	(0.728)	(0.019)	(0.011)	(0.509)	(0.088)
COMCOL _{ij}	1.712***	1.565***	1.989***	1.564***	excluded	excluded	excluded
	(0.000)	(0.000)	(0.000)	(0.000)			
COMLANG _{ij}	0.266***	0.279***	0.249***	0.231***	0.212***	0.259***	0.392***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CONTIG _{ij}	0.564***	0.584***	0.481***	0.608***	0.612***	0.553***	0.339***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GEFC _t	-0.065***	-0.023	-0.007	-0.014	-0.053**	-0.017	-0.041
	(0.002)	(0.287)	(0.809)	(0.501)	(0.011)	(0.429)	(0.167)

COVID _t	-0.012 (0.721)	0.065** (0.047)	-0.026 (0.530)	0.021 (0.530)	-0.034 (0.326)	-0.035 (0.325)	-0.041 (0.373)
Constant	-20.676*** (0.000)	-19.464*** (0.000)	-17.560*** (0.000)	-17.736*** (0.000)	-19.245*** (0.000)	-17.072*** (0.000)	-17.351*** (0.000)
Observations	8,006	8,014	8,046	8,038	8,006	8,056	3,412
R-squared	0.908	0.902	0.882	0.904	0.900	0.894	0.930

Note: The dependent variable of PPML models is BIT_{ijt} ; *, **, and *** denote the significance levels of 10%, 5%, and 1%, respectively.

Source: The author.

Table C3.33: PPML estimation results for high-high samples of GII models (for robustness check)

BIT _{ijt}	GII models						
	COC	GVE	POS	REQ	ROL	VAC	IQ
lnGDP _{it}	0.799*** (0.000)	0.567*** (0.000)	0.567*** (0.000)	0.598*** (0.000)	0.749*** (0.000)	0.590*** (0.000)	0.554*** (0.000)
lnGDP _{jt}	0.685*** (0.000)	0.509*** (0.000)	0.515*** (0.000)	0.518*** (0.000)	0.668*** (0.000)	0.507*** (0.000)	0.461*** (0.000)
lnPOP _{it}	-0.120** (0.011)	0.108** (0.028)	0.116*** (0.002)	0.092** (0.034)	-0.065 (0.215)	0.137*** (0.001)	0.156** (0.025)
lnPOP _{jt}	0.002 (0.962)	0.194*** (0.000)	0.188*** (0.000)	0.193*** (0.000)	0.041 (0.355)	0.240*** (0.000)	0.294*** (0.000)
lnDIST _{ij}	-0.527*** (0.000)	-0.494*** (0.000)	-0.546*** (0.000)	-0.509*** (0.000)	-0.522*** (0.000)	-0.621*** (0.000)	-0.674*** (0.000)
COC _{it}	0.014 (0.729)						
COC _{jt}	-0.042 (0.264)						
GVE _{it}		0.010 (0.872)					
GVE _{jt}		0.122** (0.029)					
POS _{it}			0.110* (0.090)				
POS _{jt}			-0.089 (0.186)				
REQ _{it}				0.216*** (0.000)			
REQ _{jt}				0.138*** (0.003)			
ROL _{it}					-0.079 (0.151)		
ROL _{jt}					-0.158***		

					(0.004)		
VAC _{it}						0.099	
						(0.255)	
VAC _{jt}						0.003	
						(0.968)	
lnGII _{it}	-0.134***	-0.120***	0.087***	-0.103***	-0.129***	-0.156***	0.002
	(0.000)	(0.000)	(0.008)	(0.000)	(0.000)	(0.000)	(0.965)
lnGII _{jt}	-0.033	0.002	0.001	-0.031	-0.057**	-0.046	-0.014
	(0.253)	(0.944)	(0.967)	(0.227)	(0.038)	(0.107)	(0.715)
lnREMOTE _{it}	-0.046	-0.078**	-0.287***	-0.112***	-0.052	-0.139***	-0.280***
	(0.190)	(0.036)	(0.000)	(0.001)	(0.136)	(0.000)	(0.000)
lnREMOTE _{jt}	0.343***	0.241***	0.168***	0.291***	0.337***	0.308***	0.195***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lnEXG _{jit}	0.036***	0.024***	0.014**	0.041***	0.038***	0.047***	0.025**
	(0.000)	(0.000)	(0.035)	(0.000)	(0.000)	(0.000)	(0.029)
lnDIN _{ijt}	-0.013*	0.017**	-0.027**	0.009	-0.000	0.010	0.022*
	(0.077)	(0.021)	(0.017)	(0.253)	(0.998)	(0.176)	(0.067)
lnESIM _{ijt}	-0.041**	-0.079***	-0.093***	-0.061***	-0.056***	-0.016	0.059**
	(0.018)	(0.000)	(0.000)	(0.000)	(0.001)	(0.340)	(0.047)
RTA _{ijt}	0.133***	0.173***	0.241***	0.181***	0.212***	0.111***	-0.098**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.047)
LLOCK _i	-0.337***	-0.284***	-0.199***	-0.215***	-0.220***	-0.242***	-0.301***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LLOCK _j	-0.052	-0.059	0.034	-0.010	-0.003	0.055	0.092*
	(0.295)	(0.197)	(0.334)	(0.799)	(0.947)	(0.174)	(0.086)
COMCOL _{ij}	2.151***	1.630***	2.175***	1.848***	excluded	excluded	excluded
	(0.000)	(0.000)	(0.000)	(0.000)			
COMLANG _{ij}	0.240***	0.226***	0.186***	0.214***	0.208***	0.251***	0.382***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CONTIG _{ij}	0.550***	0.590***	0.554***	0.603***	0.573***	0.510***	0.333***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GEFC _t	0.006	0.049**	-0.033	0.026	0.018	0.031	-0.036
	(0.790)	(0.039)	(0.274)	(0.265)	(0.433)	(0.176)	(0.283)

COVID _t	-0.138*** (0.000)	-0.075** (0.048)	-0.003 (0.951)	-0.084** (0.027)	-0.141*** (0.000)	-0.130*** (0.001)	-0.051 (0.323)
Constant	-15.357*** (0.000)	-13.858*** (0.000)	-16.648*** (0.000)	-14.645*** (0.000)	-15.289*** (0.000)	-14.780*** (0.000)	-16.111*** (0.000)
Observations	8,006	8,014	8,046	8,038	8,006	8,056	3,412
R-squared	0.899	0.894	0.883	0.896	0.890	0.889	0.924

Note: The dependent variable of PPML models is BIT_{ijt} ; *, **, and *** denote the significance levels of 10%, 5%, and 1%, respectively.

Source: The author.

Table C3.34: PPML estimation results for high-high samples of FLA models (for robustness check)

BIT _{ijt}	FLA models						
	COC	GVE	POS	REQ	ROL	VAC	IQ
lnGDP _{it}	0.968*** (0.000)	0.668*** (0.000)	0.643*** (0.000)	0.809*** (0.000)	0.814*** (0.000)	0.665*** (0.000)	0.624*** (0.000)
lnGDP _{jt}	0.811*** (0.000)	0.581*** (0.000)	0.616*** (0.000)	0.628*** (0.000)	0.703*** (0.000)	0.546*** (0.000)	0.531*** (0.000)
lnPOP _{it}	-0.278*** (0.000)	-0.004 (0.938)	0.061 (0.100)	-0.127*** (0.006)	-0.156*** (0.002)	0.057 (0.157)	0.087 (0.266)
lnPOP _{jt}	-0.100** (0.023)	0.134*** (0.001)	0.098*** (0.003)	0.093** (0.017)	0.001 (0.979)	0.196*** (0.000)	0.222*** (0.003)
lnDIST _{ij}	-0.508*** (0.000)	-0.484*** (0.000)	-0.541*** (0.000)	-0.497*** (0.000)	-0.510*** (0.000)	-0.607*** (0.000)	-0.667*** (0.000)
COC _{it}	0.302*** (0.000)						
COC _{jt}	0.102** (0.015)						
GVE _{it}		0.195*** (0.001)					
GVE _{jt}		0.175*** (0.001)					
POS _{it}			0.129** (0.048)				
POS _{jt}			-0.039 (0.563)				
REQ _{it}				0.534*** (0.000)			
REQ _{jt}				0.287*** (0.000)			
ROL _{it}					0.160** (0.013)		
ROL _{jt}					-0.178***		

					(0.005)		
VAC _{it}						-0.532***	
						(0.000)	
VAC _{jt}						-0.002	
						(0.984)	
lnFLA _{it}	-1.371***	-0.772***	-0.822***	-1.432***	-0.868***	-0.734***	-0.295
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.148)
lnFLA _{jt}	-0.868***	-0.518***	-0.607***	-0.728***	0.061	-0.055	-0.253
	(0.000)	(0.000)	(0.000)	(0.000)	(0.708)	(0.655)	(0.242)
lnREMOTE _{it}	-0.081**	-0.142***	-0.234***	-0.118***	-0.076**	-0.175***	-0.264***
	(0.015)	(0.000)	(0.000)	(0.000)	(0.026)	(0.000)	(0.000)
lnREMOTE _{jt}	0.323***	0.249***	0.160***	0.300***	0.291***	0.237***	0.199***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lnEXG _{jit}	0.036***	0.028***	0.012*	0.045***	0.039***	0.051***	0.024**
	(0.000)	(0.000)	(0.066)	(0.000)	(0.000)	(0.000)	(0.024)
lnDIN _{ijt}	0.007	0.029***	-0.021*	0.021***	0.011	0.022***	0.023*
	(0.384)	(0.000)	(0.061)	(0.007)	(0.163)	(0.005)	(0.053)
lnESIM _{ijt}	-0.053***	-0.079***	-0.107***	-0.058***	-0.046***	-0.021	0.061**
	(0.001)	(0.000)	(0.000)	(0.000)	(0.006)	(0.233)	(0.030)
RTA _{ijt}	0.207***	0.217***	0.285***	0.219***	0.234***	0.117***	-0.076
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.127)
LLOCK _i	-0.334***	-0.305***	-0.151***	-0.194***	-0.237***	-0.240***	-0.299***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LLOCK _j	-0.068	-0.062	0.042	0.008	-0.024	0.020	0.091
	(0.168)	(0.187)	(0.238)	(0.835)	(0.603)	(0.629)	(0.100)
COMCOL _{ij}	2.096***	1.627***	2.168***	1.690***			
	(0.000)	(0.000)	(0.000)	(0.000)			
COMLANG _{ij}	0.257***	0.220***	0.177***	0.193***	0.184***	0.245***	0.361***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CONTIG _{ij}	0.565***	0.604***	0.552***	0.638***	0.612***	0.539***	0.356***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GEFC _t	-0.019	0.024	-0.036	0.013	-0.016	0.011	-0.046
	(0.380)	(0.280)	(0.209)	(0.546)	(0.477)	(0.620)	(0.155)

COVID _t	-0.071** (0.047)	-0.026 (0.472)	-0.038 (0.372)	-0.028 (0.460)	-0.080** (0.037)	-0.064* (0.089)	-0.040 (0.404)
Constant	-11.726*** (0.000)	-11.696*** (0.000)	-13.163*** (0.000)	-10.054*** (0.000)	-13.639*** (0.000)	-14.514*** (0.000)	-15.130*** (0.000)
Observations	8,006	8,014	8,046	8,038	8,006	8,056	3,412
R-squared	0.897	0.890	0.882	0.890	0.889	0.886	0.923

Note: The dependent variable of PPML models is BIT_{ijt} ; *, **, and *** denote the significance levels of 10%, 5%, and 1%, respectively.

Source: The author.

Table C3.35: PPML estimation results for low-low samples of GDI models (for robustness check)

BIT _{ijt}	GDI models						
	COC	GVE	POS	REQ	ROL	VAC	IQ
lnGDP _{it}	0.829*** (0.000)	0.744*** (0.000)	0.572*** (0.000)	0.874*** (0.000)	0.806*** (0.000)	0.901*** (0.000)	0.647*** (0.000)
lnGDP _{jt}	0.507*** (0.000)	0.603*** (0.000)	0.757*** (0.000)	0.656*** (0.000)	0.614*** (0.000)	0.730*** (0.000)	0.709*** (0.000)
lnPOP _{it}	0.057** (0.010)	0.174*** (0.000)	0.321*** (0.000)	-0.012 (0.680)	0.104*** (0.000)	-0.204*** (0.000)	0.120*** (0.000)
lnPOP _{jt}	0.123*** (0.000)	0.066*** (0.008)	-0.020 (0.477)	-0.043* (0.069)	0.028 (0.205)	-0.079*** (0.000)	-0.013 (0.421)
lnDIST _{ij}	-0.869*** (0.000)	-0.937*** (0.000)	-0.601*** (0.000)	-0.934*** (0.000)	-0.937*** (0.000)	-0.690*** (0.000)	-0.630*** (0.000)
COC _{it}	0.175*** (0.000)						
COC _{jt}	-0.010 (0.790)						
GVE _{it}		0.299*** (0.000)					
GVE _{jt}		0.099** (0.023)					
POS _{it}			0.178*** (0.000)				
POS _{jt}			-0.011 (0.768)				
REQ _{it}				-0.039 (0.401)			
REQ _{jt}				-0.171*** (0.000)			
ROL _{it}					0.304*** (0.000)		
ROL _{jt}					0.061*		

					(0.084)		
VAC _{it}						-0.259***	
						(0.000)	
VAC _{jt}						-0.041*	
						(0.055)	
lnGDI _{it}	5.883***	5.993***	5.690***	4.494***	5.681***	2.491***	3.795***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lnGDI _{jt}	3.071***	2.282***	2.327***	1.466***	1.574***	2.236***	1.581***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lnREMOTE _{it}	0.417***	0.344***	0.152***	0.432***	0.442***	0.667***	0.252***
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
lnREMOTE _{jt}	0.221***	0.282***	0.433***	0.318***	0.344***	0.450***	0.376***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lnEXG _{jit}	0.038***	0.025***	0.033***	0.026***	0.025***	0.027***	0.024***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lnDIN _{ijt}	-0.007	-0.037***	0.099***	0.000	-0.009	0.083***	0.100***
	(0.598)	(0.001)	(0.000)	(0.992)	(0.466)	(0.000)	(0.000)
lnESIM _{ijt}	-0.003	-0.055**	-0.096***	-0.128***	-0.143***	-0.089**	-0.090***
	(0.870)	(0.012)	(0.001)	(0.000)	(0.000)	(0.016)	(0.001)
RTA _{ijt}	0.228***	0.090***	0.543***	0.133***	-0.035	0.385***	0.414***
	(0.000)	(0.002)	(0.000)	(0.000)	(0.178)	(0.000)	(0.000)
LLOCK _i	0.215***	0.227***	-0.055	0.266***	-0.042	0.214**	0.038
	(0.000)	(0.000)	(0.773)	(0.000)	(0.408)	(0.030)	(0.522)
LLOCK _j	0.028	-0.040	-0.151	-0.121**	-0.301***	0.052	0.036
	(0.574)	(0.428)	(0.487)	(0.028)	(0.000)	(0.536)	(0.593)
COMCOL _{ij}	0.984***	1.590***	1.005***	1.770***	1.689***	0.934***	1.253***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
COMLANG _{ij}	0.721***	0.474***	0.239***	0.518***	0.539***	0.106*	0.280***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.084)	(0.000)
CONTIG _{ij}	0.352***	0.243***	0.597***	0.275***	0.305***	0.385***	0.624***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GEFC _t	0.129***	0.123***	0.073*	0.147***	0.138***	0.170***	0.070**
	(0.000)	(0.000)	(0.086)	(0.000)	(0.000)	(0.000)	(0.038)

COVID _t	0.022 (0.656)	0.036 (0.473)	0.020 (0.757)	0.055 (0.281)	0.055 (0.213)	0.080 (0.222)	0.066 (0.191)
Constant	-8.321*** (0.000)	-9.301*** (0.000)	-14.724*** (0.000)	-7.452*** (0.000)	-7.161*** (0.000)	-3.639*** (0.000)	-10.972*** (0.000)
Observations	7,968	7,972	8,014	8,000	7,966	8,022	14,562
R-squared	0.823	0.772	0.751	0.784	0.796	0.742	0.706

Note: The dependent variable of PPML models is BIT_{ijt} ; *, **, and *** denote the significance levels of 10%, 5%, and 1%, respectively.

Source: The author.

Table C3.36: PPML estimation results for low-low samples of GII models (for robustness check)

BIT _{ijt}	GII models						
	COC	GVE	POS	REQ	ROL	VAC	IQ
lnGDP _{it}	0.856*** (0.000)	0.844*** (0.000)	0.573*** (0.000)	0.875*** (0.000)	0.856*** (0.000)	0.779*** (0.000)	0.531*** (0.000)
lnGDP _{jt}	0.584*** (0.000)	0.642*** (0.000)	0.848*** (0.000)	0.667*** (0.000)	0.629*** (0.000)	0.840*** (0.000)	0.789*** (0.000)
lnPOP _{it}	-0.077*** (0.000)	0.020 (0.367)	0.291*** (0.000)	-0.125*** (0.000)	-0.044** (0.031)	-0.086*** (0.001)	0.250*** (0.000)
lnPOP _{jt}	-0.014 (0.469)	-0.001 (0.960)	-0.121*** (0.000)	-0.074*** (0.000)	-0.017 (0.315)	-0.207*** (0.000)	-0.115*** (0.000)
lnDIST _{ij}	-0.839*** (0.000)	-0.895*** (0.000)	-0.570*** (0.000)	-0.874*** (0.000)	-0.893*** (0.000)	-0.661*** (0.000)	-0.605*** (0.000)
COC _{it}	-0.360*** (0.000)						
COC _{jt}	-0.221*** (0.000)						
GVE _{it}		-0.083 (0.177)					
GVE _{jt}		0.009 (0.864)					
POS _{it}			-0.069 (0.154)				
POS _{jt}			0.032 (0.485)				
REQ _{it}				-0.499*** (0.000)			
REQ _{jt}				-0.224*** (0.000)			
ROL _{it}					-0.135*** (0.000)		
ROL _{jt}					-0.033		

					(0.306)		
VAC _{it}						-0.243***	
						(0.000)	
VAC _{jt}						-0.063***	
						(0.002)	
lnGII _{it}	-0.449***	-0.320***	-0.623***	-0.435***	-0.370***	-0.371***	-0.526***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lnGII _{jt}	-0.164***	-0.101***	0.140***	-0.129***	-0.132***	0.087*	0.090***
	(0.000)	(0.002)	(0.004)	(0.000)	(0.000)	(0.063)	(0.010)
lnREMOTE _{it}	0.578***	0.489***	0.528***	0.596***	0.584***	0.705***	0.504***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lnREMOTE _{jt}	0.227***	0.221***	0.225***	0.254***	0.290***	0.458***	0.248***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lnEXG _{jit}	0.026***	0.022***	0.024***	0.018***	0.022***	0.017***	0.013***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)
lnDIN _{ijt}	-0.058***	-0.099***	0.061***	-0.058***	-0.063***	0.055***	0.084***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
lnESIM _{ijt}	-0.141***	-0.197***	-0.214***	-0.170***	-0.238***	-0.129***	-0.148***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
RTA _{ijt}	0.186***	0.078***	0.427***	0.151***	0.005	0.322***	0.341***
	(0.000)	(0.007)	(0.000)	(0.000)	(0.853)	(0.000)	(0.000)
LLOCK _i	0.282***	0.339***	0.241	0.432***	0.092*	0.259**	0.231***
	(0.000)	(0.000)	(0.266)	(0.000)	(0.079)	(0.013)	(0.001)
LLOCK _j	-0.067	-0.125**	-0.376	-0.114*	-0.340***	0.059	-0.051
	(0.183)	(0.027)	(0.120)	(0.053)	(0.000)	(0.508)	(0.392)
COMCOL _{ij}	0.856***	1.396***	0.793***	1.583***	1.518***	0.836***	1.126***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
COMLANG _{ij}	0.672***	0.434***	0.099***	0.429***	0.403***	0.054	0.232***
	(0.000)	(0.000)	(0.008)	(0.000)	(0.000)	(0.362)	(0.000)
CONTIG _{ij}	0.488***	0.369***	0.650***	0.289***	0.377***	0.500***	0.717***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GEFC _t	0.108***	0.098***	0.100**	0.189***	0.141***	0.161***	0.108***
	(0.000)	(0.001)	(0.022)	(0.000)	(0.000)	(0.000)	(0.001)

COVID _t	0.118** (0.017)	0.101* (0.061)	0.098 (0.162)	0.029 (0.567)	0.092* (0.051)	0.119* (0.085)	0.083 (0.129)
Constant	-5.095*** (0.000)	-8.662*** (0.000)	-13.569*** (0.000)	-4.686*** (0.000)	-5.162*** (0.000)	-3.132*** (0.002)	-9.740*** (0.000)
Observations	7,968	7,972	8,014	8,000	7,966	8,022	14,562
R-squared	0.823	0.757	0.731	0.780	0.790	0.724	0.697

Note: The dependent variable of PPML models is BIT_{ijt} ; *, **, and *** denote the significance levels of 10%, 5%, and 1%, respectively.

Source: The author.

Table C3.37: PPML estimation results for low-low samples of FLA models (for robustness check)

BIT _{ijt}	FLA models						
	COC	GVE	POS	REQ	ROL	VAC	IQ
lnGDP _{it}	0.851*** (0.000)	0.845*** (0.000)	0.642*** (0.000)	0.880*** (0.000)	0.837*** (0.000)	0.857*** (0.000)	0.640*** (0.000)
lnGDP _{jt}	0.520*** (0.000)	0.638*** (0.000)	0.813*** (0.000)	0.644*** (0.000)	0.614*** (0.000)	0.720*** (0.000)	0.721*** (0.000)
lnPOP _{it}	-0.067*** (0.000)	-0.004 (0.871)	0.157*** (0.000)	-0.079*** (0.001)	-0.005 (0.765)	-0.195*** (0.000)	0.076*** (0.000)
lnPOP _{jt}	0.062*** (0.002)	0.004 (0.808)	-0.106*** (0.000)	-0.051*** (0.006)	0.006 (0.732)	-0.094*** (0.000)	-0.045*** (0.002)
lnDIST _{ij}	-0.817*** (0.000)	-0.904*** (0.000)	-0.556*** (0.000)	-0.883*** (0.000)	-0.894*** (0.000)	-0.639*** (0.000)	-0.580*** (0.000)
COC _{it}	0.089*** (0.005)						
COC _{jt}	-0.023 (0.493)						
GVE _{it}		0.114** (0.022)					
GVE _{jt}		0.043 (0.271)					
POS _{it}			0.012 (0.773)				
POS _{jt}			-0.077** (0.032)				
REQ _{it}				-0.035 (0.429)			
REQ _{jt}				-0.137*** (0.000)			
ROL _{it}					0.233*** (0.000)		
ROL _{jt}					0.079**		

cli

					(0.016)		
VAC _{it}						-0.189***	
						(0.000)	
VAC _{jt}						-0.017	
						(0.504)	
lnFLA _{it}	1.309***	1.210***	1.143***	1.157***	1.276***	0.844***	1.140***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lnFLA _{jt}	0.577***	0.493***	0.427***	0.488***	0.543***	0.500***	0.502***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lnREMOTE _{it}	0.184***	0.186***	0.097**	0.235***	0.218***	0.457***	0.176***
	(0.000)	(0.001)	(0.030)	(0.000)	(0.000)	(0.000)	(0.000)
lnREMOTE _{jt}	0.128***	0.214***	0.398***	0.234***	0.242***	0.360***	0.354***
	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lnEXG _{jit}	0.029***	0.022***	0.025***	0.023***	0.020***	0.024***	0.020***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lnDIN _{ijt}	-0.019	-0.039***	0.099***	-0.005	-0.011	0.076***	0.101***
	(0.132)	(0.001)	(0.000)	(0.683)	(0.333)	(0.000)	(0.000)
lnESIM _{ijt}	0.053***	-0.007	-0.088***	-0.035*	-0.042**	-0.053	-0.051**
	(0.003)	(0.742)	(0.001)	(0.060)	(0.028)	(0.149)	(0.025)
RTA _{ijt}	0.150***	0.090***	0.520***	0.114***	-0.034	0.324***	0.413***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.162)	(0.000)	(0.000)
LLOCK _i	0.100**	0.178***	0.027	0.173***	-0.053	0.054	0.046
	(0.013)	(0.001)	(0.882)	(0.000)	(0.237)	(0.565)	(0.394)
LLOCK _j	0.023	-0.016	-0.116	-0.104**	-0.229***	0.004	0.081
	(0.579)	(0.724)	(0.606)	(0.030)	(0.000)	(0.957)	(0.188)
COMCOL _{ij}	1.227***	1.759***	1.246***	1.904***	1.794***	0.890***	1.232***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
COMLANG _{ij}	0.790***	0.565***	0.215***	0.599***	0.608***	0.154**	0.243***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.022)	(0.000)
CONTIG _{ij}	0.379***	0.260***	0.721***	0.275***	0.285***	0.475***	0.726***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GEFC _t	0.095***	0.053**	0.023	0.108***	0.106***	0.151***	0.050
	(0.000)	(0.047)	(0.577)	(0.000)	(0.000)	(0.000)	(0.117)

COVID _t	0.068 (0.165)	0.114** (0.011)	0.112* (0.063)	0.087* (0.094)	0.110*** (0.006)	0.126* (0.062)	0.110** (0.026)
Constant	-18.409*** (0.000)	-18.877*** (0.000)	-21.727*** (0.000)	-16.760*** (0.000)	-17.751*** (0.000)	-11.980*** (0.000)	-18.081*** (0.000)
Observations	8,006	8,014	8,046	8,038	8,006	8,056	14,612
R-squared	0.843	0.807	0.777	0.807	0.817	0.728	0.730

Note: The dependent variable of PPML models is BIT_{ijt} ; *, **, and *** denote the significance levels of 10%, 5%, and 1%, respectively.

Source: The author.

Table C3.38: PPML estimation results for low-high and high-low samples of GDI models (for robustness check)

BIT _{ijt}	GDI models						
	COC	GVE	POS	REQ	ROL	VAC	IQ
lnGDP _{it}	0.534*** (0.000)	0.446*** (0.000)	0.536*** (0.000)	0.573*** (0.000)	0.609*** (0.000)	0.772*** (0.000)	0.638*** (0.000)
lnGDP _{jt}	0.766*** (0.000)	0.625*** (0.000)	0.698*** (0.000)	0.640*** (0.000)	0.664*** (0.000)	0.891*** (0.000)	0.702*** (0.000)
lnPOP _{it}	0.337*** (0.000)	0.402*** (0.000)	0.270*** (0.000)	0.275*** (0.000)	0.228*** (0.000)	0.040** (0.044)	0.168*** (0.000)
lnPOP _{jt}	0.094*** (0.000)	0.214*** (0.000)	0.074*** (0.000)	0.209*** (0.000)	0.165*** (0.000)	-0.098*** (0.000)	0.120*** (0.000)
lnDIST _{ij}	-0.762*** (0.000)	-0.690*** (0.000)	-0.621*** (0.000)	-0.674*** (0.000)	-0.675*** (0.000)	-0.598*** (0.000)	-0.599*** (0.000)
COC _{it}	0.177*** (0.000)						
COC _{jt}	-0.056** (0.021)						
GVE _{it}		0.304*** (0.000)					
GVE _{jt}		0.156*** (0.000)					
POS _{it}			0.169*** (0.000)				
POS _{jt}			-0.070** (0.016)				
REQ _{it}				0.127*** (0.004)			
REQ _{jt}				0.171*** (0.000)			
ROL _{it}					0.051 (0.141)		
ROL _{jt}					0.083***		

cliv

					(0.007)		
VAC _{it}						-0.209***	
						(0.000)	
VAC _{jt}						-0.194***	
						(0.000)	
lnGDI _{it}	3.087***	3.916***	2.373***	3.069***	3.043***	1.582***	1.438***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
lnGDI _{jt}	-0.177	1.335***	0.573*	1.038***	1.216***	-1.188***	-0.502
	(0.556)	(0.000)	(0.073)	(0.002)	(0.001)	(0.000)	(0.192)
lnREMOTE _{it}	0.150***	0.075**	0.024	0.125***	0.126***	0.165***	-0.024
	(0.000)	(0.034)	(0.493)	(0.000)	(0.000)	(0.000)	(0.493)
lnREMOTE _{jt}	0.238***	0.209***	0.234***	0.235***	0.249***	0.320***	0.208***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lnEXG _{jit}	0.017***	0.027***	0.018***	0.020***	0.022***	0.019***	0.022***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lnDIN _{ijt}	0.172***	0.089***	0.081***	0.062***	0.052***	-0.050***	0.044***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)
lnESIM _{ijt}	-0.130***	-0.077***	-0.070***	-0.091***	-0.094***	-0.125***	-0.130***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
RTA _{ijt}	0.577***	0.524***	0.365***	0.482***	0.511***	0.523***	0.383***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LLOCK _i	-0.097**	-0.079*	-0.282***	0.041	-0.029	0.291***	0.017
	(0.032)	(0.076)	(0.000)	(0.406)	(0.545)	(0.000)	(0.669)
LLOCK _j	-0.353***	-0.244***	-0.326***	-0.146***	-0.206***	-0.070	-0.148***
	(0.000)	(0.000)	(0.000)	(0.002)	(0.000)	(0.194)	(0.001)
COMCOL _{ij}	1.464***	1.202***	1.542***	1.495***	1.467***	excluded	excluded
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)		
COMLANG _{ij}	-0.150***	-0.039	-0.024	-0.093**	-0.052	-0.252***	-0.186***
	(0.000)	(0.315)	(0.620)	(0.037)	(0.243)	(0.000)	(0.000)
CONTIG _{ij}	0.627***	0.762***	0.441***	0.691***	0.704***	0.692***	0.527***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GEFC _t	0.063**	0.056*	0.041	0.075**	0.053*	0.053	0.023
	(0.038)	(0.066)	(0.148)	(0.017)	(0.091)	(0.103)	(0.439)

clv

COVID _t	-0.018 (0.678)	-0.038 (0.429)	-0.112*** (0.004)	0.008 (0.862)	-0.029 (0.539)	-0.146*** (0.002)	-0.109*** (0.008)
Constant	-18.666*** (0.000)	-16.973*** (0.000)	-16.947*** (0.000)	-17.162*** (0.000)	-16.759*** (0.000)	-17.394*** (0.000)	-19.924*** (0.000)
Observations	16,746	16,734	16,660	16,682	16,748	16,642	14,746
R-squared	0.784	0.762	0.787	0.773	0.766	0.768	0.797

Note: The dependent variable of PPML models is BIT_{ijt} ; *, **, and *** denote the significance levels of 10%, 5%, and 1%, respectively.

Source: The author.

Table C3.39: PPML estimation results for low-high and high-low samples of GII models (for robustness check)

BIT _{ijt}	GII models						
	COC	GVE	POS	REQ	ROL	VAC	IQ
lnGDP _{it}	0.559*** (0.000)	0.512*** (0.000)	0.548*** (0.000)	0.573*** (0.000)	0.617*** (0.000)	0.704*** (0.000)	0.587*** (0.000)
lnGDP _{jt}	0.769*** (0.000)	0.708*** (0.000)	0.707*** (0.000)	0.702*** (0.000)	0.745*** (0.000)	0.855*** (0.000)	0.711*** (0.000)
lnPOP _{it}	0.330*** (0.000)	0.361*** (0.000)	0.269*** (0.000)	0.289*** (0.000)	0.239*** (0.000)	0.133*** (0.000)	0.255*** (0.000)
lnPOP _{jt}	0.068*** (0.009)	0.097*** (0.000)	0.056** (0.012)	0.125*** (0.000)	0.053** (0.027)	-0.074*** (0.000)	0.103*** (0.000)
lnDIST _{ij}	-0.755*** (0.000)	-0.696*** (0.000)	-0.615*** (0.000)	-0.663*** (0.000)	-0.659*** (0.000)	-0.593*** (0.000)	-0.595*** (0.000)
COC _{it}	-0.063** (0.027)						
COC _{jt}	-0.006 (0.827)						
GVE _{it}		0.087* (0.054)					
GVE _{jt}		0.167*** (0.000)					
POS _{it}			0.072* (0.080)				
POS _{jt}			-0.033 (0.293)				
REQ _{it}				-0.025 (0.572)			
REQ _{jt}				0.186*** (0.000)			
ROL _{it}					0.134*** (0.000)		
ROL _{jt}					0.028		

					(0.332)		
VAC _{it}						-0.238***	
						(0.000)	
VAC _{jt}						-0.165***	
						(0.000)	
lnGII _{it}	-0.430***	-0.352***	-0.211***	-0.387***	-0.413***	-0.326***	-0.218***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lnGII _{jt}	0.027	0.156***	0.030	0.096***	0.082**	-0.003	0.003
	(0.439)	(0.000)	(0.400)	(0.007)	(0.027)	(0.923)	(0.934)
lnREMOTE _{it}	0.370***	0.289***	0.146***	0.344***	0.329***	0.317***	0.088**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.016)
lnREMOTE _{jt}	0.183***	0.100***	0.192***	0.142***	0.171***	0.275***	0.181***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lnEXG _{jit}	0.009*	0.018***	0.015***	0.011**	0.015***	0.016***	0.018***
	(0.055)	(0.000)	(0.001)	(0.019)	(0.002)	(0.000)	(0.000)
lnDIN _{ijt}	0.197***	0.119***	0.081***	0.087***	0.081***	-0.038***	0.047***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.003)	(0.000)
lnESIM _{ijt}	-0.179***	-0.126***	-0.098***	-0.144***	-0.150***	-0.151***	-0.149***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
RTA _{ijt}	0.574***	0.475***	0.347***	0.453***	0.470***	0.524***	0.384***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LLOCK _i	-0.055	-0.018	-0.243***	0.066	0.033	0.315***	0.036
	(0.224)	(0.702)	(0.000)	(0.170)	(0.505)	(0.000)	(0.373)
LLOCK _j	-0.415***	-0.355***	-0.362***	-0.215***	-0.272***	-0.128**	-0.162***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.012)	(0.000)
COMCOL _{ij}	1.442***	1.167***	1.469***	1.491***	1.492***	excluded	excluded
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)		
COMLANG _{ij}	-0.172***	-0.122***	-0.045	-0.177***	-0.119***	-0.266***	-0.192***
	(0.000)	(0.003)	(0.345)	(0.000)	(0.006)	(0.000)	(0.000)
CONTIG _{ij}	0.648***	0.799***	0.494***	0.769***	0.761***	0.753***	0.551***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GEFC _t	0.105***	0.056*	0.065**	0.109***	0.085***	0.108***	0.063**
	(0.000)	(0.061)	(0.027)	(0.000)	(0.006)	(0.001)	(0.039)

COVID _t	-0.065 (0.144)	-0.037 (0.464)	-0.132*** (0.001)	-0.023 (0.618)	-0.068 (0.170)	-0.208*** (0.000)	-0.153*** (0.000)
Constant	-17.526*** (0.000)	-17.429*** (0.000)	-16.568*** (0.000)	-16.820*** (0.000)	-16.692*** (0.000)	-15.904*** (0.000)	-19.344*** (0.000)
Observations	16,746	16,734	16,660	16,682	16,748	16,642	14,746
R-squared	0.799	0.773	0.790	0.785	0.777	0.772	0.803

Note: The dependent variable of PPML models is BIT_{ijt} ; *, **, and *** denote the significance levels of 10%, 5%, and 1%, respectively.

Source: The author.

Table C3.40: PPML estimation results for low-high and high-low samples of FLA models (for robustness check)

BIT _{ijt}	FLA models						
	COC	GVE	POS	REQ	ROL	VAC	IQ
lnGDP _{it}	0.559*** (0.000)	0.527*** (0.000)	0.536*** (0.000)	0.570*** (0.000)	0.627*** (0.000)	0.720*** (0.000)	0.589*** (0.000)
lnGDP _{jt}	0.708*** (0.000)	0.645*** (0.000)	0.674*** (0.000)	0.618*** (0.000)	0.649*** (0.000)	0.844*** (0.000)	0.676*** (0.000)
lnPOP _{it}	0.274*** (0.000)	0.282*** (0.000)	0.241*** (0.000)	0.238*** (0.000)	0.169*** (0.000)	0.066*** (0.001)	0.203*** (0.000)
lnPOP _{jt}	0.146*** (0.000)	0.180*** (0.000)	0.080*** (0.000)	0.232*** (0.000)	0.174*** (0.000)	-0.058*** (0.000)	0.136*** (0.000)
lnDIST _{ij}	-0.751*** (0.000)	-0.659*** (0.000)	-0.597*** (0.000)	-0.640*** (0.000)	-0.634*** (0.000)	-0.603*** (0.000)	-0.582*** (0.000)
COC _{it}	0.051* (0.069)						
COC _{jt}	0.036 (0.146)						
GVE _{it}		0.120*** (0.004)					
GVE _{jt}		-0.098*** (0.004)					
POS _{it}			0.067 (0.107)				
POS _{jt}			-0.121*** (0.000)				
REQ _{it}				0.100** (0.024)			
REQ _{jt}				0.230*** (0.000)			
ROL _{it}					0.024 (0.453)		
ROL _{jt}					0.139***		

clx

					(0.000)		
VAC _{it}						-0.168***	
						(0.000)	
VAC _{jt}						-0.158***	
						(0.000)	
lnFLA _{it}	1.123***	1.098***	0.905***	1.231***	1.265***	0.901***	0.812***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lnFLA _{jt}	0.469***	0.429***	0.394***	0.487***	0.530***	0.175***	0.099*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.068)
lnREMOTE _{it}	0.097***	0.036	-0.010	0.067*	0.065*	0.127***	-0.061*
	(0.003)	(0.307)	(0.780)	(0.053)	(0.054)	(0.000)	(0.085)
lnREMOTE _{jt}	0.211***	0.194***	0.227***	0.206***	0.233***	0.302***	0.208***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lnEXG _{jit}	0.014***	0.025***	0.019***	0.018***	0.021***	0.019***	0.023***
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lnDIN _{ijt}	0.082***	0.039**	0.057***	-0.003	-0.022	-0.067***	0.031***
	(0.000)	(0.016)	(0.000)	(0.856)	(0.203)	(0.000)	(0.009)
lnESIM _{ijt}	-0.139***	-0.082***	-0.058***	-0.095***	-0.094***	-0.117***	-0.117***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
RTA _{ijt}	0.655***	0.556***	0.399***	0.538***	0.573***	0.560***	0.417***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LLOCK _i	-0.196***	-0.151***	-0.297***	-0.094**	-0.156***	0.166***	-0.034
	(0.000)	(0.000)	(0.000)	(0.026)	(0.000)	(0.000)	(0.356)
LLOCK _j	-0.366***	-0.252***	-0.298***	-0.145***	-0.224***	-0.110**	-0.122***
	(0.000)	(0.000)	(0.000)	(0.002)	(0.000)	(0.043)	(0.003)
COMCOL _{ij}	1.497***	1.322***	1.676***	1.382***	1.309***	excluded	excluded
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)		
COMLANG _{ij}	-0.040	0.033	-0.051	0.015	0.070*	-0.300***	-0.198***
	(0.286)	(0.371)	(0.292)	(0.710)	(0.075)	(0.000)	(0.000)
CONTIG _{ij}	0.661***	0.844***	0.472***	0.801***	0.822***	0.695***	0.551***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GEFC _t	0.067**	0.032	0.039	0.085***	0.059**	0.074**	0.029
	(0.016)	(0.264)	(0.169)	(0.003)	(0.042)	(0.019)	(0.313)

COVID _t	-0.008 (0.857)	-0.021 (0.674)	-0.110*** (0.003)	0.030 (0.511)	-0.021 (0.669)	-0.163*** (0.001)	-0.115*** (0.003)
Constant	-24.175*** (0.000)	-23.494*** (0.000)	-21.548*** (0.000)	-24.018*** (0.000)	-23.833*** (0.000)	-20.666*** (0.000)	-22.911*** (0.000)
Observations	16,788	16,772	16,708	16,724	16,788	16,688	14,776
R-squared	0.802	0.766	0.797	0.783	0.772	0.763	0.806

Note: The dependent variable of PPML models is BIT_{ijt} ; *, **, and *** denote the significance levels of 10%, 5%, and 1%, respectively.

Source: The author.

Table C3.41: Summary of findings on the direct effect of gender equality on bilateral trade

Contextual effects	Direct effects	Hypotheses
The aggregated sample	Exporter's and importer's GDI <i>increases</i> bilateral trade.	H.1.1.1: Supported
	Importer's GII <i>increases</i> import flows.	H.1.1.2: Not supported (opposite sign)
The high-high institutional trading relationship	Exporter's FLA <i>increases</i> export flows.	H.1.1.3: Supported H.1.4: Supported
	Exporter's GII <i>decreases</i> export flows.	H.1.1.2: Supported H.1.4: Supported
The low-low institutional trading relationship	Exporter's GDI <i>increases</i> export flows.	H.1.1.1: Supported H.1.4: Supported
The low-high and high-low institutional trading relationships	Exporter's GDI <i>increases</i> export flows.	H.1.1.1: Supported H.1.4: Supported
	Importer's GDI <i>decreases</i> import flows.	H.1.1.1: Not supported (opposite sign) H.1.4: Supported

Source: The author.

Table C3.42: Summary of findings on the moderating effect of institutional quality on the nexus between gender equality and bilateral trade

Institutional quality proxies	Moderating effects			Hypotheses
	Bilateral Trade-GDI	Bilateral Trade-GII	Bilateral Trade-FLA	
COC	Exporter (-) Importer (-)	Exporter (+) Importer (+)	Importer (+)	H.1.3.1: Supported H.1.3.2: Supported H.1.3.3: Supported
GVE	Exporter (-) Importer (-)			H.1.3.1: Supported H.1.3.2: Not supported H.1.3.3: Not supported
POS	Importer (+)		Importer (-)	H.1.3.1: Supported H.1.3.2: Not supported H.1.3.3: Supported
REQ	Importer (-)	Exporter (+)		H.1.3.1: Supported H.1.3.2: Supported H.1.3.3: Not supported
ROL				H.1.3.1: Not supported H.1.3.2: Not supported H.1.3.3: Not supported
VAC	Exporter (-)	Exporter (+) Importer (+)	Importer (-)	H.1.3.1: Supported H.1.3.2: Supported H.1.3.3: Supported
Overall IQ			Exporter (-)	H.1.3.1: Not supported H.1.3.2: Not supported H.1.3.3: Supported

Source: The author.

APPENDICES OF CHAPTER 4

Table C4.1: Estimation results of COC, GVE, and POS models (aggregated sample)

ln(1 + BIT _{ijt})	COC models			GVE models			POS models		
	FE-I	FE-II	SGMM-II	FE-I	FE-II	SGMM-II	FE-I	FE-II	SGMM-II
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
L1.ln(1 + BIT _{ijt})			0.210 ^a (0.081)			0.622 ^c (0.000)			0.413 ^c (0.000)
L2.ln(1 + BIT _{ijt})									
L1.lnGDP _{it}			-0.324 (0.349)			-1.038 ^b (0.037)			-0.432 (0.307)
L2.lnGDP _{it}						1.222 ^b (0.035)			
L1.lnGDP _{jt}			-0.109 (0.769)			-0.638 (0.357)			-0.122 (0.797)
L2.lnGDP _{jt}						1.359 ^a (0.087)			
L1.lnEXG _{jit}			0.106 (0.619)			-0.098 (0.820)			-0.079 (0.684)
L2.lnEXG _{jit}						0.068 (0.863)			
lnGDP _{it}	0.593 ^c (0.000)	0.536 ^c (0.000)		0.582 ^c (0.000)	0.527 ^c (0.000)		0.601 ^c (0.000)	0.545 ^c (0.000)	
lnGDP _{jt}	0.595 ^c (0.000)	0.541 ^c (0.000)		0.590 ^c (0.000)	0.539 ^c (0.000)		0.585 ^c (0.000)	0.531 ^c (0.000)	
lnPOP _{it}	0.511 ^c (0.000)	0.549 (0.202)	5.616 (0.104)	0.325 ^b (0.023)	0.372 (0.323)	1.291 (0.748)	0.500 ^c (0.001)	0.545 (0.192)	5.229 (0.134)
lnPOP _{jt}	-0.086 (0.572)	-0.048 (0.774)	5.572 (0.110)	-0.126 (0.427)	-0.082 (0.652)	-4.532 (0.364)	-0.112 (0.462)	-0.068 (0.683)	4.276 (0.187)
lnDIST _{ij}	omitted	-1.157 ^c (0.000)	-23.086 (0.204)	omitted	-1.159 ^c (0.000)	-7.362 (0.770)	omitted	-1.158 ^c (0.000)	-17.187 (0.244)

lnCEpc _{it}	0.606 ^c (0.000)	0.644 ^c (0.001)	0.204 (0.793)	0.481 ^c (0.000)	0.520 ^c (0.003)	1.512 (0.191)	0.567 ^c (0.000)	0.605 ^c (0.001)	0.873 (0.242)
lnCEpc _{jt}	0.447 ^c (0.000)	0.485 ^c (0.000)	-0.019 (0.981)	0.486 ^c (0.000)	0.522 ^c (0.000)	1.529 (0.164)	0.468 ^c (0.000)	0.505 ^c (0.000)	0.718 (0.357)
COC _{it}	-0.015 (0.763)	-0.009 (0.948)	-0.070 (0.916)						
COC _{jt}	-0.090 ^a (0.062)	-0.086 ^a (0.098)	0.132 (0.845)						
(rCOC*lnCEpc) _{it}	-0.047 ^b (0.048)	-0.052 (0.548)	0.906 ^a (0.069)						
(rCOC*lnCEpc) _{jt}	0.079 ^c (0.002)	0.074 ^c (0.006)	1.026 ^a (0.051)						
GVE _{it}				0.182 ^c (0.000)	0.183 (0.102)	-0.795 (0.450)			
GVE _{jt}				-0.075 ^a (0.091)	-0.076 (0.120)	-0.852 (0.453)			
(rGVE*lnCEpc) _{it}				0.052 ^c (0.000)	0.049 (0.138)	-0.041 (0.870)			
(rGVE*lnCEpc) _{jt}				0.033 ^b (0.018)	0.031 ^b (0.048)	-0.088 (0.719)			
POS _{it}							-0.043 (0.145)	-0.032 (0.708)	0.365 (0.157)
POS _{jt}							-0.042 (0.123)	-0.032 (0.313)	0.237 (0.346)
(rPOS*lnCEpc) _{it}							0.028 ^c (0.000)	0.028 (0.266)	-0.171 ^b (0.023)
(rPOS*lnCEpc) _{jt}							-0.003 (0.728)	-0.003 (0.729)	-0.158 ^b (0.046)
lnREMOTE _{it}	-1.425 ^c (0.000)	-1.420 ^c (0.000)	0.150 (0.951)	-1.396 ^c (0.000)	-1.397 ^c (0.000)	-4.177 (0.440)	-1.423 ^c (0.000)	-1.426 ^c (0.000)	-0.139 (0.945)
lnREMOTE _{jt}	-0.632 ^c (0.000)	-0.625 ^c (0.003)	0.577 (0.810)	-0.616 ^c (0.000)	-0.615 ^c (0.004)	-4.529 (0.406)	-0.591 ^c (0.000)	-0.593 ^c (0.005)	-0.353 (0.862)
lnEXG _{jit}	0.079 ^a	0.079		0.085 ^a	0.085		0.061	0.061	

	(0.065)	(0.311)		(0.065)	(0.301)		(0.198)	(0.436)	
lnESIM _{ijt}	0.113 ^c	-0.069	-2.112	0.114 ^c	-0.069	-4.172 ^a	0.113 ^c	-0.069	-0.662
	(0.001)	(0.234)	(0.112)	(0.001)	(0.229)	(0.074)	(0.001)	(0.231)	(0.549)
lnDIN _{ijt}	-0.001	0.059 ^c	0.848	0.001	0.059 ^c	0.045	-0.001	0.059 ^c	-0.034
	(0.899)	(0.008)	(0.132)	(0.892)	(0.008)	(0.962)	(0.951)	(0.008)	(0.946)
RTA _{ijt}	0.032	0.165 ^b	0.368	0.016	0.161 ^b	0.140	0.025	0.163 ^b	-1.089
	(0.248)	(0.022)	(0.679)	(0.563)	(0.024)	(0.940)	(0.359)	(0.024)	(0.352)
LLOCK _i	omitted	omitted	-55.498	omitted	omitted	-50.014	omitted	omitted	-20.780
			(0.326)			(0.679)			(0.689)
LLOCK _j	omitted	-2.064 ^c	-61.600	omitted	-2.172 ^c	-106.052	omitted	-2.183 ^c	-27.027
		(0.000)	(0.299)		(0.000)	(0.394)		(0.000)	(0.588)
COMCOL _{ij}	omitted	0.554	omitted	omitted	0.554	omitted	omitted	0.554	omitted
		(0.243)			(0.243)			(0.243)	
COMLANG _{ij}	omitted	0.190 ^a	-73.133	omitted	0.189 ^a	-180.594	omitted	0.189 ^a	-12.384
		(0.085)	(0.308)		(0.085)	(0.413)		(0.085)	(0.861)
CONTIG _{ij}	omitted	0.214	omitted	omitted	0.213	omitted	omitted	0.213	omitted
		(0.105)			(0.106)			(0.105)	
GEFC _t	-2.195 ^c	-2.117 ^c	omitted	-2.112 ^c	-2.050 ^c	omitted	-2.160 ^c	-2.095 ^c	omitted
	(0.000)	(0.000)		(0.000)	(0.001)		(0.000)	(0.000)	
COVID _t	-2.654 ^c	-2.573 ^c	-0.075	-2.545 ^c	-2.484 ^c	-5.156	-2.611 ^c	-2.546 ^c	0.055
	(0.000)	(0.000)	(0.804)	(0.000)	(0.001)	(0.454)	(0.000)	(0.000)	(0.844)
Constant	-54.903 ^c	-44.579 ^c	39.848	-50.120 ^c	-40.232 ^c	omitted	-53.665 ^c	-43.655 ^c	omitted
	(0.000)	(0.000)	(0.740)	(0.000)	(0.000)		(0.000)	(0.000)	
Observations	32,800	32,800	31,160	32,800	32,800	29,520	32,800	32,800	31,160
Groups	1,640	41	1,640	1,640	41	1,640	1,640	41	1,640
Instruments	-	-	80	-	-	74	-	-	77
R-squared	0.493	0.729	-	0.497	0.729	-	0.493	0.729	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Countrypair-fixed	Y	N	-	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-	N	Y	-
Importer-fixed	N	Y	-	N	Y	-	N	Y	-
Vce cluster	Y	Y	-	Y	Y	-	Y	Y	-
F tests ¹	153.36 ^c	348.73 ^c	-	147.76 ^c	291.34 ^c	-	153.06 ^c	344.74 ^c	-

Hausman tests ² (chi2)	1,292.50 ^c	3,904.33 ^c	-	1,134.71 ^c	2,215.03 ^c	-	1024.85 ^c	1,193.81 ^c	-
AR(1) (z)	-	-	-2.42 ^b	-	-	-2.99 ^c	-	-	-3.25 ^c
AR(1) (p)	-	-	0.016	-	-	0.003	-	-	0.001
AR(2) (z)	-	-	-0.68	-	-	1.05	-	-	0.37
AR(2) (p)	-	-	0.498	-	-	0.295	-	-	0.712
Hansen test (chi2)	-	-	47.29	-	-	33.96	-	-	45.24
Hansen test (p)	-	-	0.144	-	-	0.282	-	-	0.115

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C4.2: Estimation results of REQ, ROL, and VAC models (aggregated sample)

ln(1 + BIT _{ijt})	REQ models			ROL models			VAC models		
	FE-I	FE-II	SGMM-II	FE-I	FE-II	SGMM-II	FE-I	FE-II	SGMM-II
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
L1.ln(1 + BIT _{ijt})						0.529 ^c (0.000)			0.689 ^c (0.000)
L2.ln(1 + BIT _{ijt})			0.035 (0.756)						
L1.lnGDP _{it}			0.154 (0.758)						-1.436 ^b (0.021)
L2.lnGDP _{it}			-0.285 (0.108)			1.046 (0.183)			1.769 ^b (0.018)
L1.lnGDP _{jt}			0.501 (0.310)						-1.025 (0.103)
L2.lnGDP _{jt}			0.030 (0.876)			1.515 ^a (0.075)			1.930 ^b (0.021)
L1.lnEXG _{jit}			-0.149 (0.605)						-0.025 (0.942)
L2.lnEXG _{jit}			-0.051 (0.746)			-0.221 (0.218)			-0.057 (0.865)
lnGDP _{it}	0.616 ^c (0.000)	0.555 ^c (0.001)		0.567 ^c (0.000)	0.505 ^c (0.000)		0.607 ^c (0.000)	0.550 ^c (0.001)	
lnGDP _{jt}	0.613 ^c (0.000)	0.555 ^c (0.000)		0.586 ^c (0.000)	0.527 ^c (0.000)		0.592 ^c (0.000)	0.537 ^c (0.000)	
lnPOP _{it}	0.518 ^c (0.000)	0.555 (0.193)	5.617 (0.249)	0.564 ^c (0.000)	0.606 (0.110)	-3.351 (0.462)	0.471 ^c (0.001)	0.511 (0.218)	-3.637 (0.544)
lnPOP _{jt}	-0.082 (0.592)	-0.046 (0.788)	2.273 (0.692)	-0.074 (0.632)	-0.032 (0.849)	-6.836 (0.221)	-0.098 (0.529)	-0.059 (0.729)	-8.156 (0.165)
lnDIST _{ij}	omitted	-1.156 ^c (0.000)	-12.899 (0.614)	omitted	-1.159 ^c (0.000)	14.785 (0.677)	omitted	-1.157 ^c (0.000)	3.232 (0.919)
lnCEpc _{it}	0.588 ^c (0.000)	0.626 ^c (0.001)	0.204 (0.754)	0.549 ^c (0.000)	0.592 ^c (0.001)	1.838 ^b (0.026)	0.561 ^c (0.000)	0.598 ^c (0.001)	2.770 ^b (0.022)

clxx

lnCEpc _{jt}	0.452 ^c (0.000)	0.489 ^c (0.000)	0.033 (0.957)	0.454 ^c (0.000)	0.495 ^c (0.000)	1.705 ^b (0.032)	0.457 ^c (0.000)	0.493 ^c (0.000)	2.467 ^b (0.032)
REQ _{it}	-0.160 ^c (0.000)	-0.152 (0.176)	-0.272 (0.365)						
REQ _{jt}	-0.135 ^c (0.001)	-0.127 ^c (0.008)	-0.424 (0.225)						
(rREQ*lnCEpc) _{it}	-0.005 (0.598)	-0.007 (0.733)	0.008 (0.955)						
(rREQ*lnCEpc) _{jt}	0.025 ^c (0.008)	0.024 ^c (0.009)	-0.024 (0.865)						
ROL _{it}				0.132 ^c (0.007)	0.158 (0.272)	0.465 (0.295)			
ROL _{jt}				-0.047 (0.290)	-0.021 (0.636)	0.288 (0.547)			
(rROL*lnCEpc) _{it}				0.071 ^c (0.000)	0.062 (0.270)	-0.270 (0.220)			
(rROL*lnCEpc) _{jt}				0.051 ^c (0.004)	0.044 ^c (0.005)	-0.322 (0.146)			
VAC _{it}							-0.238 ^c (0.000)	-0.232 ^b (0.039)	-0.255 (0.819)
VAC _{jt}							-0.035 (0.473)	-0.030 (0.513)	-0.253 (0.807)
(rVAC*lnCEpc) _{it}							0.017 ^b (0.024)	0.017 (0.398)	0.191 (0.251)
(rVAC*lnCEpc) _{jt}							-0.007 (0.416)	-0.007 (0.251)	0.164 (0.289)
lnREMOTE _{it}	-1.385 ^c (0.000)	-1.369 ^c (0.001)	1.588 (0.614)	-1.444 ^c (0.000)	-1.446 ^c (0.000)	-3.062 (0.454)	-1.404 ^c (0.000)	-1.396 ^c (0.000)	-5.965 (0.384)
lnREMOTE _{jt}	-0.628 ^c (0.000)	-0.611 ^c (0.003)	0.881 (0.781)	-0.621 ^c (0.000)	-0.621 ^c (0.003)	-3.747 (0.385)	-0.608 ^c (0.000)	-0.598 ^c (0.004)	-6.202 (0.376)
lnEXG _{jit}	0.056 (0.234)	0.056 (0.512)		0.079 ^a (0.094)	0.079 (0.330)		0.039 (0.408)	0.039 (0.633)	
lnESIM _{ijt}	0.128 ^c	-0.067	-0.670	0.118 ^c	-0.069	-2.867 ^a	0.120 ^c	-0.068	-4.644 ^b

	(0.000)	(0.250)	(0.632)	(0.001)	(0.232)	(0.078)	(0.001)	(0.240)	(0.030)
lnDIN _{ijt}	-0.001	0.059 ^c	1.101 ^a	0.001	0.059 ^c	-0.088	-0.001	0.059 ^c	-0.345
	(0.920)	(0.008)	(0.099)	(0.877)	(0.008)	(0.888)	(0.952)	(0.008)	(0.706)
RTA _{ijt}	0.045 ^a	0.169 ^b	1.088	0.018	0.161 ^b	-0.195	0.036	0.166 ^b	-1.199
	(0.094)	(0.020)	(0.238)	(0.518)	(0.025)	(0.779)	(0.183)	(0.021)	(0.312)
LLOCK _i	omitted	omitted	4.333	omitted	omitted	2.261	omitted	omitted	-79.154
			(0.962)			(0.986)			(0.541)
LLOCK _j	omitted	-2.142 ^c	-19.687	omitted	-2.226 ^c	-19.190	omitted	-2.099 ^c	-115.500
		(0.000)	(0.819)		(0.000)	(0.892)		(0.000)	(0.435)
COMCOL _{ij}	omitted	0.554	omitted	omitted	0.554	omitted	omitted	0.554	omitted
		(0.243)			(0.243)			(0.243)	
COMLANG _{ij}	omitted	0.190 ^a	2.105	omitted	0.190 ^a	-61.004	omitted	0.190 ^a	-219.343
		(0.084)	(0.986)		(0.085)	(0.775)		(0.085)	(0.327)
CONTIG _{ij}	omitted	0.214	omitted	omitted	0.213	omitted	omitted	0.214	omitted
		(0.104)			(0.105)			(0.105)	
GEFC _t	-2.173 ^c	-2.061 ^c	omitted	-2.184 ^c	-2.112 ^c	omitted	-2.168 ^c	-2.078 ^c	omitted
	(0.000)	(0.000)		(0.000)	(0.000)		(0.000)	(0.000)	
COVID _t	-2.640 ^c	-2.514 ^c	-0.382	-2.627 ^c	-2.555 ^c	-4.074	-2.632 ^c	-2.535 ^c	omitted
	(0.000)	(0.000)	(0.295)	(0.000)	(0.000)	(0.467)	(0.000)	(0.000)	
Constant	-55.375 ^c	-44.374 ^c	omitted	-55.368 ^c	-44.952 ^c	-108.275	-53.520 ^c	-43.026 ^c	omitted
	(0.000)	(0.000)		(0.000)	(0.000)	(0.787)	(0.000)	(0.000)	
Observations	32,800	32,800	29,520	32,800	32,800	29,520	32,800	32,800	29,520
Groups	1,640	41	1,640	1,640	41	1,640	1,640	41	1,640
Instruments	-	-	76	-	-	75	-	-	74
R-squared	0.494	0.729	-	0.495	0.729	-	0.494	0.729	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Countrypair-fixed	Y	N	-	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-	N	Y	-
Importer-fixed	N	Y	-	N	Y	-	N	Y	-
Vce cluster	Y	Y	-	Y	Y	-	Y	Y	-
F tests ¹	155.21 ^c	347.12 ^c	-	154.85 ^c	349.29 ^c	-	155.46 ^c	378.94 ^c	-
Hausman tests ² (chi2)	1,208.82 ^c	1,920.00 ^c	-	1,550.33 ^c	1,267.22 ^c	-	2,635.52 ^c	2,432.59 ^c	-
AR(1) (z)	-	-	-1.87 ^a	-	-	-3.33 ^c	-	-	-2.51 ^b

AR(1) (p)	-	-	0.062	-	-	0.001	-	-	0.012
AR(2) (z)	-	-	-1.28	-	-	0.96	-	-	1.27
AR(2) (p)	-	-	0.199	-	-	0.339	-	-	0.205
Hansen test (chi2)	-	-	39.61	-	-	44.27	-	-	24.42
Hansen test (p)	-	-	0.167	-	-	0.112	-	-	0.753

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C4.3: Estimation results of EPS and overall IQ models (aggregated sample)

ln(1 + BIT_{ijt})	EPS models			Overall IQ models		
	FE-I	FE-II	SGMM-II	FE-I	FE-II	SGMM-II
	(1)	(2)	(3)	(4)	(5)	(6)
L1.ln(1 + BIT _{ijt})			0.377 ^c (0.002)			0.459 ^c (0.002)
L2.ln(1 + BIT _{ijt})						
L1.lnGDP _{it}			0.208 (0.567)			-0.825 (0.118)
L2.lnGDP _{it}						
L1.lnGDP _{jt}			-0.014 (0.968)			-0.411 (0.442)
L2.lnGDP _{jt}						
L1.lnEXG _{jit}			0.235 (0.297)			0.062 (0.770)
L2.lnEXG _{jit}						
lnGDP _{it}	0.464 ^c (0.000)	0.459 ^c (0.006)		0.598 ^c (0.000)	0.550 ^c (0.000)	
lnGDP _{jt}	0.485 ^c (0.000)	0.483 ^c (0.000)		0.584 ^c (0.000)	0.538 ^c (0.000)	
lnPOP _{it}	-1.486 ^c (0.000)	-1.453 (0.111)	6.142 (0.139)	0.520 ^c (0.000)	0.558 (0.171)	9.387 (0.103)
lnPOP _{jt}	-0.127 (0.675)	-0.083 (0.743)	6.857 (0.111)	-0.082 (0.592)	-0.045 (0.792)	6.661 (0.215)
lnDIST _{ij}	omitted	-1.074 ^c (0.000)	-17.977 ^a (0.099)	omitted	-1.158 ^c (0.000)	-34.256 (0.198)
lnCEpc _{it}	0.566 ^c (0.000)	0.575 ^c (0.003)	-0.797 (0.498)	0.537 ^c (0.000)	0.567 ^c (0.001)	0.843 (0.322)

lnCEpc _{jt}	0.599 ^c (0.000)	0.611 ^c (0.000)	-0.139 (0.890)	0.438 ^c (0.000)	0.466 ^c (0.000)	0.577 (0.482)
lnEPS _{it}	-0.022 (0.431)	-0.018 (0.774)	-0.420 ^a (0.066)			
lnEPS _{jt}	-0.025 (0.265)	-0.021 (0.259)	-0.264 (0.217)			
(rEPS*lnCEpc) _{it}	0.005 (0.539)	0.003 (0.862)	-0.042 (0.510)			
(rEPS*lnCEpc) _{jt}	0.010 (0.127)	0.009 (0.103)	-0.044 (0.522)			
IQ _{it}				-0.348 ^c (0.007)	-0.375 (0.424)	0.905 (0.417)
IQ _{jt}				-0.301 ^c (0.005)	-0.331 ^c (0.000)	1.095 (0.359)
(rIQ*lnCEpc) _{it}				0.192 ^c (0.001)	0.209 (0.297)	-0.486 (0.353)
(rIQ*lnCEpc) _{jt}				0.139 ^c (0.004)	0.156 ^c (0.000)	-0.550 (0.334)
lnREMOTE _{it}	-1.099 ^c (0.000)	-1.217 ^c (0.006)	0.369 (0.764)	-1.475 ^c (0.000)	-1.486 ^c (0.000)	-2.581 (0.509)
lnREMOTE _{jt}	-0.219 (0.137)	-0.340 (0.161)	0.278 (0.813)	-0.640 ^c (0.000)	-0.649 ^c (0.003)	-2.871 (0.457)
lnEXG _{jit}	0.117 ^b (0.013)	0.117 (0.249)		0.061 (0.199)	0.060 (0.436)	
lnESIM _{ijt}	0.055 (0.152)	0.010 (0.915)	-1.129 (0.164)	0.094 ^c (0.008)	-0.071 (0.213)	-1.735 (0.283)
lnDIN _{ijt}	0.000 (0.999)	0.036 (0.180)	0.217 (0.616)	0.001 (0.910)	0.059 ^c (0.007)	-0.529 (0.530)
RTA _{ijt}	0.027 (0.415)	0.211 ^c (0.006)	-1.005 (0.133)	0.024 (0.384)	0.162 ^b (0.024)	-1.485 (0.238)
LLOCK _i	omitted	omitted	-11.241 (0.338)	omitted	omitted	-58.755 (0.492)
LLOCK _j	omitted	-2.560 ^c	-13.393	omitted	-2.231 ^c	-84.945

COMCOL _{ij}	omitted	(0.000) omitted	(0.327) omitted	omitted	(0.000) 0.554 (0.243)	(0.389) omitted
COMLANG _{ij}	omitted	0.278 ^b (0.031)	omitted	omitted	0.189 ^a (0.085)	-67.887 (0.600)
CONTIG _{ij}	omitted	0.305 ^b (0.027)	omitted	omitted	0.214 (0.105)	omitted
GEFC _t	-1.038 ^c (0.000)	-1.345 ^b (0.046)	omitted	-2.252 ^c (0.000)	-2.224 ^c (0.000)	omitted
COVID _t	-0.986 ^c (0.001)	-1.342 ^a (0.065)	-0.176 (0.948)	-2.705 ^c (0.000)	-2.681 ^c (0.000)	-4.419 (0.485)
Constant	-3.674 (0.616)	0.727 (0.963)	-61.627 (0.392)	-55.726 ^c (0.000)	-46.001 ^c (0.000)	omitted
Observations	20,064	20,064	19,008	32,800	32,800	31,160
Groups	1,056	33	1,056	1,640	41	1,640
Instruments	-	-	70	-	-	77
R-squared	0.558	0.768	-	0.494	0.729	-
Year-fixed	Y	Y	Y	Y	Y	Y
Countrypair-fixed	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-
Importer-fixed	N	Y	-	N	Y	-
Vce cluster	Y	Y	-	Y	Y	-
F tests ¹	179.68 ^c	140.26 ^c	-	157.40 ^c	377.04 ^c	-
Hausman tests ² (chi2)	1,403.77 ^c	2,151.37 ^c	-	1,313.78 ^c	747.48 ^c	-
AR(1) (z)	-	-	-2.84 ^c	-	-	-1.94 ^a
AR(1) (p)	-	-	0.004	-	-	0.052
AR(2) (z)	-	-	-0.94	-	-	1.02
AR(2) (p)	-	-	0.349	-	-	0.307
Hansen test (chi2)	-	-	34.33	-	-	33.61
Hansen test (p)	-	-	0.268	-	-	0.535

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C4.4: Estimation results of high-high COC, GVE, and POS models

ln(1 + BIT _{ijt})	High-High COC models			High-High GVE models			High-High POS models		
	FE-I	FE-II	SGMM-II	FE-I	FE-II	SGMM-II	FE-I	FE-II	SGMM-II
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
L1.ln(1 + BIT _{ijt})									
L2.ln(1 + BIT _{ijt})			-0.093 ^b (0.012)			-0.091 ^b (0.014)			0.192 (0.182)
L1.lnGDP _{it}			-0.211 (0.701)			0.333 (0.519)			
L2.lnGDP _{it}									-0.423 ^b (0.035)
L1.lnGDP _{jt}			0.405 (0.350)			0.856 (0.114)			
L2.lnGDP _{jt}									-0.273 (0.178)
L1.lnEXG _{jit}			-0.370 (0.250)			-0.170 (0.675)			
L2.lnEXG _{jit}									0.026 (0.851)
lnGDP _{it}	0.411 ^c (0.000)	0.349 ^c (0.000)		0.653 ^c (0.000)	0.611 ^c (0.000)		0.751 ^c (0.000)	0.742 ^c (0.001)	
lnGDP _{jt}	0.641 ^c (0.000)	0.594 ^c (0.000)		0.644 ^c (0.000)	0.608 ^c (0.000)		0.700 ^c (0.000)	0.868 ^c (0.000)	
lnPOP _{it}	0.772 ^c (0.000)	0.956 ^c (0.000)	1.288 (0.269)	-0.810 ^b (0.017)	-0.107 (0.861)	-3.004 (0.546)	0.372 ^a (0.053)	0.512 (0.192)	2.688 ^a (0.070)
lnPOP _{jt}	0.036 (0.841)	0.188 (0.351)	1.092 (0.384)	-0.546 ^a (0.078)	0.208 (0.546)	-3.343 (0.510)	-0.215 (0.238)	-0.257 (0.258)	2.253 (0.133)
lnDIST _{ij}	omitted	-0.653 ^c (0.000)	1.062 (0.590)	omitted	-0.770 ^c (0.000)	-2.631 (0.481)	omitted	-1.052 ^c (0.000)	1.935 (0.577)
lnCEpc _{it}	0.317 ^c (0.004)	0.249 ^b (0.044)	0.332 (0.586)	0.173 (0.106)	0.130 (0.377)	-0.542 (0.649)	0.419 ^c (0.003)	0.438 ^b (0.034)	1.599 ^a (0.096)

lnCEpc _{jt}	0.569 ^c (0.000)	0.505 ^c (0.000)	0.905 (0.191)	0.452 ^c (0.000)	0.402 ^c (0.000)	0.161 (0.884)	0.512 ^c (0.000)	0.532 ^c (0.000)	1.815 ^a (0.055)
COC _{it}	-0.064 (0.211)	-0.078 (0.466)	-0.038 (0.929)						
COC _{jt}	0.041 (0.440)	0.044 (0.439)	-0.116 (0.785)						
GVE _{it}				0.005 (0.931)	0.072 (0.363)	0.725 ^b (0.036)			
GVE _{jt}				0.053 (0.293)	0.092 ^b (0.046)	0.627 ^a (0.076)			
POS _{it}							0.341 ^c (0.000)	0.359 ^c (0.003)	-0.492 ^a (0.074)
POS _{jt}							0.230 ^c (0.001)	0.276 ^b (0.033)	-0.429 (0.124)
lnREMOTE _{it}	-1.189 ^c (0.000)	-1.125 ^c (0.000)	-1.016 (0.428)	-1.101 ^c (0.000)	-1.078 ^c (0.005)	0.055 (0.967)	-1.766 ^c (0.000)	-1.917 ^c (0.000)	-0.399 (0.861)
lnREMOTE _{jt}	-0.406 ^b (0.039)	-0.408 ^b (0.033)	0.142 (0.900)	-0.338 ^b (0.045)	-0.268 (0.285)	0.452 (0.753)	-0.598 ^c (0.007)	-0.869 ^c (0.004)	0.491 (0.776)
lnEXG _{jit}	-0.076 (0.482)	-0.070 (0.606)		-0.049 (0.624)	-0.018 (0.928)		-0.005 (0.963)	-0.082 (0.608)	
lnESIM _{ijt}	0.190 ^b (0.025)	-0.100 (0.283)	-1.547 (0.221)	0.182 ^b (0.034)	-0.068 (0.359)	-0.987 (0.410)	0.268 ^b (0.027)	-0.050 (0.659)	0.087 (0.944)
lnDIN _{ijt}	-0.004 (0.644)	0.000 (0.993)	-0.316 (0.182)	-0.004 (0.633)	0.016 (0.495)	-0.175 (0.239)	-0.016 (0.121)	-0.097 ^b (0.019)	-0.233 ^a (0.075)
RTA _{ijt}	0.094 ^b (0.018)	0.528 ^c (0.000)	0.119 (0.825)	0.089 ^c (0.007)	0.393 ^c (0.000)	-0.306 (0.366)	0.038 (0.378)	0.329 ^c (0.003)	-0.028 (0.945)
LLOCK _i	omitted	omitted	-2.998 (0.510)	omitted	omitted	8.477 (0.399)	omitted	omitted	1.536 (0.559)
LLOCK _j	omitted	-0.097 (0.737)	0.821 (0.841)	omitted	-1.150 ^c (0.010)	9.454 (0.574)	omitted	-1.512 ^c (0.002)	0.052 (0.981)
COMCOL _{ij}	omitted	1.690 ^b (0.017)	omitted	omitted	0.610 (0.318)	omitted	omitted	1.411 ^b (0.046)	omitted
COMLANG _{ij}	omitted	0.268 ^b	omitted	omitted	0.222 ^b	omitted	omitted	0.024	omitted

CONTIG _{ij}	omitted	(0.028) 0.472 ^b	omitted	omitted	(0.034) 0.370 ^b	omitted	omitted	(0.854) 0.433 ^a	omitted
GEFC _t	-1.804 ^c	-1.729 ^c	omitted	-1.695 ^c	-1.680 ^c	omitted	-2.659 ^c	-3.209 ^c	omitted
COVID _t	-2.311 ^c	-2.329 ^c	-0.197	-2.092 ^c	-2.210 ^c	0.179	-3.140 ^c	-3.855 ^c	1.312
Constant	-50.509 ^c	-47.127 ^c	-51.282	-18.384 ^a	-33.193 ^a	116.034	-61.457 ^c	-64.261 ^c	-70.100
Observations	8,006	8,006	7,166	8,014	8,014	7,252	8,046	8,046	7,074
Groups	460	22	460	552	24	552	714	28	704
Instruments	-	-	77	-	-	77	-	-	76
R-squared	0.360	0.776	-	0.307	0.785	-	0.478	0.749	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Countrypair-fixed	Y	N	-	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-	N	Y	-
Importer-fixed	N	Y	-	N	Y	-	N	Y	-
Vce cluster	Y	Y	-	Y	Y	-	Y	Y	-
F tests ¹	144.30 ^c	96.04 ^c	-	139.24 ^c	104.70 ^c	-	120.76 ^c	87.47 ^c	-
Hausman tests ² (chi2)	287.20 ^c	1,270.71 ^c	-	255.41 ^c	1,174.74 ^c	-	428.99 ^c	7,587.09 ^c	-
AR(1) (z)	-	-	-2.85 ^c	-	-	-3.63 ^c	-	-	-3.15 ^c
AR(1) (p)	-	-	0.004	-	-	0.000	-	-	0.002
AR(2) (z)	-	-	-0.86	-	-	0.41	-	-	-1.34
AR(2) (p)	-	-	0.391	-	-	0.680	-	-	0.180
Hansen test (chi2)	-	-	40.68	-	-	34.48	-	-	30.63
Hansen test (p)	-	-	0.353	-	-	0.633	-	-	0.761

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C4.5: Estimation results of high-high REQ, ROL, and VAC models

ln(1 + BIT _{ijt})	High-High REQ models			High-High ROL models			High-High VAC models		
	FE-I	FE-II	SGMM-II	FE-I	FE-II	SGMM-II	FE-I	FE-II	SGMM-II
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
L1.ln(1 + BIT _{ijt})			0.402 ^b (0.049)						
L2.ln(1 + BIT _{ijt})			-0.098 (0.446)			-0.093 ^c (0.005)			-0.036 (0.820)
L1.lnGDP _{it}			0.202 (0.697)			-0.173 (0.664)			-0.008 (0.982)
L2.lnGDP _{it}									
L1.lnGDP _{jt}			0.393 (0.347)			0.174 (0.610)			-0.304 (0.352)
L2.lnGDP _{jt}									
L1.lnEXG _{jit}			0.147 (0.610)			-0.041 (0.875)			0.059 (0.752)
L2.lnEXG _{jit}									
lnGDP _{it}	0.613 ^c (0.000)	0.676 ^c (0.000)		0.662 ^c (0.000)	0.542 ^c (0.000)		0.728 ^c (0.000)	0.718 ^c (0.000)	
lnGDP _{jt}	0.721 ^c (0.000)	0.651 ^c (0.000)		0.669 ^c (0.000)	0.736 ^c (0.000)		0.779 ^c (0.000)	0.719 ^c (0.000)	
lnPOP _{it}	0.297 (0.236)	0.859 ^a (0.088)	2.041 (0.746)	-1.044 ^c (0.003)	-0.499 (0.398)	0.984 (0.737)	-2.364 ^c (0.000)	-1.780 ^b (0.013)	0.574 (0.825)
lnPOP _{jt}	-0.398 ^b (0.039)	-0.132 (0.527)	0.306 (0.947)	-0.499 (0.130)	-0.286 (0.284)	0.225 (0.948)	-1.138 ^c (0.000)	-0.712 ^a (0.087)	1.818 (0.557)
lnDIST _{ij}	omitted	-0.806 ^c (0.000)	-6.823 (0.751)	omitted	-0.761 ^c (0.000)	0.133 (0.985)	omitted	-0.804 ^c (0.000)	-0.668 (0.797)
lnCEpc _{it}	0.303 ^c (0.009)	0.379 ^c (0.001)	0.427 (0.679)	0.178 ^a (0.085)	0.079 (0.627)	0.584 (0.309)	0.380 ^c (0.000)	0.360 ^b (0.015)	-0.035 (0.953)

lnCEpc _{jt}	0.520 ^c (0.000)	0.589 ^c (0.000)	0.558 (0.590)	0.574 ^c (0.000)	0.454 ^c (0.001)	0.999 ^a (0.096)	0.581 ^c (0.000)	0.581 ^c (0.000)	0.707 (0.248)
REQ _{it}	-0.096 (0.138)	-0.154 (0.179)	-0.165 (0.635)						
REQ _{jt}	0.040 (0.590)	-0.019 (0.837)	-0.502 (0.131)						
ROL _{it}				0.128 (0.121)	0.118 (0.463)	0.205 (0.562)			
ROL _{jt}				0.239 ^a (0.052)	0.214 (0.118)	-0.081 (0.812)			
VAC _{it}							-0.393 ^c (0.000)	-0.369 ^a (0.052)	-0.558 (0.239)
VAC _{jt}							0.162 ^b (0.041)	0.147 ^a (0.070)	0.060 (0.897)
lnREMOTE _{it}	-1.333 ^c (0.000)	-0.711 ^b (0.026)	-1.085 (0.470)	-1.102 ^c (0.000)	-1.107 ^c (0.003)	-1.569 (0.132)	-1.354 ^c (0.000)	-1.305 ^c (0.000)	-0.671 (0.354)
lnREMOTE _{jt}	-0.273 (0.110)	0.239 (0.416)	0.332 (0.808)	-0.376 ^b (0.046)	-0.638 ^b (0.011)	0.318 (0.768)	-0.214 (0.214)	-0.201 (0.349)	0.688 (0.317)
lnEXG _{jit}	-0.115 (0.326)	-0.016 (0.916)		-0.052 (0.639)	-0.171 (0.229)		-0.113 (0.317)	-0.063 (0.618)	
lnESIM _{ijt}	0.211 ^b (0.021)	-0.060 (0.457)	-4.301 ^a (0.087)	0.174 ^b (0.040)	0.004 (0.959)	-1.868 ^b (0.017)	0.054 (0.535)	0.007 (0.922)	-0.915 (0.249)
lnDIN _{ijt}	-0.006 (0.460)	0.034 (0.310)	-0.240 ^a (0.059)	-0.007 (0.386)	0.018 (0.465)	-0.167 (0.137)	-0.017 ^a (0.058)	0.016 (0.682)	-0.021 (0.854)
RTA _{ijt}	0.064 ^a (0.068)	0.339 ^c (0.002)	0.041 (0.889)	0.063 ^b (0.041)	0.392 ^c (0.000)	0.072 (0.727)	0.092 ^b (0.019)	0.324 ^c (0.007)	0.211 (0.237)
LLOCK _i	omitted	omitted	0.716 (0.933)	omitted	omitted	7.774 (0.707)	omitted	omitted	0.300 (0.960)
LLOCK _j	omitted	-1.623 ^c (0.001)	-3.764 (0.724)	omitted	-2.197 ^c (0.001)	7.160 (0.760)	omitted	-1.535 ^a (0.090)	1.038 (0.912)
COMCOL _{ij}	omitted	1.372 ^a (0.059)	omitted	omitted	omitted	omitted	omitted	omitted	omitted
COMLANG _{ij}	omitted	0.284 ^c	omitted	omitted	0.308 ^c	8.737	omitted	0.285 ^c	omitted

CONTIG _{ij}	omitted	(0.010) 0.411 ^b	-52.825 (0.802)	omitted	(0.006) 0.404 ^b	(0.885) omitted	omitted	(0.010) 0.441 ^c	omitted
GEFC _t	-1.918 ^c	-0.670 (0.233)	0.036 (0.968)	-1.760 ^c	-2.158 ^c	omitted	-1.782 ^c	-1.763 ^c	omitted
COVID _t	-2.394 ^c	-0.923 (0.175)	omitted	-2.084 ^c	-2.706 ^c	omitted	-1.971 ^c	-2.038 ^c	0.243 (0.751)
Constant	-42.767 ^c	-35.834 ^c (0.001)	omitted	-17.406 ^a	-25.080 (0.124)	-30.967 (0.828)	9.828 (0.296)	2.018 (0.888)	-12.603 (0.901)
Observations	8,038	8,038	7,156	8,006	8,006	7,246	8,056	8,056	7,044
Groups	672	27	666	462	22	462	506	23	506
Instruments	-	-	77	-	-	78	-	-	76
R-squared	0.376	0.796	-	0.323	0.796	-	0.441	0.807	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Countrypair-fixed	Y	N	-	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-	N	Y	-
Importer-fixed	N	Y	-	N	Y	-	N	Y	-
Vce cluster	Y	Y	-	Y	Y	-	Y	Y	-
F tests ¹	100.34 ^c	87.92 ^c	-	156.55 ^c	126.58 ^c	-	129.35 ^c	65.19 ^c	-
Hausman tests ² (chi2)	576.85 ^c	248.00 ^c	-	325.49 ^c	526.62 ^c	-	601.77 ^c	378.08 ^c	-
AR(1) (z)	-	-	-1.77 ^a	-	-	-3.86 ^c	-	-	-2.84 ^c
AR(1) (p)	-	-	0.077	-	-	0.000	-	-	0.004
AR(2) (z)	-	-	-0.04	-	-	-0.21	-	-	-0.54
AR(2) (p)	-	-	0.966	-	-	0.833	-	-	0.591
Hansen test (chi2)	-	-	28.16	-	-	36.95	-	-	32.72
Hansen test (p)	-	-	0.852	-	-	0.608	-	-	0.712

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C4.6: Estimation results of high-high EPS and overall IQ models

ln(1 + BIT _{ijt})	High-High EPS models			High-High Overall IQ models		
	FE-I	FE-II	SGMM-II	FE-I	FE-II	SGMM-II
	(1)	(2)	(3)	(4)	(5)	(6)
L1.ln(1 + BIT _{ijt})			0.103 (0.438)			0.225 (0.164)
L2.ln(1 + BIT _{ijt})			-0.062 (0.256)			
L1.lnGDP _{it}			-0.164 (0.555)			
L2.lnGDP _{it}						0.109 (0.572)
L1.lnGDP _{jt}			-0.286 (0.176)			
L2.lnGDP _{jt}						-0.489 ^c (0.007)
L1.lnEXG _{jit}			0.246 ^a (0.097)			
L2.lnEXG _{jit}						0.493 ^c (0.007)
lnGDP _{it}	0.626 ^c (0.000)	0.517 ^c (0.007)		0.725 ^c (0.000)	0.682 ^b (0.012)	
lnGDP _{jt}	0.382 ^c (0.000)	0.442 ^c (0.000)		0.540 ^c (0.000)	0.549 ^c (0.002)	
lnPOP _{it}	-1.854 ^c (0.000)	-0.786 (0.449)	-0.782 (0.848)	-1.501 ^c (0.001)	-1.176 ^a (0.064)	1.020 (0.637)
lnPOP _{jt}	-0.206 (0.523)	0.019 (0.968)	-0.911 (0.818)	-0.756 (0.163)	-0.326 (0.582)	2.514 (0.301)
lnDIST _{ij}	omitted	-0.891 ^c (0.000)	-0.119 (0.988)	omitted	-0.789 ^c (0.000)	-3.477 (0.728)
lnCEpc _{it}	0.370 ^c (0.000)	0.323 (0.118)	0.725 (0.209)	0.448 ^c (0.001)	0.344 ^a (0.096)	0.450 (0.496)

lnCEpc _{jt}	0.532 ^c (0.000)	0.538 ^c (0.000)	0.991 ^a (0.063)	0.482 ^c (0.001)	0.542 ^b (0.014)	0.267 (0.715)
lnEPS _{it}	-0.133 ^a (0.073)	-0.112 (0.469)	-0.063 (0.787)			
lnEPS _{jt}	-0.122 ^a (0.089)	-0.061 (0.603)	-0.301 (0.229)			
lnREMOTE _{it}	-1.530 ^c (0.000)	-1.041 ^c (0.002)	1.015 (0.543)	-1.459 ^c (0.001)	-1.462 ^c (0.000)	-0.560 (0.557)
lnREMOTE _{jt}	0.090 (0.538)	0.005 (0.992)	1.894 (0.198)	-0.182 (0.389)	-0.254 (0.481)	1.094 (0.144)
lnEXG _{jit}	0.105 ^b (0.046)	0.069 (0.562)		-0.069 (0.632)	-0.132 (0.530)	
lnESIM _{ijt}	0.088 (0.332)	0.161 ^c (0.002)	0.341 (0.667)	0.219 (0.230)	0.132 (0.237)	-0.906 (0.238)
lnDIN _{ijt}	0.003 (0.669)	-0.008 (0.813)	-0.003 (0.982)	-0.011 (0.341)	0.005 (0.866)	-0.098 (0.213)
RTA _{ijt}	-0.014 (0.675)	0.176 (0.119)	0.125 (0.655)	0.041 (0.489)	0.225 (0.175)	-0.141 (0.456)
LLOCK _i	omitted	omitted	10.548 (0.766)	omitted	omitted	3.231 (0.366)
LLOCK _j	omitted	-1.474 (0.229)	4.610 (0.906)	omitted	-1.144 (0.176)	omitted
COMCOL _{ij}	omitted	omitted	omitted	omitted	omitted	omitted
COMLANG _{ij}	omitted	0.209 ^a (0.099)	45.386 (0.832)	omitted	0.293 ^a (0.082)	-10.242 (0.705)
CONTIG _{ij}	omitted	0.359 ^b (0.018)	omitted	omitted	0.362 (0.176)	-20.111 (0.755)
GEFC _t	-1.704 ^c (0.000)	-0.989 ^a (0.100)	omitted	-1.846 ^c (0.001)	-1.994 ^c (0.009)	omitted
COVID _t	-1.631 ^c (0.000)	-0.969 (0.144)	0.860 (0.354)	-2.043 ^c (0.004)	-2.311 ^b (0.014)	0.757 (0.700)
Constant	1.597	-6.525	89.991	-6.334	-12.014	omitted

	(0.880)	(0.758)	(0.519)	(0.693)	(0.566)	
Observations	5,822	5,822	5,818	3,412	3,412	2,992
Groups	692	27	692	298	18	294
Instruments	-	-	74	-	-	77
R-squared	0.271	0.781	-	0.496	0.808	-
Year-fixed	Y	Y	Y	Y	Y	Y
Countrypair-fixed	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-
Importer-fixed	N	Y	-	N	Y	-
Vce cluster	Y	Y	-	Y	Y	-
F tests ¹	198.74 ^c	42.83 ^c	-	176.68 ^c	35.76 ^c	-
Hausman tests ² (chi2)	248.57 ^c	251.97 ^c	-	336.20 ^c	178.93 ^c	-
AR(1) (z)	-	-	-2.13 ^b	-	-	-2.01 ^b
AR(1) (p)	-	-	0.033	-	-	0.044
AR(2) (z)	-	-	0.88	-	-	-0.87
AR(2) (p)	-	-	0.379	-	-	0.385
Hansen test (chi2)	-	-	46.10	-	-	43.88
Hansen test (p)	-	-	0.121	-	-	0.351

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C4.7: Estimation results of low-low COC, GVE, and POS models

ln(1 + BIT _{ijt})	Low-Low COC models			Low-Low GVE models			Low-Low POS models		
	FE-I	FE-II	SGMM-II	FE-I	FE-II	SGMM-II	FE-I	FE-II	SGMM-II
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
L1.ln(1 + BIT _{ijt})			0.298 ^a (0.094)			0.507 ^c (0.000)			0.537 ^c (0.001)
L2.ln(1 + BIT _{ijt})									0.082 (0.106)
L1.lnGDP _{it}			-0.411 (0.725)			-0.347 (0.824)			-0.050 (0.893)
L2.lnGDP _{it}									
L1.lnGDP _{jt}			-0.677 (0.591)			0.375 (0.830)			0.605 (0.100)
L2.lnGDP _{jt}									
L1.lnEXG _{jit}			0.332 (0.483)			-0.402 (0.364)			-0.175 (0.444)
L2.lnEXG _{jit}									
lnGDP _{it}	0.507 ^c (0.000)	0.513 ^b (0.013)		0.353 ^c (0.000)	0.289 (0.175)		0.417 ^c (0.000)	0.350 ^a (0.051)	
lnGDP _{jt}	0.534 ^c (0.000)	0.527 ^c (0.000)		0.560 ^c (0.000)	0.589 ^c (0.000)		0.476 ^c (0.000)	0.416 ^c (0.000)	
lnPOP _{it}	1.260 ^b (0.040)	1.327 (0.321)	10.966 (0.173)	0.640 ^b (0.021)	0.445 (0.429)	0.806 (0.857)	-0.119 (0.809)	-0.281 (0.776)	0.004 (0.999)
lnPOP _{jt}	0.607 (0.546)	0.614 (0.604)	6.251 (0.628)	0.532 (0.236)	0.520 (0.286)	-1.132 (0.788)	0.459 (0.641)	0.354 (0.766)	-2.005 (0.749)
lnDIST _{ij}	omitted	-1.536 ^c (0.000)	-36.508 (0.414)	omitted	-1.609 ^c (0.000)	22.890 (0.323)	omitted	-1.224 ^c (0.000)	-6.780 (0.755)
lnCEpc _{it}	0.503 ^c (0.001)	0.551 ^a (0.062)	-0.482 (0.736)	0.473 ^c (0.000)	0.678 ^b (0.013)	1.195 (0.525)	0.791 ^c (0.000)	0.924 ^c (0.000)	-0.231 (0.778)

lnCEpc _{jt}	0.252 ^b (0.040)	0.231 (0.131)	-0.248 (0.880)	0.358 ^c (0.008)	0.362 ^a (0.052)	1.232 (0.510)	0.516 ^c (0.000)	0.557 ^c (0.001)	-0.613 (0.474)
COC _{it}	-0.102 (0.407)	-0.102 (0.456)	1.022 (0.369)						
COC _{jt}	-0.105 (0.365)	-0.096 (0.379)	1.370 (0.210)						
GVE _{it}				0.196 ^b (0.029)	0.212 (0.265)	-0.553 (0.392)			
GVE _{jt}				-0.224 ^b (0.042)	-0.112 (0.502)	-0.652 (0.351)			
POS _{it}							-0.164 ^c (0.003)	-0.155 (0.102)	0.274 (0.514)
POS _{jt}							-0.115 ^c (0.002)	-0.112 ^c (0.003)	0.272 (0.463)
lnREMOTE _{it}	-1.793 ^c (0.000)	-1.978 ^c (0.009)	-1.628 (0.764)	-1.159 ^c (0.000)	-1.394 ^a (0.065)	7.172 (0.194)	-1.239 ^c (0.000)	-1.355 ^a (0.051)	-2.582 (0.491)
lnREMOTE _{jt}	-1.134 ^b (0.022)	-1.185 ^a (0.051)	-1.108 (0.838)	-1.195 ^c (0.001)	-1.456 ^a (0.055)	6.257 (0.343)	-0.668 (0.175)	-0.570 (0.322)	-3.407 (0.369)
lnEXG _{jit}	0.084 (0.351)	0.085 (0.556)		0.083 (0.428)	0.026 (0.866)		0.075 (0.461)	0.073 (0.562)	
lnESIM _{ijt}	0.177 ^b (0.031)	0.153 (0.155)	-0.227 (0.845)	0.171 ^b (0.025)	0.083 (0.464)	0.520 (0.763)	0.083 (0.122)	-0.135 ^b (0.039)	1.065 (0.380)
lnDIN _{ijt}	0.032 ^a (0.071)	0.053 (0.475)	-0.108 (0.759)	0.033 (0.121)	0.092 (0.218)	0.245 (0.454)	0.019 (0.320)	0.083 ^b (0.013)	0.608 ^b (0.049)
RTA _{ijt}	0.056 (0.474)	-0.024 (0.868)	-0.130 (0.868)	0.014 (0.863)	-0.040 (0.713)	-0.417 (0.747)	-0.112 ^a (0.077)	0.131 (0.108)	-1.348 (0.435)
LLOCK _i	omitted	omitted	55.707 (0.295)	omitted	omitted	2.788 (0.918)	omitted	omitted	-4.764 (0.975)
LLOCK _j	omitted	-1.416 (0.726)	22.732 (0.740)	omitted	-2.201 ^c (0.000)	2.331 (0.927)	omitted	-2.582 ^c (0.002)	-15.768 (0.676)
COMCOL _{ij}	omitted	0.424 ^a (0.060)	omitted	omitted	0.875 ^b (0.029)	omitted	omitted	0.226 (0.216)	omitted
COMLANG _{ij}	omitted	0.349	omitted	omitted	0.448 ^b	omitted	omitted	0.440 ^c	-39.242

CONTIG _{ij}	omitted	(0.117) 0.263	-171.474 (0.486)	omitted	(0.020) 0.290 ^a	112.736 (0.540)	omitted	(0.001) 0.102	(0.500) 0.425
GEFC _t	-2.838 ^c	-3.114 ^b	1.156 (0.544)	-2.054 ^c	-2.614 ^a	omitted	-1.816 ^c	-1.726 (0.152)	omitted (0.998)
COVID _t	-3.485 ^c	-3.818 ^b	omitted	-2.505 ^c	-3.176 ^a	omitted	-2.156 ^c	-2.031 (0.175)	0.227 (0.647)
Constant	-88.767 ^c	-79.481 ^a	omitted	-65.465 ^c	-53.446 ^b	omitted	-44.164 ^a	-26.287 (0.466)	omitted
Observations	8,006	8,006	7,626	8,014	8,014	7,552	8,046	8,046	7,394
Groups	462	22	462	594	25	552	630	26	630
Instruments	-	-	77	-	-	77	-	-	78
R-squared	0.579	0.704	-	0.558	0.682	-	0.570	0.709	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Countrypair-fixed	Y	N	-	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-	N	Y	-
Importer-fixed	N	Y	-	N	Y	-	N	Y	-
Vce cluster	Y	Y	-	Y	Y	-	Y	Y	-
F tests ¹	124.53 ^c	174.10 ^c	-	92.23 ^c	100.53 ^c	-	80.98 ^c	136.52 ^c	-
Hausman tests ² (chi2)	231.70 ^c	1,030.83 ^c	-	243.62 ^c	500.08 ^c	-	454.36 ^c	485.86 ^c	-
AR(1) (z)	-	-	-1.69 ^a	-	-	-2.16 ^b	-	-	-3.01 ^c
AR(1) (p)	-	-	0.092	-	-	0.031	-	-	0.003
AR(2) (z)	-	-	1.10	-	-	0.35	-	-	-0.60
AR(2) (p)	-	-	0.273	-	-	0.730	-	-	0.549
Hansen test (chi2)	-	-	40.26	-	-	34.36	-	-	36.77
Hansen test (p)	-	-	0.328	-	-	0.594	-	-	0.526

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C4.8: Estimation results of low-low REQ, ROL, and VAC models

ln(1 + BIT _{ijt})	Low-Low REQ models			Low-Low ROL models			Low-Low VAC models		
	FE-I	FE-II	SGMM-II	FE-I	FE-II	SGMM-II	FE-I	FE-II	SGMM-II
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
L1.ln(1 + BIT _{ijt})			0.494 ^c (0.005)			0.285 ^a (0.074)			0.342 ^c (0.002)
L2.ln(1 + BIT _{ijt})			-0.019 (0.732)			-0.055 (0.257)			-0.046 (0.312)
L1.lnGDP _{it}			-0.660 (0.419)						
L2.lnGDP _{it}						-0.132 (0.788)			-0.144 (0.265)
L1.lnGDP _{jt}			-0.752 (0.337)						
L2.lnGDP _{jt}						0.273 (0.484)			0.223 ^a (0.071)
L1.lnEXG _{jit}			0.008 (0.983)						
L2.lnEXG _{jit}						-0.130 (0.515)			-0.099 (0.314)
lnGDP _{it}	0.436 ^c (0.000)	0.445 ^b (0.045)		0.251 ^b (0.030)	0.244 (0.259)		0.494 ^c (0.000)	0.428 ^b (0.038)	
lnGDP _{jt}	0.503 ^c (0.000)	0.486 ^c (0.000)		0.398 ^c (0.000)	0.357 ^c (0.000)		0.419 ^c (0.000)	0.337 ^c (0.001)	
lnPOP _{it}	0.914 ^c (0.000)	0.324 (0.277)	2.154 (0.783)	0.997 ^c (0.000)	0.974 ^c (0.005)	4.833 (0.649)	0.886 ^c (0.000)	0.582 ^c (0.003)	-0.052 (0.992)
lnPOP _{jt}	0.256 (0.491)	0.173 (0.695)	3.376 (0.649)	0.140 (0.645)	0.192 (0.576)	1.676 (0.877)	0.109 (0.731)	0.062 (0.867)	-1.377 (0.794)
lnDIST _{ij}	omitted	-1.565 ^c (0.000)	-16.606 (0.524)	omitted	-1.618 ^c (0.000)	-34.753 (0.287)	omitted	-1.405 ^c (0.000)	-6.314 (0.820)
lnCEpc _{it}	0.598 ^c (0.000)	0.693 ^c (0.007)	1.805 (0.411)	0.708 ^c (0.000)	0.872 ^c (0.000)	0.646 (0.680)	0.455 ^c (0.000)	0.488 ^b (0.022)	0.599 (0.470)

CXC

lnCEpc _{jt}	0.396 ^b (0.018)	0.383 ^a (0.089)	1.547 (0.490)	0.384 ^b (0.026)	0.482 ^b (0.036)	0.225 (0.883)	0.415 ^c (0.002)	0.421 ^b (0.016)	0.703 (0.412)
REQ _{it}	-0.006 (0.941)	-0.002 (0.992)	0.257 (0.666)						
REQ _{jt}	-0.189 ^b (0.014)	-0.135 ^a (0.099)	0.407 (0.513)						
ROL _{it}				0.297 ^c (0.001)	0.255 (0.112)	-0.165 (0.858)			
ROL _{jt}				0.068 (0.400)	0.103 (0.162)	-0.147 (0.878)			
VAC _{it}							-0.026 (0.739)	-0.045 (0.718)	0.449 (0.453)
VAC _{jt}							0.193 ^a (0.060)	0.215 ^b (0.029)	0.066 (0.912)
lnREMOTE _{it}	-1.678 ^c (0.000)	-1.737 ^c (0.007)	-3.630 (0.550)	-1.501 ^c (0.000)	-1.741 ^b (0.016)	-6.327 (0.251)	-1.890 ^c (0.000)	-1.576 ^c (0.001)	-2.132 (0.214)
lnREMOTE _{jt}	-1.224 ^c (0.003)	-1.508 ^b (0.017)	-2.146 (0.646)	-1.112 ^c (0.004)	-0.780 (0.123)	-7.225 (0.146)	-1.798 ^c (0.000)	-1.535 ^c (0.007)	-3.882 ^b (0.018)
lnEXG _{jit}	0.078 (0.464)	0.082 (0.566)		0.057 (0.602)	0.030 (0.835)		0.068 (0.514)	0.067 (0.591)	
lnESIM _{ijt}	0.212 ^c (0.006)	0.099 (0.270)	0.170 (0.910)	0.169 ^b (0.035)	0.079 (0.461)	-0.108 (0.937)	0.337 ^c (0.000)	0.037 (0.708)	1.103 ^a (0.091)
lnDIN _{ijt}	0.015 (0.433)	0.029 (0.526)	0.261 (0.446)	0.032 (0.114)	0.080 (0.260)	0.262 (0.399)	-0.003 (0.877)	-0.020 (0.696)	-0.039 (0.909)
RTA _{ijt}	-0.048 (0.488)	-0.085 (0.470)	-1.348 (0.153)	-0.037 (0.646)	-0.147 (0.268)	-1.200 (0.506)	0.012 (0.831)	0.008 (0.958)	-0.173 (0.860)
LLOCK _i	omitted	omitted	3.745 (0.950)	omitted	omitted	5.180 (0.967)	omitted	omitted	8.778 (0.962)
LLOCK _j	omitted	-2.224 ^c (0.000)	8.866 (0.878)	omitted	-2.056 ^c (0.000)	-10.121 (0.927)	omitted	-3.139 ^c (0.000)	0.930 (0.996)
COMCOL _{ij}	omitted	0.956 ^b (0.017)	omitted	omitted	0.880 ^b (0.033)	omitted	omitted	0.527 (0.239)	omitted
COMLANG _{ij}	omitted	0.372 ^b	-95.511	omitted	0.301 ^a	omitted	omitted	0.046	-9.040

CONTIG _{ij}	omitted	(0.032) 0.105 (0.552)	(0.740) omitted	omitted	(0.092) 0.219 (0.238)	-186.448 (0.566)	omitted	(0.785) 0.132 (0.606)	(0.977) omitted
GEFC _t	-2.666 ^c (0.000)	-2.971 ^b (0.012)	omitted	-2.050 ^c (0.000)	-1.978 ^a (0.098)	omitted	-3.316 ^c (0.000)	-2.470 ^b (0.019)	omitted
COVID _t	-3.248 ^c (0.000)	-3.593 ^b (0.013)	-0.434 (0.660)	-2.542 ^c (0.000)	-2.447 ^a (0.095)	omitted	-4.120 ^c (0.000)	-3.077 ^b (0.016)	0.324 (0.258)
Constant	-73.273 ^c (0.000)	-52.538 ^c (0.008)	omitted	-61.733 ^c (0.000)	-46.914 ^b (0.017)	omitted	-79.199 ^c (0.000)	-49.788 ^c (0.005)	omitted
Observations	8,038	8,038	7,316	8,006	8,006	7,166	8,056	8,056	7,444
Groups	630	26	592	542	24	542	600	25	600
Instruments	-	-	77	-	-	77	-	-	77
R-squared	0.589	0.687	-	0.583	0.688	-	0.555	0.684	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Countrypair-fixed	Y	N	-	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-	N	Y	-
Importer-fixed	N	Y	-	N	Y	-	N	Y	-
Vce cluster	Y	Y	-	Y	Y	-	Y	Y	-
F tests ¹	102.90 ^c	122.60 ^c	-	112.40 ^c	134.53 ^c	-	102.27 ^c	130.37 ^c	-
Hausman tests ² (chi2)	264.17 ^c	646.39 ^c	-	211.36 ^c	478.98 ^c	-	502.39 ^c	681.43 ^c	-
AR(1) (z)	-	-	-2.88 ^c	-	-	-2.12 ^b	-	-	-2.70 ^c
AR(1) (p)	-	-	0.004	-	-	0.034	-	-	0.007
AR(2) (z)	-	-	0.31	-	-	0.98	-	-	1.20
AR(2) (p)	-	-	0.754	-	-	0.327	-	-	0.228
Hansen test (chi2)	-	-	30.57	-	-	37.39	-	-	45.86
Hansen test (p)	-	-	0.763	-	-	0.451	-	-	0.151

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C4.9: Estimation results of low-low EPS and overall IQ models

ln(1 + BIT_{ijt})	Low-Low EPS models			Low-Low Overall IQ models		
	FE-I	FE-II	SGMM-II	FE-I	FE-II	SGMM-II
	(1)	(2)	(3)	(4)	(5)	(6)
L1.ln(1 + BIT _{ijt})						0.418 ^b (0.013)
L2.ln(1 + BIT _{ijt})			-0.127 ^c (0.005)			
L1.lnGDP _{it}			0.035 (0.961)			-0.224 (0.736)
L2.lnGDP _{it}						
L1.lnGDP _{jt}			0.339 (0.700)			-0.425 (0.528)
L2.lnGDP _{jt}						
L1.lnEXG _{jit}			0.053 (0.885)			0.400 (0.206)
L2.lnEXG _{jit}						
lnGDP _{it}	-0.009 (0.929)	-0.346 (0.131)		0.496 ^c (0.000)	0.466 ^c (0.010)	
lnGDP _{jt}	0.509 ^c (0.000)	0.270 ^b (0.013)		0.533 ^c (0.000)	0.492 ^c (0.000)	
lnPOP _{it}	-3.279 ^c (0.000)	-2.593 ^a (0.066)	1.063 (0.690)	0.792 ^c (0.000)	0.755 ^b (0.013)	-5.924 (0.404)
lnPOP _{jt}	-0.620 (0.392)	-0.368 (0.586)	0.881 (0.773)	0.043 (0.853)	0.089 (0.744)	-3.274 (0.591)
lnDIST _{ij}	omitted	-1.190 ^c (0.000)	-1.878 (0.821)	omitted	-1.350 ^c (0.000)	-4.336 (0.858)
lnCEpc _{it}	0.758 ^c (0.000)	1.188 ^c (0.001)	0.601 (0.624)	0.573 ^c (0.000)	0.619 ^c (0.002)	0.365 (0.695)

lnCEpc _{jt}	0.608 ^c (0.000)	0.929 ^c (0.000)	0.870 (0.580)	0.431 ^c (0.000)	0.484 ^c (0.000)	0.008 (0.994)
lnEPS _{it}	-0.044 (0.297)	-0.145 ^a (0.086)	0.099 (0.810)			
lnEPS _{jt}	-0.048 (0.149)	-0.108 ^c (0.000)	-0.149 (0.823)			
lnREMOTE _{it}	-0.128 (0.718)	0.418 (0.582)	-1.382 (0.770)	-1.643 ^c (0.000)	-1.645 ^c (0.001)	-8.192 ^a (0.084)
lnREMOTE _{jt}	-0.053 (0.903)	-0.206 (0.689)	-1.056 (0.827)	-0.992 ^c (0.000)	-0.966 ^b (0.024)	-6.643 (0.120)
lnEXG _{jit}	-0.061 (0.519)	-0.144 (0.398)		0.034 (0.643)	0.037 (0.719)	
lnESIM _{ijt}	0.099 (0.229)	-0.131 (0.396)	-0.303 (0.830)	0.023 (0.643)	-0.083 (0.266)	0.804 (0.507)
lnDIN _{ijt}	0.021 (0.353)	0.059 ^b (0.027)	0.258 (0.163)	0.031 ^b (0.044)	0.055 (0.172)	0.766 ^a (0.091)
RTA _{ijt}	0.033 (0.694)	0.218 ^b (0.029)	0.688 (0.763)	0.076 ^a (0.083)	0.110 (0.244)	-0.525 (0.644)
LLOCK _i	omitted	omitted	1.106 (0.951)	omitted	omitted	-26.634 (0.728)
LLOCK _j	omitted	-3.472 ^c (0.000)	-3.340 (0.882)	omitted	-2.211 ^c (0.000)	-20.229 (0.757)
COMCOL _{ij}	omitted	omitted		omitted	0.486 (0.362)	omitted
COMLANG _{ij}	omitted	0.558 ^c (0.000)	2.813 (0.930)	omitted	0.387 ^c (0.010)	omitted
CONTIG _{ij}	omitted	0.377 ^b (0.033)	9.332 (0.840)	omitted	0.390 ^b (0.044)	229.162 (0.654)
GEFC _t	0.943 (0.192)	1.935 ^a (0.095)		-2.508 ^c (0.000)	-2.420 ^c (0.010)	omitted
COVID _t	1.276 (0.101)	2.219 ^a (0.085)	-1.291 (0.852)	-3.111 ^c (0.000)	-3.003 ^c (0.008)	omitted
Constant	63.375 ^c	75.433 ^b	-53.133	-66.280 ^c	-53.273 ^c	omitted

	(0.001)	(0.020)	(0.779)	(0.000)	(0.001)	
Observations	5,854	5,854	3,994	14,612	14,612	13,962
Groups	930	31	756	870	30	870
Instruments	-	-	81	-	-	77
R-squared	0.651	0.786	-	0.520	0.710	-
Year-fixed	Y	Y	Y	Y	Y	Y
Countrypair-fixed	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-
Importer-fixed	N	Y	-	N	Y	-
Vce cluster	Y	Y	-	Y	Y	-
F tests ¹	74.58 ^c	58.93 ^c	-	123.84 ^c	201.84 ^c	-
Hausman tests ² (chi2)	426.53 ^c	73.41 ^c	-	511.24 ^c	1,677.29 ^c	-
AR(1) (z)	-	-	-1.78 ^a	-	-	-2.12 ^b
AR(1) (p)	-	-	0.075	-	-	0.034
AR(2) (z)	-	-	-1.23	-	-	0.67
AR(2) (p)	-	-	0.220	-	-	0.502
Hansen test (chi2)	-	-	36.23	-	-	41.18
Hansen test (p)	-	-	0.791	-	-	0.375

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C4.10: Estimation results of low-high and high-low COC, GVE, and POS models

ln(1 + BIT _{ijt})	Low-High & High-Low COC models			Low-High & High-Low GVE models			Low-High & High-Low POS models		
	FE-I	FE-II	SGMM-II	FE-I	FE-II	SGMM-II	FE-I	FE-II	SGMM-II
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
L1.ln(1 + BIT _{ijt})			0.419 ^c (0.000)			0.417 ^c (0.002)			
L2.ln(1 + BIT _{ijt})						-0.065 (0.254)			0.019 (0.867)
L1.lnGDP _{it}			0.168 (0.758)			-0.713 (0.339)			-0.678 (0.218)
L2.lnGDP _{it}						0.898 (0.264)			
L1.lnGDP _{jt}			0.467 (0.110)			-0.267 (0.717)			-0.519 (0.486)
L2.lnGDP _{jt}						0.596 (0.457)			
L1.lnEXG _{jit}			0.036 (0.782)			-0.101 (0.762)			-0.012 (0.963)
L2.lnEXG _{jit}						0.392 (0.228)			
lnGDP _{it}	0.583 ^c (0.000)	0.482 ^c (0.003)		0.535 ^c (0.000)	0.449 ^c (0.000)		0.542 ^c (0.000)	0.453 ^b (0.011)	
lnGDP _{jt}	0.570 ^c (0.000)	0.489 ^c (0.000)		0.568 ^c (0.000)	0.527 ^c (0.000)		0.628 ^c (0.000)	0.502 ^c (0.000)	
lnPOP _{it}	0.745 ^c (0.000)	0.672 (0.220)	1.906 (0.496)	0.216 (0.232)	0.286 (0.383)	1.244 (0.711)	0.794 ^c (0.000)	0.607 (0.301)	4.667 (0.540)
lnPOP _{jt}	0.093 (0.587)	0.165 (0.260)	1.697 (0.567)	-0.257 ^a (0.071)	-0.298 (0.136)	1.432 (0.719)	-0.186 (0.288)	-0.063 (0.728)	3.449 (0.608)
lnDIST _{ij}	omitted	-1.311 ^c (0.000)	-2.803 (0.943)	omitted	-1.249 ^c (0.000)	0.435 (0.983)	omitted	-1.182 ^c (0.000)	-14.587 (0.466)
lnCEp _{cit}	0.299 ^c (0.003)	0.409 ^b (0.039)	1.123 (0.667)	0.272 ^c (0.005)	0.390 ^c (0.009)	1.627 (0.248)	0.578 ^c (0.000)	0.515 ^b (0.014)	0.643 (0.576)

lnCEpc _{jt}	0.215 ^c (0.002)	0.297 ^c (0.010)	0.837 (0.729)	0.256 ^c (0.000)	0.405 ^c (0.000)	1.749 (0.211)	0.328 ^c (0.000)	0.369 ^c (0.000)	0.678 (0.605)
COC _{it}	0.143 ^b (0.031)	0.121 (0.416)	0.270 (0.438)						
COC _{jt}	-0.012 (0.853)	0.078 (0.170)	0.183 (0.703)						
GVE _{it}				0.181 ^c (0.001)	0.173 ^a (0.064)	0.304 (0.699)			
GVE _{jt}				-0.109 ^c (0.006)	-0.156 ^b (0.032)	0.327 (0.665)			
POS _{it}							-0.026 (0.495)	-0.007 (0.941)	-0.062 (0.885)
POS _{jt}							-0.019 (0.638)	-0.017 (0.715)	-0.171 (0.702)
lnREMOTE _{it}	-1.504 ^c (0.000)	-1.525 ^c (0.000)	0.431 (0.992)	-1.309 ^c (0.000)	-1.461 ^c (0.000)	2.221 (0.677)	-1.554 ^c (0.000)	-1.378 ^c (0.001)	3.616 (0.695)
lnREMOTE _{jt}	-0.676 ^c (0.000)	-0.602 ^b (0.015)	0.591 (0.989)	-0.527 ^c (0.001)	-0.779 ^c (0.003)	2.303 (0.661)	-0.788 ^c (0.000)	-0.642 ^b (0.021)	3.462 (0.703)
lnEXG _{jit}	0.080 ^a (0.070)	0.059 (0.429)		0.099 ^c (0.010)	0.104 ^a (0.091)		0.012 (0.803)	0.064 (0.447)	
lnESIM _{ijt}	0.126 ^c (0.004)	-0.134 ^a (0.072)	-1.000 (0.824)	0.101 ^b (0.011)	-0.080 (0.146)	-1.849 (0.237)	0.084 ^a (0.085)	-0.135 ^a (0.052)	-2.204 (0.184)
lnDIN _{ijt}	-0.033 (0.246)	0.112 (0.112)	0.136 (0.909)	-0.040 ^b (0.032)	0.067 ^b (0.028)	-0.129 (0.891)	-0.007 (0.695)	0.119 ^c (0.005)	0.858 ^a (0.053)
RTA _{ijt}	0.075 ^a (0.054)	0.272 ^c (0.004)	-0.777 (0.234)	0.106 ^c (0.007)	0.246 ^c (0.004)	0.303 (0.605)	0.061 (0.109)	0.142 (0.201)	0.485 (0.747)
LLOCK _i	omitted	omitted	-2.833 (0.923)	omitted	omitted	16.720 (0.800)	omitted	omitted	16.627 (0.820)
LLOCK _j	omitted	-2.844 ^c (0.000)	-4.534 (0.859)	omitted	-2.884 ^c (0.000)	5.264 (0.927)	omitted	-2.372 ^c (0.000)	4.065 (0.948)
COMCOL _{ij}	omitted	0.174 (0.704)	-29.300 (0.760)	omitted	0.547 (0.201)	omitted	omitted	0.400 (0.387)	omitted
COMLANG _{ij}	omitted	0.178	-9.279	omitted	0.238 ^b	omitted	omitted	0.224	omitted

CONTIG _{ij}	omitted	(0.158) 0.073 (0.667)	(0.926) -13.884 (0.813)	omitted	(0.037) 0.207 (0.195)	10.436 (0.946)	omitted	(0.119) 0.184 (0.325)	omitted
GEFC _t	-2.339 ^c (0.000)	-2.171 ^c (0.001)	omitted	-1.851 ^c (0.000)	-2.278 ^c (0.000)	omitted	-2.466 ^c (0.000)	-1.971 ^c (0.005)	omitted
COVID _t	-2.922 ^c (0.000)	-2.712 ^c (0.000)	omitted	-2.248 ^c (0.000)	-2.718 ^c (0.000)	omitted	-3.094 ^c (0.000)	-2.442 ^c (0.005)	4.535 (0.711)
Constant	-61.638 ^c (0.000)	-46.824 ^c (0.001)	-37.758 (0.980)	-40.552 ^c (0.000)	-34.472 ^c (0.001)	omitted	-61.309 ^c (0.000)	-41.583 ^c (0.006)	110.559 (0.772)
Observations	16,788	16,788	15,948	16,772	16,772	15,096	16,708	16,708	15,052
Groups	956	41	956	1,128	41	1,096	1,274	41	1,272
Instruments	-	-	85	-	-	74	-	-	76
R-squared	0.480	0.782	-	0.501	0.785	-	0.453	0.741	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Countrypair-fixed	Y	N	-	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-	N	Y	-
Importer-fixed	N	Y	-	N	Y	-	N	Y	-
Vce cluster	Y	Y	-	Y	Y	-	Y	Y	-
F tests ¹	143.46 ^c	271.78 ^c	-	131.92 ^c	241.32 ^c	-	96.92 ^c	224.58 ^c	-
Hausman tests ² (chi2)	559.81 ^c	278.52 ^c	-	1,179.72 ^c	1,940.87 ^c	-	777.02 ^c	1,578.82 ^c	-
AR(1) (z)	-	-	-2.12 ^b	-	-	-2.25 ^b	-	-	-1.97 ^b
AR(1) (p)	-	-	0.034	-	-	0.024	-	-	0.049
AR(2) (z)	-	-	-0.18	-	-	1.56	-	-	-0.54
AR(2) (p)	-	-	0.856	-	-	0.119	-	-	0.590
Hansen test (chi2)	-	-	58.33 ^a	-	-	37.22	-	-	33.91
Hansen test (p)	-	-	0.088	-	-	0.204	-	-	0.615

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C4.11: Estimation results of low-high and high-low REQ, ROL, and VAC models

ln(1 + BIT _{ijt})	Low-High & High-Low REQ models			Low-High & High-Low ROL models			Low-High & High-Low VAC models		
	FE-I	FE-II	SGMM-II	FE-I	FE-II	SGMM-II	FE-I	FE-II	SGMM-II
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
L1.ln(1 + BIT _{ijt})			0.268 ^a (0.093)			0.299 ^b (0.042)			
L2.ln(1 + BIT _{ijt})						-0.010 (0.799)			-0.029 (0.287)
L1.lnGDP _{it}			-0.340 (0.570)			-0.438 (0.536)			-0.178 (0.656)
L2.lnGDP _{it}						-0.142 (0.733)			
L1.lnGDP _{jt}			-0.053 (0.934)			-0.090 (0.900)			0.075 (0.829)
L2.lnGDP _{jt}						-0.128 (0.770)			
L1.lnEXG _{jit}			0.102 (0.453)			-0.115 (0.630)			0.109 (0.512)
L2.lnEXG _{jit}						0.088 (0.430)			
lnGDP _{it}	0.586 ^c (0.000)	0.460 ^c (0.004)		0.542 ^c (0.000)	0.446 ^c (0.000)		0.567 ^c (0.000)	0.490 ^c (0.006)	
lnGDP _{jt}	0.589 ^c (0.000)	0.623 ^c (0.000)		0.572 ^c (0.000)	0.523 ^c (0.000)		0.511 ^c (0.000)	0.464 ^c (0.000)	
lnPOP _{it}	0.378 ^b (0.021)	0.533 (0.217)	2.703 ^a (0.051)	0.282 ^a (0.094)	0.279 (0.385)	5.666 ^c (0.010)	0.173 (0.332)	0.362 (0.419)	1.761 (0.225)
lnPOP _{jt}	-0.241 ^a (0.067)	-0.026 (0.872)	2.856 ^b (0.022)	-0.306 ^b (0.039)	-0.325 ^b (0.048)	5.012 ^a (0.061)	-0.265 ^a (0.074)	-0.137 (0.416)	1.744 (0.226)
lnDIST _{ij}	omitted	-1.269 ^c (0.000)	-18.386 ^b (0.046)	omitted	-1.241 ^c (0.000)	20.855 (0.159)	omitted	-1.358 ^c (0.000)	-1.841 (0.736)
lnCEpc _{it}	0.358 ^c (0.000)	0.447 ^b (0.040)	0.431 (0.732)	0.376 ^c (0.000)	0.407 ^c (0.007)	0.470 (0.547)	0.441 ^c (0.000)	0.518 ^c (0.007)	-0.904 (0.288)

cxci

lnCEpc _{it}	0.213 ^c (0.002)	0.233 ^b (0.029)	0.163 (0.898)	0.251 ^c (0.000)	0.264 ^c (0.008)	0.545 (0.486)	0.308 ^c (0.000)	0.346 ^c (0.001)	-0.730 (0.376)
REQ _{it}	-0.092 ^a (0.063)	-0.162 (0.159)	0.556 ^a (0.086)						
REQ _{jt}	0.030 (0.566)	0.079 (0.254)	0.338 (0.249)						
ROL _{it}				0.143 ^b (0.016)	0.196 ^a (0.093)	0.717 (0.503)			
ROL _{jt}				-0.010 (0.855)	0.034 (0.682)	0.257 (0.816)			
VAC _{it}							-0.116 ^b (0.032)	-0.177 (0.167)	1.613 ^a (0.057)
VAC _{jt}							0.032 (0.535)	0.115 (0.161)	1.697 ^a (0.061)
lnREMOTE _{it}	-1.479 ^c (0.000)	-1.502 ^c (0.001)	5.020 (0.204)	-1.484 ^c (0.000)	-1.619 ^c (0.000)	-1.013 (0.955)	-1.781 ^c (0.000)	-1.840 ^c (0.000)	5.871 (0.349)
lnREMOTE _{jt}	-0.705 ^c (0.000)	-0.629 ^b (0.031)	5.254 (0.200)	-0.671 ^c (0.000)	-0.949 ^c (0.000)	-1.269 (0.944)	-0.860 ^c (0.000)	-0.733 ^b (0.015)	6.255 (0.308)
lnEXG _{jit}	0.071 ^a (0.098)	0.012 (0.878)		0.105 ^c (0.009)	0.084 (0.223)		0.063 (0.124)	0.052 (0.529)	
lnESIM _{ijt}	0.108 ^c (0.008)	-0.103 (0.102)	-0.238 (0.835)	0.112 ^c (0.006)	-0.088 (0.156)	-0.930 (0.480)	0.120 ^c (0.002)	-0.085 (0.214)	-1.166 (0.306)
lnDIN _{ijt}	0.021 (0.242)	0.045 (0.380)	0.465 (0.313)	-0.018 (0.378)	0.017 (0.722)	-0.140 (0.793)	0.015 (0.362)	-0.016 (0.580)	-0.594 (0.109)
RTA _{ijt}	0.131 ^c (0.001)	0.309 ^c (0.001)	-0.568 (0.208)	0.116 ^c (0.003)	0.316 ^c (0.001)	-0.243 (0.556)	0.087 ^b (0.018)	0.265 ^c (0.004)	0.877 (0.290)
LLOCK _i	omitted	omitted	3.740 (0.820)	omitted	omitted	5.711 (0.945)	omitted	omitted	5.438 (0.615)
LLOCK _j	omitted	-2.844 ^c (0.000)	1.716 (0.916)	omitted	-3.080 ^c (0.000)	1.683 (0.983)	omitted	-3.153 ^c (0.000)	-1.938 (0.836)
COMCOL _{ij}	omitted	0.109 (0.850)	115.592 (0.407)	omitted	0.187 (0.748)	-66.775 (0.900)	omitted	omitted	omitted
COMLANG _{ij}	omitted	0.184	39.954	omitted	0.235 ^b	-91.509	omitted	0.387 ^c	-4.832

CONTIG _{ij}	omitted	(0.130) 0.349 ^b (0.045)	(0.508) -88.265 ^b (0.021)	omitted	(0.050) 0.243 (0.182)	(0.322) 102.388 (0.391)	omitted	(0.000) 0.427 ^b (0.025)	(0.755) 18.546 (0.567)
GEFC _t	-2.326 ^c (0.000)	-2.230 ^c (0.003)	omitted	-2.231 ^c (0.000)	-2.546 ^c (0.000)	1.221 (0.928)	-2.729 ^c (0.000)	-2.551 ^c (0.000)	omitted
COVID _t	-2.851 ^c (0.000)	-2.752 ^c (0.003)	omitted	-2.717 ^c (0.000)	-3.107 ^c (0.000)	omitted	-3.327 ^c (0.000)	-3.083 ^c (0.000)	omitted
Constant	-50.794 ^c (0.000)	-43.291 ^c (0.002)	224.089 ^a (0.092)	-45.821 ^c (0.000)	-37.456 ^c (0.000)	-366.313 (0.537)	-50.681 ^c (0.000)	-40.336 ^c (0.002)	143.388 (0.537)
Observations	16,724	16,724	15,884	16,788	16,788	15,108	16,688	16,688	15,032
Groups	1,248	41	1,218	1,026	41	1,026	1,094	41	1,094
Instruments	-	-	85	-	-	82	-	-	85
R-squared	0.475	0.770	-	0.483	0.771	-	0.494	0.765	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Countrypair-fixed	Y	N	-	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-	N	Y	-
Importer-fixed	N	Y	-	N	Y	-	N	Y	-
Vce cluster	Y	Y	-	Y	Y	-	Y	Y	-
F tests ¹	115.09 ^c	266.32 ^c	-	144.10 ^c	276.55 ^c	-	123.32 ^c	360.28 ^c	-
Hausman tests ² (chi2)	822.11 ^c	1,487.68 ^c	-	711.52 ^c	1,334.07 ^c	-	1,047.31 ^c	2,564.79 ^c	-
AR(1) (z)	-	-	-1.50	-	-	-1.83 ^a	-	-	-1.90 ^a
AR(1) (p)	-	-	0.134	-	-	0.067	-	-	0.057
AR(2) (z)	-	-	0.35	-	-	1.11	-	-	-0.47
AR(2) (p)	-	-	0.725	-	-	0.266	-	-	0.640
Hansen test (chi2)	-	-	55.34	-	-	34.32	-	-	46.98
Hansen test (p)	-	-	0.139	-	-	0.683	-	-	0.474

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C4.12: Estimation results of low-high and high-low EPS and overall IQ models

Ln(1 + BIT _{ijt})	Low-High & High-Low EPS models			Low-High & High-Low Overall IQ models		
	FE-I	FE-II	SGMM-II	FE-I	FE-II	SGMM-II
	(1)	(2)	(3)	(4)	(5)	(6)
L1.ln(1 + BIT _{ijt})			0.409 ^c (0.004)			0.226 (0.108)
L2.ln(1 + BIT _{ijt})			-0.030 (0.484)			
L1.lnGDP _{it}						-0.191 (0.702)
L2.lnGDP _{it}			-0.048 (0.794)			
L1.lnGDP _{jt}						0.064 (0.880)
L2.lnGDP _{jt}			-0.061 (0.723)			
L1.lnEXG _{jit}						-0.057 (0.786)
L2.lnEXG _{jit}			0.054 (0.724)			
lnGDP _{it}	0.562 ^c (0.000)	0.607 ^c (0.003)		0.595 ^c (0.000)	0.551 ^c (0.000)	
lnGDP _{jt}	0.354 ^c (0.000)	0.304 ^b (0.048)		0.544 ^c (0.000)	0.551 ^c (0.000)	
lnPOP _{it}	-2.233 ^c (0.000)	-2.267 (0.121)	1.746 (0.752)	0.213 (0.325)	0.193 (0.693)	4.652 (0.262)
lnPOP _{jt}	0.606 (0.387)	0.355 (0.632)	-3.531 (0.484)	-0.166 (0.333)	-0.136 (0.492)	4.355 (0.280)
lnDIST _{ij}	omitted	-1.160 ^c (0.000)	-2.207 (0.925)	omitted	-1.098 ^c (0.000)	-9.292 (0.147)
lnCEpc _{it}	0.074 (0.610)	0.399 (0.201)	0.093 (0.898)	0.470 ^c (0.000)	0.472 ^c (0.004)	-0.797 (0.303)

lnCEpc _{jt}	0.365 ^c (0.002)	0.804 ^c (0.001)	0.846 (0.275)	0.318 ^c (0.000)	0.359 ^c (0.002)	-0.934 (0.249)
lnEPS _{it}	-0.095 ^b (0.021)	-0.097 (0.289)	-0.187 (0.583)			
lnEPS _{jt}	-0.033 (0.311)	-0.014 (0.763)	0.028 (0.930)			
lnREMOTE _{it}	-0.681 ^c (0.005)	-1.385 ^b (0.019)	2.113 (0.518)	-1.552 ^c (0.000)	-1.423 ^c (0.000)	2.370 (0.295)
lnREMOTE _{jt}	0.084 (0.741)	-0.787 ^a (0.070)	1.986 (0.561)	-0.595 ^c (0.001)	-0.462 ^a (0.053)	2.015 (0.356)
lnEXG _{jit}	0.305 ^c (0.001)	0.291 (0.168)		0.099 ^b (0.040)	0.110 ^a (0.094)	
lnESIM _{ijt}	-0.039 (0.470)	-0.007 (0.944)	-0.010 (0.992)	0.182 ^c (0.000)	-0.076 (0.145)	0.354 (0.784)
lnDIN _{ijt}	-0.012 (0.232)	-0.011 (0.767)	-0.182 (0.545)	-0.022 ^a (0.081)	0.131 ^c (0.000)	0.511 (0.165)
RTA _{ijt}	0.040 (0.347)	0.122 (0.206)	0.341 (0.758)	0.092 ^b (0.013)	0.282 ^c (0.001)	0.930 (0.244)
LLOCK _i	omitted	omitted	-27.588 (0.729)	omitted	omitted	-12.720 (0.434)
LLOCK _j	omitted	-2.432 ^b (0.011)	-40.437 (0.686)	omitted	-2.842 ^c (0.000)	-16.866 (0.386)
COMCOL _{ij}	omitted	omitted	omitted	omitted	omitted	omitted
COMLANG _{ij}	omitted	0.128 (0.446)	omitted	omitted	0.242 ^a (0.081)	omitted
CONTIG _{ij}	omitted	0.325 ^b (0.047)	omitted	omitted	0.064 (0.681)	omitted
GEFC _t	-0.134 (0.766)	-1.926 ^a (0.057)	omitted	-2.328 ^c (0.000)	-2.066 ^c (0.001)	omitted
COVID _t	-0.132 (0.782)	-1.926 ^a (0.078)	3.263 (0.503)	-2.835 ^c (0.000)	-2.562 ^c (0.001)	omitted
Constant	8.504	1.246	128.518	-47.634 ^c	-35.819 ^c	1.078

	(0.531)	(0.949)	(0.674)	(0.000)	(0.005)	(0.993)
Observations	8,388	8,388	8,140	14,776	14,776	13,996
Groups	1,002	33	990	1,024	41	1,024
Instruments	-	-	73	-	-	77
R-squared	0.267	0.758	-	0.461	0.783	-
Year-fixed	Y	Y	Y	Y	Y	Y
Countrypair-fixed	Y	N	-	Y	N	-
Exporter-fixed	N	Y	-	N	Y	-
Importer-fixed	N	Y	-	N	Y	-
Vce cluster	Y	Y	-	Y	Y	-
F tests ¹	74.00 ^c	73.79 ^c	-	125.89 ^c	284.27 ^c	-
Hausman tests ² (chi2)	400.78 ^c	439.84 ^c	-	722.91 ^c	1,865.68 ^c	-
AR(1) (z)	-	-	-2.86 ^c	-	-	-2.23 ^b
AR(1) (p)	-	-	0.004	-	-	0.026
AR(2) (z)	-	-	-1.17	-	-	0.52
AR(2) (p)	-	-	0.243	-	-	0.604
Hansen test (chi2)	-	-	41.29	-	-	37.66
Hansen test (p)	-	-	0.215	-	-	0.576

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include $\ln GDP_{it}$, $\ln GDP_{jt}$, and $\ln EXG_{jit}$.

Source: The author.

Table C4.13: PPML estimation results for aggregated samples (for robustness check)

BIT_{ijt}	COC	GVE	POS	REQ	ROL	VAC	EPS	IQ
lnGDP _{it}	0.572*** (0.000)	0.494*** (0.000)	0.477*** (0.000)	0.605*** (0.000)	0.647*** (0.000)	0.805*** (0.000)	0.589*** (0.000)	0.515*** (0.000)
lnGDP _{jt}	0.653*** (0.000)	0.598*** (0.000)	0.637*** (0.000)	0.584*** (0.000)	0.643*** (0.000)	0.731*** (0.000)	0.740*** (0.000)	0.664*** (0.000)
lnPOP _{it}	0.177*** (0.000)	0.254*** (0.000)	0.299*** (0.000)	0.141*** (0.000)	0.088*** (0.001)	-0.089*** (0.000)	0.185*** (0.000)	0.233*** (0.000)
lnPOP _{jt}	0.065*** (0.003)	0.131*** (0.000)	0.096*** (0.000)	0.163*** (0.000)	0.086*** (0.000)	-0.005 (0.762)	0.054*** (0.001)	0.071*** (0.000)
lnDIST _{ij}	-0.586*** (0.000)	-0.570*** (0.000)	-0.572*** (0.000)	-0.582*** (0.000)	-0.591*** (0.000)	-0.608*** (0.000)	-0.607*** (0.000)	-0.574*** (0.000)
COC _{it}	0.072** (0.034)							
COC _{jt}	-0.134*** (0.000)							
(rCOC*lnCEpc) _{it}	-0.072*** (0.000)							
(rCOC*lnCEpc) _{jt}	0.107*** (0.000)							
GVE _{it}		0.235*** (0.000)						
GVE _{jt}		-0.027 (0.410)						
(rGVE*lnCEpc) _{it}		-0.081*** (0.000)						
(rGVE*lnCEpc) _{jt}		0.064*** (0.000)						
POS _{it}			0.196*** (0.000)					
POS _{jt}			0.017 (0.537)					

CCV

(rPOS*lnCEpc) _{it}	0.036*** (0.001)			
(rPOS*lnCEpc) _{jt}	-0.003 (0.807)			
REQ _{it}		0.023 (0.499)		
REQ _{jt}		-0.122*** (0.000)		
(rREQ*lnCEpc) _{it}		-0.055*** (0.000)		
(rREQ*lnCEpc) _{jt}		0.027* (0.052)		
ROL _{it}			-0.111*** (0.001)	
ROL _{jt}			-0.060** (0.027)	
(rROL*lnCEpc) _{it}			0.012 (0.488)	
(rROL*lnCEpc) _{jt}			0.042*** (0.010)	
VAC _{it}				-0.244*** (0.000)
VAC _{jt}				-0.065*** (0.000)
(rVAC*lnCEpc) _{it}				0.009 (0.576)
(rVAC*lnCEpc) _{jt}				-0.041** (0.027)
lnEPS _{it}				-0.164*** (0.000)
lnEPS _{jt}				-0.107*** (0.000)
(rEPS*lnCEpc) _{it}				0.089***

ccvī

[illegible]

COMLANG _{ij}	-0.041 (0.170)	-0.053* (0.079)	-0.040 (0.210)	-0.029 (0.319)	-0.029 (0.304)	-0.016 (0.574)	-0.141*** (0.000)	-0.017 (0.582)
CONTIG _{ij}	0.530*** (0.000)	0.556*** (0.000)	0.539*** (0.000)	0.544*** (0.000)	0.520*** (0.000)	0.532*** (0.000)	0.605*** (0.000)	0.538*** (0.000)
GEFC _t	0.021 (0.312)	0.034 (0.101)	0.019 (0.358)	0.026 (0.202)	0.020 (0.341)	0.029 (0.145)	-0.004 (0.844)	0.027 (0.192)
COVID _t	0.022 (0.545)	0.032 (0.372)	0.029 (0.423)	0.028 (0.442)	0.013 (0.722)	-0.041 (0.219)	-0.014 (0.803)	0.012 (0.729)
Constant	-17.242*** (0.000)	-17.424*** (0.000)	-17.918*** (0.000)	-17.413*** (0.000)	-17.398*** (0.000)	-15.973*** (0.000)	-21.709*** (0.000)	-17.373*** (0.000)
Observations	32,800	32,800	32,800	32,800	32,800	32,800	20,064	32,800
R-squared	0.733	0.729	0.722	0.727	0.730	0.749	0.760	0.732

Note: The dependent variable of PPML models is BIT_{ijt} ; *, **, and *** denote the significance levels of 10%, 5%, and 1%, respectively.

Source: The author.

Table C4.14: PPML estimation results for high-high samples (for robustness check)

BIT_{ijt}	COC	GVE	POS	REQ	ROL	VAC	EPS	IQ
lnGDP _{it}	0.591*** (0.000)	0.399*** (0.000)	0.500*** (0.000)	0.560*** (0.000)	0.660*** (0.000)	0.533*** (0.000)	0.563*** (0.000)	0.475*** (0.000)
lnGDP _{jt}	0.564*** (0.000)	0.368*** (0.000)	0.488*** (0.000)	0.467*** (0.000)	0.597*** (0.000)	0.427*** (0.000)	0.709*** (0.000)	0.391*** (0.000)
lnPOP _{it}	0.045 (0.363)	0.230*** (0.000)	0.180*** (0.000)	0.071* (0.058)	-0.048 (0.354)	0.118*** (0.002)	0.173*** (0.000)	0.218*** (0.002)
lnPOP _{jt}	0.103** (0.024)	0.316*** (0.000)	0.206*** (0.000)	0.216*** (0.000)	0.070 (0.127)	0.291*** (0.000)	0.042 (0.174)	0.347*** (0.000)
lnDIST _{ij}	-0.520*** (0.000)	-0.503*** (0.000)	-0.551*** (0.000)	-0.509*** (0.000)	-0.523*** (0.000)	-0.610*** (0.000)	-0.637*** (0.000)	-0.678*** (0.000)
COC _{it}	0.095*** (0.010)							
COC _{jt}	-0.015 (0.631)							
GVE _{it}		0.150** (0.011)						
GVE _{jt}		0.149*** (0.003)						
POS _{it}			0.091 (0.150)					
POS _{jt}			-0.062 (0.339)					
REQ _{it}				0.164*** (0.000)				
REQ _{jt}				0.101** (0.025)				
ROL _{it}					-0.114** (0.033)			
ROL _{jt}					-0.201*** (0.000)			

ccix

VAC _{it}						0.045		
						(0.570)		
VAC _{jt}						0.056		
						(0.461)		
lnEPS _{it}							-0.618***	
							(0.000)	
lnEPS _{jt}							-0.669***	
							(0.000)	
lnCEpc _{it}	0.391***	0.410***	0.256***	0.397***	0.444***	0.545***	0.542***	0.251***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lnCEpc _{jt}	0.139***	0.233***	0.095***	0.127***	0.186***	0.135***	0.329***	0.045
	(0.000)	(0.000)	(0.004)	(0.000)	(0.000)	(0.000)	(0.000)	(0.455)
lnREMOTE _{it}	-0.350***	-0.371***	-0.335***	-0.371***	-0.340***	-0.509***	-0.353***	-0.412***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lnREMOTE _{jt}	0.303***	0.171***	0.157***	0.282***	0.291***	0.330***	-0.105**	0.200***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.035)	(0.000)
lnEXG _{jit}	0.053***	0.033***	0.017**	0.050***	0.046***	0.063***	0.017***	0.037***
	(0.000)	(0.000)	(0.013)	(0.000)	(0.000)	(0.000)	(0.002)	(0.006)
lnDIN _{ijt}	0.003	-0.021	-0.087***	-0.005	0.014	0.084***	0.141***	0.069**
	(0.869)	(0.222)	(0.000)	(0.793)	(0.422)	(0.000)	(0.000)	(0.012)
lnESIM _{ijt}	0.003	0.031***	-0.020*	0.015**	0.009	0.025***	0.085***	0.034***
	(0.642)	(0.000)	(0.068)	(0.042)	(0.242)	(0.000)	(0.000)	(0.005)
RTA _{ijt}	0.167***	0.188***	0.264***	0.191***	0.205***	0.130***	0.108***	-0.101**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.007)	(0.042)
LLOCK _i	-0.171***	-0.195***	-0.133***	-0.194***	-0.171***	-0.202***	0.045	-0.205***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.250)	(0.000)
LLOCK _j	0.020	0.026	0.042	0.020	0.045	0.108***	0.072*	0.114*
	(0.692)	(0.561)	(0.257)	(0.614)	(0.286)	(0.005)	(0.095)	(0.083)
COMCOL _{ij}	1.826***	1.426***	2.090***	1.480***	excluded	excluded	excluded	excluded
	(0.000)	(0.000)	(0.000)	(0.000)				
COMLANG _{ij}	0.171***	0.166***	0.185***	0.152***	0.118***	0.154***	0.060	0.357***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.147)	(0.000)
CONTIG _{ij}	0.547***	0.551***	0.513***	0.589***	0.576***	0.539***	0.434***	0.323***

CCX

	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GEFC _t	-0.023	0.021	-0.023	-0.019	-0.029	-0.036*	-0.022	-0.035
	(0.285)	(0.336)	(0.411)	(0.376)	(0.178)	(0.085)	(0.395)	(0.233)
COVID _t	-0.031	0.029	0.021	-0.017	-0.052	0.016	0.034	-0.004
	(0.402)	(0.422)	(0.615)	(0.654)	(0.176)	(0.636)	(0.536)	(0.926)
Constant	-16.823***	-16.050***	-17.331***	-16.715***	-17.143***	-17.550***	-25.986***	-16.457***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	8,006	8,014	8,046	8,038	8,006	8,056	5,822	3,412
R-squared	0.906	0.901	0.887	0.902	0.899	0.905	0.789	0.929

Note: The dependent variable of PPML models is BIT_{ijt} ; *, **, and *** denote the significance levels of 10%, 5%, and 1%, respectively.

Source: The author.

Table C4.15: PPML estimation results for low-low samples (for robustness check)

BIT_{ijt}	COC	GVE	POS	REQ	ROL	VAC	EPS	IQ
lnGDP _{it}	0.849*** (0.000)	0.805*** (0.000)	0.472*** (0.000)	0.841*** (0.000)	0.861*** (0.000)	1.021*** (0.000)	0.572*** (0.000)	0.571*** (0.000)
lnGDP _{jt}	0.694*** (0.000)	0.715*** (0.000)	0.752*** (0.000)	0.725*** (0.000)	0.715*** (0.000)	0.842*** (0.000)	0.894*** (0.000)	0.672*** (0.000)
lnPOP _{it}	-0.064** (0.048)	0.050 (0.154)	0.355*** (0.000)	-0.030 (0.455)	-0.021 (0.502)	-0.323*** (0.000)	0.228*** (0.000)	0.165*** (0.000)
lnPOP _{jt}	-0.109*** (0.000)	-0.063*** (0.010)	-0.034 (0.275)	-0.118*** (0.000)	-0.087*** (0.000)	-0.196*** (0.000)	-0.049 (0.139)	0.014 (0.416)
lnDIST _{ij}	-0.850*** (0.000)	-0.905*** (0.000)	-0.556*** (0.000)	-0.893*** (0.000)	-0.912*** (0.000)	-0.708*** (0.000)	-0.515*** (0.000)	-0.606*** (0.000)
COC _{it}	-0.102*** (0.003)							
COC _{jt}	-0.172*** (0.000)							
GVE _{it}		0.097* (0.084)						
GVE _{jt}		0.063 (0.147)						
POS _{it}			0.237*** (0.000)					
POS _{jt}			0.011 (0.780)					
REQ _{it}				-0.094* (0.085)				
REQ _{jt}				-0.159*** (0.000)				
ROL _{it}					0.055 (0.105)			
ROL _{jt}					0.003 (0.935)			

VAC _{it}						0.295 (0.274)		
VAC _{jt}						0.077*** (0.002)		
lnEPS _{it}							0.027 (0.631)	
lnEPS _{jt}							0.045 (0.236)	
lnCEpc _{it}	0.259*** (0.000)	0.220*** (0.000)	0.395*** (0.000)	0.228*** (0.000)	0.187*** (0.000)	0.099** (0.015)	0.282*** (0.000)	0.315*** (0.000)
lnCEpc _{jt}	-0.060** (0.014)	0.049* (0.053)	0.177*** (0.000)	0.026 (0.348)	0.053** (0.027)	0.086** (0.024)	0.084** (0.050)	0.199*** (0.000)
lnREMOTE _{it}	0.503*** (0.000)	0.435*** (0.000)	0.108** (0.036)	0.473*** (0.000)	0.525*** (0.000)	0.695*** (0.000)	0.135** (0.038)	0.208*** (0.000)
lnREMOTE _{jt}	0.178*** (0.000)	0.181*** (0.000)	0.303*** (0.000)	0.220*** (0.000)	0.260*** (0.000)	0.499*** (0.000)	0.265*** (0.000)	0.274*** (0.000)
lnEXG _{jit}	0.028*** (0.000)	0.021*** (0.000)	0.027*** (0.000)	0.022*** (0.000)	0.022*** (0.000)	0.028*** (0.000)	0.007 (0.407)	0.020*** (0.000)
lnDIN _{ijt}	-0.145*** (0.000)	-0.188*** (0.000)	-0.133*** (0.000)	-0.204*** (0.000)	-0.247*** (0.000)	-0.129*** (0.001)	0.041 (0.260)	-0.096*** (0.000)
lnESIM _{ijt}	-0.046*** (0.000)	-0.091*** (0.000)	0.055*** (0.000)	-0.050*** (0.000)	-0.057*** (0.000)	0.056*** (0.000)	0.080*** (0.000)	0.080*** (0.000)
RTA _{ijt}	0.260*** (0.000)	0.125*** (0.000)	0.586*** (0.000)	0.183*** (0.000)	0.028 (0.419)	0.317*** (0.000)	0.480*** (0.000)	0.500*** (0.000)
LLOCK _i	0.146*** (0.003)	0.224*** (0.000)	-0.129 (0.489)	0.270*** (0.000)	0.037 (0.486)	0.270** (0.012)	0.024 (0.730)	-0.023 (0.694)
LLOCK _j	-0.066 (0.186)	-0.115** (0.035)	-0.243 (0.279)	-0.163*** (0.005)	-0.324*** (0.000)	0.099 (0.290)	-0.035 (0.597)	-0.023 (0.725)
COMCOL _{ij}	0.711*** (0.000)	1.237*** (0.000)	0.607*** (0.000)	1.440*** (0.000)	1.394*** (0.000)	0.860*** (0.000)	excluded	1.125*** (0.000)
COMLANG _{ij}	0.636*** (0.000)	0.333*** (0.000)	0.120*** (0.001)	0.297*** (0.000)	0.300*** (0.000)	0.045 (0.458)	-0.220*** (0.000)	0.240*** (0.000)
CONTIG _{ij}	0.486***	0.332***	0.633***	0.288***	0.338***	0.443***	0.796***	0.641***

	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GEFC _t	0.056**	0.077***	0.031	0.113***	0.098***	0.141***	0.169**	0.041
	(0.049)	(0.009)	(0.464)	(0.000)	(0.001)	(0.000)	(0.013)	(0.217)
COVID _t	0.132***	0.117**	0.154**	0.092*	0.131***	0.106	-0.210*	0.144***
	(0.009)	(0.033)	(0.042)	(0.085)	(0.005)	(0.123)	(0.078)	(0.009)
Constant	-7.652***	-10.087***	-15.999***	-8.143***	-7.557***	-4.140***	-20.429***	-12.427***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	8,006	8,014	8,046	8,038	8,006	8,056	5,854	14,612
R-squared	0.817	0.747	0.695	0.767	0.781	0.723	0.809	0.683

Note: The dependent variable of PPML models is BIT_{ijt} ; *, **, and *** denote the significance levels of 10%, 5%, and 1%, respectively.

Source: The author.

Table C4.16: PPML estimation results for low-high and high-low samples (for robustness check)

BIT_{ijt}	COC	GVE	POS	REQ	ROL	VAC	EPS	IQ
lnGDP _{it}	0.455*** (0.000)	0.404*** (0.000)	0.454*** (0.000)	0.487*** (0.000)	0.539*** (0.000)	0.749*** (0.000)	0.621*** (0.000)	0.497*** (0.000)
lnGDP _{jt}	0.559*** (0.000)	0.524*** (0.000)	0.579*** (0.000)	0.470*** (0.000)	0.514*** (0.000)	0.662*** (0.000)	0.690*** (0.000)	0.545*** (0.000)
lnPOP _{it}	0.395*** (0.000)	0.413*** (0.000)	0.334*** (0.000)	0.333*** (0.000)	0.270*** (0.000)	0.069** (0.016)	0.174*** (0.000)	0.286*** (0.000)
lnPOP _{jt}	0.286*** (0.000)	0.289*** (0.000)	0.179*** (0.000)	0.355*** (0.000)	0.285*** (0.000)	0.125*** (0.000)	0.110*** (0.000)	0.258*** (0.000)
lnDIST _{ij}	-0.743*** (0.000)	-0.647*** (0.000)	-0.603*** (0.000)	-0.637*** (0.000)	-0.632*** (0.000)	-0.572*** (0.000)	-0.634*** (0.000)	-0.578*** (0.000)
COC _{it}	0.112*** (0.000)							
COC _{jt}	0.065*** (0.009)							
GVE _{it}		0.259*** (0.000)						
GVE _{jt}		-0.167 (0.482)						
POS _{it}			0.222*** (0.000)					
POS _{jt}			-0.005 (0.873)					
REQ _{it}				0.101** (0.020)				
REQ _{jt}				0.208*** (0.000)				
ROL _{it}					-0.007 (0.807)			
ROL _{jt}					0.070** (0.012)			

VAC _{it}						0.190***		
						(0.000)		
VAC _{jt}						0.091***		
						(0.000)		
lnEPS _{it}							-0.078*	
							(0.099)	
lnEPS _{jt}							-0.133***	
							(0.000)	
lnCEpc _{it}	0.317***	0.315***	0.242***	0.334***	0.307***	0.103***	0.349***	0.333***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
lnCEpc _{jt}	0.358***	0.302***	0.254***	0.375***	0.352***	0.314***	0.258***	0.308***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
lnREMOTE _{it}	0.077**	0.015	-0.062	0.050	0.046	0.119***	-0.028	-0.140***
	(0.025)	(0.674)	(0.113)	(0.151)	(0.181)	(0.001)	(0.571)	(0.000)
lnREMOTE _{jt}	0.107***	0.098***	0.130***	0.094***	0.119***	0.198***	0.223***	0.074**
	(0.000)	(0.002)	(0.000)	(0.002)	(0.000)	(0.000)	(0.000)	(0.028)
lnEXG _{jit}	0.014***	0.023***	0.016***	0.017***	0.020***	0.018***	0.037***	0.021***
	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
lnDIN _{ijt}	-0.108***	-0.059***	-0.052***	-0.061***	-0.065***	-0.113***	0.029	-0.096***
	(0.000)	(0.007)	(0.004)	(0.006)	(0.005)	(0.000)	(0.300)	(0.000)
lnESIM _{ijt}	0.160***	0.108***	0.091***	0.079***	0.069***	-0.037***	0.045**	0.030**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.013)	(0.011)
RTA _{ijt}	0.700***	0.588***	0.434***	0.578***	0.590***	0.566***	0.355***	0.481***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LLOCK _i	-0.096**	-0.093**	-0.260***	0.031	-0.021	0.317***	0.160***	0.055
	(0.023)	(0.037)	(0.000)	(0.515)	(0.666)	(0.000)	(0.002)	(0.138)
LLOCK _j	-0.359***	-0.275***	-0.288***	-0.159***	-0.222***	-0.069	0.152***	-0.092**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.183)	(0.009)	(0.023)
COMCOL _{ij}	1.328***	1.073***	1.440***	1.375***	1.382***	excluded	excluded	excluded
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)			
COMLANG _{ij}	-0.124***	-0.068*	-0.084*	-0.070	-0.024	-0.298***	-0.333***	-0.221***
	(0.001)	(0.075)	(0.098)	(0.113)	(0.600)	(0.000)	(0.000)	(0.000)
CONTIG _{ij}	0.637***	0.839***	0.459***	0.771***	0.794***	0.680***	0.625***	0.488***

	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GEFC _t	0.043	0.036	0.037	0.056*	0.027	0.052*	-0.010	0.017
	(0.120)	(0.209)	(0.193)	(0.056)	(0.357)	(0.086)	(0.738)	(0.563)
COVID _t	0.078*	0.046	-0.064	0.099**	0.056	-0.095*	0.134	-0.043
	(0.074)	(0.377)	(0.112)	(0.034)	(0.262)	(0.051)	(0.216)	(0.285)
Constant	-19.594***	-18.876***	-18.461***	-18.838***	-18.416***	-18.550***	-19.631***	-21.093***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	16,788	16,772	16,708	16,724	16,788	16,688	8,388	14,776
R-squared	0.801	0.759	0.783	0.778	0.767	0.775	0.794	0.803

Note: The dependent variable of PPML models is BIT_{ijt} ; *, **, and *** denote the significance levels of 10%, 5%, and 1%, respectively.

Source: The author.

Table C4.17: Summary of findings on the direct effect of environmental quality on bilateral trade

Contextual effects	Direct effects	Hypotheses
The aggregated sample	Exporter's CO ₂ emissions <i>increases</i> export flows. Importer's CO ₂ emissions <i>increases</i> import flows.	H.2.1: Not supported (opposite sign)
The high-high institutional trading relationship	Exporter's CO ₂ emissions <i>increases</i> export flows. Importer's CO ₂ emissions <i>increases</i> import flows.	H.2.1: Not supported (opposite sign) H.2.4: Not supported
The low-low institutional trading relationship	Exporter's CO ₂ emissions <i>increases</i> export flows. Importer's CO ₂ emissions <i>increases</i> import flows.	H.2.1: Not supported (opposite sign) H.2.4: Not supported
The low-high and high-low institutional trading relationships	Exporter's CO ₂ emissions <i>increases</i> export flows. Importer's CO ₂ emissions <i>increases</i> import flows.	H.2.1: Not supported (opposite sign) H.2.4: Not supported

Source: The author.

Table C4.18: Summary of findings on the direct effect of institutional quality on bilateral trade (based on consistent findings of Chapter 3 and Chapter 4)

Institutional quality proxies	Direct effects				Hypotheses
	Aggregated	High-High	Low-Low	Different	
COC					H.2.2 & H.1.2: Not supported H.2.4: Not supported
GVE		Exporter (+) Importer (+)		Exporter (+) Importer (-)	H.2.2 & H.1.2: Supported (in specific contexts) H.2.4: Supported
POS		Importer (+)	Importer (-)		H.2.2 & H.1.2: Supported (in specific contexts) H.2.4: Supported
REQ			Importer (-)		H.2.2 & H.1.2: Not supported (opposite sign) H.2.4: Supported
ROL				Exporter (+)	H.2.2 & H.1.2: Supported (in specific contexts) H.2.4: Supported
VAC	Exporter (-)	Exporter (-) Importer (+)			H.2.2 & H.1.2: Supported (in specific contexts) H.2.4: Supported
EPS	Exporter (-)				H.2.2: Not supported (opposite sign) H.2.4: Not supported
Overall IQ					H.2.2 & H.1.2: Not supported H.2.4: Not supported

Source: The author.

Table C4.19: Summary of findings on the moderating effect of institutional quality on the nexus between environmental quality and bilateral trade

Institutional quality proxies	Moderating effects	Hypotheses
	Bilateral Trade-CO ₂ emissions	
COC	Importer (+)	H.2.3: Supported
GVE	Importer (+)	H.2.3: Supported
POS	Importer (-)	H.2.3: Supported
REQ	Importer (+)	H.2.3: Supported
ROL	Importer (+)	H.2.3: Supported
VAC		H.2.3: Not supported
EPS		H.2.3: Not supported
Overall IQ	Importer (+)	H.2.3: Supported

Source: The author.

APPENDICES OF CHAPTER 5

Table C5.1: Estimation results of COC-integrated GKC models (aggregated sample)

Dependent variable GE_{it}	$\ln GDI_{it}$			$\ln GII_{it}$			$(d.\ln FLA_{it})$	$\ln FLA_{it}$	
	(1) FE	(2) DGMM-II	(3) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II	(7) FE	(8) DGMM-II	(9) SGMM-II
L1. GE_{it}		0.725 ^c (0.000)	0.739 ^c (0.000)		0.966 ^c (0.000)	0.981 ^c (0.000)		0.809 ^c (0.000)	0.900 ^c (0.000)
L2. GE_{it}		0.223 ^c (0.000)	0.244 ^c (0.000)					-0.114 (0.221)	-0.192 (0.412)
L1. $\ln GDP_{pc_{it}}$		0.115 ^a (0.078)	0.090 (0.441)		0.803 ^c (0.004)	0.539 (0.374)		-0.273 (0.176)	-0.458 (0.551)
L2. $\ln GDP_{pc_{it}}$		-0.079 ^b (0.042)	-0.064 (0.419)					0.071 (0.511)	0.280 (0.681)
L1. $\ln GDP_{pc^2_{it}}$		-0.013 (0.107)	-0.010 (0.482)		-0.081 ^c (0.007)	-0.054 (0.453)		0.029 (0.208)	0.046 (0.602)
L2. $\ln GDP_{pc^2_{it}}$		0.010 ^b (0.033)	0.008 (0.389)					-0.006 (0.673)	-0.022 (0.776)
L1. $\ln GDP_{pc^3_{it}}$		0.001 (0.130)	0.001 (0.492)		0.003 ^c (0.009)	0.002 (0.449)		-0.001 (0.277)	-0.001 (0.654)
L2. $\ln GDP_{pc^3_{it}}$		-0.001 ^b (0.023)	-0.001 (0.334)					0.001 (0.845)	0.001 (0.858)
$\ln GDP_{pc_{it}}$	0.329 ^c (0.000)			-1.815 ^b (0.034)			-0.033 (0.542)		
$\ln GDP_{pc^2_{it}}$	-0.032 ^c (0.002)			0.281 ^c (0.010)			0.004 (0.561)		
$\ln GDP_{pc^3_{it}}$	0.001 ^b (0.012)			-0.013 ^c (0.005)			-0.001 (0.659)		
$\ln TOI_{it}$	0.001 (0.963)	0.011 ^a (0.079)	0.015 ^a (0.059)	0.026 ^a (0.086)	-0.124 ^c (0.010)	-0.070 (0.314)	0.011 (0.142)	0.041 ^a (0.062)	0.054 (0.255)
$(d.\ln TOI_{it})$	0.009 ^b (0.034)	-0.002 (0.872)	-0.005 (0.768)	-0.007 (0.830)	-0.173 ^c (0.001)	-0.084 (0.245)	0.002 (0.515)	0.082 ^c (0.009)	0.078 (0.184)

rCOC.lnTOI _{it}	-0.001	0.001	0.001	-0.045	0.001	-0.010	-0.027 ^b	-0.002	0.001
(rCOC.dlnTOI _{it})	(0.893)	(0.405)	(0.825)	(0.154)	(0.914)	(0.480)	(0.018)	(0.767)	(0.973)
rTOI.COC _{it}	-0.003	0.003	0.002	-0.004	0.022	0.038	0.002	-0.020 ^b	-0.029
	(0.239)	(0.349)	(0.619)	(0.818)	(0.217)	(0.362)	(0.226)	(0.039)	(0.140)
lnURB _{it}	-0.055	-0.020	0.001	-1.508	-0.083	-0.193 ^a	-0.013	-0.130	-0.174
(d.lnURB _{it})	(0.894)	(0.658)	(0.973)	(0.606)	(0.793)	(0.099)	(0.948)	(0.440)	(0.290)
lnIFDI _{it}	0.004 ^a	-0.006 ^b	-0.004	0.020	-0.034 ^b	-0.002	0.003 ^a	-0.006	-0.010
	(0.074)	(0.030)	(0.479)	(0.286)	(0.044)	(0.954)	(0.088)	(0.540)	(0.717)
lnFER _{it}	0.042 ^b	0.020	0.023	0.327 ^c	0.202 ^a	0.018	0.010	-0.014	0.044
(d.lnFER _{it})	(0.034)	(0.324)	(0.343)	(0.006)	(0.056)	(0.872)	(0.536)	(0.839)	(0.640)
WTO _{it}	-0.027 ^c	-0.016	-0.029	-0.119 ^b	-0.221 ^a	-0.269 ^a	-0.002	-0.181 ^a	-0.195
	(0.000)	(0.717)	(0.656)	(0.019)	(0.098)	(0.061)	(0.537)	(0.095)	(0.333)
OECD _{it}	-0.010 ^b	-0.018	0.009	-0.125 ^b	-0.098	-0.052	-0.006	-0.040	-0.040
	(0.046)	(0.208)	(0.757)	(0.022)	(0.253)	(0.734)	(0.148)	(0.418)	(0.597)
GEFC _t	0.021 ^c	omitted	omitted	-0.193 ^c	omitted	omitted	-0.006	-0.017 ^b	0.009
	(0.000)			(0.000)			(0.153)	(0.028)	(0.686)
COVID _t	0.038 ^c	0.006 ^b	omitted	-0.469 ^c	0.022 ^a	omitted	0.003	-0.012	omitted
	(0.000)	(0.012)		(0.000)	(0.085)		(0.515)	(0.186)	
Constant	-1.110 ^c		-0.171	2.443		-0.781	0.070		2.204
	(0.000)		(0.616)	(0.282)		(0.676)	(0.628)		(0.310)
Observations	2,147	1,920	2,033	2,147	2,034	2,147	2,147	1,921	2,034
Groups	113	113	113	113	113	113	113	113	113
Instruments	-	72	77	-	72	73	-	71	73
R-squared	0.555	-	-	0.600	-	-	0.141	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	Y	-	-
F tests ¹	238.83 ^c	-	-	122.39 ^c	-	-	1.37 ^c	-	-
Hausman tests ² (chi2)	287.73 ^c	-	-	734.05 ^c	-	-	137.32 ^c	-	-
AR(1) (z)	-	-4.31 ^c	-3.88 ^c	-	-4.71 ^c	-4.89 ^c	-	-4.39 ^c	-2.83 ^c
AR(1) (p)	-	0.000	0.000	-	0.000	0.000	-	0.000	0.005
AR(2) (z)	-	-0.95	-0.79	-	-0.76	-0.68	-	-1.42	-0.69
AR(2) (p)	-	0.340	0.432	-	0.447	0.498	-	0.155	0.490
Hansen test (chi2)	-	39.54	44.23	-	49.51	52.82	-	47.20	48.55

Hansen test (p)	-	0.401	0.378	-	0.170	0.102	-	0.121	0.117

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include income per capita and its squared and cubic forms.

Source: The author.

Table C5.2: Estimation results of GVE-integrated GKC models (aggregated sample)

Dependent variable GE_{it}	$\ln GDI_{it}$			$\ln GII_{it}$			$(d.\ln FLA_{it})$	$\ln FLA_{it}$	
	(1) FE	(2) DGMM-II	(3) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II	(7) FE	(8) DGMM-II	(9) SGMM-II
L1. GE_{it}		0.612 ^c (0.000)			1.090 ^c (0.000)	0.982 ^c (0.000)		0.440 ^c (0.000)	0.869 ^c (0.000)
L2. GE_{it}		0.187 ^c (0.000)	0.157 (0.244)		-0.130 ^c (0.000)				-0.156 ^b (0.019)
L1. $\ln GDP_{pcit}$		0.018 (0.746)	0.363 ^b (0.043)		-0.313 (0.472)	-0.108 (0.841)		-0.251 (0.336)	0.105 (0.789)
L2. $\ln GDP_{pcit}$					0.403 ^a (0.086)				
L1. $\ln GDP_{pc}^2_{it}$		-0.001 (0.910)	-0.039 ^a (0.053)		0.045 (0.360)	0.022 (0.730)		0.027 (0.370)	-0.012 (0.794)
L2. $\ln GDP_{pc}^2_{it}$					-0.049 ^a (0.079)				
L1. $\ln GDP_{pc}^3_{it}$		-0.001 (0.925)	0.001 ^a (0.065)		-0.002 (0.273)	-0.001 (0.719)		-0.001 (0.464)	0.001 (0.745)
L2. $\ln GDP_{pc}^3_{it}$					0.002 ^a (0.057)				
$\ln GDP_{pcit}$	0.326 ^c (0.000)			-1.832 ^b (0.032)			-0.019 (0.730)		
$\ln GDP_{pc}^2_{it}$	-0.032 ^c (0.002)			0.283 ^c (0.010)			0.002 (0.783)		
$\ln GDP_{pc}^3_{it}$	0.001 ^b (0.013)			-0.013 ^c (0.004)			-0.001 (0.901)		
$\ln TOI_{it}$	0.001 (0.918)	0.006 (0.292)	-0.037 (0.169)	0.026 ^a (0.086)	-0.138 ^c (0.007)	-0.038 (0.451)	0.008 (0.200)	0.005 (0.853)	0.009 (0.834)
$(d.\ln TOI_{it})$									
GVE_{it}	-0.001 (0.909)	-0.018 ^b (0.020)	0.013 (0.525)	-0.011 (0.719)	-0.117 ^a (0.056)	-0.061 (0.233)	0.008 ^a (0.087)	-0.128 ^c (0.002)	-0.021 (0.503)
$rGVE.\ln TOI_{it}$	0.004 (0.415)	-0.002 (0.141)	-0.004 (0.528)	-0.051 (0.195)	-0.013 (0.370)	-0.025 (0.211)	-0.013 (0.336)	0.032 ^c (0.007)	0.027 (0.207)

rTOI.GVE _{it}	-0.003 (0.347)	0.004 (0.104)	-0.001 (0.961)	0.006 (0.789)	0.013 (0.585)	0.049 (0.223)	0.001 (0.578)	-0.058 ^c (0.002)	0.001 (0.957)
lnURB _{it} (d.lnURB _{it})	-0.049 (0.906)	0.102 ^b (0.024)	0.032 (0.623)	-1.584 (0.587)	0.235 (0.534)	0.012 (0.863)	0.005 (0.980)	0.129 (0.584)	-0.148 (0.258)
lnIFDI _{it}	0.004 ^a (0.063)	-0.010 ^c (0.001)	-0.005 (0.566)	0.020 (0.267)	-0.048 ^b (0.017)	0.011 (0.669)	0.003 (0.110)	-0.019 (0.134)	-0.013 (0.629)
lnFER _{it} (d.lnFER _{it})	0.041 ^b (0.036)	0.038 ^b (0.017)	-0.053 (0.249)	0.328 ^c (0.006)	0.250 (0.105)	0.065 (0.436)	0.013 (0.447)	0.262 ^c (0.003)	0.062 (0.599)
WTO _{it}	-0.026 ^c (0.000)	-0.056 (0.205)	-0.144 (0.457)	-0.119 ^b (0.022)	-0.380 ^b (0.015)	0.074 (0.707)	-0.003 (0.314)	-0.020 (0.856)	-0.082 (0.548)
OECD _{it}	-0.009 ^b (0.047)	-0.021 (0.101)	-0.017 (0.652)	-0.122 ^b (0.026)	-0.165 ^a (0.091)	-0.094 (0.402)	-0.007 (0.107)	-0.067 (0.211)	-0.040 (0.435)
GEFC _t	0.019 ^c (0.000)	-0.008 ^c (0.002)	omitted	-0.193 ^c (0.000)	0.008 (0.831)	omitted	-0.005 (0.207)	-0.037 ^a (0.063)	-0.007 (0.487)
COVID _t	0.036 ^c (0.000)	0.002 (0.126)	omitted	-0.470 ^c (0.000)	omitted	omitted	0.003 (0.419)	-0.023 ^c (0.000)	omitted
Constant	-1.114 ^c (0.000)		-0.918 ^a (0.066)	2.482 (0.272)		-0.155 (0.917)	0.042 (0.766)		1.323 (0.437)
Observations	2,147	1,920	2,033	2,147	1,921	2,147	2,147	2,034	2,034
Groups	113	113	113	113	113	113	113	113	113
Instruments	-	72	77	-	72	77	-	68	78
R-squared	0.552	-	-	0.600	-	-	0.141	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	Y	-	-
F tests ¹	237.51 ^c	-	-	116.42 ^c	-	-	1.42 ^c	-	-
Hausman tests ² (chi2)	44.48 ^c	-	-	494.07 ^c	-	-	134.50 ^c	-	-
AR(1) (z)	-	-4.03 ^c	-3.10 ^c	-	-5.00 ^c	-4.92 ^c	-	-3.69 ^c	-4.05 ^c
AR(1) (p)	-	0.000	0.002	-	0.000	0.000	-	0.000	0.000
AR(2) (z)	-	-0.97	-1.55	-	-0.15	-1.02	-	-1.59	-1.54
AR(2) (p)	-	0.331	0.121	-	0.882	0.307	-	0.112	0.124
Hansen test (chi2)	-	42.70	40.44	-	46.61	57.30	-	41.18	56.62
Hansen test (p)	-	0.398	0.704	-	0.159	0.103	-	0.293	0.136

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include income per capita and its squared and cubic forms.

Source: The author.

Table C5.3: Estimation results of POS-integrated GKC models (aggregated sample)

Dependent variable GE_{it}	$\ln GDI_{it}$			$\ln GII_{it}$			$(d.\ln FLA_{it})$	$\ln FLA_{it}$	
	(1) FE	(2) DGMM-II	(3) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II	(7) FE	(8) DGMM-II	(9) SGMM-II
L1. GE_{it}		0.699 ^c (0.000)	0.715 ^c (0.000)		0.980 ^c (0.000)	1.117 ^c (0.000)		0.576 ^c (0.000)	0.984 ^c (0.000)
L2. GE_{it}		0.193 ^c (0.000)	0.226 ^c (0.000)			-0.125 ^b (0.023)		-0.064 ^b (0.045)	-0.153 ^b (0.019)
L1. $\ln GDP_{pc_{it}}$		0.146 ^b (0.013)	0.113 (0.323)		0.613 ^a (0.091)	0.381 (0.569)		-0.042 (0.800)	
L2. $\ln GDP_{pc_{it}}$		-0.100 ^c (0.010)	-0.076 (0.338)			-0.001 (0.999)			-0.192 (0.185)
L1. $\ln GDP_{pc^2_{it}}$		-0.015 ^b (0.026)	-0.012 (0.364)		-0.059 (0.156)	-0.031 (0.705)		0.005 (0.806)	
L2. $\ln GDP_{pc^2_{it}}$		0.012 ^c (0.010)	0.009 (0.322)			-0.006 (0.924)			0.022 (0.174)
L1. $\ln GDP_{pc^3_{it}}$		0.001 ^b (0.038)	0.001 (0.382)		0.002 (0.239)	0.001 (0.790)		-0.001 (0.972)	
L2. $\ln GDP_{pc^3_{it}}$		-0.001 ^c (0.008)	-0.001 (0.288)			0.000 (0.842)			-0.001 (0.175)
$\ln GDP_{pc_{it}}$	0.331 ^c (0.000)			-1.826 ^b (0.034)			-0.036 (0.491)		
$\ln GDP_{pc^2_{it}}$	-0.032 ^c (0.002)			0.282 ^c (0.010)			0.004 (0.513)		
$\ln GDP_{pc^3_{it}}$	0.001 ^b (0.013)			-0.013 ^c (0.005)			-0.001 (0.618)		
$\ln TOI_{it}$	0.002 (0.416)	0.008 (0.168)	0.013 (0.106)	0.025 (0.102)	-0.117 ^b (0.019)	-0.038 (0.429)	0.010 (0.170)	0.017 (0.273)	0.002 (0.895)
POS_{it}	-0.004 (0.201)	-0.008 (0.145)	0.002 (0.904)	-0.011 (0.614)	-0.113 ^b (0.022)	-0.122 ^a (0.066)	-0.001 (0.866)	-0.049 ^c (0.000)	-0.035 (0.201)
$rPOS.\ln TOI_{it}$	-0.003 (0.489)	0.001 (0.727)	0.001 (0.796)	-0.030 (0.330)	0.004 (0.644)	0.019 (0.242)	-0.016 (0.155)	-0.003 (0.421)	-0.001 (0.990)

rTOI.POS _{it}	0.004 (0.144)	0.005 ^a (0.078)	0.003 (0.686)	0.016 (0.457)	0.092 ^c (0.005)	0.113 ^a (0.052)	0.002 (0.140)	-0.020 ^b (0.047)	0.026 (0.450)
lnURB _{it} (d.lnURB _{it})	-0.059 (0.884)	-0.002 (0.935)	0.008 (0.758)	-1.609 (0.582)	-0.206 (0.649)	-0.008 (0.919)	-0.023 (0.908)	-0.121 (0.334)	-0.108 (0.123)
lnIFDI _{it}	0.004 ^a (0.056)	-0.005 ^a (0.052)	-0.005 (0.318)	0.020 (0.282)	-0.017 (0.380)	-0.010 (0.687)	0.003 ^a (0.095)	0.000 (0.990)	0.002 (0.922)
lnFER _{it} (d.lnFER _{it})	0.043 ^b (0.024)	0.012 (0.474)	0.021 (0.434)	0.330 ^c (0.005)	0.192 (0.129)	0.110 (0.266)	0.009 (0.584)	0.016 (0.799)	-0.086 (0.177)
WTO _{it}	-0.027 ^c (0.000)	-0.037 (0.464)	-0.059 (0.391)	-0.118 ^b (0.024)	-0.138 (0.419)	-0.209 (0.390)	-0.001 (0.864)	-0.077 (0.254)	0.053 (0.625)
OECD _{it}	-0.008 ^a (0.064)	-0.012 (0.328)	0.002 (0.894)	-0.125 ^b (0.021)	-0.106 (0.291)	-0.077 (0.413)	-0.007 (0.152)	0.042 (0.320)	0.018 (0.736)
GEFC _t	0.018 ^c (0.000)	omitted	omitted	-0.193 ^c (0.000)	omitted	-0.042 ^c (0.005)	-0.006 (0.100)	omitted	omitted
COVID _t	0.035 ^c (0.000)	0.004 ^a (0.085)	omitted	-0.470*** (0.000)	0.007 (0.898)	omitted	0.002 (0.667)	-0.034 ^c (0.000)	-0.032 ^b (0.044)
Constant	-1.130 ^c (0.000)		-0.185 (0.595)	2.473 (0.278)		-1.143 (0.423)	0.077 (0.580)		1.628 (0.118)
Observations	2,147	1,920	2,033	2,147	2,034	2,034	2,147	1,921	2,034
Groups	113	113	113	113	113	113	113	113	113
Instruments	-	72	77	-	72	77	-	72	78
R-squared	0.553	-	-	0.600	-	-	0.139	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	Y	-	-
F tests ¹	217.95 ^c	-	-	122.59 ^c	-	-	1.30 ^b	-	-
Hausman tests ² (chi2)	267.66 ^c	-	-	1,512.99 ^c	-	-	126.20 ^c	-	-
AR(1) (z)	-	-4.39 ^c	-3.70 ^c	-	-4.80 ^c	-4.70 ^c	-	-4.06 ^c	-4.06 ^c
AR(1) (p)	-	0.000	0.000	-	0.000	0.000	-	0.000	0.000
AR(2) (z)	-	-0.32	-0.54	-	-1.00	-0.41	-	-1.46	-1.61
AR(2) (p)	-	0.750	0.586	-	0.316	0.681	-	0.143	0.106
Hansen test (chi2)	-	41.68	45.47	-	49.93	51.13	-	52.14	56.87
Hansen test (p)	-	0.314	0.330	-	0.160	0.158	-	0.114	0.131

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include income per capita and its squared and cubic forms.

Source: The author.

Table C5.4: Estimation results of REQ-integrated GKC models (aggregated sample)

Dependent variable GE_{it}	$\ln GDI_{it}$			$\ln GII_{it}$			$(d.\ln FLA_{it})$	$\ln FLA_{it}$	
	(1) FE	(2) DGMM-II	(3) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II	(7) FE	(8) DGMM-II	(9) SGMM-II
L1. GE_{it}		0.712 ^c (0.000)	0.705 ^c (0.000)		0.942 ^c (0.000)	1.033 ^c (0.000)		1.050 ^c (0.000)	0.972 ^c (0.000)
L2. GE_{it}		0.184 ^c (0.000)	0.227 ^c (0.000)		-0.115 ^c (0.000)	-0.113 ^a (0.091)		-0.322 ^c (0.007)	-0.011 (0.955)
L1. $\ln GDP_{pc_{it}}$		0.165 ^b (0.030)	0.090 (0.406)		-0.165 (0.708)	2.071 (0.163)		-0.303 (0.224)	-0.083 (0.903)
L2. $\ln GDP_{pc_{it}}$		-0.058 (0.187)			0.332 ^a (0.097)	-2.084 (0.111)		0.256 ^a (0.067)	0.235 (0.754)
L1. $\ln GDP_{pc^2_{it}}$		-0.018 ^b (0.042)	-0.009 (0.459)		0.032 (0.525)	-0.208 (0.197)		0.035 (0.240)	0.004 (0.958)
L2. $\ln GDP_{pc^2_{it}}$		0.007 (0.169)			-0.041 ^a (0.082)	0.221 (0.114)		-0.028 ^a (0.091)	-0.016 (0.847)
L1. $\ln GDP_{pc^3_{it}}$		0.001 ^b (0.041)	0.001 (0.504)		-0.002 (0.407)	0.007 (0.225)		-0.001 (0.320)	0.000 (0.955)
L2. $\ln GDP_{pc^3_{it}}$		-0.001 (0.124)			0.002 ^b (0.045)	-0.008 (0.123)		0.001 (0.150)	0.000 (0.922)
$\ln GDP_{pc_{it}}$	0.332 ^c (0.000)			-1.736 ^b (0.046)			-0.041 (0.442)		
$\ln GDP_{pc^2_{it}}$	-0.033 ^c (0.002)			0.272 ^b (0.014)			0.005 (0.476)		
$\ln GDP_{pc^3_{it}}$	0.001 ^b (0.012)			-0.013 ^c (0.007)			-0.001 (0.577)		
$\ln TOI_{it}$	0.001 (0.843)	0.004 (0.568)	0.005 (0.504)	0.029 ^a (0.081)	-0.095 ^a (0.077)	-0.098 ^a (0.075)	0.006 (0.259)	0.084 ^c (0.002)	0.065 ^a (0.096)
REQ_{it}	-0.001 (0.907)	-0.015 (0.106)	-0.002 (0.813)	-0.060 (0.200)	-0.095 ^b (0.040)	-0.106 (0.265)	0.005 (0.287)	-0.161 ^c (0.000)	-0.105 ^b (0.035)
$rREQ.\ln TOI_{it}$	0.003 (0.575)	0.003 ^a (0.051)	0.002 (0.451)	-0.051 (0.173)	-0.018 (0.322)	-0.002 (0.894)	0.002 (0.902)	0.016 ^b (0.045)	0.024 ^b (0.033)

CCXXX

rTOI.REQ _{it}	-0.003 (0.318)	0.001 (0.975)	0.004 (0.485)	-0.018 (0.430)	0.023 (0.318)	0.043 (0.375)	0.002 (0.332)	-0.019 ^a (0.099)	-0.006 (0.742)
lnURB _{it} (d.lnURB _{it})	-0.037 (0.928)	-0.031 (0.493)	-0.010 (0.705)	-1.400 (0.627)	0.621 (0.223)	-0.053 (0.607)	-0.030 (0.877)	0.189 (0.229)	-0.102 (0.469)
lnIFDI _{it}	0.004 ^a (0.071)	-0.006 ^b (0.047)	-0.008 (0.175)	0.021 (0.257)	-0.044 ^b (0.044)	0.043 (0.250)	0.003 ^a (0.091)	-0.031 ^c (0.002)	-0.012 (0.507)
lnFER _{it} (d.lnFER _{it})	0.041 ^b (0.036)	0.004 (0.877)	0.009 (0.730)	0.325 ^c (0.006)	0.202 (0.111)	0.092 (0.213)	0.011 (0.527)	0.052 (0.562)	0.027 (0.785)
WTO _{it}	-0.027 ^c (0.000)	-0.010 (0.852)	-0.061 (0.416)	-0.122 ^c (0.009)	-0.282 (0.107)	-0.023 (0.911)	-0.001 (0.712)	-0.095 (0.366)	0.016 (0.918)
OECD _{it}	-0.009 ^b (0.040)	-0.022 (0.210)	0.003 (0.851)	-0.127 ^b (0.021)	-0.097 (0.338)	-0.123 (0.259)	-0.006 (0.135)	0.023 (0.702)	0.026 (0.694)
GEFC _t	0.019 ^c (0.000)	-0.004 ^b (0.046)	omitted	-0.201 ^c (0.000)	omitted	-0.045 ^b (0.042)	-0.006 (0.116)	omitted	-0.027 ^a (0.073)
COVID _t	0.036 ^c (0.000)	0.004 (0.170)	omitted	-0.482 ^c (0.000)	omitted	omitted	0.002 (0.553)	-0.009 (0.450)	omitted
Constant	-1.128 ^c (0.000)		-0.215 (0.534)	2.184 (0.347)		-0.034 (0.981)	0.095 (0.498)		-0.451 (0.766)
Observations	2,147	1,920	2,033	2,147	1,921	2,034	2,147	1,921	2,034
Groups	113	113	113	113	113	113	113	113	113
Instruments	-	72	77	-	72	74	-	71	73
R-squared	0.552	-	-	0.603	-	-	0.139	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	Y	-	-
F tests ¹	231.68 ^c	-	-	123.22 ^c	-	-	1.39 ^c	-	-
Hausman tests ² (chi2)	187.05 ^c	-	-	600.21 ^c	-	-	121.76 ^c	-	-
AR(1) (z)	-	-4.58 ^c	-3.75 ^c	-	-4.73 ^c	-4.30 ^c	-	-4.54 ^c	-3.09 ^c
AR(1) (p)	-	0.000	0.000	-	0.000	0.000	-	0.000	0.002
AR(2) (z)	-	-0.52	-0.88	-	0.13	-0.17	-	-0.60	-1.87 ^a
AR(2) (p)	-	0.606	0.381	-	0.900	0.864	-	0.547	0.062
Hansen test (chi2)	-	33.90	44.48	-	45.51	46.42	-	47.90	46.29
Hansen test (p)	-	0.659	0.494	-	0.188	0.193	-	0.108	0.167

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include income per capita and its squared and cubic forms.

Source: The author.

Table C5.5: Estimation results of ROL-integrated GKC models (aggregated sample)

Dependent variable GE_{it}	$\ln GDI_{it}$			$\ln GII_{it}$			$(d.\ln FLA_{it})$	$\ln FLA_{it}$	
	(1) FE	(2) DGMM-II	(3) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II	(7) FE	(8) DGMM-II	(9) SGMM-II
L1. GE_{it}		0.706 ^c (0.000)	0.696 ^c (0.000)		1.073 ^c (0.000)	0.982 ^c (0.000)		0.703 ^c (0.000)	0.786 ^c (0.000)
L2. GE_{it}		0.203 ^c (0.000)	0.230 ^c (0.000)		-0.112 ^c (0.000)			-0.101 (0.430)	0.159 (0.418)
L1. $\ln GDP_{pc_{it}}$		0.159 ^b (0.011)	0.062 (0.436)		1.968 ^b (0.029)	2.500 ^a (0.076)		0.517 (0.312)	0.305 (0.698)
L2. $\ln GDP_{pc_{it}}$		-0.092 ^c (0.009)	-0.064 (0.359)		-1.580 ^a (0.088)	-2.308 ^a (0.080)		-0.262 (0.598)	-0.142 (0.837)
L1. $\ln GDP_{pc^2_{it}}$		-0.018 ^b (0.020)	-0.006 (0.551)		-0.200 ^b (0.035)	-0.258 ^a (0.096)		-0.068 (0.227)	-0.036 (0.669)
L2. $\ln GDP_{pc^2_{it}}$		0.011 ^c (0.009)	0.007 (0.365)		0.168 ^a (0.085)	0.246 ^a (0.089)		0.035 (0.519)	0.019 (0.791)
L1. $\ln GDP_{pc^3_{it}}$		0.001 ^b (0.031)	0.001 (0.632)		0.007 ^b (0.047)	0.009 (0.112)		0.003 (0.139)	0.002 (0.599)
L2. $\ln GDP_{pc^3_{it}}$		-0.001 ^c (0.008)	-0.001 (0.349)		-0.006 (0.105)	-0.009 (0.105)		-0.001 (0.499)	-0.001 (0.745)
$\ln GDP_{pc_{it}}$	0.330 ^c (0.000)			-1.815 ^b (0.034)			-0.030 (0.573)		
$\ln GDP_{pc^2_{it}}$	-0.032 ^c (0.002)			0.280 ^c (0.010)			0.004 (0.588)		
$\ln GDP_{pc^3_{it}}$	0.001 ^b (0.012)			-0.013 ^c (0.005)			-0.001 (0.680)		
$\ln TOI_{it}$	0.001 (0.674)	0.011 ^a (0.080)	0.010 ^b (0.037)	0.021 (0.161)	-0.111 ^b (0.022)	-0.081 (0.279)	0.012 (0.138)	0.036 ^a (0.082)	0.051 (0.130)
ROL_{it}	0.003 (0.641)	-0.006 (0.523)	0.001 (0.907)	0.039 (0.316)	-0.070 (0.306)	-0.106 (0.152)	0.003 (0.451)	-0.131 ^c (0.000)	-0.050 ^a (0.073)
$rROL.\ln TOI_{it}$	-0.002 (0.726)	0.001 (0.556)	-0.001 (0.343)	-0.033 (0.312)	-0.003 (0.837)	-0.012 (0.429)	-0.030 ^c (0.009)	-0.004 (0.410)	0.001 (0.908)

rTOI.ROL _{it}	-0.002 (0.559)	0.002 (0.449)	0.001 (0.792)	-0.004 (0.836)	0.054 ^c (0.010)	0.056 (0.197)	0.002 (0.175)	-0.022 ^a (0.054)	0.001 (0.977)
lnURB _{it} (d.lnURB _{it})	-0.050 (0.903)	0.017 (0.644)	0.005 (0.637)	-1.647 (0.574)	-0.429 (0.240)	-0.075 (0.438)	-0.032 (0.869)	0.255 (0.126)	-0.054 (0.633)
lnIFDI _{it}	0.004 ^a (0.056)	-0.006 ^b (0.020)	-0.004 (0.361)	0.020 (0.285)	-0.007 (0.739)	0.046 ^a (0.069)	0.003 ^a (0.085)	-0.015 (0.136)	0.016 (0.245)
lnFER _{it} (d.lnFER _{it})	0.042 ^b (0.032)	0.033 ^b (0.026)	0.011 (0.386)	0.339 ^c (0.005)	-0.089 (0.480)	0.109 (0.170)	0.011 (0.526)	0.110 (0.228)	0.064 (0.451)
WTO _{it}	-0.027 ^c (0.000)	-0.051 (0.337)	-0.037 (0.187)	-0.123 ^b (0.022)	-0.202 (0.325)	-0.164 (0.430)	-0.002 (0.523)	-0.001 (0.991)	0.039 (0.688)
OECD _{it}	-0.009 ^a (0.058)	-0.007 (0.643)	0.008 (0.527)	-0.128 ^b (0.020)	-0.241 ^b (0.040)	-0.036 (0.753)	-0.006 (0.155)	0.125 ^a (0.084)	-0.022 (0.501)
GEFC _t	0.019 ^c (0.000)	-0.004 ^a (0.055)	omitted	-0.185 ^c (0.000)	0.042 (0.342)	-0.056 ^b (0.023)	-0.006 (0.141)	0.021 ^b (0.022)	-0.030 ^c (0.007)
COVID _t	0.037 ^c (0.000)	0.006 ^b (0.016)	omitted	-0.462 ^c (0.000)	omitted	omitted	0.003 (0.539)	-0.025 ^b (0.032)	omitted
Constant	-1.119 ^c (0.000)		-0.068 (0.692)	2.491 (0.272)		-0.494 (0.698)	0.062 (0.663)		-0.556 (0.636)
Observations	2,147	1,920	2,033	2,147	1,921	2,034	2,147	1,921	2,034
Groups	113	113	113	113	113	113	113	113	113
Instruments	-	72	81	-	69	77	-	68	77
R-squared	0.551	-	-	0.600	-	-	0.142	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	Y	-	-
F tests ¹	237.58 ^c	-	-	123.73 ^c	-	-	1.34 ^b	-	-
Hausman tests ² (chi2)	278.95 ^c	-	-	738.41 ^c	-	-	135.81 ^c	-	-
AR(1) (z)	-	-4.32 ^c	-3.80 ^c	-	-4.93 ^c	-4.88 ^c	-	-3.42 ^c	-2.02 ^b
AR(1) (p)	-	0.000	0.000	-	0.000	0.000	-	0.001	0.044
AR(2) (z)	-	-0.60	-0.82	-	-0.32	-0.92	-	-1.28	-1.90 ^a
AR(2) (p)	-	0.548	0.411	-	0.748	0.360	-	0.200	0.058
Hansen test (chi2)	-	44.27	46.59	-	44.31	54.66	-	37.02	53.03
Hansen test (p)	-	0.224	0.448	-	0.134	0.110	-	0.331	0.118

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include income per capita and its squared and cubic forms.

Source: The author.

Table C5.6: Estimation results of VAC-integrated GKC models (aggregated sample)

Dependent variable GE_{it}	$\ln GDI_{it}$			$\ln GII_{it}$			$(d.\ln FLA_{it})$	$\ln FLA_{it}$	
	(1) FE	(2) DGMM-II	(3) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II	(7) FE	(8) DGMM-II	(9) SGMM-II
L1. GE_{it}		0.685 ^c (0.000)	0.702 ^c (0.000)		0.964 ^c (0.000)	0.948 ^c (0.000)		1.043 ^c (0.000)	0.903 ^c (0.000)
L2. GE_{it}		0.208 ^c (0.000)	0.238 ^c (0.000)					-0.363 ^c (0.000)	0.010 (0.965)
L1. $\ln GDP_{pcit}$		0.173 ^b (0.024)	0.039 (0.703)		0.813 ^c (0.006)	-0.391 (0.470)			0.106 (0.723)
L2. $\ln GDP_{pcit}$		-0.085 ^b (0.031)	-0.047 (0.477)					0.061 (0.320)	0.077 (0.568)
L1. $\ln GDP_{pc}^2_{it}$		-0.019 ^b (0.035)	-0.003 (0.787)		-0.080 ^b (0.013)	0.052 (0.426)			-0.012 (0.728)
L2. $\ln GDP_{pc}^2_{it}$		0.010 ^b (0.027)	0.006 (0.464)					-0.006 (0.447)	-0.007 (0.688)
L1. $\ln GDP_{pc}^3_{it}$		0.001 ^b (0.046)	0.001 (0.857)		0.003 ^b (0.020)	-0.002 (0.420)			0.001 (0.643)
L2. $\ln GDP_{pc}^3_{it}$		-0.001 ^b (0.019)	-0.001 (0.441)					0.001 (0.605)	0.001 (0.879)
$\ln GDP_{pcit}$	0.323 ^c (0.000)			-1.826 ^b (0.033)			-0.031 (0.581)		
$\ln GDP_{pc}^2_{it}$	-0.032 ^c (0.002)			0.282 ^c (0.010)			0.004 (0.599)		
$\ln GDP_{pc}^3_{it}$	0.001 ^b (0.017)			-0.013 ^c (0.005)			-0.001 (0.708)		
$\ln TOI_{it}$	0.002 (0.414)	0.007 (0.351)	0.011 ^b (0.042)	0.025 ^a (0.071)	-0.163 ^c (0.002)	-0.063 (0.290)	0.008 (0.176)	0.033 ^a (0.051)	0.061 (0.105)
VAC_{it}	-0.011 (0.321)	-0.004 (0.600)	0.005 (0.693)	-0.009 (0.790)	-0.091 ^b (0.035)	0.040 (0.528)	0.005 (0.492)	0.014 (0.408)	0.010 (0.643)
$rVAC.\ln TOI_{it}$	-0.007 ^a (0.098)	0.001 (0.677)	0.001 (0.884)	-0.042 (0.195)	-0.001 (0.912)	-0.003 (0.879)	-0.007 (0.560)	0.017 ^c (0.001)	0.010 (0.166)

rTOI.VAC _{it}	0.010	-0.001	-0.002	-0.007	0.025	0.077 ^a	-0.011	-0.044 ^c	-0.034 ^a
(rTOI.dVAC _{it})	(0.352)	(0.969)	(0.666)	(0.877)	(0.176)	(0.073)	(0.306)	(0.000)	(0.087)
lnURB _{it}	-0.045	-0.006	0.002	-1.571	-0.438	-0.039	-0.023	0.003	-0.011
(d.lnURB _{it})	(0.912)	(0.848)	(0.901)	(0.593)	(0.175)	(0.616)	(0.906)	(0.976)	(0.923)
lnIFDI _{it}	0.004 ^a	-0.006 ^b	-0.004	0.020	-0.037 ^b	0.024	0.003 ^a	-0.012	0.002
	(0.061)	(0.034)	(0.347)	(0.290)	(0.037)	(0.406)	(0.098)	(0.202)	(0.925)
lnFER _{it}	0.042 ^b	0.035 ^b	0.014	0.330 ^c	0.062	0.093	0.011	0.121 ^b	0.121 ^a
(d.lnFER _{it})	(0.030)	(0.028)	(0.267)	(0.005)	(0.554)	(0.256)	(0.532)	(0.015)	(0.071)
WTO _{it}	-0.027 ^c	-0.055	-0.040	-0.121 ^b	-0.272 ^a	-0.104	-0.001	-0.079	-0.023
	(0.000)	(0.349)	(0.172)	(0.022)	(0.058)	(0.671)	(0.608)	(0.527)	(0.822)
OECD _{it}	-0.008 ^a	-0.012	0.005	-0.124 ^b	-0.102	-0.260 ^b	-0.006	0.001	-0.039
	(0.077)	(0.334)	(0.677)	(0.022)	(0.255)	(0.024)	(0.155)	(0.982)	(0.353)
GEFC _t	0.019 ^c	omitted	omitted	-0.191 ^c	-0.027	omitted	-0.007	omitted	-0.010
	(0.000)			(0.000)	(0.127)		(0.106)		(0.356)
COVID _t	0.037 ^c	0.007 ^c	omitted	-0.467 ^c	-0.005	omitted	0.001	-0.009	omitted
	(0.000)	(0.002)		(0.000)	(0.913)		(0.765)	(0.220)	
Constant	-1.104 ^c		-0.040	2.485		1.207	0.061		-0.610
	(0.000)		(0.839)	(0.273)		(0.431)	(0.678)		(0.653)
Observations	2,147	1,920	2,033	2,147	2,034	2,147	2,147	1,921	2,034
Groups	113	113	113	113	113	113	113	113	113
Instruments	-	72	81	-	72	74	-	71	77
R-squared	0.552	-	-	0.600	-	-	0.138	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	Y	-	-
F tests ¹	241.51 ^c	-	-	129.65 ^c	-	-	1.36 ^c	-	-
Hausman tests ² (chi2)	282.05 ^c	-	-	1,200.52 ^c	-	-	112.71 ^c	-	-
AR(1) (z)	-	-4.26 ^c	-3.82 ^c	-	-4.74 ^c	-4.79 ^c	-	-4.95 ^c	-2.44 ^b
AR(1) (p)	-	0.000	0.000	-	0.000	0.000	-	0.000	0.015
AR(2) (z)	-	-0.80	-0.92	-	-0.85	-0.94	-	-0.96	-1.57
AR(2) (p)	-	0.425	0.356	-	0.395	0.347	-	0.335	0.116
Hansen test (chi2)	-	46.94	48.50	-	52.69	52.91	-	52.33 ^a	53.69
Hansen test (p)	-	0.152	0.372	-	0.104	0.121	-	0.092	0.107

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include income per capita and its squared and cubic forms.

Source: The author.

Table C5.7: Estimation results of high COC-integrated GKC models

Dependent variable GE_{it}	$\ln GDI_{it}$			$\ln GII_{it}$			$(d.\ln FLA_{it})$	$\ln FLA_{it}$	
	(1) FE	(2) DGMM-II	(3) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II	(7) FE	(8) DGMM-II	(9) SGMM-II
L1. GE_{it}		0.362 ^c (0.000)	0.550 ^b (0.029)		0.684 ^c (0.000)	0.948 ^c (0.000)		0.834 ^c (0.000)	0.979 ^c (0.000)
L2. GE_{it}		0.153 ^c (0.000)							-0.043 (0.532)
L1. $\ln GDP_{pcit}$		0.159 ^c (0.005)	0.103 (0.699)		1.657 ^c (0.000)	0.644 (0.466)		0.266 ^a (0.060)	
L2. $\ln GDP_{pcit}$									-0.737 ^a (0.053)
L1. $\ln GDP_{pc}^2_{it}$		-0.016 ^b (0.017)	-0.009 (0.764)		-0.197 ^c (0.000)	-0.068 (0.493)		-0.030 ^b (0.050)	
L2. $\ln GDP_{pc}^2_{it}$									0.085 ^b (0.044)
L1. $\ln GDP_{pc}^3_{it}$		0.001 ^b (0.041)	0.001 (0.798)		0.008 ^c (0.000)	0.003 (0.450)		0.001 ^b (0.019)	
L2. $\ln GDP_{pc}^3_{it}$									-0.003 ^b (0.046)
$\ln GDP_{pcit}$	0.141 (0.276)			-2.735 ^b (0.048)			-0.177 (0.205)		
$\ln GDP_{pc}^2_{it}$	-0.010 (0.477)			0.411 ^b (0.014)			0.020 (0.201)		
$\ln GDP_{pc}^3_{it}$	0.001 (0.677)			-0.018 ^c (0.008)			-0.001 (0.205)		
$\ln TOI_{it}$	0.002 (0.633)	-0.014 ^c (0.002)	-0.038 ^b (0.035)	0.021 (0.664)	-0.055 (0.258)	-0.168 (0.334)	0.002 (0.834)	0.030 ^b (0.024)	0.024 (0.624)
$(d.\ln TOI_{it})$									
COC_{it}	-0.001 (0.902)	-0.018 ^c (0.000)	0.001 (0.927)	0.001 (0.985)	-0.090 ^b (0.011)	-0.024 (0.827)	0.003 (0.586)	-0.060 ^c (0.000)	-0.006 (0.863)
$rTOI.COC_{it}$	-0.003 ^b (0.037)	0.004 (0.359)	0.001 (0.925)	-0.015 (0.485)	-0.070 ^c (0.004)	-0.071 (0.502)	0.002 (0.412)	-0.044 ^c (0.000)	-0.032 (0.386)

lnURB _{it}	-0.458 ^a	0.207 ^c	-0.042	-4.792	2.853 ^c	0.274	-0.060	0.367 ^c	-0.121
(d.lnURB _{it})	(0.071)	(0.000)	(0.429)	(0.298)	(0.000)	(0.465)	(0.850)	(0.000)	(0.351)
lnIFDI _{it}	0.005 ^b	-0.010 ^c	-0.011	-0.024	-0.074 ^c	-0.050	0.006	-0.004	0.023
	(0.038)	(0.000)	(0.312)	(0.530)	(0.000)	(0.422)	(0.178)	(0.499)	(0.236)
lnFER _{it}	0.018	-0.007	-0.071	0.350 ^b	0.856 ^c	0.300	0.027	0.121 ^c	-0.011
(d.lnFER _{it})	(0.153)	(0.684)	(0.167)	(0.028)	(0.000)	(0.229)	(0.243)	(0.002)	(0.896)
WTO _{it}	omitted	omitted	-0.096	omitted	omitted	-0.045	omitted	omitted	0.101
			(0.804)			(0.984)			(0.796)
OECD _{it}	-0.006	-0.003	-0.013	-0.111 ^b	-0.141 ^c	-0.291 ^b	-0.008	-0.024	-0.041
	(0.151)	(0.609)	(0.552)	(0.037)	(0.002)	(0.048)	(0.158)	(0.123)	(0.326)
GEFC _t	0.005	omitted	omitted	-0.293 ^c	omitted	omitted	-0.007	omitted	omitted
	(0.258)			(0.000)			(0.194)		
COVID _t	0.011 ^a	0.001	omitted	-0.712 ^c	0.006	0.014	-0.006	-0.022 ^c	omitted
	(0.087)	(0.525)		(0.000)	(0.460)	(0.475)	(0.344)	(0.000)	
Constant	-0.651 ^a		0.111	3.179		-2.758	0.470		2.484
	(0.090)		(0.917)	(0.415)		(0.441)	(0.223)		(0.104)
Observations	1,073	959	1,073	1,073	1,014	1,073	1,073	1,014	1,014
Groups	77	73	77	77	74	77	77	74	74
Instruments	-	69	74	-	72	73	-	72	73
R-squared	0.393	-	-	0.709	-	-	0.144	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	Y	-	-
F tests ¹	146.76 ^c	-	-	81.37 ^c	-	-	1.60 ^c	-	-
Hausman tests ² (chi2)	43.31 ^c	-	-	224.47 ^c	-	-	36.10 ^c	-	-
AR(1) (z)	-	-2.14 ^b	-1.72 ^a	-	-3.65 ^c	-3.86 ^c	-	-4.02 ^c	-3.53 ^c
AR(1) (p)	-	0.032	0.085	-	0.000	0.000	-	0.000	0.000
AR(2) (z)	-	-0.31	1.26	-	1.38	0.24	-	1.09	0.32
AR(2) (p)	-	0.756	0.209	-	0.166	0.814	-	0.276	0.749
Hansen test (chi2)	-	33.71	46.37	-	48.20	49.94	-	42.33	41.95
Hansen test (p)	-	0.748	0.335	-	0.271	0.187	-	0.500	0.473

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include income per capita and its squared and cubic forms.

Source: The author.

Table C5.8: Estimation results of high GVE-integrated GKC models

Dependent variable GE _{it}	lnGDI _{it}			lnGII _{it}			(d.lnFLA _{it})	lnFLA _{it}	
	(1) FE	(2) DGMM-II	(3) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II	(7) FE	(8) DGMM-II	(9) SGMM-II
L1.GE _{it}		0.563 ^c (0.000)	0.744 ^c (0.000)		0.785 ^c (0.000)	0.934 ^c (0.000)		0.623 ^c (0.000)	0.788 ^c (0.000)
L2.GE _{it}									
L1.lnGDPpc _{it}		0.013 (0.769)			-1.556 ^b (0.026)	3.790 (0.169)		-0.762 ^c (0.000)	
L2.lnGDPpc _{it}			-0.049 (0.604)			-6.181 ^b (0.043)			-0.307 (0.498)
L1.lnGDPpc ² _{it}		-0.001 (0.809)			0.150 ^b (0.037)	-0.389 (0.180)		0.089 ^c (0.000)	
L2.lnGDPpc ² _{it}			0.006 (0.593)			0.658 ^b (0.040)			0.038 (0.433)
L1.lnGDPpc ³ _{it}		0.001 (0.732)			-0.005 ^a (0.057)	0.013 (0.200)		-0.003 ^c (0.000)	
L2.lnGDPpc ³ _{it}			-0.001 (0.578)			-0.023 ^b (0.041)			-0.001 (0.423)
lnGDPpc _{it}	0.519 ^b (0.039)			-2.411 (0.411)			-0.382 (0.341)		
lnGDPpc ² _{it}	-0.049 ^a (0.066)			0.380 (0.240)			0.042 (0.323)		
lnGDPpc ³ _{it}	0.002 ^a (0.097)			-0.017 (0.156)			-0.001 (0.313)		
lnTOI _{it}	0.009 (0.168)	-0.001 (0.853)	-0.004 (0.704)	0.006 (0.913)	-0.220 ^c (0.000)	-0.181 (0.252)	0.011 (0.336)	-0.004 (0.839)	0.048 (0.536)
(d.lnTOI _{it})									
GVE _{it}	0.001 (0.747)	-0.013 ^c (0.001)	-0.006 (0.364)	-0.060 (0.309)	-0.032 (0.383)	-0.047 (0.639)	0.012 ^a (0.064)	-0.003 (0.855)	0.031 (0.302)
rTOI.GVE _{it}	-0.004 ^b (0.012)	0.004 ^a (0.052)	0.004 (0.456)	0.002 (0.923)	-0.035 (0.210)	-0.007 (0.950)	-0.001 (0.756)	-0.070 ^c (0.000)	-0.055 ^a (0.061)

lnURB _{it}	-0.421 ^b	0.132 ^c	0.077	-5.055	1.765 ^c	0.535	0.116	-0.153	-0.179
(d.lnURB _{it})	(0.039)	(0.000)	(0.233)	(0.174)	(0.001)	(0.567)	(0.656)	(0.164)	(0.222)
lnIFDI _{it}	0.005 ^a	-0.010 ^c	-0.010 ^a	-0.037	-0.048 ^c	-0.001	0.005	-0.005	0.002
	(0.054)	(0.000)	(0.079)	(0.343)	(0.009)	(0.993)	(0.281)	(0.533)	(0.950)
lnFER _{it}	0.021 ^a	-0.018 ^a	-0.004	0.386 ^b	0.387 ^c	0.239	0.021	-0.074 ^b	-0.001
(d.lnFER _{it})	(0.087)	(0.088)	(0.846)	(0.018)	(0.009)	(0.319)	(0.385)	(0.033)	(0.985)
WTO _{it}	omitted	omitted	1.201	omitted	omitted	-4.373	omitted	omitted	4.202
			(0.456)			(0.493)			(0.688)
OECD _{it}	-0.006	-0.016 ^c	-0.011	-0.086	-0.166 ^c	-0.473 ^b	-0.009 ^a	0.015	-0.010
	(0.162)	(0.002)	(0.475)	(0.151)	(0.001)	(0.022)	(0.054)	(0.396)	(0.837)
GEFC _t	0.003	-0.002	omitted	-0.296 ^c	omitted	omitted	-0.004	0.003	omitted
	(0.437)	(0.408)		(0.000)			(0.448)	(0.557)	
COVID _t	0.007	0.002 ^c	0.002	-0.718 ^c	-0.026 ^a	omitted	-0.001	-0.021 ^c	-0.022
	(0.134)	(0.006)	(0.376)	(0.000)	(0.077)		(0.840)	(0.007)	(0.116)
Constant	-1.888 ^b		-1.312	2.121		9.555	1.112		-2.152
	(0.017)		(0.416)	(0.814)		(0.354)	(0.375)		(0.823)
Observations	1,077	1,025	1,025	1,077	1,025	1,025	1,077	1,025	1,025
Groups	71	70	70	71	70	70	71	70	70
Instruments	-	69	73	-	69	73	-	69	73
R-squared	0.431	-	-	0.710	-	-	0.146	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	Y	-	-
F tests ¹	173.78 ^c	-	-	84.47 ^c	-	-	1.73 ^c	-	-
Hausman tests ² (chi2)	61.87 ^c	-	-	407.04 ^c	-	-	38.86 ^c	-	-
AR(1) (z)	-	-3.71 ^c	-3.51 ^c	-	-3.87 ^c	-3.37 ^c	-	-4.49 ^c	-2.97 ^c
AR(1) (p)	-	0.000	0.000	-	0.000	0.001	-	0.000	0.003
AR(2) (z)	-	1.48	1.47	-	0.77	-0.14	-	0.22	-0.72
AR(2) (p)	-	0.139	0.141	-	0.439	0.890	-	0.824	0.474
Hansen test (chi2)	-	37.04	44.18	-	45.53	41.25	-	45.11	44.65
Hansen test (p)	-	0.604	0.422	-	0.253	0.416	-	0.267	0.402

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include income per capita and its squared and cubic forms.

Source: The author.

Table C5.9: Estimation results of high POS-integrated GKC models

Dependent variable GE_{it}	$\ln GDI_{it}$			$\ln GII_{it}$			$(d.\ln FLA_{it})$	$\ln FLA_{it}$	
	(1) FE	(2) DGMM-II	(3) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II	(7) FE	(8) DGMM-II	(9) SGMM-II
L1. GE_{it}		0.353 ^c (0.000)	0.644 ^c (0.003)		0.741 ^c (0.000)	0.960 ^c (0.000)		0.886 ^c (0.000)	0.773 ^c (0.000)
L2. GE_{it}		0.192 ^c (0.000)			-0.027 ^a (0.081)			-0.035 (0.197)	
L1. $\ln GDP_{pcit}$		0.094 ^a (0.072)	0.247 (0.162)		-1.321 ^b (0.016)	0.528 (0.682)		-0.453 ^c (0.000)	-0.123 (0.685)
L2. $\ln GDP_{pcit}$									
L1. $\ln GDP_{pc}^2_{it}$		-0.009 (0.129)	-0.026 (0.202)		0.128 ^b (0.029)	-0.047 (0.748)		0.053 ^c (0.000)	0.018 (0.610)
L2. $\ln GDP_{pc}^2_{it}$									
L1. $\ln GDP_{pc}^3_{it}$		0.001 (0.174)	0.001 (0.246)		-0.004 ^a (0.069)	0.002 (0.739)		-0.002 ^c (0.000)	-0.001 (0.663)
L2. $\ln GDP_{pc}^3_{it}$									
$\ln GDP_{pcit}$	0.264 ^b (0.023)			-2.746 ^b (0.047)			-0.114 ^a (0.085)		
$\ln GDP_{pc}^2_{it}$	-0.025 ^b (0.045)			0.391 ^b (0.022)			0.013 ^a (0.093)		
$\ln GDP_{pc}^3_{it}$	0.001 ^a (0.090)			-0.017 ^b (0.018)			-0.001 (0.105)		
$\ln TOI_{it}$	-0.002 (0.795)	-0.006 ^a (0.057)	-0.004 (0.799)	0.044 (0.356)	-0.083 ^b (0.046)	-0.114 (0.262)	0.002 (0.725)	0.048 ^c (0.000)	0.043 ^a (0.097)
$(d.\ln TOI_{it})$									
POS_{it}	0.005 (0.369)	-0.005 (0.153)	0.001 (0.871)	0.019 (0.713)	-0.009 (0.752)	0.044 (0.656)	0.001 (0.919)	0.048 ^c (0.002)	0.079 ^a (0.065)
$rTOI.POS_{it}$	-0.001 (0.956)	0.009 ^c (0.005)	0.005 (0.486)	-0.011 (0.775)	-0.001 (0.966)	-0.072 (0.466)	0.001 (0.672)	-0.076 ^c (0.000)	-0.088 ^a (0.081)

lnURB _{it}	-0.011	0.060 ^a	0.027	-2.473	2.077 ^c	-0.065	-0.235	0.112 ^a	-0.185
(d.lnURB _{it})	(0.982)	(0.093)	(0.779)	(0.604)	(0.000)	(0.919)	(0.248)	(0.094)	(0.149)
lnIFDI _{it}	0.004 ^a	-0.009 ^c	-0.008	-0.034	-0.078 ^c	-0.006	0.005	-0.003	-0.008
	(0.079)	(0.000)	(0.239)	(0.347)	(0.000)	(0.935)	(0.249)	(0.671)	(0.653)
lnFER _{it}	0.029 ^b	-0.022 ^b	-0.001	0.257	0.372 ^c	0.229	-0.010	-0.095 ^c	0.064
(d.lnFER _{it})	(0.049)	(0.026)	(0.969)	(0.125)	(0.001)	(0.294)	(0.698)	(0.006)	(0.176)
WTO _{it}	-0.015 ^a	-0.005	-0.037	-0.106	0.028	-0.223	-0.003	-0.014	-0.051
	(0.076)	(0.582)	(0.488)	(0.190)	(0.733)	(0.516)	(0.417)	(0.514)	(0.455)
OECD _{it}	-0.005	-0.038 ^c	-0.018	-0.125 ^b	-0.062	-0.337 ^a	-0.005	-0.030 ^b	-0.068 ^a
	(0.285)	(0.000)	(0.117)	(0.039)	(0.259)	(0.086)	(0.286)	(0.028)	(0.074)
GEFC _t	0.012 ^b	omitted	-0.005 ^a	-0.279 ^c	omitted	0.043 ^b	-0.003	omitted	0.001
	(0.026)		(0.093)	(0.000)		(0.050)	(0.546)		(0.991)
COVID _t	0.021 ^c	0.008 ^b	omitted	-0.706 ^c	-0.282 ^c	omitted	-0.001	-0.049 ^c	omitted
	(0.006)	(0.018)		(0.000)	(0.000)		(0.972)	(0.000)	
Constant	-0.932 ^c		-0.823	4.132		-1.439	0.301 ^a		1.618
	(0.009)		(0.251)	(0.276)		(0.722)	(0.087)		(0.162)
Observations	1,071	957	1,071	1,071	957	1,071	1,071	957	1,071
Groups	75	74	75	75	74	75	75	74	75
Instruments	-	72	73	-	72	70	-	72	70
R-squared	0.348	-	-	0.699	-	-	0.125	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	Y	-	-
F tests ¹	89.86 ^c	-	-	95.02 ^c	-	-	1.26 ^a	-	-
Hausman tests ² (chi2)	173.80 ^c	-	-	618.24 ^c	-	-	35.34 ^c	-	-
AR(1) (z)	-	-2.36 ^b	-2.01 ^b	-	-3.71 ^c	-3.75 ^c	-	-4.14 ^c	-3.14 ^c
AR(1) (p)	-	0.018	0.044	-	0.000	0.000	-	0.000	0.002
AR(2) (z)	-	-1.30	1.28	-	0.88	0.41	-	-0.32	0.14
AR(2) (p)	-	0.194	0.202	-	0.377	0.683	-	0.748	0.892
Hansen test (chi2)	-	41.82	40.64	-	52.99	47.33	-	48.17	39.06
Hansen test (p)	-	0.479	0.531	-	0.119	0.169	-	0.237	0.467

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include income per capita and its squared and cubic forms.

Source: The author.

Table C5.10: Estimation results of high REQ-integrated GKC models

Dependent variable GE_{it}	$\ln GDI_{it}$			$\ln GII_{it}$			$(d.\ln FLA_{it})$	$\ln FLA_{it}$	
	(1) FE	(2) DGMM-II	(3) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II	(7) FE	(8) DGMM-II	(9) SGMM-II
L1. GE_{it}		0.585 ^c (0.000)	0.687 ^c (0.000)		0.752 ^c (0.000)	0.885 ^c (0.000)		0.795 ^c (0.000)	0.948 ^c (0.000)
L2. GE_{it}									
L1. $\ln GDP_{pcit}$		0.241 ^b (0.028)	0.475 ^a (0.060)		-3.297 ^c (0.001)			-0.083 (0.769)	0.266 (0.825)
L2. $\ln GDP_{pcit}$						-3.826 ^a (0.097)			0.522 (0.681)
L1. $\ln GDP_{pc}^2_{it}$		-0.026 ^b (0.024)	-0.049 ^a (0.066)		0.360 ^c (0.001)			0.018 (0.559)	-0.033 (0.792)
L2. $\ln GDP_{pc}^2_{it}$						0.411 ^a (0.084)			-0.047 (0.727)
L1. $\ln GDP_{pc}^3_{it}$		0.001 ^b (0.023)	0.002 ^a (0.070)		-0.012 ^c (0.001)			-0.001 (0.454)	0.001 (0.756)
L2. $\ln GDP_{pc}^3_{it}$						-0.015 ^a (0.074)			0.001 (0.766)
$\ln GDP_{pcit}$	0.190 (0.195)			-7.504 ^c (0.010)			-0.487 ^a (0.070)		
$\ln GDP_{pc}^2_{it}$	-0.016 (0.310)			0.898 ^c (0.006)			0.051 ^a (0.074)		
$\ln GDP_{pc}^3_{it}$	0.001 (0.403)			-0.034 ^c (0.005)			-0.002 ^a (0.081)		
$\ln TOI_{it}$	0.007 (0.172)	-0.001 (0.772)	-0.008 (0.584)	-0.006 (0.918)	-0.172 ^b (0.016)	-0.179 (0.139)	0.022 ^a (0.098)	0.122 ^c (0.000)	0.122 ^b (0.037)
REQ_{it}	-0.002 (0.694)	-0.005 (0.205)	-0.001 (0.926)	-0.156 (0.180)	-0.119 ^c (0.001)	-0.048 (0.692)	-0.004 (0.616)	-0.015 (0.301)	0.003 (0.927)
$rTOI.REQ_{it}$	-0.003 (0.106)	0.003 (0.126)	0.001 (0.819)	-0.012 (0.701)	-0.154 ^c (0.000)	-0.126 (0.332)	0.001 (0.554)	-0.053 ^c (0.000)	-0.050 (0.283)

lnURB _{it}	-0.526 ^c	0.259 ^c	0.022	-5.291	1.052 ^a	0.720	-0.068	-0.015	-0.095
(d.lnURB _{it})	(0.007)	(0.000)	(0.740)	(0.130)	(0.069)	(0.547)	(0.823)	(0.906)	(0.497)
lnFDI _{it}	0.004	-0.012 ^c	-0.015 ^b	-0.031	0.034	0.011	0.005	-0.012 ^a	0.003
	(0.143)	(0.000)	(0.024)	(0.425)	(0.131)	(0.884)	(0.312)	(0.063)	(0.907)
lnFER _{it}	0.014	0.021	0.013	0.311 ^a	0.385 ^c	0.266	0.008	-0.014	0.046
(d.lnFER _{it})	(0.245)	(0.173)	(0.509)	(0.052)	(0.000)	(0.527)	(0.737)	(0.776)	(0.631)
WTO _{it}	omitted	omitted	omitted	omitted	omitted	omitted	omitted	omitted	omitted
OECD _{it}	-0.006	-0.018 ^c	-0.018 ^a	-0.103 ^a	-0.011	-0.234	-0.007	-0.035 ^a	-0.011
	(0.146)	(0.009)	(0.081)	(0.098)	(0.840)	(0.219)	(0.130)	(0.069)	(0.828)
GEFC _t	0.000	-0.001	omitted	-0.331 ^c	omitted	omitted	-0.006	omitted	omitted
	(0.886)	(0.844)		(0.000)			(0.311)		
COVID _t	0.005	0.003 ^c	0.008 ^c	-0.782 ^c	-0.035 ^c	omitted	-0.005	-0.017 ^c	-0.018
	(0.262)	(0.000)	(0.004)	(0.000)	(0.003)		(0.456)	(0.000)	(0.447)
Constant	-0.788 ^a		-1.570 ^b	18.457 ^b		9.218	1.517 ^a		-2.581
	(0.076)		(0.037)	(0.038)		(0.247)	(0.069)		(0.389)
Observations	1,077	1,025	1,077	1,077	1,025	1,025	1,077	1,025	1,025
Groups	66	66	66	66	66	66	66	66	66
Instruments	-	64	62	-	65	65	-	65	65
R-squared	0.402	-	-	0.728	-	-	0.125	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	Y	-	-
F tests ¹	163.02 ^c	-	-	103.73 ^c	-	-	1.35 ^b	-	-
Hausman tests ² (chi2)	187.21 ^c	-	-	754.87 ^c	-	-	32.23 ^c	-	-
AR(1) (z)	-	-3.51 ^c	-2.22 ^b	-	-4.07 ^c	-3.84 ^c	-	-4.06 ^c	-3.59 ^c
AR(1) (p)	-	0.000	0.026	-	0.000	0.000	-	0.000	0.000
AR(2) (z)	-	1.52	1.09	-	1.21	0.67	-	-1.11	-1.27
AR(2) (p)	-	0.128	0.274	-	0.225	0.501	-	0.266	0.203
Hansen test (chi2)	-	30.54	35.52	-	42.15	36.93	-	34.69	35.59
Hansen test (p)	-	0.683	0.306	-	0.222	0.426	-	0.531	0.348

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include income per capita and its squared and cubic forms.

Source: The author.

Table C5.11: Estimation results of high ROL-integrated GKC models

Dependent variable GE_{it}	$\ln GDI_{it}$			$\ln GII_{it}$			$(d.\ln FLA_{it})$	$\ln FLA_{it}$	
	(1) FE	(2) DGMM-II	(3) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II	(7) FE	(8) DGMM-II	(9) SGMM-II
L1. GE_{it}		0.296 ^c (0.000)	0.475 ^c (0.000)		0.784 ^c (0.000)	0.900 ^c (0.000)		0.687 ^c (0.000)	0.833 ^c (0.000)
L2. GE_{it}			0.340 ^c (0.004)		-0.134 (0.183)				
L1. $\ln GDP_{pcit}$					2.461 ^c (0.001)			-0.563 ^b (0.013)	0.453 (0.712)
L2. $\ln GDP_{pcit}$		-0.007 (0.898)	0.317 ^a (0.051)		-2.889 ^c (0.001)	-2.120 (0.141)			0.061 (0.941)
L1. $\ln GDP_{pc}^2_{it}$					-0.266 ^c (0.001)			0.061 ^b (0.015)	-0.055 (0.679)
L2. $\ln GDP_{pc}^2_{it}$		0.004 (0.535)	-0.032 ^a (0.082)		0.313 ^c (0.001)	0.239 (0.128)			-0.004 (0.961)
L1. $\ln GDP_{pc}^3_{it}$					0.009 ^c (0.002)			-0.002 ^b (0.031)	0.002 (0.635)
L2. $\ln GDP_{pc}^3_{it}$		-0.001 (0.418)	0.001 (0.101)		-0.010 ^c (0.002)	-0.009 (0.135)			0.001 (0.966)
$\ln GDP_{pcit}$	0.052 (0.702)			-3.611 ^c (0.006)			-0.322 ^a (0.055)		
$\ln GDP_{pc}^2_{it}$	-0.001 (0.964)			0.500 ^c (0.002)			0.037 ^a (0.054)		
$\ln GDP_{pc}^3_{it}$	-0.001 (0.822)			-0.021 ^c (0.002)			-0.001 ^a (0.057)		
$\ln TOI_{it}$	0.001 (0.992)	-0.020 ^c (0.000)	0.004 (0.820)	0.038 (0.475)	-0.291 ^c (0.000)	-0.247 ^b (0.036)	-0.001 (0.975)	0.037 ^b (0.015)	0.069 ^a (0.076)
ROL_{it}	-0.003 (0.736)	-0.031 ^c (0.000)	-0.014 (0.190)	0.001 (0.994)	0.115 ^b (0.035)	0.009 (0.916)	0.003 (0.650)	-0.085 ^c (0.000)	-0.038 (0.397)
$rTOI.ROL_{it}$	-0.003 ^a (0.055)	0.009 ^c (0.006)	0.005 (0.504)	-0.008 (0.764)	-0.014 (0.683)	-0.114 (0.274)	0.001 (0.680)	-0.023 ^c (0.005)	-0.040 (0.307)

lnURB _{it}	-0.126	0.101 ^a	-0.110	-5.504	1.653 ^b	0.466	0.130	-0.013	0.057
(d.lnURB _{it})	(0.641)	(0.094)	(0.193)	(0.137)	(0.030)	(0.494)	(0.647)	(0.900)	(0.768)
lnIFDI _{it}	0.007 ^b	-0.007 ^c	-0.019 ^b	-0.037	-0.003	0.002	0.006	-0.004	-0.009
	(0.017)	(0.004)	(0.050)	(0.343)	(0.889)	(0.983)	(0.157)	(0.575)	(0.557)
lnFER _{it}	0.026 ^a	-0.054 ^c	-0.048	0.281 ^a	0.491 ^c	0.191	0.026	-0.046	0.096
(d.lnFER _{it})	(0.081)	(0.000)	(0.196)	(0.088)	(0.001)	(0.513)	(0.299)	(0.300)	(0.306)
WTO _{it}	omitted	omitted	omitted	omitted	omitted	omitted	omitted	omitted	omitted
OECD _{it}	-0.006	-0.008	-0.017	-0.128 ^b	-0.194 ^b	-0.177	-0.007	0.017	0.003
	(0.165)	(0.274)	(0.529)	(0.015)	(0.023)	(0.285)	(0.142)	(0.386)	(0.943)
GEFC _t	0.006	0.003	omitted	-0.291 ^c	0.197 ^c	omitted	-0.008	0.007	omitted
	(0.239)	(0.175)		(0.000)	(0.002)		(0.168)	(0.340)	
COVID _t	0.010	-0.002 ^c	omitted	-0.712 ^c	omitted	omitted	-0.006	-0.022 ^c	omitted
	(0.122)	(0.001)		(0.000)			(0.381)	(0.000)	
Constant	-0.389		-0.567	6.093 ^a		5.137	0.880 ^a		-1.478
	(0.357)		(0.317)	(0.092)		(0.235)	(0.063)		(0.648)
Observations	1,073	958	1,015	1,073	958	1,015	1,073	1,015	1,015
Groups	70	69	69	70	69	69	70	69	69
Instruments	-	68	67	-	68	65	-	68	63
R-squared	0.398	-	-	0.707	-	-	0.140	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	Y	-	-
F tests ¹	167.93 ^c	-	-	89.48 ^c	-	-	1.72 ^c	-	-
Hausman tests ² (chi2)	136.85 ^c	-	-	465.66 ^c	-	-	31.29 ^c	-	-
AR(1) (z)	-	-2.27 ^b	-2.02 ^b	-	-3.38 ^c	-3.60 ^c	-	-4.34 ^c	-3.79 ^c
AR(1) (p)	-	0.023	0.043	-	0.001	0.000	-	0.000	0.000
AR(2) (z)	-	0.65	-1.12	-	1.31	0.86	-	0.48	-0.04
AR(2) (p)	-	0.514	0.261	-	0.190	0.390	-	0.631	0.969
Hansen test (chi2)	-	40.33	34.29	-	40.71	38.70	-	45.01	27.90
Hansen test (p)	-	0.456	0.597	-	0.271	0.349	-	0.235	0.626

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include income per capita and its squared and cubic forms.

Source: The author.

Table C5.12: Estimation results of high VAC-integrated GKC models

Dependent variable GE _{it}	lnGDI _{it}			lnGII _{it}			(d.lnFLA _{it})	lnFLA _{it}	
	(1) FE	(2) DGMM-II	(3) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II	(7) FE	(8) DGMM-II	(9) SGMM-II
L1.GE _{it}		0.727 ^c (0.000)	0.749 ^c (0.001)		0.889 ^c (0.000)	0.961 ^c (0.000)		0.696 ^c (0.000)	0.643 ^c (0.000)
L2.GE _{it}									
L1.lnGDPpc _{it}		0.218 ^c (0.000)	-0.151 (0.521)		1.429 (0.104)	0.013 (0.993)		-0.842 ^c (0.000)	-0.627 (0.519)
L2.lnGDPpc _{it}			0.125 (0.592)		-1.261 ^a (0.081)				
L1.lnGDPpc ² _{it}		-0.023 ^c (0.000)	0.018 (0.490)		-0.148 (0.140)	0.023 (0.896)		0.095 ^c (0.000)	0.063 (0.550)
L2.lnGDPpc ² _{it}			-0.013 (0.615)		0.143 ^a (0.079)				
L1.lnGDPpc ³ _{it}		0.001 ^c (0.000)	-0.001 (0.525)		0.005 (0.137)	-0.001 (0.856)		-0.003 ^c (0.000)	-0.002 (0.615)
L2.lnGDPpc ³ _{it}			0.001 (0.727)		-0.005 ^a (0.095)				
lnGDPpc _{it}	0.204 (0.181)			-3.251 ^c (0.010)			-0.126 (0.228)		
lnGDPpc ² _{it}	-0.018 (0.273)			0.450 ^c (0.004)			0.014 (0.245)		
lnGDPpc ³ _{it}	0.001 (0.387)			-0.019 ^c (0.003)			-0.001 (0.282)		
lnTOI _{it}	-0.008 ^a	0.012 ^c	0.007	0.062	-0.224 ^c	-0.255 ^a	0.002	0.054 ^c	0.065
(d.lnTOI _{it})	(0.091)	(0.000)	(0.724)	(0.218)	(0.000)	(0.053)	(0.870)	(0.006)	(0.228)
VAC _{it}	-0.010	-0.002	0.002	-0.088	-0.034	0.027	0.009	0.020 ^a	-0.005
(d.VAC _{it})	(0.441)	(0.224)	(0.871)	(0.221)	(0.500)	(0.835)	(0.298)	(0.091)	(0.906)
rTOI.VAC _{it}	0.004	0.006 ^c	0.006	0.085	-0.041	-0.061	-0.011	-0.058 ^c	-0.061 ^b
(rTOI.dVAC _{it})	(0.766)	(0.005)	(0.608)	(0.303)	(0.339)	(0.441)	(0.457)	(0.000)	(0.041)

lnURB _{it}	0.138	0.034	0.037	-1.301	-0.027	-0.444	-0.291	-0.016	0.111
(d.lnURB _{it})	(0.794)	(0.107)	(0.716)	(0.796)	(0.971)	(0.585)	(0.200)	(0.893)	(0.659)
lnIFDI _{it}	0.008 ^c	-0.010 ^c	-0.011	-0.020	-0.008	-0.053	0.005	-0.024 ^c	-0.007
	(0.006)	(0.000)	(0.353)	(0.582)	(0.798)	(0.559)	(0.243)	(0.000)	(0.758)
lnFER _{it}	0.019	-0.003	-0.011	0.428 ^b	0.048	-0.087	-0.003	-0.029	0.078
(d.lnFER _{it})	(0.147)	(0.667)	(0.725)	(0.012)	(0.767)	(0.779)	(0.901)	(0.589)	(0.279)
WTO _{it}	omitted	omitted	omitted	omitted	omitted	omitted	omitted	omitted	omitted
OECD _{it}	-0.003	-0.004 ^b	0.007	-0.131 ^c	-0.147 ^a	-0.197 ^b	-0.006	-0.043 ^c	-0.040
	(0.429)	(0.049)	(0.612)	(0.008)	(0.084)	(0.016)	(0.160)	(0.001)	(0.202)
GEFC _t	0.008 ^a	omitted	omitted	-0.293 ^c	0.113 ^b	omitted	-0.011 ^b	omitted	omitted
	(0.075)			(0.000)	(0.039)		(0.031)		
COVID _t	0.011 ^b	0.004 ^c	omitted	-0.717 ^c	-0.030 ^a	omitted	0.001	-0.025 ^c	-0.018 ^a
	(0.021)	(0.000)		(0.000)	(0.087)		(0.921)	(0.000)	(0.085)
Constant	-0.822 ^a		-0.114	5.172		2.098	0.351		2.625
	(0.087)		(0.843)	(0.137)		(0.690)	(0.229)		(0.259)
Observations	1,072	1,014	1,014	1,072	960	1,072	1,072	1,014	1,072
Groups	66	65	65	66	64	66	66	65	66
Instruments	-	64	64	-	61	65	-	64	62
R-squared	0.390	-	-	0.698	-	-	0.177	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	Y	-	-
F tests ¹	129.42 ^c	-	-	121.24 ^c	-	-	1.59 ^c	-	-
Hausman tests ² (chi2)	62.83 ^c	-	-	894.31 ^c	-	-	72.11 ^c	-	-
AR(1) (z)	-	-1.97 ^b	-2.65 ^c	-	-3.50 ^c	-3.35 ^c	-	-4.15 ^c	-3.25 ^c
AR(1) (p)	-	0.049	0.008	-	0.000	0.001	-	0.000	0.001
AR(2) (z)	-	1.17	1.22	-	0.28	-0.38	-	-0.28	-0.26
AR(2) (p)	-	0.242	0.221	-	0.778	0.707	-	0.783	0.796
Hansen test (chi2)	-	43.17	35.98	-	29.84	35.85	-	43.12	34.23
Hansen test (p)	-	0.162	0.287	-	0.474	0.428	-	0.163	0.361

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include income per capita and its squared and cubic forms.

Source: The author.

Table C5.13: Estimation results of low COC-integrated GKC models

Dependent variable GE _{it}	lnGDI _{it}			lnGII _{it}			(d.lnFLA _{it})	lnFLA _{it}	
	(1) FE	(2) DGMM-II	(3) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II	(7) FE	(8) DGMM-II	(9) SGMM-II
L1.GE _{it}		0.533 ^c (0.000)	0.746 ^c (0.000)		0.786 ^c (0.000)	0.985 ^c (0.000)		0.330 ^c (0.000)	0.957 ^c (0.000)
L2.GE _{it}									
L1.lnGDPpc _{it}		-0.705 ^c (0.001)	0.310 (0.490)		0.386 (0.246)	0.979 (0.350)			-1.643 (0.572)
L2.lnGDPpc _{it}		0.480 ^b (0.034)						-0.510 (0.227)	3.641 (0.140)
L1.lnGDPpc ² _{it}		0.094 ^c (0.000)	-0.043 (0.483)		-0.043 (0.328)	-0.112 (0.438)			0.206 (0.592)
L2.lnGDPpc ² _{it}		-0.062 ^b (0.037)						0.076 (0.173)	-0.503 (0.122)
L1.lnGDPpc ³ _{it}		-0.004 ^c (0.000)	0.002 (0.477)		0.002 (0.339)	0.004 (0.497)			-0.009 (0.607)
L2.lnGDPpc ³ _{it}		0.002 ^a (0.054)						-0.004 (0.124)	0.023 (0.110)
lnGDPpc _{it}	0.453 ^c (0.003)			-0.132 (0.855)			0.083 (0.423)		
lnGDPpc ² _{it}	-0.052 ^c (0.007)			0.038 (0.704)			-0.011 (0.418)		
lnGDPpc ³ _{it}	0.002 ^b (0.025)			-0.003 (0.562)			0.001 (0.399)		
lnTOI _{it}	-0.001 (0.943)	-0.004 (0.624)	0.027 (0.289)	0.013 (0.281)	-0.045 ^c (0.002)	-0.029 (0.479)	0.007 (0.276)	0.082 ^c (0.000)	0.080 (0.339)
(d.lnTOI _{it})									
COC _{it}	0.014 ^b (0.013)	-0.019 ^a (0.073)	-0.013 (0.681)	-0.052 (0.131)	-0.090 ^c (0.000)	-0.136 ^a (0.064)	-0.004 (0.241)	0.151 ^c (0.000)	0.087 (0.163)
rTOI.COC _{it}	-0.002 (0.627)	0.011 ^a (0.097)	0.019 (0.253)	0.007 (0.649)	0.038 ^b (0.040)	0.038 (0.525)	0.004 ^a (0.089)	-0.033 ^c (0.003)	-0.029 (0.563)

ccli

lnURB _{it}	0.044	0.038	-0.048	-0.882	0.110	-0.093	0.192	-0.192	0.289
(d.lnRUB _{it})	(0.936)	(0.363)	(0.564)	(0.737)	(0.467)	(0.648)	(0.110)	(0.134)	(0.228)
lnIFDI _{it}	-0.001	-0.011 ^c	-0.009	-0.008	0.018 ^a	-0.009	0.001	-0.003	0.000
	(0.792)	(0.000)	(0.380)	(0.519)	(0.077)	(0.812)	(0.783)	(0.746)	(0.994)
lnFER _{it}	0.092 ^a	0.063	-0.075	0.229	-0.190 ^b	0.063	-0.001	0.500 ^c	0.268
(d.lnFER _{it})	(0.063)	(0.183)	(0.343)	(0.182)	(0.028)	(0.714)	(0.997)	(0.000)	(0.277)
WTO _{it}	-0.032 ^c	-0.091 ^c	-0.052	-0.147 ^b	-0.092 ^b	-0.178 ^a	0.002	-0.116 ^c	-0.242
	(0.000)	(0.002)	(0.363)	(0.030)	(0.019)	(0.070)	(0.586)	(0.008)	(0.199)
OECD _{it}	-0.031 ^c	omitted	0.365	0.031 ^b	omitted	0.241	0.002	omitted	0.006
	(0.000)		(0.510)	(0.038)		(0.680)	(0.733)		(0.993)
GEFC _t	0.039 ^c	0.022 ^c	omitted	-0.086 ^c	0.097 ^c	omitted	-0.003	0.047 ^c	omitted
	(0.000)	(0.000)		(0.001)	(0.000)		(0.644)	(0.009)	
COVID _t	0.069 ^c	0.057 ^c	0.018	-0.210 ^c	-0.008 ^b	-0.100	0.016 ^c	0.105 ^c	-0.025
	(0.000)	(0.000)	(0.234)	(0.000)	(0.022)	(0.439)	(0.005)	(0.002)	(0.374)
Constant	-1.354 ^c		-0.539	-0.536		-2.358	-0.212		-5.382
	(0.001)		(0.661)	(0.757)		(0.388)	(0.400)		(0.345)
Observations	1,074	962	1,073	1,074	1,020	1,074	1,074	962	1,020
Groups	68	67	68	68	68	68	68	67	68
Instruments	-	65	67	-	65	65	-	64	65
R-squared	0.674	-	-	0.595	-	-	0.170	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	N	-	-
F tests ¹	254.97 ^c	-	-	216.25 ^c	-	-	1.04	-	-
Hausman tests ² (chi2)	305.14 ^c	-	-	238.97 ^c	-	-	162.12 ^c	-	-
AR(1) (z)	-	-3.41 ^c	-3.17 ^c	-	-2.58 ^c	-2.84 ^c	-	-1.70 ^a	-2.12 ^b
AR(1) (p)	-	0.001	0.002	-	0.010	0.005	-	0.089	0.034
AR(2) (z)	-	1.07	1.61	-	-1.17	-1.18	-	-1.57	-1.30
AR(2) (p)	-	0.287	0.107	-	0.242	0.240	-	0.117	0.193
Hansen test (chi2)	-	43.25	42.79	-	33.59	31.03	-	40.37	37.85
Hansen test (p)	-	0.133	0.202	-	0.584	0.614	-	0.283	0.220

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include income per capita and its squared and cubic forms.

Source: The author.

Table C5.14: Estimation results of low GVE-integrated GKC models

Dependent variable GE _{it}	lnGDI _{it}			lnGII _{it}			(d.lnFLA _{it})	lnFLA _{it}	
	(1) FE	(2) DGMM-II	(3) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II	(7) FE	(8) DGMM-II	(9) SGMM-II
L1.GE _{it}		0.426 ^c (0.000)	0.489 ^c (0.000)		0.707 ^c (0.000)	0.956 ^c (0.000)		0.595 ^c (0.000)	0.905 ^c (0.000)
L2.GE _{it}		0.283 ^c (0.000)	0.326 ^a (0.086)					-0.202 ^c (0.001)	
L1.lnGDPpc _{it}		0.260 ^b (0.050)	0.304 (0.370)		0.593 ^b (0.032)	0.818 (0.229)		-0.350 (0.538)	
L2.lnGDPpc _{it}								0.364 (0.450)	0.893 (0.306)
L1.lnGDPpc ² _{it}		-0.036 ^b (0.048)	-0.044 (0.354)		-0.076 ^b (0.041)	-0.100 (0.268)		0.059 (0.437)	
L2.lnGDPpc ² _{it}								-0.052 (0.419)	-0.134 (0.284)
L1.lnGDPpc ³ _{it}		0.002 ^a (0.058)	0.002 (0.353)		0.003 ^b (0.037)	0.004 (0.291)		-0.003 (0.384)	
L2.lnGDPpc ³ _{it}								0.002 (0.435)	0.006 (0.291)
lnGDPpc _{it}	0.357 ^b (0.021)			0.108 (0.865)			0.030 (0.775)		
lnGDPpc ² _{it}	-0.038 ^a (0.057)			0.003 (0.969)			-0.003 (0.817)		
lnGDPpc ³ _{it}	0.001 (0.166)			-0.001 (0.788)			0.001 (0.838)		
lnTOI _{it}	-0.001 (0.760)	0.031 ^c (0.001)	0.036 (0.179)	0.007 (0.510)	-0.027 ^b (0.049)	-0.002 (0.965)	0.005 (0.375)	0.001 (0.943)	0.027 (0.610)
(d.lnTOI _{it})									
GVE _{it}	-0.008 (0.330)	-0.013 ^c (0.006)	-0.016 (0.399)	-0.053 ^a (0.058)	-0.087 ^c (0.000)	-0.082 ^b (0.012)	-0.003 (0.292)	0.011 (0.481)	-0.017 (0.786)
rTOI.GVE _{it}	-0.001 (0.819)	-0.002 (0.795)	-0.004 (0.825)	0.006 (0.658)	0.080 ^c (0.000)	0.040 (0.290)	0.004 (0.169)	-0.019 ^a (0.063)	0.003 (0.958)

lnURB _{it}	0.324	0.124 ^c	0.051	-2.276	0.087	0.003	0.231 ^a	0.210	0.376 ^c
(d.lnURB _{it})	(0.618)	(0.000)	(0.282)	(0.362)	(0.279)	(0.976)	(0.066)	(0.200)	(0.003)
lnIFDI _{it}	-0.001	-0.002	0.004	-0.001	0.006	-0.004	-0.001	0.003	0.009
	(0.578)	(0.396)	(0.594)	(0.869)	(0.402)	(0.840)	(0.683)	(0.757)	(0.645)
lnFER _{it}	0.095 ^b	0.076 ^a	0.047	0.299 ^a	-0.178 ^c	0.093	0.005	0.487 ^c	0.418 ^a
(d.lnFER _{it})	(0.028)	(0.057)	(0.507)	(0.099)	(0.000)	(0.422)	(0.908)	(0.000)	(0.055)
WTO _{it}	-0.026 ^c	-0.080 ^c	-0.074	-0.114 ^b	-0.076 ^c	-0.072	0.001	-0.064	-0.180
	(0.001)	(0.000)	(0.101)	(0.017)	(0.000)	(0.155)	(0.764)	(0.205)	(0.291)
OECD _{it}	omitted	omitted	-0.287	omitted	omitted	0.398	0.001	omitted	-5.058
			(0.761)			(0.408)	(0.911)		(0.321)
GEFC _t	0.038 ^c	omitted	omitted	-0.083 ^c	-0.059 ^c	omitted	-0.004	-0.040 ^b	omitted
	(0.000)			(0.000)	(0.000)		(0.437)	(0.015)	
COVID _t	0.068 ^c	0.022 ^c	0.026	-0.207 ^c	-0.153 ^c	-0.014	0.011 ^b	-0.036 ^c	0.026
	(0.000)	(0.000)	(0.518)	(0.000)	(0.000)	(0.826)	(0.049)	(0.000)	(0.691)
Constant	-1.157 ^c		-1.063	-1.092		-2.360	-0.092		-3.346
	(0.004)		(0.252)	(0.491)		(0.229)	(0.713)		(0.124)
Observations	1,070	946	1,008	1,070	1,009	1,070	1,070	947	1,009
Groups	68	67	68	68	68	68	68	67	68
Instruments	-	65	65	-	67	65	-	64	67
R-squared	0.653	-	-	0.616	-	-	0.157	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	N	-	-
F tests ¹	236.46 ^c	-	-	225.51 ^c	-	-	1.02	-	-
Hausman tests ² (chi2)	464.45 ^c	-	-	469.75 ^c	-	-	128.95 ^c	-	-
AR(1) (z)	-	-3.39 ^c	-2.05 ^b	-	-3.14 ^c	-2.96 ^c	-	-3.17 ^c	-2.59 ^c
AR(1) (p)	-	0.001	0.041	-	0.002	0.003	-	0.001	0.010
AR(2) (z)	-	-1.37	-0.62	-	-1.03	-0.93	-	-0.26	-0.44
AR(2) (p)	-	0.171	0.536	-	0.303	0.352	-	0.794	0.661
Hansen test (chi2)	-	40.08	37.74	-	35.74	35.08	-	31.64	31.13
Hansen test (p)	-	0.294	0.302	-	0.574	0.417	-	0.484	0.740

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include income per capita and its squared and cubic forms.

Source: The author.

Table C5.15: Estimation results of low POS-integrated GKC models

Dependent variable GE _{it}	lnGDI _{it}			lnGII _{it}			(d.lnFLA _{it})	lnFLA _{it}	
	(1) FE	(2) DGMM-II	(3) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II	(7) FE	(8) DGMM-II	(9) SGMM-II
L1.GE _{it}		0.550 ^c (0.000)	0.891 ^c (0.000)		0.766 ^c (0.000)	0.742 ^c (0.000)		0.520 ^c (0.000)	0.740 ^c (0.000)
L2.GE _{it}									
L1.lnGDPpc _{it}		0.262 ^c (0.000)	omitted		-0.850 ^c (0.000)	-1.672 (0.227)		0.368 (0.237)	
L2.lnGDPpc _{it}			-0.300 ^b (0.012)					-0.433 (0.104)	1.022 ^a (0.082)
L1.lnGDPpc ² _{it}		-0.035 ^c (0.000)	0.001 (0.877)		0.128 ^c (0.000)	0.239 (0.184)		-0.057 (0.127)	
L2.lnGDPpc ² _{it}			0.036 ^c (0.009)					0.063 ^a (0.061)	-0.143 ^a (0.063)
L1.lnGDPpc ³ _{it}		0.001 ^c (0.000)	0.000 (0.775)		-0.006 ^c (0.000)	-0.011 (0.149)		0.003 ^a (0.071)	
L2.lnGDPpc ³ _{it}			-0.002 ^c (0.008)					-0.003 ^b (0.030)	0.007 ^a (0.057)
lnGDPpc _{it}	0.588 ^c (0.000)			-0.831 (0.316)			0.006 (0.921)		
lnGDPpc ² _{it}	-0.070 ^c (0.000)			0.125 (0.268)			-0.001 (0.920)		
lnGDPpc ³ _{it}	0.003 ^c (0.000)			-0.006 (0.224)			0.001 (0.891)		
lnTOI _{it}	0.002 (0.456)	-0.017 ^c (0.001)	0.010 (0.585)	0.003 (0.754)	-0.054 ^c (0.000)	-0.129 ^a (0.093)	0.007 (0.279)	0.030 ^b (0.015)	0.005 (0.848)
POS _{it}	-0.004 (0.310)	0.002 (0.442)	-0.007 (0.498)	0.005 (0.766)	0.027 ^c (0.004)	0.037 (0.300)	-0.002 (0.259)	-0.048 ^c (0.000)	-0.047 ^a (0.083)
rTOI.POS _{it}	0.004 (0.208)	-0.005 ^a (0.060)	0.001 (0.944)	0.025 ^a (0.051)	-0.006 (0.422)	-0.005 (0.929)	0.004 ^a (0.082)	0.024 ^c (0.010)	-0.025 (0.362)

lnURB _{it}	-0.009	0.195 ^c	0.008	-3.215	0.078	-0.119	0.166	0.336 ^c	-0.022
(d.lnURB _{it})	(0.986)	(0.000)	(0.654)	(0.101)	(0.452)	(0.512)	(0.177)	(0.010)	(0.891)
lnIFDI _{it}	0.001	-0.007 ^b	-0.005	0.008	-0.001	0.055	0.001	-0.001	-0.004
	(0.752)	(0.018)	(0.496)	(0.399)	(0.920)	(0.403)	(0.695)	(0.959)	(0.866)
lnFER _{it}	0.045	0.026	-0.025	0.165	-0.069	0.035	0.033	0.385 ^c	0.063
(d.lnFER _{it})	(0.247)	(0.125)	(0.407)	(0.232)	(0.138)	(0.855)	(0.392)	(0.000)	(0.788)
WTO _{it}	-0.035 ^c	-0.063 ^c	-0.024	-0.184 ^c	-0.001	0.028	0.001	-0.091	-0.267
	(0.000)	(0.001)	(0.502)	(0.000)	(0.990)	(0.914)	(0.676)	(0.175)	(0.443)
OECD _{it}	-0.026 ^c	-0.015 ^b	0.022	-0.165 ^a	-0.077 ^c	-0.107	0.003	0.063 ^c	-0.030
	(0.000)	(0.020)	(0.285)	(0.056)	(0.000)	(0.324)	(0.584)	(0.006)	(0.775)
GEFC _t	0.029 ^c	-0.005	omitted	-0.074 ^c	0.056 ^c	omitted	-0.004	0.020 ^b	omitted
	(0.000)	(0.221)		(0.005)	(0.000)		(0.446)	(0.034)	
COVID _t	0.055 ^c	-0.004 ^c	omitted	-0.217 ^c	-0.009 ^c	omitted	0.011 ^b	-0.002	omitted
	(0.000)	(0.000)		(0.000)	(0.005)		(0.042)	(0.920)	
Constant	-1.715 ^c		0.809 ^b	1.332		4.336	-0.023		-1.137
	(0.000)		(0.024)	(0.509)		(0.199)	(0.891)		(0.476)
Observations	1,076	1,021	1,022	1,076	1,022	1,076	1,076	964	1,022
Groups	73	73	73	73	73	73	-	73	73
Instruments	-	72	72	-	72	70	-	72	69
R-squared	0.645	-	-	0.655	-	-	0.173	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	N	-	-
F tests ¹	225.72 ^c	-	-	190.97 ^c	-	-	0.99	-	-
Hausman tests ² (chi2)	296.72 ^c	-	-	264.51 ^c	-	-	95.72 ^c	-	-
AR(1) (z)	-	-3.19 ^c	-3.21 ^c	-	-3.31 ^c	-2.82 ^c	-	-3.35 ^c	-2.32 ^b
AR(1) (p)	-	0.001	0.001	-	0.001	0.005	-	0.001	0.020
AR(2) (z)	-	1.35	1.45	-	-0.88	-0.83	-	-1.52	-1.27
AR(2) (p)	-	0.177	0.146	-	0.379	0.405	-	0.130	0.203
Hansen test (chi2)	-	44.15	39.84	-	48.69	42.84	-	49.52	40.21
Hansen test (p)	-	0.381	0.433	-	0.222	0.310	-	0.144	0.416

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include income per capita and its squared and cubic forms.

Source: The author.

Table C5.16: Estimation results of low REQ-integrated GKC models

Dependent variable GE _{it}	lnGDI _{it}			lnGII _{it}			(d.lnFLA _{it})	lnFLA _{it}	
	(1) FE	(2) DGMM-II	(3) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II	(7) FE	(8) DGMM-II	(9) SGMM-II
L1.GE _{it}		0.444 ^c (0.000)	0.521 ^c (0.002)		0.715 ^c (0.000)	0.932 ^c (0.000)		0.734 ^c (0.000)	0.735 ^c (0.000)
L2.GE _{it}		0.288 ^c (0.000)	0.305 ^b (0.050)					-0.168 ^c (0.000)	
L1.lnGDPpc _{it}		0.314 ^b (0.030)	0.900 (0.330)		-0.061 (0.852)			-0.655 (0.158)	-1.251 (0.645)
L2.lnGDPpc _{it}			-0.521 (0.533)			-0.421 (0.651)		0.184 (0.659)	1.801 (0.644)
L1.lnGDPpc ² _{it}		-0.046 ^b (0.017)	-0.121 (0.293)		0.016 (0.715)			0.100 ^a (0.091)	0.174 (0.614)
L2.lnGDPpc ² _{it}			0.067 (0.532)			0.072 (0.566)		-0.047 (0.380)	-0.258 (0.622)
L1.lnGDPpc ³ _{it}		0.002 ^b (0.014)	0.005 (0.261)		-0.001 (0.656)			-0.005 ^a (0.061)	-0.008 (0.596)
L2.lnGDPpc ³ _{it}			-0.003 (0.522)			-0.004 (0.499)		0.003 (0.221)	0.012 (0.608)
lnGDPpc _{it}	0.415 ^b (0.016)			-0.430 (0.574)			0.110 (0.397)		
lnGDPpc ² _{it}	-0.047 ^b (0.041)			0.081 (0.443)			-0.016 (0.385)		
lnGDPpc ³ _{it}	0.002 (0.105)			-0.005 (0.336)			0.001 (0.356)		
lnTOI _{it}	-0.001 (0.918)	0.016 ^b (0.013)	0.023 (0.322)	0.011 (0.330)	-0.082 ^c (0.000)	-0.020 (0.671)	0.003 (0.527)	0.015 (0.150)	0.017 (0.642)
(d.lnTOI _{it})									
REQ _{it}	-0.006 (0.439)	-0.014 ^b (0.026)	-0.016 (0.149)	-0.036 (0.267)	-0.073 ^c (0.000)	-0.099 (0.128)	0.009 (0.261)	-0.078 ^c (0.002)	-0.050 (0.557)
rTOI.REQ _{it}	-0.001 (0.826)	-0.008 (0.179)	-0.010 (0.580)	-0.004 (0.802)	0.044 ^c (0.001)	0.069 (0.198)	0.002 (0.580)	0.003 (0.846)	0.021 (0.536)

lnURB _{it}	0.028	0.025	0.028	-1.973	0.169	-0.084	0.105	0.273 ^b	0.079
(d.lnURB _{it})	(0.968)	(0.674)	(0.548)	(0.350)	(0.216)	(0.540)	(0.666)	(0.020)	(0.847)
lnFDI _{it}	-0.001	0.012 ^c	-0.001	-0.003	-0.009	-0.014	0.002	-0.028 ^a	-0.004
	(0.612)	(0.003)	(0.999)	(0.692)	(0.244)	(0.629)	(0.387)	(0.067)	(0.923)
lnFER _{it}	0.085	0.051	-0.013	0.456 ^c	-0.184 ^c	-0.074	0.029	-0.131 ^b	0.174
(d.lnFER _{it})	(0.102)	(0.146)	(0.753)	(0.010)	(0.000)	(0.528)	(0.275)	(0.032)	(0.601)
WTO _{it}	-0.031 ^c	-0.043 ^c	-0.004	-0.109 ^a	-0.062 ^c	-0.008	-0.001	0.004	-0.068
	(0.001)	(0.002)	(0.843)	(0.062)	(0.002)	(0.908)	(0.657)	(0.934)	(0.671)
OECD _{it}	omitted	omitted	-0.103	omitted	omitted	0.353	omitted	omitted	-1.602
			(0.610)			(0.489)			(0.527)
GEFC _t	0.038 ^c	0.016 ^c	omitted	-0.097 ^c	-0.043 ^c	omitted	-0.010	0.021	omitted
	(0.000)	(0.001)		(0.000)	(0.000)		(0.146)	(0.153)	
COVID _t	0.069 ^c	0.025 ^b	0.018	-0.218 ^c	-0.146 ^c	-0.024	0.008	-0.038 ^c	0.009
	(0.000)	(0.040)	(0.212)	(0.000)	(0.000)	(0.562)	(0.218)	(0.000)	(0.841)
Constant	-1.276 ^c		-1.052	0.126		1.148	-0.258		-0.607
	(0.004)		(0.192)	(0.945)		(0.594)	(0.403)		(0.909)
Observations	1,070	948	1,008	1,070	1,009	1,009	1,070	949	1,009
Groups	68	67	67	68	67	67	68	67	67
Instruments	-	63	66	-	65	66	-	66	66
R-squared	0.664	-	-	0.618	-	-	0.168	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	Y	-	-
F tests ¹	232.87 ^c	-	-	243.38 ^c	-	-	1.52 ^c	-	-
Hausman tests ² (chi2)	303.54 ^c	-	-	226.38 ^c	-	-	160.78 ^c	-	-
AR(1) (z)	-	-3.51 ^c	-2.11 ^b	-	-2.71 ^c	-2.01 ^b	-	-3.31 ^c	-3.20 ^c
AR(1) (p)	-	0.000	0.035	-	0.007	0.044	-	0.001	0.001
AR(2) (z)	-	-1.55	-0.64	-	-0.97	-0.78	-	-1.30	-1.22
AR(2) (p)	-	0.121	0.525	-	0.333	0.436	-	0.195	0.224
Hansen test (chi2)	-	35.55	29.86	-	40.70	38.27	-	33.05	37.83
Hansen test (p)	-	0.395	0.575	-	0.271	0.367	-	0.514	0.258

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include income per capita and its squared and cubic forms.

Source: The author.

Table C5.17: Estimation results of low ROL-integrated GKC models

Dependent variable GE_{it}	$\ln GDI_{it}$			$\ln GII_{it}$			$(d.\ln FLA_{it})$	$\ln FLA_{it}$	
	(1) FE	(2) DGMM-II	(3) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II	(7) FE	(8) DGMM-II	(9) SGMM-II
L1. GE_{it}		0.479 ^c (0.000)	0.589 ^c (0.000)		0.758 ^c (0.000)	0.896 ^c (0.000)			0.910 ^c (0.000)
L2. GE_{it}		0.129 ^a (0.061)						0.121 (0.202)	
L1. $\ln GDP_{pcit}$		0.520 ^c (0.001)	-0.786 (0.373)		-0.705 ^a (0.051)	-0.347 (0.745)		-0.850 (0.288)	-2.467 (0.406)
L2. $\ln GDP_{pcit}$			1.240 ^a (0.070)						1.748 (0.439)
L1. $\ln GDP_{pc}^2_{it}$		-0.071 ^c (0.001)	0.099 (0.377)		0.106 ^b (0.030)	0.061 (0.668)		0.137 (0.200)	0.323 (0.408)
L2. $\ln GDP_{pc}^2_{it}$			-0.159 ^a (0.070)						-0.255 (0.383)
L1. $\ln GDP_{pc}^3_{it}$		0.003 ^c (0.001)	-0.004 (0.391)		-0.005 ^b (0.029)	-0.003 (0.613)		-0.007 (0.142)	-0.014 (0.415)
L2. $\ln GDP_{pc}^3_{it}$			0.007 ^a (0.073)						0.012 (0.347)
$\ln GDP_{pcit}$	0.361 ^b (0.023)			-0.186 (0.797)			0.043 (0.682)		
$\ln GDP_{pc}^2_{it}$	-0.038 ^a (0.068)			0.045 (0.656)			-0.005 (0.706)		
$\ln GDP_{pc}^3_{it}$	0.001 (0.197)			-0.003 (0.527)			0.001 (0.710)		
$\ln TOI_{it}$	0.001 (0.922)	0.037 ^c (0.004)	0.013 (0.715)	0.008 (0.484)	-0.015 (0.353)	0.004 (0.943)	0.008 (0.163)	0.047 ^b (0.026)	0.061 (0.367)
ROL_{it}	0.005 (0.477)	0.035 ^c (0.000)	0.035 (0.275)	-0.050 (0.137)	-0.038 (0.151)	-0.077 (0.179)	-0.003 (0.366)	-0.109 ^c (0.000)	-0.114 ^b (0.050)
$rTOI.ROL_{it}$	0.001 (0.893)	0.001 (0.991)	0.012 (0.629)	0.010 (0.518)	0.077 ^c (0.000)	0.059 (0.130)	0.003 (0.161)	0.019 ^a (0.061)	0.012 (0.839)

lnURB _{it}	-0.101	0.099	-0.032	0.290	0.113	-0.073	0.204 ^a	-0.005	0.198
(d.lnURB _{it})	(0.874)	(0.216)	(0.620)	(0.923)	(0.500)	(0.646)	(0.093)	(0.985)	(0.381)
lnFDI _{it}	-0.001	-0.013 ^c	-0.014	-0.010	-0.019 ^a	0.007	-0.001	-0.018	-0.011
	(0.794)	(0.010)	(0.354)	(0.414)	(0.053)	(0.772)	(0.743)	(0.202)	(0.758)
lnFER _{it}	0.104 ^b	-0.064	-0.070	0.332 ^a	-0.347 ^c	0.092	-0.004	0.817 ^c	0.140
(d.lnFER _{it})	(0.022)	(0.244)	(0.342)	(0.058)	(0.000)	(0.623)	(0.905)	(0.000)	(0.491)
WTO _{it}	-0.030 ^c	-0.053 ^a	-0.074	-0.169 ^b	-0.019	-0.134	0.002	-0.076 ^b	-0.092
	(0.000)	(0.087)	(0.381)	(0.013)	(0.422)	(0.116)	(0.538)	(0.024)	(0.519)
OECD _{it}	-0.037 ^c	0.107	0.016	0.031 ^b	0.206	0.051	0.002	-0.106	0.086
	(0.000)	(0.178)	(0.897)	(0.041)	(0.410)	(0.745)	(0.750)	(0.756)	(0.787)
GEFC _t	0.035 ^c	0.001	omitted	-0.078 ^c	omitted	omitted	-0.003	0.027 ^a	omitted
	(0.000)	(0.741)		(0.000)			(0.521)	(0.066)	
COVID _t	0.063 ^c	0.016	-0.001	-0.205 ^c	-0.013 ^c	omitted	0.014 ^b	0.098 ^c	0.045
	(0.000)	(0.217)	(0.990)	(0.000)	(0.005)		(0.013)	(0.005)	(0.446)
Constant	-1.163 ^c		-0.849	-0.397		0.645	-0.120		1.586
	(0.005)		(0.554)	(0.819)		(0.816)	(0.636)		(0.742)
Observations	1,074	962	1,019	1,074	1,019	1,074	1,074	963	1,019
Groups	64	64	64	64	64	64	-	64	64
Instruments	-	60	61	-	63	61	-	60	62
R-squared	0.656	-	-	0.616	-	-	0.169	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	N	-	-
F tests ¹	257.59 ^c	-	-	236.27 ^c	-	-	1.05	-	-
Hausman tests ² (chi2)	434.32 ^c	-	-	323.12 ^c	-	-	171.81 ^c	-	-
AR(1) (z)	-	-3.52 ^c	-2.87 ^c	-	-2.70 ^c	-2.89 ^c	-	2.42 ^b	-3.28 ^c
AR(1) (p)	-	0.000	0.004	-	0.007	0.004	-	0.016	0.001
AR(2) (z)	-	0.28	1.61	-	-1.43	-1.00	-	-0.68	-1.01
AR(2) (p)	-	0.782	0.108	-	0.153	0.318	-	0.497	0.311
Hansen test (chi2)	-	31.05	32.66	-	41.88	37.75	-	39.21	33.36
Hansen test (p)	-	0.413	0.248	-	0.138	0.156	-	0.148	0.264

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include income per capita and its squared and cubic forms.

Source: The author.

Table C5.18: Estimation results of low VAC-integrated GKC models

Dependent variable GE_{it}	$\ln GDI_{it}$			$\ln GII_{it}$			$(d.\ln FLA_{it})$	$\ln FLA_{it}$	
	(1) FE	(2) DGMM-II	(3) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II	(7) FE	(8) DGMM-II	(9) SGMM-II
L1. GE_{it}		0.517 ^c (0.000)	0.670 ^c (0.000)		0.741 ^c (0.000)			0.968 ^c (0.000)	1.093 ^c (0.000)
L2. GE_{it}						0.652 ^c (0.000)		-0.238 ^c (0.001)	-0.240 (0.289)
L1. $\ln GDP_{pcit}$			0.003 (0.994)		-0.461 ^b (0.030)			0.722 ^b (0.033)	0.163 (0.835)
L2. $\ln GDP_{pcit}$		0.191 ^c (0.010)				0.155 (0.921)			
L1. $\ln GDP_{pc}^2_{it}$			-0.003 (0.953)		0.078 ^c (0.003)			-0.097 ^b (0.020)	-0.022 (0.824)
L2. $\ln GDP_{pc}^2_{it}$		-0.024 ^c (0.006)				0.017 (0.927)			
L1. $\ln GDP_{pc}^3_{it}$			0.001 (0.920)		-0.004 ^c (0.001)			0.004 ^c (0.010)	0.001 (0.808)
L2. $\ln GDP_{pc}^3_{it}$		0.001 ^b (0.017)				-0.002 (0.779)			
$\ln GDP_{pcit}$	0.374 ^c (0.001)			-3.156 ^c (0.001)			0.035 (0.558)		
$\ln GDP_{pc}^2_{it}$	-0.042 ^c (0.001)			0.464 ^c (0.000)			-0.005 (0.532)		
$\ln GDP_{pc}^3_{it}$	0.001 ^c (0.005)			-0.022 ^c (0.000)			0.001 (0.484)		
$\ln TOI_{it}$	0.002 (0.536)	-0.026 ^c (0.000)	0.003 (0.912)	0.008 (0.452)	-0.117 ^c (0.000)	-0.209 ^b (0.015)	0.008 (0.168)	0.044 ^b (0.047)	0.065 (0.378)
VAC_{it}	-0.016 (0.172)	-0.008 (0.265)	-0.007 (0.735)	0.001 (0.962)	-0.023 (0.235)	-0.150 (0.162)	0.004 (0.689)	0.120 ^c (0.000)	0.102 (0.151)
$rTOI.VAC_{it}$	0.015 (0.215)	-0.006 (0.302)	0.006 (0.609)	-0.007 (0.857)	0.036 ^b (0.038)	0.011 (0.819)	-0.015 (0.298)	-0.039 ^c (0.001)	-0.021 (0.399)

lnURB _{it}	-0.207	-0.016	-0.013	-2.919	0.209	-0.238	0.123	0.179	-0.071
(d.lnURB _{it})	(0.677)	(0.675)	(0.782)	(0.189)	(0.265)	(0.360)	(0.277)	(0.151)	(0.562)
lnFDI _{it}	-0.001	0.002	-0.006	-0.002	-0.027 ^b	0.009	-0.001	-0.020 ^a	0.002
	(0.608)	(0.532)	(0.524)	(0.878)	(0.011)	(0.910)	(0.274)	(0.061)	(0.950)
lnFER _{it}	0.073	0.076 ^c	-0.020	0.272	-0.321 ^c	-0.052	0.008	0.017	0.102
(d.lnFER _{it})	(0.113)	(0.000)	(0.474)	(0.163)	(0.000)	(0.822)	(0.825)	(0.766)	(0.584)
WTO _{it}	-0.032 ^c	-0.075 ^c	-0.133	-0.135 ^a	0.023	0.067	0.001	-0.107	-0.109
	(0.000)	(0.000)	(0.205)	(0.053)	(0.374)	(0.792)	(0.884)	(0.122)	(0.496)
OECD _{it}	omitted	omitted	0.127	omitted	omitted	-0.127	0.004	omitted	-0.363
			(0.691)			(0.895)	(0.473)		(0.861)
GEFC _t	0.039 ^c	0.015 ^c	omitted	-0.079 ^b	omitted	omitted	0.002	0.005	omitted
	(0.000)	(0.000)		(0.014)			(0.741)	(0.607)	
COVID _t	0.070 ^c	0.058 ^c	0.032	-0.228 ^c	-0.127 ^c	-0.147 ^a	0.010 ^a	-0.024 ^c	0.057
	(0.000)	(0.000)	(0.386)	(0.000)	(0.000)	(0.090)	(0.070)	(0.000)	(0.788)
Constant	-1.154 ^c		0.188	6.526 ^c		0.196	-0.086		0.127
	(0.000)		(0.828)	(0.004)		(0.963)	(0.574)		(0.957)
Observations	1,075	961	1,074	1,075	1,020	1,020	1,075	961	1,020
Groups	64	64	64	64	64	64	-	64	64
Instruments	-	61	62	-	63	62	-	60	62
R-squared	0.669	-	-	0.661	-	-	0.132	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	N	-	-
F tests ¹	297.28 ^c	-	-	212.87 ^c	-	-	1.00	-	-
Hausman tests ² (chi2)	310.53 ^c	-	-	419.19 ^c	-	-	50.05 ^c	-	-
AR(1) (z)	-	-3.54 ^c	-3.17 ^c	-	-3.17 ^c	-1.72 ^a	-	-3.02 ^c	-2.00 ^b
AR(1) (p)	-	0.000	0.001	-	0.002	0.085	-	0.003	0.045
AR(2) (z)	-	1.50	1.20	-	-0.93	-0.55	-	-1.51	-1.04
AR(2) (p)	-	0.133	0.231	-	0.353	0.580	-	0.130	0.298
Hansen test (chi2)	-	34.63	39.51	-	36.76	32.75	-	30.61	26.96
Hansen test (p)	-	0.390	0.141	-	0.342	0.430	-	0.486	0.674

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include income per capita and its squared and cubic forms.

Source: The author.

Table C5.19: Estimation results of High Openness COC-integrated GKC models

Dependent variable GE _{it}	lnGDI _{it}			lnGII _{it}			(d.lnFLA _{it})	lnFLA _{it}	
	(1) FE	(2) DGMM-II	(3) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II	(7) FE	(8) DGMM-II	(9) SGMM-II
L1.GE _{it}			0.536 ^c (0.002)		0.587 ^c (0.000)	0.865 ^c (0.000)		0.701 ^c (0.000)	0.921 ^c (0.000)
L2.GE _{it}		0.172 ^c (0.000)			-0.097 ^c (0.000)			-0.103 ^c (0.000)	-0.076 (0.355)
L1.lnGDPpc _{it}		0.173 ^b (0.019)	0.279 (0.160)		1.075 ^b (0.032)	0.221 (0.787)			0.046 (0.890)
L2.lnGDPpc _{it}			-0.342 ^b (0.043)					-0.256 ^c (0.003)	
L1.lnGDPpc ² _{it}		-0.020 ^b (0.018)	-0.028 (0.211)		-0.137 ^b (0.011)	-0.032 (0.746)			-0.007 (0.859)
L2.lnGDPpc ² _{it}			0.037 ^a (0.052)					0.030 ^c (0.004)	
L1.lnGDPpc ³ _{it}		0.001 ^b (0.018)	0.001 (0.255)		0.005 ^c (0.007)	0.002 (0.651)			0.001 (0.784)
L2.lnGDPpc ³ _{it}			-0.001 ^a (0.062)					-0.001 ^c (0.003)	
lnGDPpc _{it}	0.121 (0.316)			-4.759 ^c (0.000)			-0.131 ^a (0.058)		
lnGDPpc ² _{it}	-0.011 (0.422)			0.637 ^c (0.000)			0.016 ^a (0.056)		
lnGDPpc ³ _{it}	0.001 (0.553)			-0.027 ^c (0.000)			-0.001 ^a (0.075)		
lnTOI _{it} (d.lnTOI _{it})	0.001 (0.969)	-0.023 ^c (0.004)	0.002 (0.909)	0.026 (0.643)	-0.335 ^c (0.000)	-0.047 (0.701)	0.016 ^a (0.096)	0.005 (0.762)	0.043 ^a (0.078)
COC _{it}	-0.003 (0.621)	-0.026 ^c (0.000)	0.001 (0.953)	-0.051 (0.267)	-0.183 ^c (0.001)	-0.184 ^a (0.079)	-0.001 (0.797)	0.051 ^c (0.001)	-0.034 (0.212)
rCOC.lnTOI _{it} (rCOC.dlnTOI _{it})	0.004 (0.677)	0.006 ^c (0.000)	0.001 (0.668)	-0.091 (0.192)	-0.004 (0.587)	-0.003 (0.889)	-0.030 ^b (0.043)	-0.009 ^c (0.010)	-0.003 (0.515)

lnURB _{it}	-0.078	0.209 ^c	-0.008	0.210	3.284 ^c	0.713	0.195	-0.257 ^b	0.094
(d.lnURB _{it})	(0.846)	(0.000)	(0.843)	(0.957)	(0.000)	(0.278)	(0.395)	(0.014)	(0.470)
lnIFDI _{it}	0.006 ^a	-0.007 ^c	-0.006	0.011	0.006	0.073	0.005	0.007	-0.010
	(0.069)	(0.002)	(0.297)	(0.726)	(0.761)	(0.124)	(0.181)	(0.322)	(0.503)
lnFER _{it}	0.035 ^b	-0.006	-0.051	0.253 ^a	1.280 ^c	0.644 ^a	0.017	0.039	0.089
(d.lnFER _{it})	(0.016)	(0.730)	(0.121)	(0.088)	(0.000)	(0.059)	(0.447)	(0.386)	(0.290)
WTO _{it}	-0.009	-0.049 ^a	-0.010	-0.001	-0.401 ^b	-0.034	-0.003	0.013	-0.014
	(0.370)	(0.091)	(0.600)	(0.998)	(0.016)	(0.882)	(0.593)	(0.725)	(0.811)
OECD _{it}	-0.011 ^c	-0.082 ^c	-0.030	-0.142 ^a	-0.114	-0.056	0.001	0.129 ^c	0.041
	(0.005)	(0.000)	(0.319)	(0.064)	(0.123)	(0.777)	(0.944)	(0.000)	(0.534)
GEFC _t	0.012	omitted	omitted	-0.187 ^c	omitted	omitted	-0.004	-0.025 ^c	omitted
	(0.104)			(0.006)			(0.433)	(0.000)	
COVID _t	0.022 ^b	0.016 ^c	0.002	-0.491 ^c	-0.033 ^c	omitted	-0.002	-0.022 ^c	-0.019 ^c
	(0.028)	(0.003)	(0.503)	(0.000)	(0.000)		(0.728)	(0.000)	(0.008)
Constant	-0.477		0.189	10.103 ^c		-4.388	0.310 ^a		-0.137
	(0.173)		(0.621)	(0.000)		(0.221)	(0.098)		(0.927)
Observations	1,082	980	1,034	1,082	980	1,082	1,082	980	1,034
Groups	75	74	75	75	74	75	75	74	75
Instruments	-	72	74	-	72	74	-	72	74
R-squared	0.403	-	-	0.635	-	-	0.075	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	Y	-	-
F tests ¹	268.78 ^c	-	-	83.00 ^c	-	-	1.39 ^b	-	-
Hausman tests ² (chi2)	104.56 ^c	-	-	102.14 ^c	-	-	20.55 ^a	-	-
AR(1) (z)	-	-2.16 ^b	-2.81 ^c	-	-2.48 ^b	-3.56 ^c	-	-3.82 ^c	-3.14 ^c
AR(1) (p)	-	0.031	0.005	-	0.013	0.000	-	0.000	0.002
AR(2) (z)	-	-1.24	0.76	-	0.56	-0.50	-	-1.29	-1.20
AR(2) (p)	-	0.215	0.446	-	0.578	0.615	-	0.196	0.229
Hansen test (chi2)	-	42.65	38.14	-	49.66	49.46	-	46.27	45.88
Hansen test (p)	-	0.486	0.599	-	0.194	0.231	-	0.300	0.353

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include income per capita and its squared and cubic forms.

Source: The author.

Table C5.20: Estimation results of High Openness GVE-integrated GKC models

Dependent variable GE_{it}	$\ln GDI_{it}$			$\ln GII_{it}$			$(d.\ln FLA_{it})$	$\ln FLA_{it}$	
	(1) FE	(2) DGMM-II	(3) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II	(7) FE	(8) DGMM-II	(9) SGMM-II
L1. GE_{it}		0.473 ^c (0.000)	0.653 ^c (0.000)		0.540 ^c (0.000)	0.870 ^c (0.000)		0.622 ^c (0.000)	0.756 ^c (0.000)
L2. GE_{it}			0.360 ^c (0.004)					-0.097 ^c (0.000)	
L1. $\ln GDP_{pcit}$		0.006 (0.927)	-0.057 (0.818)		1.167 ^a (0.096)				-0.143 (0.660)
L2. $\ln GDP_{pcit}$		-0.025 (0.557)	-0.084 (0.706)		-1.719 ^c (0.008)	-0.922 (0.306)		-0.272 ^b (0.012)	
L1. $\ln GDP_{pc}^2_{it}$		0.001 (0.890)	0.008 (0.771)		-0.114 (0.139)				0.016 (0.674)
L2. $\ln GDP_{pc}^2_{it}$		0.001 (0.890)	0.008 (0.747)		0.172 ^b (0.019)	0.109 (0.305)		0.031 ^b (0.013)	
L1. $\ln GDP_{pc}^3_{it}$		-0.001 (0.806)	-0.001 (0.756)		0.004 (0.175)				-0.001 (0.760)
L2. $\ln GDP_{pc}^3_{it}$		0.001 (0.820)	-0.001 (0.751)		-0.006 ^b (0.031)	-0.004 (0.337)		-0.001 ^b (0.015)	
$\ln GDP_{pcit}$	0.109 (0.359)			-4.734 ^c (0.000)			-0.135 ^a (0.061)		
$\ln GDP_{pc}^2_{it}$	-0.009 (0.484)			0.633 ^c (0.000)			0.016 ^a (0.063)		
$\ln GDP_{pc}^3_{it}$	0.001 (0.632)			-0.027 ^c (0.000)			-0.001 ^a (0.086)		
$\ln TOI_{it}$	-0.001 (0.897)	-0.016 (0.111)	0.004 (0.851)	0.031 (0.599)	-0.251 ^c (0.001)	-0.070 (0.633)	0.008 (0.389)	-0.029 ^a (0.094)	0.066 ^b (0.031)
GVE _{it}	-0.006 (0.223)	0.020 ^c (0.000)	-0.005 (0.544)	-0.003 (0.953)	-0.182 ^c (0.003)	-0.096 (0.533)	0.001 (0.928)	-0.068 ^c (0.000)	-0.052 ^b (0.045)
rGVE. $\ln TOI_{it}$	0.008 (0.359)	-0.005 ^c (0.003)	0.001 (0.860)	-0.123 ^a (0.086)	-0.015 (0.212)	-0.015 (0.408)	-0.006 (0.700)	0.004 ^b (0.026)	0.001 (0.766)

lnURB _{it}	-0.068	0.050	-0.010	-0.067	3.118 ^c	0.490	0.185	-0.212 ^a	0.088
(d.lnURB _{it})	(0.870)	(0.343)	(0.800)	(0.986)	(0.000)	(0.510)	(0.425)	(0.081)	(0.522)
lnIFDI _{it}	0.006 ^b	-0.005 ^b	-0.003	0.009	0.068 ^c	0.098 ^b	0.004	0.024 ^c	-0.005
	(0.036)	(0.037)	(0.649)	(0.758)	(0.009)	(0.038)	(0.220)	(0.005)	(0.732)
lnFER _{it}	0.034 ^b	-0.060 ^c	-0.009	0.266 ^a	0.858 ^c	0.447	0.019	0.207 ^c	0.139 ^a
(d.lnFER _{it})	(0.021)	(0.002)	(0.770)	(0.074)	(0.000)	(0.215)	(0.379)	(0.000)	(0.081)
WTO _{it}	-0.009	0.016	0.005	0.004	-0.342 ^b	-0.028	-0.002	0.032	-0.030
	(0.386)	(0.221)	(0.726)	(0.949)	(0.041)	(0.942)	(0.634)	(0.582)	(0.636)
OECD _{it}	-0.011 ^c	-0.041 ^b	0.009	-0.149 ^b	-0.137 ^a	-0.208	-0.001	0.071 ^c	0.035
	(0.008)	(0.012)	(0.614)	(0.041)	(0.081)	(0.220)	(0.890)	(0.002)	(0.584)
GEFC _t	0.011	omitted	omitted	-0.174 ^c	omitted	omitted	-0.004	-0.038 ^c	omitted
	(0.101)			(0.007)			(0.456)	(0.000)	
COVID _t	0.020 ^b	0.001	omitted	-0.475 ^c	-0.407 ^c	omitted	-0.003	-0.027 ^c	omitted
	(0.025)	(0.278)		(0.000)	(0.000)		(0.674)	(0.000)	
Constant	-0.452		0.433	10.085 ^c		-0.028	0.326 ^a		0.567
	(0.192)		(0.230)	(0.000)		(0.995)	(0.091)		(0.695)
Observations	1,082	980	1,034	1,082	980	1,034	1,082	980	1,082
Groups	75	74	75	75	74	75	75	74	75
Instruments	-	72	73	-	68	73	-	72	74
R-squared	0.407	-	-	0.634	-	-	0.072	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	Y	-	-
F tests ¹	263.03 ^c	-	-	79.95 ^c	-	-	1.38 ^b	-	-
Hausman tests ² (chi2)	126.67 ^c	-	-	253.98 ^c	-	-	19.63 ^a	-	-
AR(1) (z)	-	-3.55 ^c	-2.85 ^c	-	-2.67 ^c	-3.38 ^c	-	-3.26 ^c	-3.08 ^c
AR(1) (p)	-	0.000	0.004	-	0.008	0.001	-	0.001	0.002
AR(2) (z)	-	-0.13	-1.53	-	-0.09	-0.65	-	-0.47	-1.33
AR(2) (p)	-	0.893	0.126	-	0.925	0.513	-	0.638	0.184
Hansen test (chi2)	-	39.93	36.24	-	34.24	52.18	-	45.02	44.83
Hansen test (p)	-	0.473	0.596	-	0.552	0.159	-	0.347	0.395

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include income per capita and its squared and cubic forms.

Source: The author.

Table C5.21: Estimation results of High Openness POS-integrated GKC models

Dependent variable GE _{it}	lnGDI _{it}			lnGII _{it}			(d.lnFLA _{it})	lnFLA _{it}	
	(1) FE	(2) DGMM-II	(3) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II	(7) FE	(8) DGMM-II	(9) SGMM-II
L1.GE _{it}		0.611 ^c (0.000)	0.800 ^c (0.000)		0.569 ^c (0.000)	0.940 ^c (0.000)		0.657 ^c (0.000)	0.917 ^c (0.000)
L2.GE _{it}									-0.102 (0.166)
L1.lnGDPpc _{it}		-0.003 (0.940)	-0.058 (0.533)		0.935 ^b (0.050)	2.197 (0.233)		-0.148 (0.222)	0.360 (0.332)
L2.lnGDPpc _{it}						-2.470 (0.254)			-0.346 (0.348)
L1.lnGDPpc ² _{it}		0.001 (0.977)	0.007 (0.501)		-0.123 ^b (0.021)	-0.200 (0.342)		0.014 (0.336)	-0.046 (0.288)
L2.lnGDPpc ² _{it}						0.239 (0.332)			0.045 (0.288)
L1.lnGDPpc ³ _{it}		-0.001 (0.982)	-0.001 (0.484)		0.005 ^c (0.010)	0.007 (0.396)		-0.001 (0.606)	0.002 (0.258)
L2.lnGDPpc ³ _{it}						-0.008 (0.360)			-0.002 (0.269)
lnGDPpc _{it}	0.110 (0.356)			-4.783 ^c (0.000)			-0.138 ^b (0.049)		
lnGDPpc ² _{it}	-0.010 (0.464)			0.638 ^c (0.000)			0.017 ^b (0.050)		
lnGDPpc ³ _{it}	0.001 (0.607)			-0.027 ^c (0.000)			-0.001 ^a (0.068)		
lnTOI _{it} (d.lnTOI _{it})	0.002 (0.838)	-0.001 (0.872)	0.001 (0.943)	0.026 (0.679)	-0.393 ^c (0.000)	-0.253 ^b (0.029)	0.015 (0.162)	-0.001 (0.927)	0.048 ^a (0.097)
POS _{it}	0.004 (0.290)	0.015 ^c (0.001)	0.011 (0.267)	0.019 (0.477)	0.030 (0.312)	-0.103 (0.324)	0.002 (0.426)	-0.023 ^c (0.007)	0.003 (0.916)
rPOS.lnTOI _{it} (rPOS.dlnTOI _{it})	-0.003 (0.743)	-0.001 ^a (0.066)	-0.002 ^a (0.067)	-0.107 (0.170)	0.002 (0.675)	0.026 ^a (0.085)	-0.022 (0.192)	-0.004 ^c (0.002)	-0.001 (0.818)

lnURB _{it}	-0.101	0.066 ^b	-0.006	-0.144	2.676 ^c	-0.121	0.174	-0.154 ^b	-0.009
(d.lnURB _{it})	(0.799)	(0.013)	(0.828)	(0.970)	(0.000)	(0.784)	(0.451)	(0.032)	(0.937)
lnIFDI _{it}	0.005 ^a	-0.009 ^c	-0.005	0.009	0.027 ^a	0.109 ^a	0.004	0.007	-0.012
	(0.071)	(0.000)	(0.220)	(0.791)	(0.071)	(0.059)	(0.209)	(0.355)	(0.399)
lnFER _{it}	0.034 ^b	-0.006	-0.018	0.259 ^a	0.850 ^c	0.012	0.017	0.054	0.048
(d.lnFER _{it})	(0.021)	(0.591)	(0.461)	(0.080)	(0.000)	(0.951)	(0.434)	(0.238)	(0.466)
WTO _{it}	-0.007	-0.007	-0.004	0.013	-0.355 ^c	-0.020	-0.002	0.098 ^b	-0.053
	(0.470)	(0.467)	(0.886)	(0.836)	(0.010)	(0.957)	(0.750)	(0.027)	(0.720)
OECD _{it}	-0.011 ^c	-0.040 ^c	-0.012	-0.149 ^b	-0.223 ^c	-0.122	-0.001	0.099 ^c	0.019
	(0.005)	(0.000)	(0.408)	(0.042)	(0.000)	(0.642)	(0.972)	(0.000)	(0.749)
GEFC _t	0.014 ^b	omitted	omitted	-0.166 ^b	omitted	omitted	-0.003	omitted	omitted
	(0.046)			(0.015)			(0.579)		
COVID _t	0.025 ^c	0.015 ^c	omitted	-0.466 ^c	-0.069 ^c	omitted	-0.001	-0.021 ^c	omitted
	(0.010)	(0.002)		(0.000)	(0.000)		(0.838)	(0.000)	
Constant	-0.440		0.207	10.258 ^c		1.615	0.336 ^a		0.522
	(0.202)		(0.517)	(0.000)		(0.761)	(0.075)		(0.619)
Observations	1,082	1,034	1,082	1,082	1,034	1,034	1,082	1,034	1,034
Groups	75	75	75	75	75	75	75	75	75
Instruments	-	72	72	-	72	65	-	72	74
R-squared	0.407	-	-	0.635	-	-	0.074	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	Y	-	-
F tests ¹	247.47 ^c	-	-	90.51 ^c	-	-	1.39 ^b	-	-
Hausman tests ² (chi2)	112.45 ^c	-	-	194.55 ^c	-	-	19.08 ^a	-	-
AR(1) (z)	-	-3.79 ^c	-3.28 ^c	-	-3.05 ^c	-2.03 ^b	-	-3.66 ^c	-3.04 ^c
AR(1) (p)	-	0.000	0.001	-	0.002	0.043	-	0.000	0.002
AR(2) (z)	-	0.54	0.94	-	-0.37	-0.91	-	-1.55	-1.04
AR(2) (p)	-	0.588	0.345	-	0.712	0.360	-	0.120	0.297
Hansen test (chi2)	-	43.76	33.82	-	50.50	29.10	-	53.77	38.29
Hansen test (p)	-	0.397	0.779	-	0.173	0.614	-	0.105	0.547

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include income per capita and its squared and cubic forms.

Source: The author.

Table C5.22: Estimation results of High Openness REQ-integrated GKC models

Dependent variable GE _{it}	lnGDI _{it}			lnGII _{it}			(d.lnFLA _{it})	lnFLA _{it}	
	(1) FE	(2) DGMM-II	(3) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II	(7) FE	(8) DGMM-II	(9) SGMM-II
L1.GE _{it}		0.877 ^c (0.000)	0.806 ^c (0.000)		0.614 ^c (0.000)	0.905 ^c (0.000)		0.576 ^c (0.000)	0.804 ^c (0.000)
L2.GE _{it}					-0.100 ^c (0.000)				
L1.lnGDPpc _{it}		-0.094 ^c (0.010)	-0.125 (0.155)		0.761 ^a (0.051)	1.230 (0.556)			-0.111 (0.770)
L2.lnGDPpc _{it}						-1.961 (0.302)		-0.187 ^b (0.029)	
L1.lnGDPpc ² _{it}		0.011 ^b (0.011)	0.015 (0.151)		-0.094 ^b (0.032)	-0.108 (0.651)			0.014 (0.764)
L2.lnGDPpc ² _{it}						0.191 (0.367)		0.023 ^b (0.023)	
L1.lnGDPpc ³ _{it}		-0.001 ^b (0.013)	-0.001 (0.170)		0.003 ^b (0.037)	0.004 (0.673)			-0.001 (0.801)
L2.lnGDPpc ³ _{it}						-0.007 (0.389)		-0.001 ^b (0.019)	
lnGDPpc _{it}	0.128 (0.290)			-4.588 ^c (0.000)			-0.121 ^b (0.034)		
lnGDPpc ² _{it}	-0.012 (0.393)			0.620 ^c (0.000)			0.015 ^b (0.022)		
lnGDPpc ³ _{it}	0.001 (0.513)			-0.027 ^c (0.000)			-0.001 ^b (0.018)		
lnTOI _{it} (d.lnTOI _{it})	-0.001 (0.956)	-0.003 (0.691)	-0.011 (0.591)	0.067 (0.238)	-0.425 ^c (0.000)	-0.194 (0.194)	0.008 (0.498)	0.007 (0.671)	0.090 ^b (0.012)
REQ _{it}	-0.007 (0.183)	0.004 (0.264)	0.004 (0.675)	-0.187 ^c (0.004)	-0.022 (0.604)	-0.085 (0.468)	-0.002 (0.318)	-0.054 ^c (0.000)	-0.058 ^a (0.077)
rREQ.lnTOI _{it} (rREQ.dlnTOI _{it})	0.006 (0.458)	-0.001 ^a (0.064)	-0.001 (0.559)	-0.166 ^b (0.023)	-0.008 (0.446)	0.014 (0.637)	-0.007 (0.674)	0.008 ^c (0.006)	0.003 (0.667)

lnURB _{it}	-0.069	-0.057 ^c	-0.038	0.430	2.501 ^c	0.137	0.266 ^b	-0.316 ^c	0.034
(d.lnURB _{it})	(0.865)	(0.005)	(0.138)	(0.905)	(0.000)	(0.724)	(0.034)	(0.003)	(0.804)
lnIFDI _{it}	0.006 ^a	-0.004 ^b	-0.003	0.020	0.041 ^b	0.112 ^a	0.003 ^c	0.012 ^a	-0.009
	(0.051)	(0.012)	(0.429)	(0.516)	(0.030)	(0.078)	(0.008)	(0.063)	(0.524)
lnFER _{it}	0.034 ^b	-0.013	-0.049 ^a	0.225	0.865 ^c	0.211	-0.005	0.172 ^c	0.068
(d.lnFER _{it})	(0.018)	(0.174)	(0.057)	(0.116)	(0.000)	(0.360)	(0.843)	(0.000)	(0.372)
WTO _{it}	-0.010	0.013	0.005	-0.016	-0.302 ^c	0.020	0.001	-0.001	-0.033
	(0.330)	(0.171)	(0.754)	(0.786)	(0.004)	(0.925)	(0.869)	(0.980)	(0.592)
OECD _{it}	-0.011 ^c	-0.013	-0.012	-0.143 ^a	-0.204 ^c	-0.273	-0.002	0.063 ^a	0.042
	(0.003)	(0.160)	(0.576)	(0.064)	(0.002)	(0.198)	(0.413)	(0.081)	(0.370)
GEFC _t	0.011	0.001	omitted	-0.218 ^c	omitted	omitted	-0.001	omitted	omitted
	(0.107)	(0.889)		(0.001)			(0.912)		
COVID _t	0.020 ^b	0.003 ^c	omitted	-0.541 ^c	-0.038 ^c	-0.022	0.002	0.025 ^c	omitted
	(0.030)	(0.000)		(0.000)	(0.000)	(0.321)	(0.671)	(0.010)	
Constant	-0.500		0.581 ^a	9.472 ^c		1.491	0.290 ^a		0.440
	(0.151)		(0.052)	(0.000)		(0.639)	(0.072)		(0.735)
Observations	1,082	1,034	1,082	1,082	980	1,034	1,082	980	1,082
Groups	75	75	75	75	74	75	75	74	75
Instruments	-	68	74	-	72	73	-	72	74
R-squared	0.408	-	-	0.651	-	-	0.069	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	N	-	-
F tests ¹	259.36 ^c	-	-	92.72 ^c	-	-	1.40 ^b	-	-
Hausman tests ² (chi2)	133.36 ^c	-	-	188.98 ^c	-	-	18.27	-	-
AR(1) (z)	-	-4.01 ^c	-3.28 ^c	-	-3.01 ^c	-3.75 ^c	-	-3.07 ^c	-3.42 ^c
AR(1) (p)	-	0.000	0.001	-	0.003	0.000	-	0.002	0.001
AR(2) (z)	-	1.30	1.28	-	0.31	-0.95	-	-1.33	-1.58
AR(2) (p)	-	0.193	0.200	-	0.755	0.344	-	0.185	0.115
Hansen test (chi2)	-	34.20	38.42	-	46.92	44.29	-	39.92	38.64
Hansen test (p)	-	0.646	0.670	-	0.278	0.295	-	0.606	0.661

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include income per capita and its squared and cubic forms.

Source: The author.

Table C5.23: Estimation results of High Openness ROL-integrated GKC models

[illegible]

lnURB _{it}	-0.125	0.102 ^c	-0.043	-0.148	3.011 ^c	-0.031	0.209	-0.098	0.037
(d.lnURB _{it})	(0.748)	(0.006)	(0.222)	(0.970)	(0.000)	(0.943)	(0.349)	(0.312)	(0.694)
lnIFDI _{it}	0.005 ^a	-0.008 ^c	-0.005	0.009	0.041 ^a	0.106	0.005	0.015 ^b	-0.007
	(0.085)	(0.000)	(0.290)	(0.785)	(0.070)	(0.163)	(0.169)	(0.014)	(0.661)
lnFER _{it}	0.037 ^b	-0.044 ^c	-0.046	0.265 ^a	0.967 ^c	0.161	0.015	0.116 ^b	0.070
(d.lnFER _{it})	(0.014)	(0.000)	(0.118)	(0.073)	(0.000)	(0.536)	(0.492)	(0.025)	(0.318)
WTO _{it}	-0.009	-0.008	0.001	0.003	-0.414 ^c	0.004	-0.003	-0.032	-0.030
	(0.356)	(0.381)	(0.981)	(0.966)	(0.008)	(0.988)	(0.609)	(0.719)	(0.720)
OECD _{it}	-0.012 ^c	-0.062 ^c	-0.012	-0.151 ^b	-0.141 ^a	-0.313	0.001	0.097 ^c	0.052
	(0.003)	(0.000)	(0.672)	(0.042)	(0.091)	(0.164)	(0.817)	(0.008)	(0.520)
GEFC _t	0.013 ^a	omitted	omitted	-0.171 ^b	omitted	omitted	-0.004	-0.021 ^c	omitted
	(0.071)			(0.011)			(0.429)	(0.008)	
COVID _t	0.023 ^b	0.002 ^b	omitted	-0.472 ^c	-0.044 ^c	omitted	-0.002	-0.023 ^c	omitted
	(0.017)	(0.049)		(0.000)	(0.000)		(0.759)	(0.000)	
Constant	-0.507		0.559 ^a	9.947 ^c		2.824	0.319 ^a		0.741
	(0.146)		(0.056)	(0.000)		(0.252)	(0.100)		(0.433)
Observations	1,082	980	1,082	1,082	980	1,034	1,082	980	1,034
Groups	75	74	75	75	74	75	75	74	75
Instruments	-	72	74	-	72	73	-	69	74
R-squared	0.405	-	-	0.634	-	-	0.077	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	Y	-	-
F tests ¹	267.16 ^c	-	-	86.33 ^c	-	-	1.35 ^b	-	-
Hausman tests ² (chi2)	105.65 ^c	-	-	99.92 ^c	-	-	23.25 ^b	-	-
AR(1) (z)	-	-3.42 ^c	-2.99 ^c	-	-2.68 ^c	-3.71 ^c	-	-3.17 ^c	-2.92 ^c
AR(1) (p)	-	0.001	0.003	-	0.007	0.000	-	0.002	0.004
AR(2) (z)	-	0.47	1.12	-	0.49	-1.06	-	-0.82	-1.40
AR(2) (p)	-	0.636	0.263	-	0.628	0.287	-	0.413	0.161
Hansen test (chi2)	-	47.17	38.49	-	47.52	43.88	-	38.70	45.52
Hansen test (p)	-	0.306	0.667	-	0.258	0.310	-	0.483	0.368

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include income per capita and its squared and cubic forms.

Source: The author.

Table C5.24: Estimation results of High Openness VAC-integrated GKC models

Dependent variable GE_{it}	$\ln GDI_{it}$			$\ln GII_{it}$			$(d.\ln FLA_{it})$	$\ln FLA_{it}$	
	(1) FE	(2) DGMM-II	(3) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II	(7) FE	(8) DGMM-II	(9) SGMM-II
L1. GE_{it}		0.906 ^c (0.000)	0.821 ^c (0.000)		0.550 ^c (0.000)	0.856 ^c (0.000)		0.656 ^c (0.000)	0.833 ^c (0.000)
L2. GE_{it}					0.035 (0.614)				
L1. $\ln GDP_{pcit}$		-0.072 ^b (0.041)	-0.094 (0.693)		1.066 ^c (0.001)	1.191 (0.521)		-0.142 (0.321)	0.391 (0.313)
L2. $\ln GDP_{pcit}$			-0.017 (0.937)			-2.629 (0.266)			-0.454 (0.217)
L1. $\ln GDP_{pc}^2_{it}$		0.008 ^b (0.044)	0.012 (0.650)		-0.130 ^c (0.000)	-0.097 (0.662)		0.012 (0.468)	-0.047 (0.286)
L2. $\ln GDP_{pc}^2_{it}$			0.001 (0.967)			0.269 (0.320)			0.055 (0.190)
L1. $\ln GDP_{pc}^3_{it}$		-0.001 ^a (0.052)	-0.001 (0.624)		0.005 ^c (0.001)	0.003 (0.735)		-0.001 (0.757)	0.002 (0.263)
L2. $\ln GDP_{pc}^3_{it}$			-0.001 (0.983)			-0.010 (0.345)			-0.002 (0.175)
$\ln GDP_{pcit}$	0.123 (0.311)			-4.701 ^c (0.000)			-0.130 ^a (0.062)		
$\ln GDP_{pc}^2_{it}$	-0.011 (0.413)			0.630 ^c (0.000)			0.016 ^a (0.060)		
$\ln GDP_{pc}^3_{it}$	0.001 (0.543)			-0.027 ^c (0.000)			-0.001 ^a (0.079)		
$\ln TOI_{it}$	-0.001 (0.974)	-0.001 (0.955)	-0.006 (0.790)	0.039 (0.504)	-0.539 ^c (0.000)	-0.294 ^a (0.060)	0.015 (0.139)	0.022 (0.112)	0.042 ^a (0.089)
VAC_{it}	0.003 (0.297)	0.007 (0.222)	0.001 (0.918)	0.002 (0.941)	-0.110 ^b (0.049)	0.019 (0.904)	-0.007 (0.369)	0.039 ^c (0.004)	0.001 (0.963)
$rVAC.\ln TOI_{it}$	0.004 (0.580)	-0.001 (0.369)	0.001 (0.901)	-0.159 ^b (0.025)	0.026 ^b (0.017)	0.034 (0.301)	-0.026 (0.133)	-0.006 ^b (0.022)	-0.004 (0.600)

lnURB _{it}	-0.086	-0.052 ^c	-0.026	-0.060	2.121 ^c	-0.363	0.173	-0.004	-0.002
(d.lnURB _{it})	(0.834)	(0.008)	(0.456)	(0.988)	(0.000)	(0.304)	(0.444)	(0.964)	(0.979)
lnIFDI _{it}	0.005 ^a	-0.004 ^c	-0.004	0.010	0.044 ^b	0.130 ^b	0.004	0.008	-0.016
	(0.070)	(0.005)	(0.494)	(0.769)	(0.042)	(0.033)	(0.193)	(0.194)	(0.312)
lnFER _{it}	0.036 ^b	-0.010	-0.035	0.256 ^a	0.997 ^c	0.071	0.018	0.073 ^a	0.033
(d.lnFER _{it})	(0.018)	(0.392)	(0.371)	(0.088)	(0.000)	(0.815)	(0.414)	(0.100)	(0.530)
WTO _{it}	-0.009	0.013	0.003	0.002	-0.634 ^c	-0.056	-0.003	0.127 ^b	-0.039
	(0.374)	(0.117)	(0.884)	(0.974)	(0.000)	(0.861)	(0.581)	(0.014)	(0.741)
OECD _{it}	-0.011 ^c	-0.004	-0.011	-0.149 ^b	-0.369 ^c	-0.377	0.001	0.120 ^c	0.012
	(0.004)	(0.583)	(0.445)	(0.042)	(0.000)	(0.270)	(0.992)	(0.000)	(0.856)
GEFC _t	0.012 ^a	omitted	omitted	-0.172 ^b	omitted	omitted	-0.003	omitted	omitted
	(0.072)			(0.011)			(0.475)		
COVID _t	0.023 ^b	0.007 ^a	omitted	-0.474 ^c	-0.195 ^c	omitted	-0.002	-0.031 ^c	omitted
	(0.017)	(0.083)		(0.000)	(0.000)		(0.722)	(0.001)	
Constant	-0.478		0.465	9.997 ^c		5.966	0.310 ^a		0.683
	(0.172)		(0.120)	(0.000)		(0.153)	(0.100)		(0.546)
Observations	1,082	1,034	1,034	1,082	980	1,034	1,082	1,034	1,034
Groups	75	75	75	75	74	75	75	75	75
Instruments	-	68	73	-	71	69	-	72	73
R-squared	0.403	-	-	0.635	-	-	0.075	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	Y	-	-
F tests ¹	270.07 ^c	-	-	91.41 ^c	-	-	1.39 ^b	-	-
Hausman tests ² (chi2)	100.47 ^c	-	-	54.48 ^c	-	-	20.27 ^a	-	-
AR(1) (z)	-	-4.00 ^c	-3.45 ^c	-	-2.35 ^b	-3.33 ^c	-	-3.65 ^c	-3.29 ^c
AR(1) (p)	-	0.000	0.001	-	0.019	0.001	-	0.000	0.001
AR(2) (z)	-	1.22	1.06	-	-0.94	-0.99	-	-1.50	-1.55
AR(2) (p)	-	0.224	0.287	-	0.345	0.320	-	0.134	0.122
Hansen test (chi2)	-	34.25	40.65	-	43.46	40.97	-	53.06	39.84
Hansen test (p)	-	0.643	0.442	-	0.367	0.261	-	0.118	0.477

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include income per capita and its squared and cubic forms.

Source: The author.

Table C5.25: Estimation results of Low Openness COC-integrated GKC models

Dependent variable GE_{it}	$\ln GDI_{it}$			$\ln GII_{it}$			$(d.\ln FLA_{it})$	$\ln FLA_{it}$	
	(1) FE	(2) DGMM-II	(3) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II	(7) FE	(8) DGMM-II	(9) SGMM-II
L1. GE_{it}		0.572 ^c (0.000)	0.699 ^a (0.001)		1.068 ^c (0.000)	0.937 ^c (0.000)		0.410 ^c (0.000)	0.830 ^c (0.003)
L2. GE_{it}		0.134 ^c (0.000)	0.112 (0.616)		-0.072 ^c (0.000)				-0.025 (0.939)
L1. $\ln GDP_{pcit}$		0.193 ^c (0.002)	0.163 (0.631)		1.641 ^c (0.000)	1.395 (0.431)		-0.235 ^a (0.059)	-1.533 ^a (0.069)
L2. $\ln GDP_{pcit}$						-0.874 (0.544)			0.891 (0.215)
L1. $\ln GDP_{pc}^2_{it}$		-0.020 ^c (0.006)	-0.017 (0.667)		-0.180 ^c (0.000)	-0.157 (0.424)		0.031 ^b (0.020)	0.174 ^a (0.068)
L2. $\ln GDP_{pc}^2_{it}$						0.101 (0.521)			-0.100 (0.223)
L1. $\ln GDP_{pc}^3_{it}$		0.001 ^b (0.024)	0.001 (0.695)		0.007 ^c (0.000)	0.006 (0.435)		-0.001 ^c (0.008)	-0.006 ^a (0.071)
L2. $\ln GDP_{pc}^3_{it}$						-0.004 (0.522)			0.004 (0.252)
$\ln GDP_{pcit}$	0.255 ^b (0.043)			0.432 (0.610)			-0.022 (0.617)		
$\ln GDP_{pc}^2_{it}$	-0.022 (0.133)			-0.019 (0.851)			0.003 (0.578)		
$\ln GDP_{pc}^3_{it}$	0.001 (0.349)			-0.001 (0.983)			-0.001 (0.567)		
$\ln TOI_{it}$	0.003 (0.398)	-0.012 ^b (0.048)	-0.022 (0.204)	0.034 (0.119)	-0.094 ^c (0.000)	-0.104 ^a (0.062)	0.008 (0.206)	0.001 (0.986)	0.007 (0.556)
COC_{it}	0.015 ^c (0.007)	-0.005 (0.456)	-0.034 (0.227)	0.019 (0.662)	0.007 (0.753)	0.025 (0.608)	-0.001 (0.754)	0.028 ^c (0.003)	0.026 (0.531)
$rCOC.\ln TOI_{it}$	-0.004 (0.555)	0.006 ^c (0.000)	0.008 ^a (0.059)	0.008 (0.848)	0.002 (0.566)	0.001 (0.932)	-0.019 (0.198)	0.008 ^b (0.014)	0.010 (0.404)

lnURB _{it}	0.589	-0.028	-0.067	-2.009	-0.830 ^c	-0.014	0.029	-0.307 ^c	-0.110
(d.lnURB _{it})	(0.376)	(0.351)	(0.176)	(0.624)	(0.001)	(0.879)	(0.823)	(0.000)	(0.338)
lnIFDI _{it}	0.002	0.009 ^c	0.001	0.025	-0.002	-0.015	0.001	-0.001	-0.012
	(0.361)	(0.000)	(0.927)	(0.162)	(0.850)	(0.557)	(0.688)	(0.846)	(0.589)
lnFER _{it}	0.030	0.051 ^c	-0.050 ^a	0.677 ^c	-0.009	0.069	0.010	0.102 ^b	-0.070
(d.lnFER _{it})	(0.430)	(0.000)	(0.051)	(0.004)	(0.887)	(0.404)	(0.787)	(0.012)	(0.453)
WTO _{it}	-0.035 ^c	-0.029 ^b	-0.023	-0.136 ^c	-0.039	0.047	0.001	-0.044	-0.002
	(0.001)	(0.035)	(0.581)	(0.000)	(0.432)	(0.808)	(0.780)	(0.147)	(0.981)
OECD _{it}	-0.004	-0.002	0.051	-0.071	-0.054	-0.187	0.001	-0.055 ^a	0.016
	(0.635)	(0.869)	(0.213)	(0.263)	(0.308)	(0.180)	(0.820)	(0.059)	(0.799)
GEFC _t	0.023 ^c	-0.010 ^c	0.007	-0.230 ^c	-0.010	omitted	-0.005	0.024 ^c	omitted
	(0.001)	(0.001)	(0.336)	(0.000)	(0.728)		(0.268)	(0.000)	
COVID _t	0.044 ^c	omitted	omitted	-0.473 ^c	omitted	-0.020	0.012 ^b	0.034 ^c	omitted
	(0.000)			(0.000)		(0.483)	(0.018)	(0.006)	
Constant	-0.968 ^c		-0.163	-2.829		-1.282	0.051		3.099 ^a
	(0.007)		(0.858)	(0.237)		(0.465)	(0.661)		(0.077)
Observations	1,065	940	999	1,065	941	1,000	1,065	1,000	1,000
Groups	79	76	78	79	76	78	-	78	78
Instruments	-	72	70	-	72	74	-	72	73
R-squared	0.631	-	-	0.586	-	-	0.211	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	N	-	-
F tests ¹	136.48 ^c	-	-	77.96 ^c	-	-	0.99	-	-
Hausman tests ² (chi2)	251.57 ^c	-	-	305.44 ^c	-	-	121.15 ^c	-	-
AR(1) (z)	-	-3.50 ^c	-2.15 ^b	-	-3.89 ^c	-3.53 ^c	-	-2.76 ^c	-1.69 ^a
AR(1) (p)	-	0.000	0.032	-	0.000	0.000	-	0.006	0.091
AR(2) (z)	-	0.92	0.21	-	0.76	-0.33	-	-0.91	-0.70
AR(2) (p)	-	0.359	0.833	-	0.446	0.744	-	0.362	0.484
Hansen test (chi2)	-	50.69	34.68	-	37.50	41.71	-	40.44	39.82
Hansen test (p)	-	0.168	0.667	-	0.668	0.440	-	0.540	0.433

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include income per capita and its squared and cubic forms.

Source: The author.

Table C5.26: Estimation results of Low Openness GVE-integrated GKC models

Dependent variable GE_{it}	lnGDI_{it}			lnGII_{it}			(d.lnFLA _{it})	lnFLA_{it}	
	(1) FE	(2) DGMM-II	(3) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II	(7) FE	(8) DGMM-II	(9) SGMM-II
L1.GE _{it}		0.531 ^c (0.000)	0.671 ^c (0.000)		1.071 ^c (0.000)	0.981 ^c (0.000)		0.425 ^c (0.000)	0.842 ^c (0.000)
L2.GE _{it}		0.167 ^c (0.000)	0.278 ^c (0.000)		-0.056 ^c (0.000)	0.053 (0.737)		0.009 (0.839)	0.014 (0.958)
L1.lnGDPpc _{it}		0.157 ^b (0.015)	0.091 (0.578)		1.287 ^c (0.000)	2.823 ^b (0.017)		-0.312 ^a (0.062)	-0.399 (0.345)
L2.lnGDPpc _{it}						-1.380 (0.151)		0.160 (0.110)	
L1.lnGDPpc ² _{it}		-0.016 ^b (0.042)	-0.010 (0.607)		-0.143 ^c (0.000)	-0.319 ^b (0.019)		0.039 ^b (0.037)	0.048 (0.332)
L2.lnGDPpc ² _{it}						0.155 (0.156)		-0.020 ^a (0.096)	
L1.lnGDPpc ³ _{it}		0.001 ^a (0.099)	0.001 (0.605)		0.006 ^c (0.000)	0.012 ^b (0.021)		-0.002 ^b (0.035)	-0.002 (0.333)
L2.lnGDPpc ³ _{it}						-0.005 (0.191)		0.001 ^a (0.084)	
lnGDPpc _{it}	0.265 ^b (0.036)			0.456 (0.583)			-0.024 (0.584)		
lnGDPpc ² _{it}	-0.023 (0.123)			-0.022 (0.827)			0.003 (0.541)		
lnGDPpc ³ _{it}	0.001 (0.337)			0.001 (0.997)			-0.001 (0.521)		
lnTOI _{it}	0.003 (0.303)	-0.002 (0.818)	0.021 ^a (0.083)	0.034 (0.103)	-0.073 ^c (0.003)	-0.008 (0.863)	0.006 (0.317)	0.004 (0.655)	-0.001 (0.987)
GVE _{it}	-0.001 (0.987)	-0.023 ^c (0.000)	-0.001 (0.937)	0.009 (0.829)	-0.084 ^c (0.000)	-0.098 ^a (0.076)	-0.001 (0.965)	-0.024 (0.121)	-0.020 (0.509)
rGVE.lnTOI _{it}	0.001 (0.903)	0.004 ^c (0.006)	0.003 (0.368)	0.026 (0.584)	0.008 ^a (0.076)	0.006 (0.552)	-0.009 (0.588)	0.024 ^c (0.000)	0.036 ^b (0.021)

lnURB _{it}	0.532	0.046	-0.027	-1.959	-0.630 ^c	-0.150 ^b	0.032	-0.202 ^a	-0.139
(d.lnURB _{it})	(0.407)	(0.184)	(0.206)	(0.636)	(0.002)	(0.030)	(0.803)	(0.074)	(0.399)
lnFDI _{it}	0.003	-0.002	0.008	0.026	-0.020 ^b	-0.010	0.001	-0.004	-0.009
	(0.295)	(0.551)	(0.302)	(0.150)	(0.018)	(0.686)	(0.678)	(0.643)	(0.703)
lnFER _{it}	0.032	0.039 ^b	0.013	0.680 ^c	-0.094	0.061	0.009	0.216 ^c	-0.033
(d.lnFER _{it})	(0.416)	(0.030)	(0.550)	(0.004)	(0.148)	(0.412)	(0.806)	(0.000)	(0.627)
WTO _{it}	-0.033 ^c	-0.028	-0.026	-0.135 ^c	0.007	-0.112	0.001	-0.070	-0.096
	(0.001)	(0.145)	(0.644)	(0.000)	(0.900)	(0.238)	(0.835)	(0.147)	(0.293)
OECD _{it}	-0.005	-0.003	-0.016	-0.073	-0.025	-0.088	0.001	-0.042	0.014
	(0.565)	(0.770)	(0.426)	(0.248)	(0.562)	(0.162)	(0.799)	(0.134)	(0.866)
GEFC _t	0.019 ^c	-0.008 ^c	-0.003	-0.232 ^c	0.008	omitted	-0.005	-0.054 ^c	omitted
	(0.004)	(0.008)	(0.487)	(0.000)	(0.716)		(0.266)	(0.000)	
COVID _t	0.040 ^c	-0.001	omitted	-0.476 ^c	omitted	0.016	0.012 ^b	omitted	omitted
	(0.000)	(0.267)		(0.000)		(0.612)	(0.019)		
Constant	-1.015 ^c		-0.287	-2.904		-3.779 ^c	0.056		2.229
	(0.005)		(0.524)	(0.218)		(0.005)	(0.630)		(0.256)
Observations	1,065	940	999	1,065	941	1,000	1,065	941	1,000
Groups	79	76	78	79	76	78	-	76	78
Instruments	-	72	75	-	72	70	-	71	73
R-squared	0.620	-	-	0.586	-	-	0.210	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	N	-	-
F tests ¹	131.89 ^c	-	-	75.30 ^c	-	-	1.10	-	-
Hausman tests ² (chi2)	179.89 ^c	-	-	314.10 ^c	-	-	125.69 ^c	-	-
AR(1) (z)	-	-3.30 ^c	-3.06 ^c	-	-3.94 ^c	-2.16 ^b	-	-2.85 ^c	-2.23 ^b
AR(1) (p)	-	0.001	0.002	-	0.000	0.031	-	0.004	0.026
AR(2) (z)	-	-0.69	-1.17	-	0.83	0.04	-	-1.44	-1.57
AR(2) (p)	-	0.492	0.242	-	0.406	0.967	-	0.150	0.116
Hansen test (chi2)	-	42.66	45.94	-	38.41	29.89	-	40.65	49.35
Hansen test (p)	-	0.443	0.392	-	0.630	0.753	-	0.355	0.203

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include income per capita and its squared and cubic forms.

Source: The author.

Table C5.27: Estimation results of Low Openness POS-integrated GKC models

Dependent variable GE_{it}	$\ln GDI_{it}$			$\ln GII_{it}$			(d. $\ln FLA_{it}$)	$\ln FLA_{it}$	
	(1) FE	(2) DGMM-II	(3) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II	(7) FE	(8) DGMM-II	(9) SGMM-II
L1. GE_{it}		0.459 ^c (0.000)			1.020 ^c (0.000)	1.000 ^c (0.000)		0.351 ^c (0.000)	0.740 ^c (0.000)
L2. GE_{it}		0.121 ^c (0.000)	0.353 ^c (0.002)			-0.085 (0.140)			
L1. $\ln GDP_{pcit}$		0.336 ^c (0.000)	0.448 (0.112)		1.983 ^c (0.000)	1.566 (0.376)			0.348 (0.517)
L2. $\ln GDP_{pcit}$						-0.857 (0.595)		-0.229 ^b (0.035)	
L1. $\ln GDP_{pc}^2_{it}$		-0.036 ^c (0.000)	-0.049 (0.130)		-0.217 ^c (0.000)	-0.178 (0.362)			-0.038 (0.569)
L2. $\ln GDP_{pc}^2_{it}$						0.101 (0.564)		0.030 ^b (0.018)	
L1. $\ln GDP_{pc}^3_{it}$		0.001 ^c (0.000)	0.002 (0.129)		0.008 ^c (0.000)	0.007 (0.368)			0.002 (0.581)
L2. $\ln GDP_{pc}^3_{it}$						-0.004 (0.558)		-0.001 ^c (0.008)	
$\ln GDP_{pcit}$	0.280 ^b (0.027)			0.490 (0.559)			-0.022 (0.605)		
$\ln GDP_{pc}^2_{it}$	-0.024 (0.101)			-0.025 (0.808)			0.003 (0.565)		
$\ln GDP_{pc}^3_{it}$	0.001 (0.288)			0.001 (0.976)			-0.001 (0.552)		
$\ln TOI_{it}$	0.005 (0.162)	-0.017 ^b (0.012)	-0.008 (0.694)	0.032 (0.104)	-0.074 ^c (0.005)	-0.097 ^a (0.094)	0.007 (0.256)	-0.019 ^a (0.076)	-0.001 (0.959)
POS_{it}	-0.007 ^a (0.066)	-0.014 ^c (0.000)	-0.030 (0.129)	-0.021 (0.405)	-0.044 ^b (0.022)	-0.012 (0.744)	-0.001 (0.546)	-0.055 ^c (0.000)	-0.034 (0.323)
$rPOS.\ln TOI_{it}$	-0.006 (0.435)	0.001 (0.167)	0.011 ^a (0.061)	0.048 (0.181)	-0.010 ^a (0.055)	-0.006 (0.542)	-0.012 (0.405)	0.001 (0.992)	-0.002 (0.889)

lnURB _{it}	0.566	-0.004	-0.061	-2.037	-1.000 ^c	-0.028	0.038	-0.162	-0.200
(d.lnURB _{it})	(0.357)	(0.887)	(0.118)	(0.603)	(0.000)	(0.809)	(0.767)	(0.125)	(0.480)
lnFDI _{it}	0.003	0.002	0.012	0.025	-0.009	-0.008	0.001	-0.017 ^c	-0.019
	(0.362)	(0.269)	(0.384)	(0.159)	(0.566)	(0.857)	(0.634)	(0.009)	(0.400)
lnFER _{it}	0.036	0.069 ^c	-0.035	0.689 ^c	0.104	0.070	0.010	0.180 ^c	-0.018
(d.lnFER _{it})	(0.342)	(0.000)	(0.319)	(0.003)	(0.135)	(0.337)	(0.783)	(0.000)	(0.933)
WTO _{it}	-0.032 ^c	-0.058 ^c	-0.154	-0.128 ^c	-0.078	0.158	0.001	-0.049	-0.048
	(0.002)	(0.002)	(0.176)	(0.000)	(0.152)	(0.497)	(0.725)	(0.169)	(0.780)
OECD _{it}	-0.004	0.001	-0.014	-0.069	-0.046	-0.168	0.001	-0.017	0.082
	(0.642)	(0.965)	(0.642)	(0.304)	(0.527)	(0.106)	(0.914)	(0.536)	(0.511)
GEFC _t	0.017 ^b	-0.019 ^c	-0.009	-0.241 ^c	-0.061 ^b	omitted	-0.006	-0.063 ^c	0.029
	(0.011)	(0.000)	(0.261)	(0.000)	(0.028)		(0.233)	(0.000)	(0.255)
COVID _t	0.038 ^c	-0.002 ^a	omitted	-0.485 ^c	0.007	-0.036	0.011 ^b	omitted	omitted
	(0.000)	(0.056)		(0.000)	(0.261)	(0.126)	(0.021)		
Constant	-1.072 ^c		-1.068	-3.064		-1.982	0.051		0.738
	(0.003)		(0.175)	(0.196)		(0.105)	(0.656)		(0.694)
Observations	1,065	940	999	1,065	1,000	1,000	1,065	941	1,065
Groups	79	76	78	79	78	78	-	76	79
Instruments	-	72	72	-	68	74	-	72	71
R-squared	0.627	-	-	0.588	-	-	0.210	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	N	-	-
F tests ¹	125.51 ^c	-	-	75.98 ^c	-	-	0.96	-	-
Hausman tests ² (chi2)	152.39 ^c	-	-	301.64 ^c	-	-	112.95 ^c	-	-
AR(1) (z)	-	-3.28 ^c	-2.62 ^c	-	-3.39 ^c	-3.20 ^c	-	-2.22 ^b	-2.72 ^c
AR(1) (p)	-	0.001	0.009	-	0.001	0.001	-	0.027	0.007
AR(2) (z)	-	0.53	-1.43	-	-0.30	0.21	-	-0.74	-1.35
AR(2) (p)	-	0.597	0.153	-	0.766	0.837	-	0.457	0.176
Hansen test (chi2)	-	48.45	39.67	-	31.25	42.18	-	53.15	49.37
Hansen test (p)	-	0.229	0.574	-	0.773	0.377	-	0.138	0.147

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include income per capita and its squared and cubic forms.

Source: The author.

Table C5.28: Estimation results of Low Openness REQ-integrated GKC models

[illegible]

lnURB _{it}	0.534	-0.009	-0.024	-2.053	-0.385 ^b	-0.075	0.032	-0.125	-0.195
(d.lnURB _{it})	(0.407)	(0.848)	(0.386)	(0.608)	(0.048)	(0.238)	(0.803)	(0.414)	(0.437)
lnFDI _{it}	0.003	-0.001	0.017 ^a	0.026	-0.017	0.001	0.001	-0.022 ^b	-0.038
	(0.311)	(0.957)	(0.100)	(0.155)	(0.130)	(0.964)	(0.715)	(0.021)	(0.256)
lnFER _{it}	0.032	0.039 ^c	0.025	0.673 ^c	0.039	0.052	0.007	0.077	-0.028
(d.lnFER _{it})	(0.408)	(0.004)	(0.321)	(0.005)	(0.382)	(0.346)	(0.857)	(0.215)	(0.738)
WTO _{it}	-0.033 ^c	-0.052 ^c	-0.036	-0.134 ^c	0.013	0.108	-0.001	0.029	-0.017
	(0.001)	(0.001)	(0.576)	(0.000)	(0.803)	(0.554)	(0.929)	(0.553)	(0.847)
OECD _{it}	-0.005	-0.010	-0.021	-0.075	-0.059	-0.066	0.001	-0.039	0.061
	(0.561)	(0.407)	(0.381)	(0.236)	(0.380)	(0.483)	(0.941)	(0.217)	(0.522)
GEFC _t	0.019 ^c	-0.018 ^c	-0.008	-0.236 ^c	-0.019	omitted	-0.006	-0.048 ^c	omitted
	(0.004)	(0.000)	(0.187)	(0.000)	(0.357)		(0.235)	(0.002)	
COVID _t	0.040 ^c	-0.003 ^c	omitted	-0.480 ^c	-0.001	-0.020	0.011 ^b	-0.033 ^c	omitted
	(0.000)	(0.009)		(0.000)	(0.852)	(0.426)	(0.022)	(0.000)	
Constant	-1.012 ^c		-0.394	-2.870		-2.127 ^b	0.063		2.174
	(0.006)		(0.350)	(0.246)		(0.043)	(0.582)		(0.119)
Observations	1,065	940	999	1,065	1,000	1,000	1,065	1,000	1,000
Groups	79	76	78	79	78	78	-	78	78
Instruments	-	68	75	-	72	76	-	68	74
R-squared	0.620	-	-	0.586	-	-	0.210	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	N	-	-
F tests ¹	129.80 ^c	-	-	77.72 ^c	-	-	1.03	-	-
Hausman tests ² (chi2)	831.91 ^c	-	-	300.03 ^c	-	-	106.09 ^c	-	-
AR(1) (z)	-	-3.19 ^c	-3.21 ^c	-	-3.42 ^c	-2.22 ^b	-	-2.41 ^b	-2.16 ^b
AR(1) (p)	-	0.001	0.001	-	0.001	0.026	-	0.016	0.031
AR(2) (z)	-	-0.85	-0.66	-	-0.21	-0.41	-	-0.16	-0.67
AR(2) (p)	-	0.395	0.511	-	0.837	0.684	-	0.876	0.500
Hansen test (chi2)	-	46.70	42.15	-	38.25	45.19	-	37.68	44.65
Hansen test (p)	-	0.157	0.421	-	0.636	0.464	-	0.484	0.283

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include income per capita and its squared and cubic forms.

Source: The author.

Table C5.29: Estimation results of Low Openness ROL-integrated GKC models

Dependent variable GE _{it}	lnGDI _{it}			lnGII _{it}			(d.lnFLA _{it})	lnFLA _{it}	
	(1) FE	(2) DGMM-II	(3) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II	(7) FE	(8) DGMM-II	(9) SGMM-II
L1.GE _{it}		0.540 ^c (0.000)			1.029 ^c (0.000)	0.973 ^c (0.000)		0.278 ^c (0.000)	0.815 ^c (0.000)
L2.GE _{it}		0.137 ^c (0.000)	0.311 ^b (0.012)			0.012 (0.932)		-0.048 (0.146)	
L1.lnGDPpc _{it}		0.203 ^c (0.000)	-0.028 (0.960)		1.075 ^c (0.000)	0.799 ^b (0.036)		0.542 ^b (0.032)	0.243 (0.534)
L2.lnGDPpc _{it}			-0.140 (0.769)						
L1.lnGDPpc ² _{it}		-0.022 ^c (0.000)	0.005 (0.933)		-0.112 ^c (0.000)	-0.089 ^a (0.062)		-0.063 ^b (0.036)	-0.028 (0.563)
L2.lnGDPpc ² _{it}			0.016 (0.765)						
L1.lnGDPpc ³ _{it}		0.001 ^c (0.002)	-0.001 (0.944)		0.004 ^c (0.000)	0.003 ^a (0.089)		0.003 ^b (0.029)	0.001 (0.566)
L2.lnGDPpc ³ _{it}			-0.001 (0.695)						
lnGDPpc _{it}	0.267 ^b (0.036)			0.401 (0.637)			-0.017 (0.706)		
lnGDPpc ² _{it}	-0.023 (0.124)			-0.016 (0.879)			0.002 (0.674)		
lnGDPpc ³ _{it}	0.001 (0.335)			-0.001 (0.954)			-0.001 (0.677)		
lnTOI _{it} (d.lnTOI _{it})	0.003 (0.206)	-0.014 ^c (0.005)	-0.001 (0.954)	0.029 (0.122)	-0.098 ^c (0.000)	-0.076 (0.242)	0.008 (0.189)	0.015 (0.181)	-0.006 (0.815)
ROL _{it}	-0.002 (0.777)	-0.003 (0.573)	0.063 ^c (0.005)	0.045 (0.406)	-0.051 ^a (0.090)	-0.068 (0.127)	-0.002 (0.438)	-0.097 ^c (0.000)	-0.033 (0.295)
rROL.lnTOI _{it} (rROL.dlnTOI _{it})	-0.001 (0.984)	0.001 (0.213)	-0.007 (0.363)	0.036 (0.360)	0.006 (0.196)	0.001 (0.947)	-0.022 (0.138)	-0.027 ^c (0.000)	-0.019 ^a (0.078)

lnURB _{it}	0.531	0.011	0.001	-1.994	-0.617 ^c	-0.080	0.041	-0.100	-0.155
(d.lnURB _{it})	(0.407)	(0.644)	(0.994)	(0.629)	(0.004)	(0.290)	(0.749)	(0.375)	(0.292)
lnIFDI _{it}	0.003	0.005 ^b	0.012	0.026	-0.022 ^b	0.008	0.001	0.005	-0.001
	(0.300)	(0.017)	(0.375)	(0.138)	(0.050)	(0.728)	(0.662)	(0.593)	(0.989)
lnFER _{it}	0.032	0.050 ^c	-0.070	0.691 ^c	0.021	0.058	0.009	0.247 ^c	-0.067
(d.lnFER _{it})	(0.424)	(0.000)	(0.182)	(0.004)	(0.641)	(0.177)	(0.801)	(0.000)	(0.301)
WTO _{it}	-0.033 ^c	-0.054 ^c	-0.093	-0.136 ^c	-0.047	0.072	0.001	0.005	0.103
	(0.001)	(0.000)	(0.247)	(0.000)	(0.440)	(0.609)	(0.661)	(0.920)	(0.639)
OECD _{it}	-0.005	-0.002	-0.046	-0.070	-0.065	0.010	0.001	0.101	0.121
	(0.563)	(0.824)	(0.457)	(0.272)	(0.244)	(0.889)	(0.782)	(0.148)	(0.125)
GEFC _t	0.019 ^c	0.004 ^c	-0.013	-0.225 ^c	-0.043 ^a	omitted	-0.006	-0.044 ^c	0.050 ^b
	(0.004)	(0.005)	(0.342)	(0.000)	(0.069)		(0.234)	(0.000)	(0.026)
COVID _t	0.040 ^c	0.012 ^c	omitted	-0.471 ^c	-0.004	-0.024	0.011 ^b	omitted	omitted
	(0.000)	(0.000)		(0.000)	(0.445)	(0.373)	(0.022)		
Constant	-1.023 ^c		0.589	-2.727		-2.068 ^a	0.037		0.496
	(0.005)		(0.453)	(0.255)		(0.056)	(0.755)		(0.707)
Observations	1,065	940	999	1,065	1,000	1,000	1,065	941	1,065
Groups	79	76	78	79	78	78	-	76	79
Instruments	-	72	71	-	72	76	-	69	72
R-squared	0.620	-	-	0.588	-	-	0.212	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	N	-	-
F tests ¹	132.67 ^c	-	-	78.28 ^c	-	-	0.98	-	-
Hausman tests ² (chi2)	71.05 ^c	-	-	310.30 ^c	-	-	113.69 ^c	-	-
AR(1) (z)	-	-3.24 ^c	-2.74 ^c	-	-3.39 ^c	-2.19 ^b	-	-2.05 ^b	-2.72 ^c
AR(1) (p)	-	0.001	0.006	-	0.001	0.029	-	0.040	0.007
AR(2) (z)	-	0.25	-1.62	-	-0.61	-0.39	-	0.06	-1.30
AR(2) (p)	-	0.805	0.105	-	0.542	0.699	-	0.950	0.192
Hansen test (chi2)	-	48.16	36.72	-	39.88	47.95	-	41.39	49.04
Hansen test (p)	-	0.238	0.529	-	0.564	0.354	-	0.367	0.182

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include income per capita and its squared and cubic forms.

Source: The author.

Table C5.30: Estimation results of Low Openness VAC-integrated GKC models

Dependent variable GE_{it}	lnGDI_{it}			lnGII_{it}			(d.lnFLA _{it})	lnFLA_{it}	
	(1) FE	(2) DGMM-II	(3) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II	(7) FE	(8) DGMM-II	(9) SGMM-II
L1.GE _{it}		0.453 ^c (0.000)	0.509 ^c (0.007)		1.014 ^c (0.000)	0.927 ^c (0.000)		0.437 ^c (0.000)	0.881 ^c (0.002)
L2.GE _{it}		0.168 ^c (0.000)	0.285 ^a (0.099)					0.009 (0.827)	-0.196 ^a (0.099)
L1.lnGDPpc _{it}		0.126 ^c (0.010)	0.160 (0.710)		1.714 ^c (0.000)	0.679 (0.311)		-0.329 ^a (0.072)	-0.341 (0.278)
L2.lnGDPpc _{it}			-0.320 (0.402)			-0.056 (0.893)			
L1.lnGDPpc ² _{it}		-0.014 ^b (0.011)	-0.017 (0.724)		-0.180 ^c (0.000)	-0.071 (0.374)		0.043 ^b (0.035)	0.039 (0.294)
L2.lnGDPpc ² _{it}			0.035 (0.411)			0.006 (0.906)			
L1.lnGDPpc ³ _{it}		0.001 ^b (0.030)	0.001 (0.697)		0.006 ^c (0.000)	0.002 (0.468)		-0.002 ^b (0.023)	-0.001 (0.311)
L2.lnGDPpc ³ _{it}			-0.001 (0.366)			-0.001 (0.991)			
lnGDPpc _{it}	0.257 ^b (0.046)			0.451 (0.595)			-0.024 (0.584)		
lnGDPpc ² _{it}	-0.022 (0.149)			-0.021 (0.839)			0.003 (0.539)		
lnGDPpc ³ _{it}	0.001 (0.384)			-0.001 (0.994)			-0.001 (0.516)		
lnTOI _{it}	0.005 (0.185)	-0.008 (0.195)	0.012 (0.525)	0.033 ^a (0.095)	-0.126 ^c (0.000)	-0.110 ^a (0.082)	0.005 (0.370)	0.011 (0.362)	0.012 (0.515)
VAC _{it}	-0.010 (0.359)	0.027 ^c (0.000)	0.044 ^a (0.055)	0.008 (0.802)	-0.087 ^c (0.001)	-0.017 (0.718)	0.006 (0.448)	0.054 ^c (0.000)	0.091 ^a (0.083)
rVAC.lnTOI _{it}	-0.015 ^b (0.021)	-0.001 (0.952)	-0.008 (0.341)	0.022 (0.549)	-0.012 ^b (0.016)	-0.001 (0.983)	-0.001 (0.937)	0.009 ^c (0.000)	0.002 (0.867)

lnURB _{it}	0.529	0.045	0.045	-2.063	-1.101 ^c	-0.024	0.038	-0.226 ^b	-0.192
(d.lnURB _{it})	(0.410)	(0.126)	(0.429)	(0.608)	(0.000)	(0.763)	(0.767)	(0.045)	(0.274)
lnFDI _{it}	0.003	0.006 ^b	0.016	0.026	-0.016	-0.017	0.001	-0.002	-0.008
	(0.315)	(0.016)	(0.279)	(0.146)	(0.140)	(0.340)	(0.657)	(0.751)	(0.773)
lnFER _{it}	0.035	0.049 ^c	0.007	0.678 ^c	-0.141 ^a	0.073	0.008	0.189 ^c	-0.057
(d.lnFER _{it})	(0.367)	(0.000)	(0.866)	(0.004)	(0.071)	(0.225)	(0.819)	(0.000)	(0.513)
WTO _{it}	-0.033 ^c	-0.054 ^c	0.023	-0.134 ^c	-0.001	0.001	0.001	-0.106	-0.073
	(0.001)	(0.003)	(0.660)	(0.000)	(0.988)	(0.992)	(0.860)	(0.117)	(0.708)
OECD _{it}	-0.005	-0.011	-0.021	-0.072	-0.115 ^a	-0.107	0.001	-0.058 ^b	0.004
	(0.598)	(0.445)	(0.508)	(0.253)	(0.062)	(0.316)	(0.808)	(0.044)	(0.962)
GEFC _t	0.020 ^c	-0.008 ^c	-0.007	-0.234 ^c	-0.041 ^a	omitted	-0.006	0.015 ^c	omitted
	(0.002)	(0.000)	(0.381)	(0.000)	(0.077)		(0.246)	(0.000)	
COVID _t	0.041 ^c	-0.003 ^c	omitted	-0.479 ^c	omitted	-0.032	0.011 ^b	0.035 ^c	omitted
	(0.000)	(0.001)		(0.000)		(0.178)	(0.019)	(0.000)	
Constant	-0.993 ^c		0.215	-2.910		-1.558	0.055		3.058 ^a
	(0.007)		(0.671)	(0.223)		(0.214)	(0.630)		(0.083)
Observations	1,065	940	999	1,065	1,000	1,000	1,065	941	1,000
Groups	79	76	78	79	78	78	-	76	78
Instruments	-	68	69	-	72	76	-	71	71
R-squared	0.622	-	-	0.586	-	-	0.210	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	N	-	-
F tests ¹	133.61 ^c	-	-	78.15 ^c	-	-	0.96	-	-
Hausman tests ² (chi2)	161.21 ^c	-	-	295.10 ^c	-	-	94.57 ^c	-	-
AR(1) (z)	-	-3.34 ^c	-2.17 ^b	-	-3.15 ^c	-3.40 ^c	-	-2.52 ^b	-1.99 ^b
AR(1) (p)	-	0.001	0.030	-	0.002	0.001	-	0.012	0.047
AR(2) (z)	-	-0.63	-0.68	-	-0.52	-0.37	-	-1.27	-0.87
AR(2) (p)	-	0.527	0.498	-	0.603	0.713	-	0.203	0.382
Hansen test (chi2)	-	40.63	44.98	-	32.21	38.27	-	43.03	44.17
Hansen test (p)	-	0.355	0.120	-	0.862	0.676	-	0.384	0.300

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include income per capita and its squared and cubic forms.

Source: The author.

Table C5.31: Summary of findings on the direct effect of trade openness on gender equality

Contextual effects	Direct effects			Hypotheses
	GDI	GII	FLA	
Aggregated	Increasing (+)	Decreasing (-)	Increasing (+)	H.3.1.1: Supported H.3.1.2: Supported H.3.1.3: Supported
High Institution	Decreasing (-)	Decreasing (-)	Increasing (+)	H.3.1.1: Not supported (opposite sign) H.3.1.2: Supported H.3.1.3: Supported H.3.6: Supported (in GDI models)
Low Institution		Decreasing (-)	Increasing (+)	H.3.1.1: Not supported H.3.1.2: Supported H.3.1.3: Supported H.3.6: Supported (in GDI models)
High Openness	Decreasing (-)	Decreasing (-)	Increasing (+)	H.3.1.1: Not supported (opposite sign) H.3.1.2: Supported H.3.1.3: Supported H.3.5: Supported (in GDI and FLA models)
Low Openness		Decreasing (-)		H.3.1.1: Not supported H.3.1.2: Supported H.3.1.3: Not supported H.3.5: Supported (in GDI and FLA models)

Source: The author.

Table C5.32: Summary of findings on the direct effect of institutional quality on gender equality

Contextual effects	Direct effects			Hypotheses
	GDI	GII	FLA	
Aggregated	GVE (-)	COC, GVE, POS, REQ, VAC (-)	COC (+) POS, REQ, ROL (-)	H.3.2.1: Not supported (opposite sign) H.3.2.2: Supported H.3.2.3: Supported (in COC model)
High Institution	COC, GVE, ROL (-)	COC, REQ (-) ROL (+)	COC, ROL (-) POS, VAC (+)	H.3.2.1: Not supported H.3.2.2: Supported (in COC and REQ models) H.3.2.3: Supported (in POS and VAC models) H.3.6: Supported
Low Institution	GVE, REQ (-) ROL (+)	COC, GVE, REQ (-) POS (+)	POS, REQ, ROL (-) COC, VAC (+)	H.3.2.1: Supported (in ROL model) H.3.2.2: Supported (in COC, GVE, and REQ models) H.3.2.3: Supported (in COC and VAC models) H.3.6: Supported
High Openness	COC (-) GVE, POS, ROL (+)	COC, GVE, VAC (-)	COC, VAC (+) GVE, POS (-)	H.3.2.1: Supported (in GVE, POS, and ROL models) H.3.2.2: Supported H.3.2.3: Supported (in COC and VAC models) H.3.5: Supported

Low Openess	GVE, POS (-) ROL, VAC (+)	GVE, POS, REQ, ROL, VAC (-)	COC, VAC (+) POS, REQ, ROL (-)	H.3.2.1: Supported (in ROL and VAC models) H.3.2.2: Supported H.3.2.3: Supported (in COC and VAC models) H.3.5: Supported

Source: The author.

Table C5.33: Summary of findings on the moderating effect of trade openness on the gender-institution nexus

Contextual effects	Moderating effects of trade openness			Hypotheses
	GDI-Institution	GII-Institution	FLA-Institution	
Aggregated	GDI-POS (+)	GII-POS (+) GII-ROL (+) GII-VAC (+)	FLA-All (-)	H.3.3.1: Supported H.3.3.2: Supported H.3.3.3: Supported
High Institution	GDI-POS (+) GDI-VAC (+)	GII-COC (-) GII-REQ (-)	FLA-All (-)	H.3.3.1: Supported H.3.3.2: Supported H.3.3.3: Supported
Low Institution	GDI-COC (+) GDI-POS (-)	GII-COC (+) GII-GVE (+) GII-REQ (+) GII-ROL (+) GII-VAC (+)	FLA-POS (+) FLA-ROL (+) FLA-GVE (-) FLA-VAC (-)	H.3.3.1: Supported H.3.3.2: Supported H.3.3.3: Supported

Source: The author.

Table C5.34: Summary of findings on the moderating effect of institutional quality on the gender-liberalization nexus

Contextual effects	Moderating effects of institutional quality			Hypotheses
	GDI-Openness	GII-Openness	FLA-Openness	
Aggregated			GVE, REQ, VAC (+)	H.3.4.1: Not supported H.3.4.2: Not supported H.3.4.3: Supported
High Openness	COC (+) GVE, POS, REQ (-)	POS (+) ROL (-)	GVE, REQ (+) COC, POS, ROL, VAC (-)	H.3.4.1: Supported H.3.4.2: Supported H.3.4.3: Supported
Low Openness	COC, GVE, POS, REQ (+)	GVE (+) POS, VAC (-)	COC, GVE, REQ, VAC (+) ROL (-)	H.3.4.1: Supported H.3.4.2: Supported H.3.4.3: Supported

Source: The author.

APPENDICES OF CHAPTER 6

Table C6.1: Estimation results of COC-, GVE- and POS-integrated EKC models (aggregated sample)

Dependent variable $\ln CE_{pcit}$	COC models			GVE models			POS models		
	(1) FE	(2) DGMM-II	(3) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II	(7) FE	(8) DGMM-II	(9) SGMM-II
L1. $\ln CE_{pcit}$		0.382 ^c (0.000)	0.741 ^c (0.001)		0.334 ^c (0.002)	0.750 ^c (0.000)		0.259 ^c (0.009)	
L2. $\ln CE_{pcit}$					0.006 (0.826)			0.005 (0.864)	-0.004 (0.942)
L1. $\ln TOI_{it}$			0.323 (0.561)		-0.509 ^a (0.095)	-0.417 (0.121)		-0.287 (0.262)	0.065 (0.924)
L2. $\ln TOI_{it}$		0.038 (0.435)	-0.075 (0.874)						-0.295 (0.703)
L1. TOI^2_{it}			-0.080 (0.393)		0.071 ^a (0.097)	0.064 ^a (0.093)		0.017 (0.692)	-0.092 (0.282)
L2. $\ln TOI^2_{it}$		0.001 (0.951)	0.079 (0.345)						0.119 (0.251)
$\ln TOI_{it}$	-0.267 ^b (0.013)			-0.268 ^b (0.016)			-0.277 ^c (0.010)		
$\ln TOI^2_{it}$	0.049 ^b (0.031)			0.049 ^b (0.036)			0.053 ^b (0.018)		
COC_{it}	0.083 (0.158)	-0.022 (0.849)	0.134 (0.532)						
$rCOC.\ln TOI_{it}$	0.038 (0.590)	-0.220 ^c (0.008)	-0.333 ^a (0.099)						
$rCOC.\ln TOI^2_{it}$	-0.013 (0.456)	0.049 ^c (0.009)	0.081 (0.128)						
GVE_{it}				0.006 (0.899)	-0.143 (0.160)	-0.147 (0.482)			
$rGVE.\ln TOI_{it}$				0.073 (0.292)	0.037 (0.762)	0.065 (0.714)			

rGVE.lnTOI ² _{it}				-0.016 (0.328)	-0.001 (0.967)	-0.008 (0.811)			
POS _{it}							0.039 (0.319)	0.115 (0.300)	0.122 (0.617)
rPOS.lnTOI _{it}							0.102 (0.169)	-0.282 ^b (0.038)	-0.805 ^b (0.050)
rPOS.lnTOI ² _{it}							-0.027 (0.128)	0.060 ^a (0.054)	0.181 ^b (0.050)
lnURB _{it}	2.017 ^c (0.000)	2.628 ^c (0.000)	0.688 (0.574)	2.032 ^c (0.000)	2.807 ^c (0.000)	0.921 ^a (0.095)	2.025 ^c (0.000)	2.071 ^b (0.031)	3.788 ^c (0.000)
lnIFDI _{it}	0.098 ^c (0.004)	0.029 (0.368)	0.083 (0.316)	0.098 ^c (0.004)	0.024 (0.536)	0.033 (0.576)	0.101 ^c (0.003)	0.040 (0.313)	0.191 (0.138)
lnGDPp _{cit}	0.371 ^c (0.000)	0.191 ^b (0.014)	0.032 (0.880)	0.383 ^c (0.000)	0.173 ^b (0.018)	0.101 (0.190)	0.376 ^c (0.000)	0.250 ^c (0.002)	0.034 (0.893)
WTO _{it}	0.103 (0.197)	0.019 (0.957)	-0.719 (0.469)	0.103 (0.204)	0.144 (0.771)	0.684 ^a (0.054)	0.104 (0.182)	-0.202 (0.641)	-0.024 (0.983)
OECD _{it}	-0.005 (0.929)	-0.451 (0.170)	-0.618 (0.148)	0.002 (0.971)	-0.445 (0.264)	-0.357 (0.258)	0.009 (0.862)	-0.850 ^a (0.058)	-1.056 (0.106)
GEFC _t	-0.395 ^c (0.000)	omitted	omitted	-0.409 ^c (0.000)	0.198 ^c (0.003)	omitted	-0.399 ^c (0.000)	-0.101 ^b (0.014)	omitted
COVID _t	-0.556 ^c (0.000)	-0.375 ^c (0.000)	-0.129 (0.163)	-0.571 ^c (0.000)	-0.080 ^c (0.000)	-0.279 ^c (0.000)	-0.563 ^c (0.000)	omitted	-0.135 ^b (0.025)
Constant	-10.390 ^c (0.000)		-3.351 (0.334)	-10.588 ^c (0.000)		-4.313 ^b (0.027)	-10.506 ^c (0.000)		-14.771 ^c (0.000)
Observations	2,147	1,808	1,921	2,147	1,808	2,034	2,147	1,808	1,921
Groups	113	113	113	113	113	113	113	113	113
Instruments	-	51	54	-	51	55	-	51	53
R-squared	0.436	-	-	0.432	-	-	0.437	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	Y	-	-
F tests ¹	230.68 ^c	-	-	240.41 ^c	-	-	255.53 ^c	-	-
Hausman tests ² (chi2)	337.85 ^c	-	-	389.51 ^c	-	-	359.66 ^c	-	-
AR(1) (z)	-	-2.90 ^c	-3.52 ^c	-	-2.42 ^b	-3.93 ^c	-	-2.01 ^b	-1.84 ^a

AR(1) (p)	-	0.004	0.000	-	0.016	0.000	-	0.044	0.065
AR(2) (z)	-	0.54	0.21	-	0.03	0.35	-	-0.32	0.01
AR(2) (p)	-	0.586	0.835	-	0.979	0.725	-	0.749	0.989
Hansen test (chi2)	-	26.89	21.84	-	27.43	25.40	-	25.48	19.50
Hansen test (p)	-	0.310	0.589	-	0.238	0.496	-	0.326	0.672

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include trade openness and its squared form.

Source: The author.

Table C6.2: Estimation results of REQ-, ROL- and VAC-integrated EKC models (aggregated sample)

Dependent variable $\ln CEp_{cit}$	REQ models			ROL models			VAC models		
	(1) FE	(2) DGMM-II	(3) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II
L1. $\ln CEp_{cit}$		0.251 ^c (0.009)	0.660 ^c (0.002)		0.162 ^a (0.059)	0.861 ^c (0.000)		0.273 ^c (0.000)	0.743 ^c (0.000)
L2. $\ln CEp_{cit}$		-0.002 (0.960)	0.042 (0.496)		-0.034 (0.227)			-0.009 (0.734)	
L1. $\ln TOI_{it}$			0.380 (0.412)		-0.774 ^c (0.000)				
L2. $\ln TOI_{it}$		0.045 (0.161)	0.030 (0.945)			0.097 (0.146)		0.067 (0.143)	0.067 (0.500)
L1. TOI^2_{it}			-0.093 (0.206)		0.085 ^c (0.007)				
L2. $\ln TOI^2_{it}$		-0.001 (0.995)	0.060 (0.442)			-0.006 (0.565)		-0.004 (0.555)	-0.003 (0.839)
$\ln TOI_{it}$	-0.267 ^b (0.017)			-0.286 ^b (0.011)			-0.281 ^c (0.005)		
$\ln TOI^2_{it}$	0.050 ^b (0.035)			0.055 ^b (0.023)			0.054 ^b (0.013)		
REQ_{it}	-0.014 (0.814)	-0.106 (0.241)	-0.083 (0.731)						
$rREQ.\ln TOI_{it}$	0.101 (0.249)	-0.196 ^a (0.051)	-0.376 ^a (0.095)						
$rREQ.\ln TOI^2_{it}$	-0.020 (0.350)	0.055 ^b (0.013)	0.098 ^a (0.062)						
ROL_{it}				0.064 (0.351)	0.010 (0.948)	-0.045 (0.796)			
$rROL.\ln TOI_{it}$				0.106 (0.165)	0.034 (0.759)	-0.246 ^a (0.094)			
$rROL.\ln TOI^2_{it}$				-0.026 (0.156)	0.005 (0.839)	0.058 ^b (0.041)			

CCXCV

VAC _{it}							0.016	-0.181 ^b	0.117
(d.VAC _{it})							(0.688)	(0.047)	(0.316)
rVAC.lnTOI _{it}							0.140 ^b	-0.072	-0.276 ^b
							(0.039)	(0.489)	(0.044)
rVAC.lnTOI ² _{it}							-0.029 ^a	0.014	0.065 ^a
							(0.066)	(0.456)	(0.067)
lnURB _{it}	2.043 ^c	3.025 ^c	1.027	2.051 ^c	3.116 ^c	0.543	2.088 ^c	3.284 ^c	0.479
	(0.000)	(0.000)	(0.457)	(0.000)	(0.000)	(0.160)	(0.000)	(0.000)	(0.406)
lnIFDI _{it}	0.095 ^c	0.064 ^a	0.106	0.098 ^c	0.040	0.052	0.112 ^c	0.017	0.092
	(0.006)	(0.078)	(0.303)	(0.004)	(0.185)	(0.318)	(0.002)	(0.541)	(0.193)
lnGDPp _{it}	0.383 ^c	0.230 ^c	0.006	0.377 ^c	0.305 ^c	0.036	0.375 ^c	0.214 ^c	0.129 ^a
	(0.000)	(0.002)	(0.972)	(0.000)	(0.000)	(0.568)	(0.000)	(0.001)	(0.100)
WTO _{it}	0.097	0.056	-0.747	0.110	0.019	0.068	0.074	0.059	-0.016
	(0.213)	(0.895)	(0.280)	(0.174)	(0.957)	(0.797)	(0.336)	(0.872)	(0.964)
OECD _{it}	0.004	-0.313	-0.413	-0.002	-0.647	-0.292	0.005	-0.141	-0.560 ^a
	(0.939)	(0.379)	(0.142)	(0.968)	(0.120)	(0.234)	(0.928)	(0.665)	(0.086)
GEFC _t	-0.410 ^c	omitted	omitted	-0.405 ^c	omitted	omitted	-0.363 ^c	omitted	omitted
	(0.000)			(0.000)			(0.000)		
COVID _t	-0.569 ^c	omitted	-0.109 ^c	-0.568 ^c	-0.074 ^c	-0.081 ^c	-0.534 ^c	omitted	-0.076 ^c
	(0.000)		(0.001)	(0.000)	(0.000)	(0.000)	(0.000)		(0.004)
Constant	-10.648 ^c		-4.797	-10.626 ^c		-2.893 ^b	-10.861 ^c		-3.268
	(0.000)		(0.290)	(0.000)		(0.093)	(0.000)		(0.118)
Observations	2,147	1,808	1,921	2,147	1,808	1,921	2,034	1,808	1,921
Groups	113	113	113	113	113	113	113	113	113
Instruments	-	51	54	-	51	56	-	51	55
R-squared	0.434	-	-	0.435	-	-	0.432	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	Y	-	-
F tests ¹	249.39 ^c	-	-	239.91 ^c	-	-	257.31 ^c	-	-
Hausman tests ² (chi2)	374.80 ^c	-	-	380.91 ^c	-	-	350.49 ^c	-	-
AR(1) (z)	-	-2.09 ^b	-3.44 ^c	-	-1.79 ^a	-3.99 ^c	-	-2.27 ^b	-3.15 ^c
AR(1) (p)	-	0.037	0.001	-	0.074	0.000	-	0.023	0.002
AR(2) (z)	-	0.04	-0.55	-	0.20	0.21	-	0.85	0.50

AR(2) (p)	-	0.970	0.584	-	0.842	0.835	-	0.393	0.616
Hansen test (chi2)	-	23.94	27.17	-	24.26	29.11	-	29.81	28.11
Hansen test (p)	-	0.407	0.249	-	0.389	0.407	-	0.155	0.405

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include trade openness and its squared form.

Source: The author.

Table C6.3: Estimation results of high COC-, high GVE-, and high POS-integrated EKC models

Dependent variable lnCEp _{cit}	High COC models			High GVE models			High POS models		
	(1) FE	(2) DGMM-II	(3) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II	(7) FE	(8) DGMM-II	(9) SGMM-II
L1.lnCEp _{cit}		0.275 ^c (0.000)	0.682 ^c (0.000)		0.161 ^a (0.059)	0.480 ^c (0.007)		0.393 ^c (0.000)	0.648 ^c (0.000)
L2.lnCEp _{cit}			0.095 (0.247)					-0.037 (0.352)	-0.053 (0.569)
L1.lnTOI _{it}		0.807 ^c (0.009)	0.669 ^a (0.085)		-0.065 (0.898)	1.428 ^b (0.014)			
L2.lnTOI _{it}		-1.317 ^c (0.004)			-1.974 ^c (0.000)	-0.562 (0.135)		-0.774 ^c (0.000)	-0.829 ^a (0.081)
L1.TOI ² _{it}		-0.127 ^c (0.002)	-0.075 ^a (0.095)		0.047 (0.534)	-0.167 ^b (0.029)			
L2.lnTOI ² _{it}		0.195 ^c (0.001)			0.187 ^b (0.020)	0.063 (0.154)		0.096 ^c (0.000)	0.102 ^a (0.061)
lnTOI _{it}	1.679 ^b (0.045)			1.459 ^b (0.043)			1.246 ^a (0.070)		
lnTOI ² _{it}	-0.161 ^a (0.080)			-0.138 ^a (0.087)			-0.125 (0.101)		
COC _{it}	0.096 (0.154)	0.268 ^c (0.010)	0.082 (0.532)						
GVE _{it}				0.042 (0.460)	0.508 ^c (0.000)	0.511 ^b (0.030)			
POS _{it}							-0.048 (0.316)	0.064 (0.278)	0.257 ^b (0.020)
lnURB _{it}	2.021 ^c (0.000)	5.425 ^c (0.000)	0.602 (0.361)	1.584 ^c (0.000)	3.324 ^b (0.036)	-0.439 (0.707)	2.169 ^c (0.000)	4.430 ^c (0.000)	1.004 ^a (0.069)
lnIFDI _{it}	0.036 (0.219)	-0.019 (0.622)	0.035 (0.397)	0.001 (0.983)	-0.030 (0.644)	0.121 (0.216)	-0.010 (0.700)	0.019 (0.630)	0.085 (0.283)
lnGDPp _{cit}	0.400 ^c (0.000)	-0.415 ^c (0.001)	-0.010 (0.924)	0.413 ^c (0.000)	0.010 (0.955)	-0.004 (0.976)	0.476 ^c (0.000)	-0.195 ^b (0.029)	-0.064 (0.607)

WTO _{it}	omitted	omitted	3.488 (0.321)	0.430 ^c (0.000)	omitted	omitted	0.077 (0.514)	-0.099 (0.738)	0.240 (0.660)
OECD _{it}	0.103 ^b (0.045)	0.035 (0.877)	0.017 (0.920)	0.088 ^a (0.078)	0.126 (0.618)	0.190 (0.497)	0.095 ^a (0.088)	0.733 ^c (0.003)	0.097 (0.686)
GEFC _t	-0.478 ^c (0.000)	0.244 ^c (0.000)	omitted	-0.466 ^c (0.000)	omitted	0.121 (0.146)	-0.520 ^c (0.000)	omitted	omitted
COVID _t	-0.705 ^c (0.000)	-0.123 ^c (0.000)	-0.076 ^c (0.000)	-0.659 ^c (0.000)	-0.069 ^c (0.001)	-0.111 ^c (0.002)	-0.754 ^c (0.000)	-0.388 ^c (0.000)	-0.248 ^c (0.001)
Constant	-14.928 ^c (0.000)		-7.282 (0.154)	-12.883 ^c (0.000)		-0.062 (0.990)	-14.811 ^c (0.000)		-2.021 (0.401)
Observations	1,073	901	956	1,073	917	968	1,073	900	955
Groups	76	72	73	69	68	68	77	74	74
Instruments	-	49	57	-	45	55	-	51	55
R-squared	0.458	-	-	0.452	-	-	0.505	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	Y	-	-
F tests ¹	236.79 ^c	-	-	277.52 ^c	-	-	265.45 ^c	-	-
Hausman tests ² (chi2)	229.47 ^c	-	-	284.29 ^c	-	-	111.52 ^c	-	-
AR(1) (z)	-	-1.60 ^a	-2.01 ^b	-	-2.66 ^c	-2.35 ^b	-	-2.31 ^b	-2.01 ^b
AR(1) (p)	-	0.100	0.044	-	0.008	0.019	-	0.021	0.045
AR(2) (z)	-	1.12	0.14	-	1.02	0.39	-	0.65	0.12
AR(2) (p)	-	0.261	0.888	-	0.307	0.695	-	0.515	0.903
Hansen test (chi2)	-	21.76	28.83	-	18.57	30.33	-	27.10	31.97
Hansen test (p)	-	0.535	0.527	-	0.485	0.348	-	0.351	0.276

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include trade openness and its squared form.

Source: The author.

Table C6.4: Estimation results of high REQ-, high ROL-, and high VAC-integrated EKC models

Dependent variable lnCEp _{cit}	High REQ models			High ROL models			High VAC models		
	(1) FE	(2) DGMM-II	(3) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II	(7) FE	(8) DGMM-II	(9) SGMM-II
L1.lnCEp _{cit}			0.745 ^c (0.000)			0.832 ^c (0.000)		0.294 ^c (0.000)	0.791 ^c (0.000)
L2.lnCEp _{cit}		0.092 (0.270)			0.154 ^b (0.050)				
L1.lnTOI _{it}			0.977 ^b (0.041)		0.224 (0.612)	1.147 ^b (0.029)		0.982 ^c (0.000)	0.888 (0.321)
L2.lnTOI _{it}		-1.217 ^c (0.002)							
L1.TOI ² _{it}			-0.100 ^a (0.067)		-0.031 (0.612)	-0.130 ^b (0.040)		-0.115 ^c (0.002)	-0.075 (0.510)
L2.lnTOI ² _{it}		0.154 ^c (0.006)							
lnTOI _{it}	1.490 ^b (0.043)			1.423 ^b (0.029)			1.539 ^c (0.008)		
lnTOI ² _{it}	-0.141 ^a (0.085)			-0.137 ^a (0.060)			-0.159 ^c (0.008)		
REQ _{it}	0.080 (0.204)	-0.048 (0.719)	0.096 (0.554)						
ROL _{it}				0.035 (0.748)	-0.544 ^c (0.000)	-0.013 (0.942)			
VAC _{it} (d.VAC _{it})							0.029 (0.574)	0.179 ^c (0.001)	0.234 ^b (0.017)
lnURB _{it}	1.409 ^c (0.000)	10.180 ^c (0.000)	0.171 (0.767)	1.888 ^c (0.000)	9.072 ^c (0.000)	-0.124 (0.761)	2.052 ^c (0.000)	3.559 ^c (0.000)	1.036 (0.257)
lnIFDI _{it}	-0.003 (0.912)	-0.014 (0.761)	-0.010 (0.871)	0.015 (0.636)	-0.085 ^b (0.014)	-0.004 (0.933)	-0.001 (0.971)	-0.039 (0.242)	-0.088 (0.374)
lnGDPp _{cit}	0.427 ^c (0.000)	-0.268 (0.221)	0.076 (0.574)	0.425 ^c (0.000)	-0.197 (0.275)	0.122 (0.228)	0.509 ^c (0.000)	-0.042 (0.383)	-0.112 (0.159)

CCC

WTO _{it}	0.401 ^c (0.000)	omitted	omitted	omitted	omitted	omitted	omitted	omitted	omitted
OECD _{it}	0.093 ^b (0.048)	-0.429 ^a (0.077)	0.054 (0.703)	0.092 ^a (0.080)	0.410 (0.238)	0.096 (0.535)	0.070 (0.114)	-0.016 (0.863)	0.049 (0.702)
GEFC _t	-0.474 ^c (0.000)	omitted	omitted	-0.483 ^c (0.000)	0.349 ^c (0.000)	omitted	-0.437 ^c (0.000)	omitted	omitted
COVID _t	-0.695 ^c (0.000)	-0.135 ^c (0.000)	-0.141 ^c (0.005)	-0.705 ^c (0.000)	-0.121 ^c (0.000)	-0.091 ^c (0.000)	-0.663 ^c (0.000)	-0.098 ^c (0.000)	-0.089 ^c (0.000)
Constant	-12.387 ^c (0.000)		-3.446 (0.114)	-13.756 ^c (0.000)		-2.910 ^a (0.063)	-15.327 ^c (0.000)		-5.317 ^a (0.079)
Observations	1,073	915	1,020	1,073	901	1,016	1,015	957	1,015
Groups	66	65	65	70	68	69	66	65	66
Instruments	-	42	55	-	40	55	-	51	55
R-squared	0.470	-	-	0.466	-	-	0.506	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	Y	-	-
F tests ¹	293.40 ^c	-	-	263.35 ^c	-	-	300.16 ^c	-	-
Hausman tests ² (chi2)	390.33 ^c	-	-	340.47 ^c	-	-	432.49 ^c	-	-
AR(1) (z)	-	2.30 ^b	-2.51 ^b	-	1.66 ^a	-2.23 ^b	-	-1.98 ^b	-3.09 ^c
AR(1) (p)	-	0.021	0.012	-	0.096	0.026	-	0.048	0.002
AR(2) (z)	-	1.51	0.22	-	1.42	0.51	-	-0.85	-1.52
AR(2) (p)	-	0.132	0.830	-	0.156	0.612	-	0.394	0.129
Hansen test (chi2)	-	22.38	26.26	-	22.38	33.07	-	24.06	28.56
Hansen test (p)	-	0.216	0.611	-	0.131	0.275	-	0.572	0.488

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include trade openness and its squared form.

Source: The author.

Table C6.5: Estimation results of low COC-, low GVE-, and low POS-integrated EKC models

Dependent variable lnCEp _{cit}	Low COC models			Low GVE models			Low POS models		
	(1) FE	(2) DGMM-II	(3) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II	(7) FE	(8) DGMM-II	(9) SGMM-II
L1.lnCEp _{cit}		0.540 ^c (0.000)	0.759 ^c (0.000)		0.386 ^c (0.000)	0.565 ^c (0.006)		0.580 ^c (0.000)	0.866 ^c (0.000)
L2.lnCEp _{cit}		-0.001 (0.988)			0.071 (0.494)				
L1.lnTOI _{it}		0.581 ^c (0.001)			0.050 (0.852)	-0.010 (0.946)			-0.232 ^a (0.078)
L2.lnTOI _{it}			0.059 (0.185)					-0.236 ^a (0.096)	
L1.TOI ² _{it}		-0.043 ^b (0.046)			0.004 (0.898)	0.007 (0.761)			0.040 ^b (0.045)
L2.lnTOI ² _{it}			0.004 (0.683)					0.049 ^b (0.027)	
lnTOI _{it}	-0.270 ^b (0.022)			-0.239 ^a (0.061)			-0.284 ^b (0.027)		
lnTOI ² _{it}	0.060 ^b (0.022)			0.054 ^a (0.061)			0.062 ^b (0.031)		
COC _{it}	-0.055 (0.557)	0.179 ^b (0.033)	0.180 ^a (0.068)						
GVE _{it}				-0.120 (0.131)	-0.031 (0.505)	-0.040 (0.648)			
POS _{it}							0.059 (0.200)	0.109 ^b (0.046)	0.103 (0.264)
lnURB _{it}	1.408 ^c (0.000)	1.484 ^b (0.017)	0.070 (0.862)	1.534 ^c (0.000)	1.447 ^b (0.029)	0.855 (0.301)	1.359 ^c (0.000)	1.365 ^a (0.085)	0.164 (0.687)
lnIFDI _{it}	0.113 ^c (0.005)	-0.039 (0.250)	0.028 (0.599)	0.093 ^c (0.010)	-0.036 (0.486)	-0.015 (0.797)	0.119 ^c (0.003)	0.001 (0.997)	0.017 (0.785)
lnGDPp _{cit}	0.320 ^c (0.000)	0.300 ^c (0.000)	0.100 (0.165)	0.311 ^c (0.002)	0.224 ^c (0.004)	0.130 (0.132)	0.279 ^c (0.001)	0.119 ^b (0.020)	0.096 (0.237)

WTO _{it}	0.018 (0.847)	-0.341 ^a (0.055)	-0.206 ^c (0.008)	0.005 (0.959)	-0.128 (0.539)	-0.131 (0.476)	0.029 (0.784)	-0.205 (0.715)	-0.024 (0.928)
OECD _{it}	omitted	omitted	0.570 (0.532)	omitted	omitted	-3.937 (0.666)	-0.219 ^c (0.004)	-0.408 (0.315)	-0.248 (0.498)
GEFC _t	-0.239 ^a (0.059)	0.038 (0.530)	omitted	-0.237 ^a (0.094)	-0.016 (0.780)	omitted	-0.191 (0.132)	0.038 (0.495)	omitted
COVID _t	-0.223 (0.119)	-0.057 ^c (0.000)	-0.024 (0.681)	-0.228 (0.140)	-0.062 ^c (0.000)	-0.075 (0.534)	-0.205 (0.138)	-0.079 ^c (0.000)	-0.076 ^c (0.000)
Constant	-8.070 ^c (0.000)		-1.124 (0.510)	-8.533 ^c (0.000)		-4.203 (0.225)	-7.465 ^c (0.000)		-1.052 (0.485)
Observations	1,074	907	965	1,074	891	1,014	1,074	908	1,020
Groups	68	67	68	68	67	68	73	73	73
Instruments	-	51	55	-	46	55	-	48	55
R-squared	0.530	-	-	0.521	-	-	0.497	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	Y	-	-
F tests ¹	202.34 ^c	-	-	163.92 ^c	-	-	188.90 ^c	-	-
Hausman tests ² (chi2)	26.62 ^c	-	-	99.42 ^c	-	-	71.63 ^c	-	-
AR(1) (z)	-	-3.23 ^c	-2.92 ^c	-	-2.48 ^b	-2.23 ^b	-	-3.64 ^c	-3.77 ^c
AR(1) (p)	-	0.001	0.003	-	0.013	0.026	-	0.000	0.000
AR(2) (z)	-	0.26	-0.24	-	-0.59	0.19	-	0.68	0.78
AR(2) (p)	-	0.796	0.810	-	0.558	0.846	-	0.494	0.437
Hansen test (chi2)	-	25.57	27.32	-	20.46	26.39	-	19.80	25.35
Hansen test (p)	-	0.487	0.555	-	0.492	0.552	-	0.654	0.609

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include trade openness and its squared form.

Source: The author.

Table C6.6: Estimation results of low REQ-, low ROL-, and low VAC-integrated EKC models

Dependent variable lnCEp _{cit}	Low REQ models			Low ROL models			Low VAC models		
	(1) FE	(2) DGMM-II	(3) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II	(7) FE	(8) DGMM-II	(9) SGMM-II
L1.lnCEp _{cit}		0.619 ^c (0.000)	0.877 ^c (0.000)		0.581 ^c (0.000)	0.723 ^c (0.000)		0.228 ^b (0.035)	0.745 ^c (0.000)
L2.lnCEp _{cit}		-0.015 (0.511)	0.032 (0.635)		-0.011 (0.521)			0.101 (0.356)	
L1.lnTOI _{it}		0.326 ^a (0.081)	-0.170 (0.240)		0.539 ^c (0.002)	0.021 (0.870)			0.012 (0.949)
L2.lnTOI _{it}								-0.526 ^b (0.038)	0.021 (0.836)
L1.TOI ² _{it}		-0.031 (0.178)	0.032 (0.159)		-0.059 ^c (0.007)	0.004 (0.873)			-0.001 (0.963)
L2.lnTOI ² _{it}								0.083 ^b (0.028)	0.008 (0.597)
lnTOI _{it}	-0.276 ^b (0.015)			-0.270 ^b (0.027)			-0.347 ^c (0.001)		
lnTOI ² _{it}	0.065 ^c (0.010)			0.058 ^b (0.034)			0.080 ^c (0.001)		
REQ _{it}	-0.143 ^a (0.060)	0.236 ^c (0.002)	0.269 ^a (0.053)						
ROL _{it}				-0.037 (0.593)	-0.147 ^b (0.038)	-0.081 (0.568)			
VAC _{it} (d.VAC _{it})							-0.009 (0.819)	-0.032 (0.729)	0.154 ^a (0.086)
lnURB _{it}	1.395 ^c (0.000)	1.133 (0.127)	0.011 (0.959)	1.445 ^c (0.000)	1.202 ^b (0.034)	0.394 (0.410)	1.483 ^c (0.000)	2.038 (0.116)	0.199 (0.722)
lnIFDI _{it}	0.100 ^c (0.002)	-0.044 (0.416)	-0.045 (0.658)	0.105 ^c (0.008)	-0.036 (0.365)	-0.041 (0.480)	0.112 ^c (0.003)	-0.039 (0.356)	0.059 (0.506)
lnGDPp _{cit}	0.315 ^c (0.000)	0.202 ^c (0.000)	0.041 (0.678)	0.308 ^c (0.001)	0.186 ^c (0.000)	0.056 (0.435)	0.287 ^c (0.001)	0.128 ^b (0.026)	0.049 (0.608)

WTO _{it}	-0.020 (0.841)	-0.127 (0.433)	-0.190 (0.371)	0.025 (0.788)	-0.183 (0.335)	-0.196 (0.236)	-0.011 (0.894)	-0.042 (0.882)	-0.347 (0.190)
OECD _{it}	omitted	omitted	0.621 (0.557)	-0.066 (0.179)	0.053 (0.824)	-0.127 (0.808)	omitted	omitted	-0.687 (0.839)
GEFC _t	-0.214 ^a (0.064)	0.021 (0.678)	omitted	-0.227 ^a (0.082)	-0.103 ^c (0.000)	omitted	-0.208 ^a (0.053)	-0.117 ^c (0.005)	omitted
COVID _t	-0.169 (0.194)	-0.066 ^c (0.000)	-0.062 ^b (0.011)	-0.214 (0.140)	-0.171 ^b (0.022)	0.012 (0.880)	-0.184 (0.152)	-0.242 ^a (0.073)	-0.057 (0.431)
Constant	-8.053 ^c (0.000)		0.286 (0.873)	-8.096 ^c (0.000)		-1.896 (0.344)	-8.124 ^c (0.000)		-1.167 (0.539)
Observations	1,074	893	953	1,074	907	1,018	1,019	905	964
Groups	69	67	67	65	64	64	64	64	64
Instruments	-	51	61	-	51	55	-	45	56
R-squared	0.564	-	-	0.507	-	-	0.525	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	Y	-	-
F tests ¹	203.87 ^c	-	-	184.93 ^c	-	-	218.86 ^c	-	-
Hausman tests ² (chi2)	18.97 ^b	-	-	25.79 ^c	-	-	45.75 ^c	-	-
AR(1) (z)	-	-3.43 ^c	-3.31 ^c	-	-3.87 ^c	-3.21 ^c	-	-2.08 ^b	-2.55 ^b
AR(1) (p)	-	0.001	0.001	-	0.000	0.001	-	0.038	0.011
AR(2) (z)	-	0.75	0.23	-	0.20	0.13	-	-0.46	1.04
AR(2) (p)	-	0.454	0.819	-	0.844	0.895	-	0.643	0.299
Hansen test (chi2)	-	20.26	30.08	-	21.31	23.18	-	20.50	25.30
Hansen test (p)	-	0.779	0.660	-	0.675	0.724	-	0.427	0.611

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include trade openness and its squared form.

Source: The author.

Table C6.7: Estimation results of High Openness COC-, GVE- and POS-integrated EKC models

Dependent variable $\ln CE_{pit}$	High Openness COC models			High Openness GVE models			High Openness POS models		
	(1) FE	(2) DGMM-II	(3) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II	(7) FE	(8) DGMM-II	(9) SGMM-II
L1. $\ln CE_{pit}$		0.307 ^c (0.000)	0.661 ^c (0.000)		0.227 ^c (0.006)	0.727 ^c (0.000)		0.299 ^c (0.003)	0.636 ^b (0.023)
L2. $\ln CE_{pit}$									0.072 (0.368)
L1. $\ln TOI_{it}$		2.584 ^c (0.007)	3.103 ^a (0.087)		1.530 ^a (0.068)	3.034 ^a (0.054)		-0.147 (0.880)	2.733 ^a (0.082)
L2. $\ln TOI_{it}$						-0.431 (0.545)		-2.089 ^b (0.027)	
L1. TOI^2_{it}		-0.294 ^b (0.011)	-0.359 ^a (0.095)		-0.145 (0.147)	-0.343 ^a (0.075)		0.017 (0.876)	-0.306 (0.104)
L2. $\ln TOI^2_{it}$						0.057 (0.442)		0.310 ^c (0.003)	
$\ln TOI_{it}$	3.226 (0.159)			3.682 (0.129)			2.817 (0.222)		
$\ln TOI^2_{it}$	-0.347 (0.165)			-0.407 (0.132)			-0.300 (0.232)		
COC_{it}	0.033 (0.772)	0.569 ^c (0.004)	0.170 (0.586)						
$rCOC.\ln TOI_{it}$	-0.174 (0.346)	-0.395 ^b (0.021)	-0.129 (0.791)						
$rCOC.\ln TOI^2_{it}$	0.036 (0.381)	0.098 ^c (0.007)	0.034 (0.731)						
GVE_{it}				0.011 (0.876)	0.390 ^c (0.000)	0.238 (0.254)			
$rGVE.\ln TOI_{it}$				-0.267 (0.234)	-0.488 ^c (0.004)	-0.010 (0.978)			
$rGVE.\ln TOI^2_{it}$				0.060 (0.226)	0.113 ^c (0.002)	0.002 (0.984)			

POS _{it}							0.088 (0.269)	-0.022 (0.727)	0.062 (0.726)
rPOS.lnTOI _{it}							-0.120 (0.544)	-0.715 ^c (0.000)	-0.671 ^b (0.044)
rPOS.lnTOI ² _{it}							0.022 (0.603)	0.163 ^c (0.000)	0.151 ^a (0.052)
lnURB _{it}	2.318 ^c (0.000)	5.442 ^c (0.000)	0.262 (0.812)	2.277 ^c (0.000)	5.445 ^c (0.000)	0.136 (0.903)	2.277 ^c (0.000)	5.969 ^c (0.000)	0.413 (0.797)
lnIFDI _{it}	0.095 ^a (0.083)	0.049 (0.276)	0.162 ^b (0.037)	0.098 ^a (0.078)	0.011 (0.812)	0.172 ^b (0.037)	0.099 ^a (0.067)	0.134 ^b (0.030)	0.194 ^a (0.057)
lnGDPp _{cit}	0.487 ^c (0.000)	0.132 (0.100)	0.085 (0.635)	0.472 ^c (0.000)	0.293 ^c (0.000)	-0.038 (0.811)	0.468 ^c (0.000)	0.201 ^c (0.004)	0.174 (0.379)
WTO _{it}	0.047 (0.719)	0.481 (0.141)	1.080 ^a (0.090)	0.030 (0.815)	0.140 (0.700)	0.670 (0.367)	0.066 (0.583)	0.337 (0.692)	1.192 (0.653)
OECD _{it}	0.021 (0.667)	0.289 (0.366)	-0.224 (0.620)	0.026 (0.572)	0.110 (0.715)	0.105 (0.701)	0.038 (0.396)	0.474 ^a (0.076)	-0.454 (0.510)
GEFC _t	-0.524 ^c (0.000)	-0.132 ^c (0.000)	omitted	-0.510 ^c (0.001)	0.258 ^c (0.000)	omitted	-0.501 ^c (0.002)	omitted	omitted
COVID _t	-0.739 ^c (0.000)	-0.554 ^c (0.000)	-0.112 ^c (0.001)	-0.729 ^c (0.000)	-0.085 ^c (0.000)	-0.194 ^b (0.011)	-0.707 ^c (0.000)	-0.075 ^c (0.000)	-0.198 ^a (0.086)
Constant	-20.131 ^c (0.001)		-9.785 ^a (0.078)	-20.714 ^c (0.000)		-7.161 (0.334)	-18.953 ^c (0.001)		-10.805 (0.256)
Observations	1,073	977	1,025	1,073	977	977	1,073	922	977
Groups	75	74	74	75	74	74	75	73	74
Instruments	-	51	55	-	50	55	-	49	54
R-squared	0.390	-	-	0.393	-	-	0.396	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	Y	-	-
F tests ¹	118.49 ^c	-	-	122.17 ^c	-	-	122.06 ^c	-	-
Hausman tests ² (chi2)	262.95 ^c	-	-	967.40 ^c	-	-	179.34 ^c	-	-
AR(1) (z)	-	-2.10 ^b	-2.82 ^c	-	-1.99 ^b	-2.63 ^c	-	-1.98 ^b	-2.27 ^b
AR(1) (p)	-	0.035	0.005	-	0.047	0.008	-	0.048	0.023
AR(2) (z)	-	1.24	0.32	-	0.26	-0.14	-	1.34	-1.54

AR(2) (p)	-	0.215	0.751	-	0.796	0.891	-	0.181	0.124
Hansen test (chi2)	-	27.12	29.26	-	29.41	29.49	-	20.19	33.96
Hansen test (p)	-	0.251	0.299	-	0.133	0.244	-	0.446	0.109

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include trade openness and its squared form.

Source: The author.

Table C6.8: Estimation results of High Openness REQ-, ROL- and VAC-integrated EKC models

Dependent variable $\ln CE_{pit}$	High Openness REQ models			High Openness ROL models			High Openness VAC models		
	(1) FE	(2) DGMM-II	(3) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II
L1. $\ln CE_{pit}$		-0.031 (0.783)	0.621 ^b (0.013)		0.213 ^b (0.026)	0.596 ^c (0.000)		0.296 ^c (0.000)	0.811 ^c (0.000)
L2. $\ln CE_{pit}$					-0.122 (0.315)				
L1. $\ln TOI_{it}$		3.574 ^c (0.001)	3.062 ^b (0.020)		1.445 (0.143)	3.292 ^b (0.034)		1.086 (0.274)	2.240 ^b (0.033)
L2. $\ln TOI_{it}$			-0.689 (0.484)		-0.841 (0.281)			-0.562 (0.558)	-0.573 (0.447)
L1. TOI^2_{it}		-0.425 ^c (0.000)	-0.355 ^b (0.028)		-0.190 (0.101)	-0.389 ^b (0.048)		-0.152 (0.190)	-0.240 ^a (0.062)
L2. $\ln TOI^2_{it}$			0.089 (0.391)		0.165 ^a (0.059)			0.135 (0.204)	0.068 (0.415)
$\ln TOI_{it}$	3.801 (0.104)			3.014 (0.197)			2.191 (0.354)		
$\ln TOI^2_{it}$	-0.425 (0.101)			-0.326 (0.209)			-0.225 (0.381)		
REQ_{it}	-0.064 (0.565)	-0.034 (0.840)	-0.118 (0.669)						
$rREQ.\ln TOI_{it}$	-0.304 (0.171)	-0.271 (0.362)	-0.357 (0.545)						
$rREQ.\ln TOI^2_{it}$	0.074 (0.142)	0.092 (0.132)	0.080 (0.548)						
ROL_{it}				0.134 (0.244)	0.247 (0.302)	0.216 (0.434)			
$rROL.\ln TOI_{it}$				-0.172 (0.452)	-0.352 ^a (0.094)	-0.212 (0.552)			
$rROL.\ln TOI^2_{it}$				0.036 (0.465)	0.087 ^a (0.073)	0.055 (0.470)			

VAC _{it}							-0.025	-0.171	-0.227
(d.VAC _{it})							(0.622)	(0.163)	(0.241)
rVAC.lnTOI _{it}							0.077	-0.011	0.067
							(0.550)	(0.940)	(0.789)
rVAC.lnTOI ² _{it}							-0.010	0.011	-0.008
							(0.709)	(0.627)	(0.872)
lnURB _{it}	2.440 ^c	7.859 ^c	1.375	2.287 ^c	6.839 ^c	0.520	2.378 ^c	5.659 ^c	0.384
	(0.000)	(0.000)	(0.294)	(0.000)	(0.000)	(0.659)	(0.000)	(0.000)	(0.402)
lnIFDI _{it}	0.094 ^a	-0.074	0.180 ^b	0.092 ^a	0.037	0.118	0.116 ^a	0.109 ^b	0.116 ^a
	(0.083)	(0.164)	(0.039)	(0.084)	(0.577)	(0.174)	(0.052)	(0.036)	(0.053)
lnGDPp _{cit}	0.489 ^c	0.112	0.040	0.473 ^c	0.132	0.067	0.491 ^c	0.164 ^a	0.033
	(0.000)	(0.443)	(0.841)	(0.000)	(0.207)	(0.590)	(0.000)	(0.063)	(0.760)
WTO _{it}	0.060	-0.356	0.807	0.040	0.723	0.876	-0.053	1.042 ^a	0.057
	(0.631)	(0.674)	(0.561)	(0.754)	(0.228)	(0.298)	(0.543)	(0.077)	(0.836)
OECD _{it}	0.030	-0.014	-0.091	0.005	0.233	-0.411	0.040	0.441 ^a	0.267
	(0.555)	(0.982)	(0.862)	(0.908)	(0.466)	(0.278)	(0.357)	(0.093)	(0.342)
GEFC _t	-0.549 ^c	0.217 ^c	omitted	-0.516 ^c	omitted	omitted	-0.474 ^c	omitted	omitted
	(0.000)	(0.000)		(0.001)			(0.000)		
COVID _t	-0.767 ^c	-0.111 ^c	-0.287 ^c	-0.730 ^c	-0.626 ^c	-0.116 ^a	-0.709 ^c	-0.123 ^c	-0.212 ^c
	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.086)	(0.000)	(0.000)	(0.001)
Constant	-21.726 ^c		-12.173	-19.364 ^c		-10.470 ^a	-18.383 ^c		-6.222 ^b
	(0.000)		(0.122)	(0.001)		(0.070)	(0.002)		(0.042)
Observations	1,073	977	977	1,073	922	1,025	1,025	922	977
Groups	75	74	74	75	73	74	74	73	74
Instruments	-	43	55	-	48	55	-	49	58
R-squared	0.404	-	-	0.395	-	-	0.387	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	Y	-	-
F tests ¹	125.08 ^c	-	-	122.42 ^c	-	-	125.80 ^c	-	-
Hausman tests ² (chi2)	211.89 ^c	-	-	180.21 ^c	-	-	188.82 ^c	-	-
AR(1) (z)	-	2.03 ^b	-1.99 ^b	-	-2.28 ^b	-2.51 ^b	-	-2.19 ^b	-2.87 ^c
AR(1) (p)	-	0.043	0.047	-	0.022	0.012	-	0.029	0.004
AR(2) (z)	-	-0.09	-0.59	-	1.16	-0.58	-	1.24	0.37

CCCX

AR(2) (p)	-	0.925	0.553	-	0.245	0.559	-	0.215	0.708
Hansen test (chi2)	-	20.08	31.69	-	22.48	32.76	-	26.11	32.99
Hansen test (p)	-	0.169	0.167	-	0.211	0.169	-	0.162	0.236

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include trade openness and its squared form.

Source: The author.

Table C6.9: Estimation results of Low Openness COC-, GVE- and POS-integrated EKC models

Dependent variable $\ln CE_{p_{cit}}$	Low Openness COC models			Low Openness GVE models			Low Openness POS models		
	(1) FE	(2) DGMM-II	(3) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II	(7) FE	(8) DGMM-II	(9) SGMM-II
L1. $\ln CE_{p_{cit}}$		0.238 ^b (0.021)	0.491 ^c (0.003)		0.200 ^b (0.016)	0.664 ^c (0.000)		0.302 ^c (0.002)	0.965 ^c (0.000)
L2. $\ln CE_{p_{cit}}$									
L1. $\ln TOI_{it}$			1.291 ^b (0.040)					0.043 (0.874)	-0.234 (0.287)
L2. $\ln TOI_{it}$		-0.284 ^a (0.099)	-0.822 ^a (0.064)		0.070 ^c (0.004)	-0.066 (0.765)			0.155 ^c (0.003)
L1. TOI^2_{it}			-0.214 ^b (0.014)					-0.015 (0.670)	0.048 (0.117)
L2. $\ln TOI^2_{it}$		0.053 ^b (0.023)	0.157 ^c (0.009)		-0.006 (0.212)	0.022 (0.518)			-0.023 ^b (0.045)
$\ln TOI_{it}$	-0.420 ^c (0.000)			-0.436 ^c (0.000)			-0.453 ^c (0.000)		
$\ln TOI^2_{it}$	0.085 ^c (0.000)			0.090 ^c (0.000)			0.096 ^c (0.000)		
COC_{it}	0.129 ^c (0.007)	-0.086 (0.499)	0.507 ^b (0.014)						
$rCOC.\ln TOI_{it}$	-0.110 (0.253)	-0.092 (0.371)	-0.307 ^b (0.026)						
$rCOC.\ln TOI^2_{it}$	0.024 (0.341)	0.019 (0.477)	0.075 ^b (0.030)						
GVE_{it}				0.049 (0.380)	-0.137 ^b (0.018)	0.020 (0.892)			
$rGVE.\ln TOI_{it}$				-0.043 (0.717)	-0.143 (0.164)	-0.354 ^a (0.093)			
$rGVE.\ln TOI^2_{it}$				0.012 (0.711)	0.032 (0.185)	0.078 ^a (0.094)			

POS _{it}							-0.004 (0.921)	0.089 (0.373)	0.028 (0.858)
rPOS.lnTOI _{it}							0.094 (0.314)	-0.190 ^b (0.030)	-0.168 (0.533)
rPOS.lnTOI ² _{it}							-0.023 (0.317)	0.041 ^a (0.053)	0.029 (0.652)
lnURB _{it}	1.958 ^c (0.000)	2.638 ^b (0.022)	0.459 (0.529)	1.938 ^c (0.000)	2.697 ^c (0.000)	0.284 (0.590)	1.929 ^c (0.000)	1.838 ^c (0.010)	-0.360 (0.475)
lnIFDI _{it}	0.095 ^c (0.009)	0.026 (0.528)	0.082 (0.360)	0.101 ^c (0.006)	-0.004 (0.897)	0.156 ^a (0.093)	0.102 ^c (0.007)	-0.010 (0.753)	-0.071 (0.309)
lnGDPp _{cit}	0.330 ^c (0.000)	0.167 ^a (0.052)	0.123 (0.373)	0.338 ^c (0.000)	0.151 ^b (0.031)	0.188 (0.117)	0.346 ^c (0.000)	0.192 ^b (0.017)	0.234 (0.121)
WTO _{it}	0.106 (0.110)	0.146 (0.498)	-1.033 (0.187)	0.103 (0.129)	-0.077 (0.685)	0.111 (0.819)	0.114 ^b (0.047)	0.055 (0.815)	0.048 (0.894)
OECD _{it}	0.085 (0.408)	-0.053 (0.901)	-0.398 (0.165)	0.067 (0.548)	-0.347 (0.348)	-0.094 (0.695)	0.058 (0.579)	-0.323 (0.506)	-0.186 (0.341)
GEFC _t	-0.356 ^c (0.000)	-0.159 ^c (0.006)	omitted	-0.366 ^c (0.000)	-0.127 ^c (0.000)	omitted	-0.372 ^c (0.000)	0.109 ^a (0.091)	omitted
COVID _t	-0.467 ^c (0.000)	-0.392 ^c (0.003)	-0.014 (0.882)	-0.477 ^c (0.000)	-0.314 ^c (0.000)	-0.102 ^a (0.071)	-0.480 ^c (0.000)	-0.060 ^c (0.000)	-0.007 (0.911)
Constant	-9.829 ^c (0.000)		-2.725 (0.246)	-9.888 ^c (0.000)		-3.096 (0.166)	-9.944 ^c (0.000)		-0.298 (0.815)
Observations	1,074	886	944	1,074	886	944	1,074	944	944
Groups	79	76	78	79	76	78	79	78	78
Instruments	-	48	52	-	51	52	-	51	57
R-squared	0.589	-	-	0.579	-	-	0.578	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	Y	-	-
F tests ¹	279.89 ^c	-	-	289.53 ^c	-	-	273.09 ^c	-	-
Hausman tests ² (chi2)	192.54 ^c	-	-	212.81 ^c	-	-	51.62 ^c	-	-
AR(1) (z)	-	-1.97 ^b	-2.77 ^c	-	-1.99 ^b	-2.67 ^c	-	-2.02 ^b	-3.83 ^c
AR(1) (p)	-	0.049	0.006	-	0.046	0.008	-	0.043	0.000
AR(2) (z)	-	-1.09	0.73	-	-0.47	-1.06	-	-0.79	-0.46

AR(2) (p)	-	0.276	0.463	-	0.641	0.291	-	0.428	0.643
Hansen test (chi2)	-	20.01	20.94	-	25.78	23.24	-	29.02	26.25
Hansen test (p)	-	0.521	0.525	-	0.364	0.505	-	0.180	0.505

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include trade openness and its squared form.

Source: The author.

Table C6.10: Estimation results of Low Openness REQ-, ROL- and VAC-integrated EKC models

Dependent variable $\ln CE_{pit}$	Low Openness REQ models			Low Openness ROL models			Low Openness VAC models		
	(1) FE	(2) DGMM-II	(3) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II	(4) FE	(5) DGMM-II	(6) SGMM-II
L1. $\ln CE_{pit}$		0.052 (0.598)	0.806 ^c (0.000)		0.218 ^b (0.014)	0.582 ^b (0.033)			0.764 ^c (0.000)
L2. $\ln CE_{pit}$								0.099 (0.496)	0.030 (0.502)
L1. $\ln TOI_{it}$		1.035 ^b (0.035)	0.936 ^c (0.010)			0.297 (0.544)		1.171 ^a (0.062)	0.879 ^a (0.060)
L2. $\ln TOI_{it}$		-0.605 ^b (0.017)	-0.693 ^a (0.091)		-0.269 (0.117)			-0.477 ^b (0.025)	-0.814 ^a (0.092)
L1. TOI^2_{it}		-0.163 ^b (0.014)	-0.143 ^b (0.019)			-0.033 (0.653)		-0.188 ^b (0.019)	-0.142 ^b (0.027)
L2. $\ln TOI^2_{it}$		0.122 ^c (0.000)	0.119 ^b (0.039)		0.054 ^b (0.029)			0.105 ^c (0.000)	0.134 ^a (0.053)
$\ln TOI_{it}$	-0.446 ^c (0.000)			-0.445 ^c (0.000)			-0.416 ^c (0.000)		
$\ln TOI^2_{it}$	0.094 ^c (0.000)			0.094 ^c (0.000)			0.088 ^c (0.000)		
REQ_{it}	-0.001 (0.992)	-0.032 (0.787)	0.067 (0.723)						
$rREQ.\ln TOI_{it}$	0.096 (0.419)	-0.160 ^a (0.068)	-0.073 (0.618)						
$rREQ.\ln TOI^2_{it}$	-0.023 (0.445)	0.036 ^a (0.087)	0.025 (0.442)						
ROL_{it}				0.039 (0.599)	-0.258 ^a (0.061)	0.281 (0.383)			
$rROL.\ln TOI_{it}$				0.075 (0.417)	0.070 (0.480)	-0.273 ^a (0.095)			
$rROL.\ln TOI^2_{it}$				-0.020 (0.414)	-0.009 (0.696)	0.071 ^a (0.069)			

VAC _{it}							0.043	-0.039	0.247
(d.VAC _{it})							(0.300)	(0.801)	(0.133)
rVAC.lnTOI _{it}							0.161	-0.047	-0.442 ^b
							(0.210)	(0.788)	(0.038)
rVAC.lnTOI ² _{it}							-0.038	0.017	0.098 ^a
							(0.241)	(0.666)	(0.059)
lnURB _{it}	1.924 ^c	2.930 ^c	-0.292	1.936 ^c	3.677 ^c	0.413	1.995 ^c	3.662 ^c	-0.454
	(0.000)	(0.000)	(0.627)	(0.000)	(0.000)	(0.683)	(0.000)	(0.000)	(0.339)
lnIFDI _{it}	0.099 ^c	0.031	0.057	0.101 ^c	-0.016	0.109	0.107 ^c	-0.071	0.118
	(0.010)	(0.452)	(0.480)	(0.007)	(0.698)	(0.352)	(0.009)	(0.200)	(0.224)
lnGDPp _{cit}	0.341 ^c	0.197 ^a	0.210	0.336 ^c	0.123	0.239 ^b	0.326 ^c	0.038	0.261 ^b
	(0.000)	(0.063)	(0.318)	(0.000)	(0.162)	(0.045)	(0.000)	(0.753)	(0.011)
WTO _{it}	0.113 ^a	-0.285	-0.251	0.114 ^a	0.087	-0.532	0.099 ^b	-0.042	0.014
	(0.066)	(0.463)	(0.616)	(0.065)	(0.702)	(0.606)	(0.021)	(0.941)	(0.977)
OECD _{it}	0.051	-0.035	-0.182	0.059	-0.250	0.049	0.037	-0.576	-0.162
	(0.627)	(0.954)	(0.307)	(0.592)	(0.493)	(0.907)	(0.729)	(0.216)	(0.425)
GEFC _t	-0.364 ^c	-0.153 ^c	omitted	-0.362 ^c	-0.165 ^c	omitted	-0.299 ^c	-0.115 ^a	omitted
	(0.000)	(0.009)		(0.000)	(0.001)		(0.000)	(0.081)	
COVID _t	-0.472 ^c	-0.344 ^c	-0.025	-0.473 ^c	-0.428 ^c	omitted	-0.424 ^c	-0.283 ^b	-0.068
	(0.000)	(0.005)	(0.769)	(0.000)	(0.000)		(0.000)	(0.015)	(0.291)
Constant	-9.884 ^c		-1.044	-9.896 ^c		-3.672	-10.147 ^c		-0.632
	(0.000)		(0.521)	(0.000)		(0.291)	(0.000)		(0.692)
Observations	1,074	886	944	1,074	886	1,009	1,009	886	944
Groups	79	76	78	79	76	79	79	76	78
Instruments	-	48	54	-	45	49	-	46	54
R-squared	0.578	-	-	0.578	-	-	0.574	-	-
Year-fixed	Y	Y	Y	Y	Y	Y	Y	Y	Y
Vce clustered	Y	-	-	Y	-	-	Y	-	-
F tests ¹	284.11 ^c	-	-	283.11 ^c	-	-	284.86 ^c	-	-
Hausman tests ² (chi2)	215.99 ^c	-	-	207.71 ^c	-	-	191.01 ^c	-	-
AR(1) (z)	-	-3.13 ^c	-4.10 ^c	-	-1.98 ^b	1.81 ^a	-	-3.50 ^c	-3.02 ^c
AR(1) (p)	-	0.002	0.000	-	0.048	0.070	-	0.000	0.002
AR(2) (z)	-	-0.28	0.30	-	-0.49	-1.01	-	-0.40	-0.22

AR(2) (p)	-	0.779	0.765	-	0.624	0.313	-	0.692	0.824
Hansen test (chi2)	-	20.26	27.33	-	19.56	25.84	-	18.47	22.23
Hansen test (p)	-	0.379	0.289	-	0.358	0.171	-	0.360	0.506

Note: ¹For non-robust estimations, which determines whether fixed or Pooled OLS estimation is more appropriate; ²The test is employed prior to the *Vce clustered* added to the fixed effect estimations; *a*, *b*, and *c* denote the significance levels of 10%, 5%, and 1%, respectively. Endogenous variables include trade openness and its squared form.

Source: The author.

Table C6.11: Summary of findings on the direct effect of trade openness on environmental quality

Contextual effects	Direct effects			Hypotheses
	Openness $\rightarrow$ CO ₂ emissions	Openness ² $\rightarrow$ CO ₂ emissions	Shape of the Openness-Emissions nexus	
Aggregated	Decreasing (-) (t, t-1)	Increasing (+) (t, t-1)	U-shaped (t, t-1)	H.4.1.1: Not supported (opposite sign) H.4.1.2: Not supported (opposite sign)
High Institution	Increasing (+) (t, t-1)	Decreasing (-) (t, t-1)	Inverse U-shaped (t, t-1)	H.4.1.1: Supported H.4.1.2: Supported H.4.5: Supported
	Decreasing (-) (t-2)	Increasing (+) (t-2)	U-shaped (t-2)	H.4.1.1: Not supported (opposite sign) H.4.1.2: Not supported (opposite sign) H.4.4: Not supported
Low Institution	Decreasing (-) (t, t-2)	Increasing (+) (t, t-2)	U-shaped (t, t-2)	H.4.1.1: Not supported (opposite sign) H.4.1.2: Not supported (opposite sign) H.4.5: Not supported
High Openness	Increasing (+) (t-1)	Decreasing (-) (t-1)	Inverse U-shaped (t-1)	H.4.1.1: Supported H.4.1.2: Supported H.4.4: Not supported
Low Openness	Decreasing (-) (t)	Increasing (+) (t)	U-shaped (t)	H.4.1.1: Not supported (opposite sign) H.4.1.2: Not supported (opposite sign)

				H.4.4: Supported
	Increasing (+) (t-1)	Decreasing (-) (t-1)	Inverse U-shaped (t-1)	H.4.1.1: Supported H.4.1.2: Supported H.4.4: Not supported

Source: The author.

Illustration:

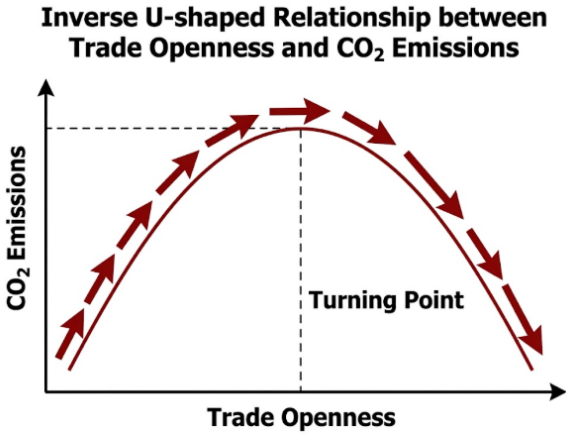
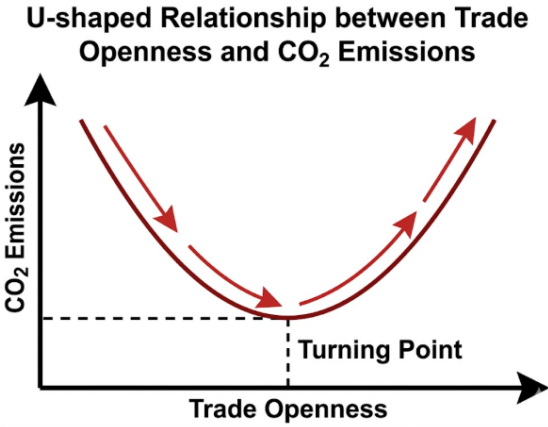


Table C6.12: Summary of findings on the direct effect of institutional quality on environmental quality

Contextual effects	Direct effects of institutional quality on CO₂ emissions	Hypotheses
Aggregated	VAC (-)	H.4.2: Supported
High Institution	COC, GVE, POS, VAC (+)	H.4.2: Not supported (opposite sign) H.4.5: Supported
	ROL (-)	H.4.2: Supported H.4.5: Not supported
Low Institution	COC, POS, VAC (+)	H.4.2: Not supported (opposite sign) H.4.5: Supported
	ROL (-)	H.4.2: Supported H.4.5: Not supported
High Openness	COC, GVE (+)	H.4.2: Not supported (opposite sign) H.4.4: Supported
Low Openness	COC (+)	H.4.2: Not supported (opposite sign) H.4.4: Supported
	GVE, ROL (-)	H.4.2: Supported H.4.4: Supported

Source: The author.

Table C6.13: Summary of findings on the moderating effect of institutional quality on the environment-liberalization nexus

Contextual effects	Moderating effects of institutional quality		Hypotheses
	Emissions-Openness	Emissions-Openness ²	
Aggregated	COC, POS, REQ, ROL (-)	COC, POS, REQ, ROL (+)	H.4.3: Supported
High Openness	COC, GVE, POS, ROL (-)	COC, GVE, POS, ROL (+)	H.4.3: Supported H.4.4: Supported
Low Openness	COC, GVE, POS, REQ, ROL, VAC (-)	COC, GVE, POS, REQ, ROL, VAC (+)	H.4.3: Supported H.4.4: Supported

Source: The author.

**MINISTRY OF EDUCATION AND TRAINING
UNIVERSITY OF ECONOMICS HO CHI MINH CITY**



LE DUC NHA

**THE NEXUS BETWEEN TRADE, GENDER EQUALITY, ENVIRONMENT, AND
INSTITUTION: INSIGHTS FROM THE GRAVITATIONAL AND KUZNETS
CURVE APPROACH**

Major: Development Economics

Major ID: 9310105

SUMMARY OF DOCTORAL DISSERTATION

ACADEMIC SUPERVISOR:

ASSOC. PROF. DR. PHAM KHANH NAM

Ho Chi Minh City – 2026

OVERVIEW INFORMATION

The dissertation is completed at University of Economics Ho Chi Minh City (UEH University), Vietnam.

Academic supervisor: Assoc. Prof. Dr. Pham Khanh Nam

Reviewer 1:

.....

Reviewer 2:

.....

Reviewer 3:

.....

The dissertation is defended at the UEH-level doctoral dissertation evaluation council at University of Economics Ho Chi Minh City (UEH University), Vietnam.

At..... hour..... day..... year.....

The dissertation can be accessed at the Librabry of University of Economics Ho Chi Minh City (UEH University), Vietnam.

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES	vi
LIST OF ABBREVIATIONS.....	vii
CHAPTER 1: INTRODUCTION	1
1.1. Research background and context	1
1.1.1. The global nexus between trade, gender equality, environment, and institutions ..	1
1.1.2. The nexus between trade and gender equality	1
1.1.3. The relationship between trade and environment	1
1.1.4. The relationship between trade and institution	1
1.1.5. The role of institution in gender and environment issues	2
1.2. Problem statement	2
1.2.1. The trade-gender nexus	2
1.2.2. The trade-environment nexus.....	2
1.2.3. The role of institution in trade, gender, and environment nexus.....	3
1.3. Research gaps and research questions.....	3
1.4. Research objectives.....	3
1.5. Scopes of the research.....	4
1.6. Research methodology.....	4
1.6.1. Combined fixed effect estimation methods.....	4
1.6.2. Generalized Method of Moments estimation methods	5
1.6.3. Poisson Pseudo Maximum Likelihood estimation method for robustness check of gravity models	5
1.7. Contributions of the dissertation.....	5
1.7.1. Theoretical contributions.....	5
1.7.2. Practical contributions.....	5
1.8. Structure of the dissertation	5
CHAPTER 2: THEORETICAL BACKGROUNDS AND LITERATURE REVIEW....	6
2.1. Research concepts	6
2.1.1. Trade and trade openness	6
2.1.2. Gender equality	6
2.1.3. Environmental quality	6
2.1.4. Institutional quality and environmental institutional quality	6
2.2. The Trade Gravity model.....	6
2.3. The Environmental Kuznets Curve (EKC) Hypothesis	6

2.4. The Gender-driven Kuznets Curve Hypothesis.....	7
2.5. Theoretical foundations of the trade-gender nexus.....	7
2.5.1. The impact of gender equality on trade.....	7
2.5.2. The impact of trade on gender equality.....	7
2.6. Theoretical foundations of the trade-environment nexus.....	7
2.6.1. The impact of trade on environmental quality	7
2.6.2. The impact of environmental quality on trade	8
2.7. Theoretical foundations of the trade-institution nexus	8
2.8. The moderating role of institutional quality: Theoretical perspectives	8
2.9. Analytical frameworks	8
CHAPTER 3: THE GRAVITATIONAL APPROACH TO THE TRADE, GENDER EQUALITY, AND INSTITUTIONAL QUALITY NEXUS	10
3.1. Introduction.....	10
3.2. Model specification, variable measurement, and estimation strategy	10
3.2.1. Model specification and variable measurement	10
3.2.2. Estimation strategy	11
3.3. Summary of empirical results.....	11
CHAPTER 4: THE GRAVITATIONAL APPROACH TO THE TRADE, ENVIRONMENTAL QUALITY, AND INSTITUTIONAL QUALITY NEXUS	12
4.1. Introduction.....	12
4.2. Model specification, variable measurement, and estimation strategy	13
4.2.1. Model specification and variable measurement	13
4.2.2. Estimation strategy	14
4.3. Summary of empirical results.....	14
CHAPTER 5: THE GENDER-BASED KUZNETS CURVE APPROACH TO THE NEXUS BETWEEN GENDER EQUALITY, TRADE, AND INSTITUTIONAL QUALITY	15
5.1. Introduction.....	15
5.2. Model specification, variable measurement, and estimation strategy	16
5.2.1. Model specification and variable measurement	16
5.2.2. Estimation strategy	17
5.3. Summary of empirical results.....	17
CHAPTER 6: THE OPENNESS-BASED ENVIRONMENTAL KUZNETS CURVE APPROACH TO THE NEXUS BETWEEN ENVIRONMENTAL QUALITY, TRADE, AND INSTITUTIONAL QUALITY	19

6.1. Introduction.....	19
6.2. Model specification, variable measurement, and estimation strategy	19
6.2.1. Model specification and variable measurement	19
6.2.2. Estimation strategy	20
6.3. Summary of empirical results.....	20
CHAPTER 7: CONCLUSIONS AND POLICY IMPLICATIONS	22
7.1. Summary of key findings	22
7.1.1. Findings on the gravitational approach to the nexus between trade, gender equality, and institutional quality	22
7.1.2. Findings on the gravitational approach to the nexus between trade, environmental quality, and institutional quality	22
7.1.3. Findings on the Gender-based Kuznets Curve approach to the nexus between gender equality, trade, and institutional quality	23
7.1.4. Findings on the Openness-based Environmental Kuznets Curve approach to the nexus between environmental quality, trade, and institutional quality	24
7.2. Policy implications	24
7.2.1. Implications from the link between bilateral trade, gender equality, and institutional quality	24
7.2.2. Implications from the link between bilateral trade, environmental quality, and institutional quality	25
7.2.3. Implications from the link between gender equality, trade liberalization, and institutional quality	25
7.2.4. Implications from the link between environmental quality, trade liberalization, and institutional quality	26
7.3. Limitations and future research directions	26
7.4. Conclusions.....	26
LIST OF AUTHOR’S PUBLICATIONS RELATED TO THE DISSERTATION.....	i

LIST OF TABLES AND FIGURES

Figure 2.1: The integrated analytical framework.....	9
Table C3.41: Summary of findings on the direct effect of gender equality on bilateral trade	11
Table C3.42: Summary of findings on the moderating effect of institutional quality on the nexus between gender equality and bilateral trade	12
Table C4.17: Summary of findings on the direct effect of environmental quality on bilateral trade	14
Table C4.18: Summary of findings on the direct effect of institutional quality on bilateral trade (based on consistent findings of Chapter 3 and Chapter 4)	14
Table C4.19: Summary of findings on the moderating effect of institutional quality on the nexus between environmental quality and bilateral trade	15
Table C5.31: Summary of findings on the direct effect of trade openness on gender equality	17
Table C5.32: Summary of findings on the direct effect of institutional quality on gender equality	17
Table C5.33: Summary of findings on the moderating effect of trade openness on the gender-institution nexus	18
Table C5.34: Summary of findings on the moderating effect of institutional quality on the gender-liberalization nexus	18
Table C6.11: Summary of findings on the direct effect of trade openness on environmental quality	20
Table C6.12: Summary of findings on the direct effect of institutional quality on environmental quality	21
Table C6.13: Summary of findings on the moderating effect of institutional quality on the environment-liberalization nexus	22

LIST OF ABBREVIATIONS

ASEAN	Association of Southeast Asian Nations
BRICS	Brazil, Russia, India, China, and South Africa
CO ₂	Carbon dioxide
COC	Control of corruption
DGMM-II	Difference Generalized Method of Moments two-step
EAC	Environmental Assimilative Capacity
EKC	Environmental Kuznets Curve
EPS	Environmental Policy Stringency
EU	European Union
FE	Fixed effect
FLA	Female labor force participation
FTA	Free Trade Agreement
GDI	Gender development (index)
GDP	Gross domestic product
GII	Gender inequality (index)
GKC	Gender-based Kuznets Curve
GVE	Government effectiveness
H-O	Heckscher-Ohlin
IQ	Institutional quality
LCUs	Local currency units
OECD	Organisation for Economic Co-operation and Development
OEKC	Openness-based Environmental Kuznets Curve
OWD	Our World in Data project of the Global Change Data Lab
POS	Political stability and absence of violence/terrorism
PPML	Poisson Pseudo Maximum Likelihood
RE	Random effect
REQ	Regulatory quality
RG	Research gap
RO	Research objective
ROL	Rule of law
RQ	Research question
SC	Self-constructed (variables)
SDGs	Sustainable Development Goals
SGMM-II	System Generalized Method of Moments two-step
SS	Stolper-Samuelson
UNCTAD	United Nations Trade and Development
VAC	Voice and accountability
WB	World Bank
WTO	World Trade Organization

CHAPTER 1: INTRODUCTION

1.1. Research background and context

1.1.1. The global nexus between trade, gender equality, environment, and institutions

Aligned with the 2030 Agenda for Sustainable Development and its “5Ps” (People, Planet, Prosperity, Peace, and Partnership), this dissertation investigates the Trade, Institution, Gender, and Environment (TIGE) nexus. It explores how international trade interacts with gender equality (SDG 5) and environmental quality (SDG 13) within diverse institutional settings (SDG 17). The research employs two empirical dimensions: a gravity framework analyzing bilateral trade between Vietnam and 40 partners, and a global cross-country analysis of 113 economies to test the Environmental Kuznets Curve (EKC) hypotheses. Central to this study is trade openness, which serves as the primary engine for global integration and modern development. A key theoretical debate exists between the “race to the bottom”, where trade leads to social and environmental degradation, and the “race to the top”, where trade fosters prosperity, equality, and technological spillover.

1.1.2. The nexus between trade and gender equality

International trade is a powerful instrument for women’s economic empowerment, narrowing income gaps and expanding opportunities within global value chains. Trade-active firms often provide higher wages and better working conditions than those limited to domestic markets. Conversely, gender equality drives trade performance; female ownership and upskilling improve productivity and national comparative advantage. However, without inclusive institutions, trade may lead to exploitation. This dissertation addresses the gap regarding how institutional quality moderates the bidirectional relationship between trade liberalization and gender equality.

1.1.3. The relationship between trade and environment

The link between trade and the environment involves a complex tension between prosperity and sustainability. While the “scale effect” suggests trade-driven expansion increases CO₂ emissions, the Openness-based Environmental Kuznets Curve (OEKC) proposed by this dissertation posits a non-linear relationship where emissions may eventually decline as trade facilitates the adoption of greener technologies. Conversely, environmental degradation and climate change undermine trade resilience by increasing costs and lowering productivity in climate-sensitive sectors. Developing nations and MSMEs (micro-, small-, and medium-sized enterprises) are particularly vulnerable to these shifts. While environmental quality can define a nation’s comparative advantage, trade also serves as a critical mechanism for climate adaptation.

1.1.4. The relationship between trade and institution

Institutional quality, encompassing policies, laws, and organizations, is vital for incentivizing productivity and building public trust. Strong institutions enable nations to avoid the middle-income trap and promote inclusiveness. SDG 17 emphasizes that a rule-based and multilateral trading system is essential for sustainable development. This dissertation examines the often-overlooked moderating and contextual impacts of institutional quality on the trade-gender and trade-environment nexuses.

1.1.5. The role of institution in gender and environment issues

Institutions act as the essential catalyst determining whether trade results in a “race to the top” or “race to the bottom”. Coherent policies and sound governance facilitate the enforcement of anti-discrimination laws and reduce the costs of green technology transfers. By directing foreign investment and financial inflows toward sustainable goals, institutions ensure that economic growth protects "natural capital" and fosters gender-inclusive development. Ultimately, achieving the promises of SDGs 5 and 13 depends on leveraging global partnerships through high-quality multi-dimensional institutions.

1.2. Problem statement

1.2.1. The trade-gender nexus

1.2.1.1. The impacts of gender equality on trade

The relationship between gender and trade is theoretically complex. Feminist Trade Theory suggests two opposing forces: the competitiveness underachiever effect, where inequality restricts resource access, and the source of competitiveness effect, where low-cost female labor is exploited to boost trade. Additionally, the Heckscher-Ohlin model (via the Rybczynski effect) and Porter’s Diamond Framework suggest that higher female participation expands labor pools and enhances factor endowments, creating comparative and locational advantages. Empirically, while older studies linked wage inequality to export growth, recent evidence from the ASEAN and D-8 regions (Bangladesh, Egypt, Indonesia, Iran, Malaysia, Nigeria, Pakistan and Turkey) identifies gender equality as a primary driver of trade expansion. However, research has yet to examine how the gender equality of bilateral trading partners, both exporters and importers, affects trade flows.

1.2.1.2. The impacts of trade on gender equality

Conversely, trade impacts gender equality through the Gender-driven Kuznets Curve (GKC), which proposes an inverse U-shaped relationship between economic integration and equality. While some evidence shows trade reduces inequality by encouraging technology adoption and education, other studies suggest it can worsen wage gaps for low-skilled workers or cause divergent sectoral shifts depending on a country's development level. This dissertation addresses gaps regarding the moderating and contextual roles of institutional quality in these gender-trade links.

1.2.2. The trade-environment nexus

1.2.2.1. The impacts of environmental quality on trade

The nexus between CO₂ emissions and trade openness often exhibits bidirectional causality, where trade affects emissions through production while environmental policies simultaneously reshape trade patterns. In some contexts, environmental quality acts as a unidirectional driver of trade flows. Despite these findings, the influence of the environmental quality of bilateral partners on cross-border trade remains under-investigated.

1.2.2.2. The impacts of trade on environmental quality

Regarding trade’s impact on the environment, results are conflicting. Some research indicates trade exacerbates degradation through increased scale, while others suggest it mitigates emissions via sustainable technology transfers and green policies. To address these inconsistencies, this dissertation replaces the traditional GDP-focused Environmental Kuznets Curve with a new Openness-based EKC model to directly examine the non-linear relationship between trade openness and environmental quality. Furthermore, this dissertation examines the moderating and contextual role of institutional quality and trade in influencing the trade-environment nexus.

1.2.3. The role of institution in trade, gender, and environment nexus

1.2.3.1. *The impact of institutional quality on environmental quality, trade openness and gender equality*

Institutional quality significantly influences environmental, trade, and gender outcomes. While strong institutions often reduce CO₂ emissions in developed nations, results in developing economies are mixed, with some institutions inadvertently increasing emissions. In trade, institutional quality consistently acts as a catalyst by reducing transaction costs and enhancing contract enforcement. Similarly, sound institutions generally foster gender equality, though weak governance (corruption) remains a critical bottleneck for female labor participation.

1.2.3.2. *The moderating role of institutional quality*

Institution also plays a vital moderating role. It can mitigate the environmental damage caused by trade, trigger the positive effects of liberalization on equality, and enhance the impact of government spending on social outcomes. A significant research gap exists because most studies use aggregate institutional quality indices rather than disaggregated dimensions. This dissertation utilizes gravity, EKC, and GKC models to examine how specific institutional dimensions moderate and underline the interlinked relationships between trade, gender, and the environment.

1.3. Research gaps and research questions

Given the research contexts which have arisen from the sustainable development agenda, the dissertation has recognized the following potential research gaps and research questions relevant to the relationship between trade, gender, environment, and institution. Particularly, the research gap (RG) is three-fold.

❖ **RG 1:** The impacts of gender equality and environmental quality on bilateral trade flows which arise from both sides (exporting and importing) of the trading relationship.

❖ **RG 2:** The linear and curvilinear impacts of trade liberalization (trade openness) on environmental quality.

❖ **RG 3:** The moderating and contextual impacts of institutional quality and trade liberalization on the links between trade, gender equality, and environmental quality.

Based on the research gaps, the dissertation has specified four research questions (RQ) as follows:

▪ **RQ 1: (a)** Is bilateral trade influenced by gender equality? **(b)** Are those influences moderated by the level of institutional quality of the exporting and importing country? **(c)** Do they vary by directions of trade in terms of institutional quality levels (high and low) of trading partners?

▪ **RQ 2: (a)** Is bilateral trade influenced by environmental quality? **(b)** Are those influences moderated by the level of institutional quality of the exporting and importing country? **(c)** Do they vary by directions of trade in terms of institutional quality levels (high and low) of trading partners?

▪ **RQ 3: (a)** Do trade openness and institutional quality influence gender equality? **(b)** Are the moderating and contextual impacts of trade openness and institutional quality on the gender-related links significant?

▪ **RQ 4: (a)** Does trade openness and institutional quality influence environmental quality? **(b)** Are the moderating and contextual impacts of trade openness and institutional quality on the environment-related links significant?

1.4. Research objectives

In order to solve the research questions, a number of research objectives (RO) have been established as follows:

Regarding RQ 1: RO 1.1: To examine the direct impacts of gender equality of the exporting and importing countries on the bilateral trade flows; **RO 1.2:** To assess the moderating impacts of institutional quality (six dimensions) on the relationship between bilateral trade and gender equality; and **RO 1.3:** To investigate whether the level of institutional quality has the significant contextual effects (high-high, low-low, and different) on the relationship between bilateral trade and gender equality.

Regarding RQ 2: RO 2.1: To examine the direct impacts of environmental quality of the exporting and importing countries on the bilateral trade flows; **RO 2.2:** To assess the moderating impact of institutional quality on the relationship between bilateral trade and environmental quality; and **RO 2.3:** To investigate whether the level of institutional quality has the significant contextual effects (high-high, low-low, and different) on the relationship between bilateral trade and environmental quality.

Regarding RQ 3: RO 3.1: To examine the direct impacts of trade openness and institutional quality on gender equality; **RO 3.2:** To assess the moderating impacts of trade openness and institutional quality on gender-related (gender-institution and gender-openness) links; and **RO 3.3:** To investigate whether the level of trade openness (high and low) and institutional quality (high and low) has the significant contextual effects on the gender-institution and gender-openness links.

Regarding RQ 4: RO 4.1: To examine the direct impacts of trade openness (linear and curvilinear) and institutional quality on environmental quality; **RO 4.2:** To assess the moderating impacts of institutional quality on the relationship between environmental quality and trade openness (linear and curvilinear); and **RO 4.3:** To investigate whether the level of trade openness (high and low) and institutional quality (high and low) has the significant contextual effects on the environment-openness and environment-institution links.

1.5. Scopes of the research

In order to solve the research questions and achieve the research objectives, three underlying research models which are recommended by two conceptual frameworks have been proposed by the dissertation, which include the Trade Gravity model (for solving RQ 1 and RQ 2), the GKC model (for solving RQ 3), and the OEKC model (for solving RQ 4). Accordingly, due to data availability, the three datasets have been built for investigating the proposed hypotheses in the three models. The first, second, and third dataset has been applied to the Trade Gravity model, the GKC model, and the OEKC model, respectively: (i) The first dataset covers the 2002-2021 period with 41 worldwide trading economies, which includes Vietnam and 40 largest trading partners. The selection of trading economies has been dependent on the trade revenue (export and import) in the 2017-2021 period. The spatial and temporal scope of the first dataset has generated a panel data sample of 32,800 observations ($41 \times 40 \times 20$) due to the symmetry of the bilateral trade flows; (ii) The second dataset covers the 2002-2021 period with 113 worldwide economies, which has generated a panel data sample of 2,260 observations (113×20); and (iii) The third dataset covers the 2002-2020 period with 113 worldwide economies, which has generated a panel data sample of 2,147 observations (113×19).

1.6. Research methodology

This dissertation utilizes a comprehensive methodological framework, employing combined fixed effect (FE), random effect (RE), and two-step difference and system generalized method of moments (DGMM-II and SGMM-II) to analyze the proposed models.

1.6.1. Combined fixed effect estimation methods

To address heterogeneity in panel data across multiple countries, the dissertation uses specific fixed effect configurations. For the gravity models, two types are employed: FE-I, which includes year-fixed and dyad-fixed effects, and FE-II, which incorporates exporter-fixed, importer-fixed, and year-fixed effects. For

the Kuznets curve models, country-fixed and year-fixed effects are applied to capture time-invariant and country-specific factors and global macroeconomic shocks and common trends.

1.6.2. Generalized Method of Moments estimation methods

To resolve endogeneity in dynamic panel models, particularly issues caused by reverse causality (simultaneity bias) and lagged dependent variables, the dissertation applies DGMM-II and SGMM-II. These methods are particularly effective for dynamic data with a large number of units (N) and short time periods (T). GMM addresses endogeneity by using lagged values of endogenous variables as internal instruments. These satisfy the relevance condition (past values influence current values) and the exogeneity condition (the future cannot change the past), ensuring unbiased estimates.

1.6.3. Poisson Pseudo Maximum Likelihood estimation method for robustness check of gravity models

As a robustness check for the gravity models, the PPML method is used to verify baseline results. PPML is essential because standard log-linear models face two issues: (i) zero-trade observations are excluded during log-linearization, causing selection bias, and (ii) heteroskedasticity can lead to inconsistent estimates.

1.7. Contributions of the dissertation

1.7.1. Theoretical contributions

The dissertation offers five primary theoretical contributions by integrating gender, environment, and institutions into trade frameworks: (1) Establishing gender equality as a determinant of national comparative advantage within the gravity model; (2) Using gravity model symmetry to analyze the dual impact of environmental quality and the moderating role of institutions; (3) Applying a Gender-driven Kuznets Curve to exploring the relationship between gender equality and trade liberalization; (4) Identifying an Openness-based Environmental Kuznets Curve (OEKC) showing how trade openness and institutions shape environmental outcomes; and (5) Providing a contextual analysis of how institutional quality and openness moderate the nexuses between trade, gender, and the environment.

1.7.2. Practical contributions

The practical contributions are structured across two strategic dimensions to aid global development. First, for the world's largest trading economies, the dissertation provides an evidence-based framework for integrating gender-responsive and environmental mandates directly into bilateral trade negotiations and national export policies. This ensures that the expansion of trade and liberalization, as envisioned in SDG 17, aligns systematically with SDG 5 (Gender Equality) and SDG 13 (Climate Action). Second, on a broader global scale, the dissertation offers a tailored roadmap for policymakers to navigate the complex trade-gender-environment nexus according to their specific institutional settings and degrees of openness. By examining the critical moderating influence of specific institutional dimensions, such as the role of the rule of law in successfully mitigating emissions, the dissertation assists governments in designing targeted institutional reforms. Ultimately, these insights serve as a practical guide for harmonizing trade liberalization with the 2030 Agenda for Sustainable Development, offering mechanisms to balance economic incentives with gender equity and environmental preservation.

1.8. Structure of the dissertation

The structure of the dissertation is seven-fold, which is as follows: **Chapter 1:** Introduction. **Chapter 2:** Theoretical backgrounds and literature review. **Chapter 3:** The gravitational approach to the trade, gender equality, and institutional quality nexus. **Chapter 4:** The gravitational approach to the trade, environmental quality, and institutional quality nexus. **Chapter 5:** The Gender-based Kuznets Curve approach to the nexus between gender equality, trade, and institutional quality. **Chapter 6:** The Openness-based Environmental

Kuznets Curve approach to the nexus between environmental quality, trade, and institutional quality. **Chapter 7: Conclusions and policy implications.**

CHAPTER 2: THEORETICAL BACKGROUNDS AND LITERATURE REVIEW

2.1. Research concepts

2.1.1. Trade and trade openness

Trade openness measures economic integration, calculated as the sum of exports and imports divided by GDP. This dissertation examines trade through two lenses: openness (or liberalization) in Chapters 5 and 6 using the Kuznets curve approach, and bilateral trade flows in Chapters 3 and 4 using the gravitational framework.

2.1.2. Gender equality

Gender equality ensures parity for women in areas like education, health, and employment. This dissertation employs three indicators: Gender Development Index (female-to-male HDI ratio), Gender Inequality Index (a composite measuring health, empowerment, and labor market competition), and Female Labor Force Participation (the share of females in the workforce).

2.1.3. Environmental quality

As CO₂ emissions are the primary contributor to global greenhouse gases and climate change, this research uses CO₂ emissions per capita as the proxy for environmental quality.

2.1.4. Institutional quality and environmental institutional quality

This dissertation utilizes the World Bank's six Worldwide Governance Indicators, which include control of corruption, government effectiveness, political stability and absence of violence/terrorism, regulatory quality, rule of law, and voice and accountability. Additionally, environmental institutional quality is measured by the OECD's Environmental Policy Stringency (EPS) index (scored 0–6). This index covers market and administrative measures, impacting environmental quality via direct penalty costs and indirect incentives for green activities.

2.2. The Trade Gravity model

Originally proposed by Poyhonen (1963) and Tinbergen (1962), the trade gravity model posits that bilateral trade is positively related to the economic size of trading partners and negatively related to the geographic distance between them. A larger economy, proxied by Gross Domestic Product (GDP), indicates both a higher production capacity for export supply and greater income to drive import demand. Conversely, geographic distance represents higher logistics and transportation costs, which reduce transaction profitability and hinder trade. While the original model focuses on GDP and distance, augmented models incorporate additional macroeconomic determinants for both the exporting and importing countries. These advanced models allow researchers to analyze how various factors, including institutional quality, renewable energy, and sustainable development issues like gender equality and carbon emissions, influence aggregated and sectoral trade.

2.3. The Environmental Kuznets Curve (EKC) Hypothesis

The EKC hypothesis is an adaptation of the Kuznets curve, which originally described an inverse U-shaped relationship between economic development and income inequality. In an environmental context, the EKC suggests a similar inverse U-shaped link between economic growth and environmental degradation. During the initial phase of development, intensive resource exploitation and economic upscaling lead to a

positive correlation between growth and environmental deterioration (often proxied by CO₂ emissions). However, as economies mature, a second phase emerges where higher living standards and technological advancements facilitate the adoption of carbon-neutral technologies and sustainable business practices. Consequently, further economic growth eventually leads to a mitigation of environmental degradation.

2.4. The Gender-driven Kuznets Curve Hypothesis

Inspired by the EKC, the GKC model explores the complex relationship between economic development and gender equality, often characterized as N-shaped, S-shaped, or U-shaped. Three primary perspectives define this link: (1) Feminist Approach: Suggests development may consolidate patriarchal structures, negatively impacting women's employment and income; (2) Neoliberal Approach: Argues that growth improves women's education, social networks, and technological access, thereby enhancing equality; and (3) U-Shaped Approach: Proposes that equality initially declines during early development but eventually rises as women's increased labor participation and income balance their bargaining power. Modern applications of the GKC model incorporate variables such as trade openness, FDI inflows, and institutional quality to examine how these macro-determinants influence gender-related sustainability outcomes across different income levels.

2.5. Theoretical foundations of the trade-gender nexus

2.5.1. The impact of gender equality on trade

Gender equality shapes trade through several theoretical lenses. Feminist Trade Theory identifies two conflicting impacts: the “competitiveness underachiever” effect, where inequality restricts resources for female exporters, and the “source of competitiveness” effect, where suppressed female bargaining power lowers costs in labor-intensive industries. Under Heckscher-Ohlin Theory and the Rybczynski Theorem, increased female labor participation expands production in female-intensive sectors, boosting exports in countries abundant in female labor. Additionally, Porter's Competition Theory and Diamond Framework suggest equality enhances “location attractiveness” via labor pooling and strengthens “advanced factors” through improved female managerial capabilities, fostering national competitive advantage and export growth.

2.5.2. The impact of trade on gender equality

Trade's impact on gender equality is multifaceted. The Stolper-Samuelson Theorem suggests that trade-induced price rises in female-intensive goods can improve female wages and welfare. The Three-fold Effect, scale, composition, and technique, illustrates how trade creates jobs but also shifts industry specialization and technology demands, leading to varied outcomes for different skill levels. Furthermore, the Gender-based Kuznets Curve links trade openness to evolving equality patterns. Research also highlights four specific channels: expanding service-sector employment, lowering consumer prices, increasing trade costs for small female-led firms, and reducing public welfare funding via lost tariff revenue. Ultimately, trade can either reduce discrimination through competitive pressure or widen wage gaps if female bargaining power is weak or if specialization favors male-dominated sectors.

2.6. Theoretical foundations of the trade-environment nexus

2.6.1. The impact of trade on environmental quality

Trade affects emissions through the Theory of Three-fold Effects: the scale effect (expanded economic activity increasing emissions), the composition effect (structural shifts toward either carbon-intensive or green sectors based on comparative advantage), and the technique effect (technology transfers reducing emissions). These mechanisms often create an inverse U-shaped relationship. In the early stages of openness, emissions rise as the scale effect and the Pollution Haven Hypothesis, the relocation of dirty and polluting industries to

developing nations, dominate. Eventually, a turning point occurs as the Pollution Halo Hypothesis takes hold, particularly, advanced carbon-neutral technology transfers allow the technique effect to drive total emission reductions. This dissertation utilizes an Openness-based EKC model to specifically examine this non-linear relationship.

2.6.2. The impact of environmental quality on trade

Environmental quality also shapes trade via Environmental Assimilative Capacity (EAC) – the environment's ability to neutralize pollution. Following the Heckscher-Ohlin Theory, high emissions deplete EAC, which alters a nation's comparative advantage and subsequent trade flows. Furthermore, Porter's Diamond Model suggests that environmental degradation can foster trade by increasing consumer awareness (Demand Conditions). This pressures firms to innovate, ultimately bolstering export competitiveness. In this framework, EAC is categorized as a factor endowment, while environmental policies and degradation serve as policy and opportunity components that strengthen a nation's global market position.

2.7. Theoretical foundations of the trade-institution nexus

Several frameworks explain how institutions drive trade. Porter's (1990) Diamond Model suggests that the "Policy" component, linked to institutional quality, is vital for national competitive advantage, determining a country's specialization and bilateral trade flows. Belloc (2006) adds that institutional quality influences industrial structures, financial markets, and transaction costs, which collectively dictate trade openness. From a Transaction Cost Theory perspective, institutions are critical because they manage coordination costs and transaction risks. Furthermore, Levchenko (2007) posits that institutions themselves serve as a source of comparative advantage, determining the relative gains or losses a nation experiences through global trade.

2.8. The moderating role of institutional quality: Theoretical perspectives

Institutional quality also moderates the relationship between trade liberalization, environmental quality, and gender equality. According to Transaction Cost Theory, robust contract enforcement and property protection reduce risks for foreign investors, facilitating the transfer of carbon-neutral technologies that mitigate environmental decay. Similarly, controlling corruption lowers costs for small and medium enterprises, amplifying the role of the female labor force in driving trade flows. New Institutional Economics (North, 1990; Ménard, 2011) further identifies four moderating components: Law, Polity, Administration, and Ideology. While Law and Polity establish the legal frameworks and political priorities necessary to protect women's rights and environmental standards, Administration ensures these rules are effectively enforced. Finally, Ideology acts as an underpinning moderator; societal beliefs and informal norms can either foster compliance or hinder progress toward equality and sustainability, regardless of formal regulations.

2.9. Analytical frameworks

In order to achieve four research objectives and test the research hypotheses of the dissertation, the integrated analytical framework, which includes Panel A and Panel B, has been proposed as follows:

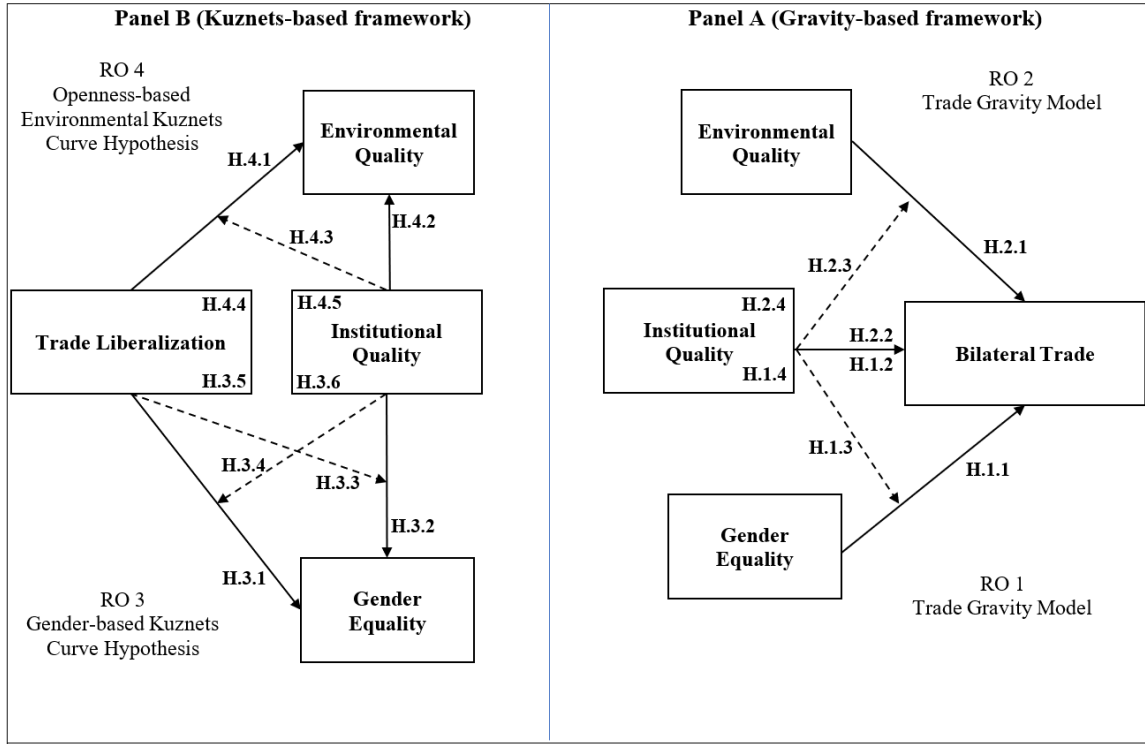
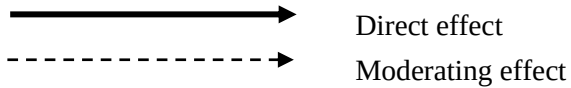


Figure 2.1: The integrated analytical framework



Source: The author.

As could be seen in Figure 2.1, the integrated analytical framework aims at investigating the relationships between trade (liberalization and bilateral flows), environmental quality, gender quality, and institutional quality (six institutional dimensions and environmental institutional quality). For achieving RO 1 and RO 2 in Panel A, the *Trade Gravity Model* is employed to analyze the direct effects of gender equality, environmental quality, and institutional quality on bilateral trade flows. In addition, the moderating and contextual effects of institutional quality on trade-gender and trade-environment links are investigated. For achieving RO 3 in Panel B, the *Gender-based Kuznets Curve Hypothesis (GKC model)* is applied to discovering the nexus between trade liberalization and gender equality. The moderating effects of institutional quality and trade liberalization on the gender-liberalization and gender-institution links have also been investigated by the GKC framework. For achieving RO 4 in Panel B, the *Openness-based Environmental Kuznets Curve Hypothesis (OEKC model)* is applied to exploring the linear and curvilinear relationship between trade liberalization and environmental quality. In addition, the moderating effect of institutional quality on the linear and curvilinear environment-liberalization link has been examined by the OEKC framework. Finally, the contextual effects of institutional quality and trade liberalization are also investigated in the gravitational and Kuznets curve approaches of the framework.

CHAPTER 3: THE GRAVITATIONAL APPROACH TO THE TRADE, GENDER EQUALITY, AND INSTITUTIONAL QUALITY NEXUS

3.1. Introduction

To achieve RO1, this chapter has explored the effects of gender equality on bilateral trade which include the two sides of a trading relationship (exporting and importing). In addition, the moderating and contextual effects of institutional quality on the nexus between bilateral trade and gender equality have been under-examined by previous research. Therefore, the chapter proposes four hypotheses as follows:

H.1.1: Gender equality (of the exporting and importing country) has a significant positive effect on bilateral trade.

H.1.1.1: Gender development (of the exporting and importing country) has a significant positive effect on bilateral trade.

H.1.1.2: Gender inequality (of the exporting and importing country) has a significant negative effect on bilateral trade.

H.1.1.3: Female labor force participation (of the exporting and importing country) has a significant positive effect on bilateral trade.

H.1.2: Institutional quality (of the exporting and importing country) has a significant positive effect on bilateral trade.

H.1.3: Institutional quality (of the exporting and importing country) significantly moderates the link between bilateral trade and gender equality.

H.1.3.1: Institutional quality (of the exporting and importing country) significantly moderates the link between bilateral trade and gender development.

H.1.3.2: Institutional quality (of the exporting and importing country) significantly moderates the link between bilateral trade and gender inequality.

H.1.3.3: Institutional quality (of the exporting and importing country) significantly moderates the link between bilateral trade and female labor force participation.

H.1.4: Institutional quality (of the exporting and importing country) has a significant contextual effect on the link between bilateral trade and gender equality.

3.2. Model specification, variable measurement, and estimation strategy

3.2.1. Model specification and variable measurement

To examine the proposed hypotheses, the general dynamic trade gravity model with gender equality and institutional quality has been proposed as follows (Eshetu & Goshu, 2021; Golovko & Sahin, 2021; Islam et al., 2024; Lohani, 2024; Martínez-Martínez et al., 2023):

$$\begin{aligned} \text{Trade}_{ijt} = & \alpha_0 + \alpha_1 \text{Trade}_{ij,t-1} + \alpha_2 \text{Trade}_{ij,t-2} + \alpha_3 \text{Size}_{it1} + \alpha_4 \text{Size}_{it2} + \alpha_5 \text{Size}_{jt1} + \alpha_6 \text{Size}_{jt2} \\ & + \alpha_7 \text{Distance}_{ij} + \alpha_8 \text{IQ}_{it} + \alpha_9 \text{IQ}_{jt} + \alpha_{10} \text{GE}_{it} + \alpha_{11} \text{GE}_{jt} + \alpha_{12} (\text{IQ} \cdot \text{GE})_{it} + \alpha_{13} (\text{IQ} \cdot \text{GE})_{jt} \\ & + \alpha_{14} \text{MRT}_{it} + \alpha_{15} \text{MRT}_{jt} + \sum_{k=16}^{26} \alpha_k \text{Control}_{k,ij,t,ij,ijt} + \sum_{m=27}^{30} \alpha_m \text{FE}_{m,ij,t} + \varepsilon_{ijt} \end{aligned}$$

where i and j denote the exporting and importing country, t denotes the year of the observation, α denotes the coefficients of explanatory variables (except for α_0 which denotes the y-intercept of the estimation), and $t-1$ and $t-2$ denote the first and second lags of the dependent variable Trade_{ijt} . Trade_{ijt} is the bilateral trade, Size_{it1} , Size_{it2} , Size_{jt1} , and Size_{jt2} denotes gross domestic product (economic size) and population, Distance_{ij} is the geographic distance, IQ_{it} and IQ_{jt} denote the institutional quality, GE_{it} and GE_{jt} denote the

gender equality, $(IQ.GE)_{it}$ and $(IQ.GE)_{jt}$ denote the cross-terms of institutional quality and gender equality, which allows the examination of the moderating effect of institutional quality on the trade-gender nexus, MRT_{it} and MRT_{jt} are the multilateral resistance terms (MRT) for addressing the *third-country effect* on the bilateral trading relationship as pointed out by Anderson and Van Wincoop (2003), Baier and Bergstrand (2009), and Head and Mayer (2014), $\sum_{k=16}^{26} \alpha_k Control_{k,i,j,t,ij,ijt}$ denotes the set of control variables for the individual and common characteristics of country i and j in year t and for the special global events in year t , $\sum_{m=27}^{30} \alpha_m FE_{m,i,j,ij,t}$ denotes the set of control variables for exporter-fixed (i), importer-fixed (j), countrypair-fixed (ij), and year-fixed effects (t), and ε_{ijt} denotes the error term of the estimation. Based on the general model, the specific model has been proposed whose variables are interpreted in Table A.1 (the Appendices A). The panel data samples include the aggregated, partners of high institutional quality (high-high direction), partners of low institutional quality (low-low direction), and partners of different institutional quality (high-low and low-high directions). Data sources are built from the databases of World Bank and World Trade Organization. The distance and common characteristics variables are built based on Conte et al. (2022). The panel includes 41 countries (Vietnam and 40 largest trading partners) in the 2002-2021 period. The panel size is $41 \times 40 \times 20 = 32,800$ observations, which includes Vietnam and the most dynamic trading economies which are selected based on the total trade value in the 2017-2021 period.

3.2.2. Estimation strategy

To estimate the proposed models, this chapter employs the combined fixed effect (FE-I and FE-II), random effect (RE), and two-step system generalized method of moments (SGMM-II) methods. The endogenous variables include gross domestic product of the exporting and importing countries and the bilateral exchange rate (Kahouli, 2016; Le, 2022; Le & Pham, 2024). For robustness check, the PPML estimation is applied. Links are not confirmed when (i) there are conflicting results of FE-I, FE-II, SGMM-II, and PPML estimations or (ii) the links are only significant in one of FE-I, FE-II, and PPML estimations or (iii) the links are only significant in one of FE-I and FE-II estimations.

3.3. Summary of empirical results

Some noticeable findings of this chapter are as follows (please see Table C3.41 and C3.42 in the Appendices of Chapter 3 for the summary of explored effects):

Table C3.41: Summary of findings on the direct effect of gender equality on bilateral trade

Contextual effects	Direct effects	Hypotheses
The aggregated sample	Exporter's and importer's GDI <i>increases</i> bilateral trade.	H.1.1.1: Supported
	Importer's GII <i>increases</i> import flows.	H.1.1.2: Not supported (opposite sign)
The high-high institutional trading relationship	Exporter's FLA <i>increases</i> export flows.	H.1.1.3: Supported H.1.4: Supported
	Exporter's GII <i>decreases</i> export flows.	H.1.1.2: Supported H.1.4: Supported
The low-low institutional trading relationship	Exporter's GDI <i>increases</i> export flows.	H.1.1.1: Supported H.1.4: Supported
	Exporter's GDI <i>increases</i> export flows.	H.1.1.1: Supported H.1.4: Supported

The low-high and high-low institutional trading relationships	Importer's GDI <i>decreases</i> import flows.	H.1.1.1: Not supported (opposite sign) H.1.4: Supported

Source: The author.

Table C3.41 (Appendices of Chapter 3) summarizes findings on the direct effect of gender equality on bilateral trade and the contextual effects of institutional quality on the trade-gender nexus, while Table C3.42 (Appendices of Chapter 3) indicates findings on the moderating effects of institutional quality's dimensions.

Table C3.42: Summary of findings on the moderating effect of institutional quality on the nexus between gender equality and bilateral trade

Institutional quality proxies	Moderating effects			Hypotheses
	Bilateral Trade-GDI	Bilateral Trade-GII	Bilateral Trade-FLA	
COC	Exporter (-) Importer (-)	Exporter (+) Importer (+)	Importer (+)	H.1.3.1: Supported H.1.3.2: Supported H.1.3.3: Supported
GVE	Exporter (-) Importer (-)			H.1.3.1: Supported H.1.3.2: Not supported H.1.3.3: Not supported
POS	Importer (+)		Importer (-)	H.1.3.1: Supported H.1.3.2: Not supported H.1.3.3: Supported
REQ	Importer (-)	Exporter (+)		H.1.3.1: Supported H.1.3.2: Supported H.1.3.3: Not supported
ROL				H.1.3.1: Not supported H.1.3.2: Not supported H.1.3.3: Not supported
VAC	Exporter (-)	Exporter (+) Importer (+)	Importer (-)	H.1.3.1: Supported H.1.3.2: Supported H.1.3.3: Supported
Overall IQ			Exporter (-)	H.1.3.1: Not supported H.1.3.2: Not supported H.1.3.3: Supported

Source: The author.

CHAPTER 4: THE GRAVITATIONAL APPROACH TO THE TRADE, ENVIRONMENTAL QUALITY, AND INSTITUTIONAL QUALITY NEXUS

4.1. Introduction

To achieve RO 2, this chapter has examined the effects of environmental quality on bilateral trade which include the two sides of a trading relationship (exporting and importing). In addition, the moderating and contextual effects of institutional quality on the link between bilateral trade and environmental quality

have been under-examined by previous research. Therefore, the following hypotheses have been proposed as follows:

H.2.1: Environmental quality (of the exporting and importing country) has a significant positive effect on bilateral trade.

H.2.2: Institutional quality (of the exporting and importing country) has a significant positive effect on bilateral trade.

H.2.3: Institutional quality (of the exporting and importing country) significantly moderates the link between bilateral trade and environmental quality.

H.2.4: Institutional quality (of the exporting and importing country) has a significant contextual effect on the link between bilateral trade and environmental quality.

4.2. Model specification, variable measurement, and estimation strategy

4.2.1. Model specification and variable measurement

To examine the proposed hypotheses, the general dynamic trade gravity model with environmental quality and institutional quality has been proposed as follows (Eshetu & Goshu, 2021; Golovko & Sahin, 2021; Guo & Mai, 2023; Islam et al., 2024; Lohani, 2024; Martínez-Martínez et al., 2023):

$$\begin{aligned} \text{Trade}_{ijt} = & \beta_0 + \beta_1 \text{Trade}_{ij,t-1} + \beta_2 \text{Trade}_{ij,t-2} + \beta_3 \text{Size}_{it1} + \beta_4 \text{Size}_{it2} + \beta_5 \text{Size}_{jt1} + \beta_6 \text{Size}_{jt2} \\ & + \beta_7 \text{Distance}_{ij} + \beta_8 \text{IQ}_{it} + \beta_9 \text{IQ}_{jt} + \beta_{10} \text{EQ}_{it} + \beta_{11} \text{EQ}_{jt} + \beta_{12} (\text{IQ} \cdot \text{EQ})_{it} + \beta_{13} (\text{IQ} \cdot \text{EQ})_{jt} \\ & + \beta_{14} \text{MRT}_{it} + \beta_{15} \text{MRT}_{jt} + \sum_{k=16}^{26} \beta_k \text{Control}_{k,i,j,t,ij,ijt} + \sum_{m=27}^{30} \beta_m \text{FE}_{i,j,ij,t} + \eta_{ijt} \end{aligned}$$

where i and j denote the exporting and importing country, t denotes the year of the observation, β denotes the coefficients of explanatory variables (except for β_0 which denotes the y-intercept of the estimation), and $t-1$ and $t-2$ denote the first and second lags of the dependent variable Trade_{ijt} . Trade_{ijt} is the bilateral trade, Size_{it1} , Size_{it2} , Size_{jt1} , and Size_{jt2} denotes gross domestic product (economic size) and population, Distance_{ij} is the geographic distance, IQ_{it} and IQ_{jt} denote the institutional quality, EQ_{it} and EQ_{jt} denote the environmental quality, $(\text{IQ} \cdot \text{EQ})_{it}$ and $(\text{IQ} \cdot \text{EQ})_{jt}$ denote the cross-terms of institutional quality and environmental quality, which allows the examination of the moderating effect of institutional quality on the trade-environment link, MRT_{it} and MRT_{jt} are the multilateral resistance terms (MRT) for addressing the *third-country effect* on the bilateral trading relationship as pointed out by Anderson and Van Wincoop (2003), Baier and Bergstrand (2009), and Head and Mayer (2014), $\sum_{k=16}^{26} \beta_k \text{Control}_{k,i,j,t,ij,ijt}$ denotes the set of control variables for the individual and common characteristics of country i and j in year t and for the special global events in year t , $\sum_{m=27}^{30} \beta_m \text{FE}_{i,j,ij,t}$ denotes the set of control variables for exporter-fixed (i), importer-fixed (j), country pair-fixed (ij), and year-fixed effects (t), and η_{ijt} denotes the error term of the estimation. Based on the general model, the specific model has been proposed whose variables are interpreted in Table A.2 (the Appendices A).

The six institutional quality variables (explanatory variables) are included separately in the research models in order to avoid the potential multi-collinearity. The panel data samples include the aggregated, partners of high institutional quality (high-high direction), partners of low institutional quality (low-low direction), and partners of different institutional quality (high-low and low-high directions). Data sources are built from the databases of The World Bank, The World Trade Organization, and The Our World in Data project of the Global Change Data Lab (for the CO₂ emissions). The distance and common characteristics variables are built based on Conte et al. (2022). The panel includes 41 countries (Vietnam and 40 largest trading partners) in the 2002-2021 period. The panel size is $41 \times 40 \times 20 = 32,800$ observations, which includes

Vietnam and the most dynamic trading economies which are selected based on the total trade value in the 2017-2021 period.

4.2.2. Estimation strategy

To estimate the proposed models, this chapter employs the combined fixed effect (FE-I and FE-II), random effect (RE), and two-step system generalized method of moments (SGMM-II) methods. The endogenous variables include gross domestic product of the exporting and importing countries and the bilateral exchange rate (Kahouli, 2016; Le, 2022; Le & Pham, 2024). For robustness check, the PPML estimation is applied. Links are not confirmed when (i) there are conflicting results of FE-I, FE-II, SGMM-II, and PPML estimations or (ii) the links are only significant in one of FE-I, FE-II, and PPML estimations or (iii) the links are only significant in one of FE-I and FE-II estimations.

4.3. Summary of empirical results

Some noticeable findings of this chapter are as follows (please see Table C4.17, C4.18, and C4.19 in the Appendices of Chapter 4 for the summary of explored effects):

Table C4.17: Summary of findings on the direct effect of environmental quality on bilateral trade

Contextual effects	Direct effects	Hypotheses
The aggregated sample	Exporter's CO ₂ emissions <i>increases</i> export flows. Importer's CO ₂ emissions <i>increases</i> import flows.	H.2.1: Not supported (opposite sign)
The high-high institutional trading relationship	Exporter's CO ₂ emissions <i>increases</i> export flows. Importer's CO ₂ emissions <i>increases</i> import flows.	H.2.1: Not supported (opposite sign) H.2.4: Not supported
The low-low institutional trading relationship	Exporter's CO ₂ emissions <i>increases</i> export flows. Importer's CO ₂ emissions <i>increases</i> import flows.	H.2.1: Not supported (opposite sign) H.2.4: Not supported
The low-high and high-low institutional trading relationships	Exporter's CO ₂ emissions <i>increases</i> export flows. Importer's CO ₂ emissions <i>increases</i> import flows.	H.2.1: Not supported (opposite sign) H.2.4: Not supported

Source: The author.

Table C4.17 summarizes findings on the direct effect of environmental quality on bilateral trade and the contextual effects of institutional quality on the trade-environment nexus. Table C4.18 summarizes the consistent findings of Chapters 3 and 4 on the direct effect of institutional quality's dimensions on bilateral trade.

Table C4.18: Summary of findings on the direct effect of institutional quality on bilateral trade (based on consistent findings of Chapter 3 and Chapter 4)

Institutional quality proxies	Direct effects				Hypotheses
	Aggregated	High-High	Low-Low	Different	
COC					H.2.2 & H.1.2: Not supported H.2.4: Not supported
GVE		Exporter (+) Importer (+)		Exporter (+) Importer (-)	H.2.2 & H.1.2: Supported (in specific contexts) H.2.4: Supported
POS		Importer (+)	Importer (-)		H.2.2 & H.1.2: Supported (in specific contexts) H.2.4: Supported

REQ			Importer (-)		H.2.2 & H.1.2: Not supported (opposite sign) H.2.4: Supported
ROL				Exporter (+)	H.2.2 & H.1.2: Supported (in specific contexts) H.2.4: Supported
VAC	Exporter (-)	Exporter (-) Importer (+)			H.2.2 & H.1.2: Supported (in specific contexts) H.2.4: Supported
EPS	Exporter (-)				H.2.2: Not supported (opposite sign) H.2.4: Not supported
Overall IQ					H.2.2 & H.1.2: Not supported H.2.4: Not supported

Source: The author.

Table C4.19 summarizes the findings on the moderating effects of institutional quality's dimensions on the trade-environment nexus.

Table C4.19: Summary of findings on the moderating effect of institutional quality on the nexus between environmental quality and bilateral trade

Institutional quality proxies	Moderating effects	Hypotheses
	Bilateral Trade-CO ₂ emissions	
COC	Importer (+)	H.2.3: Supported
GVE	Importer (+)	H.2.3: Supported
POS	Importer (-)	H.2.3: Supported
REQ	Importer (+)	H.2.3: Supported
ROL	Importer (+)	H.2.3: Supported
VAC		H.2.3: Not supported
EPS		H.2.3: Not supported
Overall IQ	Importer (+)	H.2.3: Supported

Source: The author.

CHAPTER 5: THE GENDER-BASED KUZNETS CURVE APPROACH TO THE NEXUS BETWEEN GENDER EQUALITY, TRADE, AND INSTITUTIONAL QUALITY

5.1. Introduction

To achieve RO 3, this chapter investigates the direct impacts of trade liberalization (trade openness) and institutional quality on gender equality, and the moderating and contextual impacts of trade liberalization (trade openness) and institutional quality on gender-institution and gender-liberalization links. Therefore, the following hypotheses have been proposed as follows:

H.3.1: Trade liberalization has a significant positive effect on gender equality.

H.3.1.1: Trade liberalization has a significant positive effect on gender development.

H.3.1.2: Trade liberalization has a significant negative effect on gender inequality.

H.3.1.3: Trade liberalization has a significant positive effect on female labor force participation.

H.3.2: Institutional quality has a significant positive effect on gender equality.

H.3.2.1: Institutional quality has a significant positive effect on gender development.

H.3.2.2: Institutional quality has a significant negative effect on gender inequality.

H.3.2.3: Institutional quality has a significant positive effect on female labor force participation.

H.3.3: Trade liberalization significantly moderates the link between gender equality and institutional quality.

H.3.3.1: Trade liberalization significantly moderates the link between gender development and institutional quality.

H.3.3.2: Trade liberalization significantly moderates the link between gender inequality and institutional quality.

H.3.3.3: Trade liberalization significantly moderates the link between female labor force participation and institutional quality.

H.3.4: Institutional quality significantly moderates the link between gender equality and trade liberalization.

H.3.4.1: Institutional quality significantly moderates the link between gender development and trade liberalization.

H.3.4.2: Institutional quality significantly moderates the link between gender inequality and trade liberalization.

H.3.4.3: Institutional quality significantly moderates the link between female labor force participation and trade liberalization.

H.3.5: Trade liberalization has a significant contextual effect on the gender-liberalization and gender-institution links.

H.3.6: Institutional quality has a significant contextual effect on the gender-liberalization and gender-institution links.

5.2. Model specification, variable measurement, and estimation strategy

5.2.1. Model specification and variable measurement

The general Gender-driven Kuznet Curve model in this chapter has been proposed as follows (Anyanwu, 2016; Ghosh, 2022; Nguyen & Su, 2021; Nguyen 2022; Nguyen & Nguyen, 2023):

$$GE_{it} = \gamma_0 + \gamma_1 GE_{i,t-1} + \gamma_2 GE_{i,t-2} + \gamma_3 Income_{it} + \gamma_4 Income_{it}^2 + \gamma_5 Income_{it}^3 + \gamma_6 Openness_{it} + \gamma_7 IQ_{k,it} + \gamma_8 (IQ_{LEV,k} \cdot Openness)_{it} + \gamma_9 (Openness_{LEV} \cdot IQ_k)_{it} + \sum_{m=10}^{16} \gamma_m Control_{m,it,t} + \delta_t + \theta_{it}$$

where i denotes the country of the observation, t denotes the year of the observation, $t-1$ and $t-2$ denote the first and second lags of the dependent variable GE_{it} , γ denotes the coefficients of explanatory variables (except for γ_0 which denotes the y-intercept of the estimation), GE_{it} denotes the gender equality, $Income_{it}$ denotes the income, $Openness_{it}$ denotes trade openness, $IQ_{k,it}$ represents six Worldwide Governance Indicators for constituent dimensions of institutional quality ($k = 1, \dots, 6$), $(IQ_{LEV,k} \cdot Openness)_{it}$ denotes the cross-terms of the level of institutional quality's dimensions and trade openness, $(Openness_{LEV} \cdot IQ_k)_{it}$ denotes the cross-terms of institutional quality's dimensions and trade openness level, $\sum_{m=10}^{16} \gamma_m Control_{m,it,t}$ represents the set of control variables, δ_t is the time-fixed effect, and θ_{it} is the error term of the estimation. Based on the general model, the specific model has been proposed whose variables are interpreted in Table A.3 (the Appendices A). The panel data samples include the aggregated, high institutional quality, low institutional quality, high openness, and low openness. Data sources are built from the databases of The World Bank, The World Trade Organization, and The United Nations Conference on Trade and Development. The panel data includes 113 worldwide countries in the 2002-2021 period. Therefore, the panel size is $113 \times 20 = 2,260$ observations.

5.2.2. Estimation strategy

To estimate the proposed models, this chapter employs the combined fixed effect (FE), random effect (RE), two-step difference generalized method of moments (DGMM-II), and two-step system generalized method of moments (SGMM-II) methods. In this chapter, the endogenous variables include gross domestic product per capita (income per capita) in the original, squared, and cubed terms as gender equality could have the significant impact on income per capita and economic growth (Akhtar et al., 2023; Klasen & Lamanna, 2009; Mitra et al., 2015; Nandan & Mallick, 2020), which much possibly triggers the reverse causality running from gender equality to income. To ensure the reliability of the findings, the dissertation has conducted a cross-comparison between FE, DGMM-II, and SGMM-II estimations. Links are not confirmed when (i) there are conflicting results between FE, DGMM-II, and SGMM-II estimations or (ii) the links are only significant in the FE estimation (except income variables).

5.3. Summary of empirical results

Some noticeable findings of this chapter are as follows (please see Table C5.31, C5.32, C5.33, and C5.34 in the Appendices of Chapter 5 for the summary of explored effects):

Table C5.31: Summary of findings on the direct effect of trade openness on gender equality

Contextual effects	Direct effects			Hypotheses
	GDI	GII	FLA	
Aggregated	Increasing (+)	Decreasing (-)	Increasing (+)	H.3.1.1: Supported H.3.1.2: Supported H.3.1.3: Supported
High Institution	Decreasing (-)	Decreasing (-)	Increasing (+)	H.3.1.1: Not supported (opposite sign) H.3.1.2: Supported H.3.1.3: Supported H.3.6: Supported (in GDI models)
Low Institution		Decreasing (-)	Increasing (+)	H.3.1.1: Not supported H.3.1.2: Supported H.3.1.3: Supported H.3.6: Supported (in GDI models)
High Openness	Decreasing (-)	Decreasing (-)	Increasing (+)	H.3.1.1: Not supported (opposite sign) H.3.1.2: Supported H.3.1.3: Supported H.3.5: Supported (in GDI and FLA models)
Low Openness		Decreasing (-)		H.3.1.1: Not supported H.3.1.2: Supported H.3.1.3: Not supported H.3.5: Supported (in GDI and FLA models)

Source: The author.

Table C5.31 summarizes the direct effects of trade openness on gender equality and the contextual effects of institutional quality's dimensions and trade openness on the gender-trade nexus. Table C5.32 summarizes the direct effects of institutional quality's dimensions on gender equality and the contextual effects of institutional quality's dimensions and trade openness on the gender-institution nexus.

Table C5.32: Summary of findings on the direct effect of institutional quality on gender equality

Contextual effects	Direct effects			Hypotheses
	GDI	GII	FLA	
Aggregated	GVE (-)	COC, GVE, POS, REQ, VAC (-)	COC (+) POS, REQ, ROL (-)	H.3.2.1: Not supported (opposite sign) H.3.2.2: Supported

				H.3.2.3: Supported (in COC model)
High Institution	COC, GVE, ROL (-)	COC, REQ (-) ROL (+)	COC, ROL (-) POS, VAC (+)	H.3.2.1: Not supported H.3.2.2: Supported (in COC and REQ models) H.3.2.3: Supported (in POS and VAC models) H.3.6: Supported
Low Institution	GVE, REQ (-) ROL (+)	COC, GVE, REQ (-) POS (+)	POS, REQ, ROL (-) COC, VAC (+)	H.3.2.1: Supported (in ROL model) H.3.2.2: Supported (in COC, GVE, and REQ models) H.3.2.3: Supported (in COC and VAC models) H.3.6: Supported
High Openness	COC (-) GVE, POS, ROL (+)	COC, GVE, VAC (-)	COC, VAC (+) GVE, POS (-)	H.3.2.1: Supported (in GVE, POS, and ROL models) H.3.2.2: Supported H.3.2.3: Supported (in COC and VAC models) H.3.5: Supported
Low Openness	GVE, POS (-) ROL, VAC (+)	GVE, POS, REQ, ROL, VAC (-)	COC, VAC (+) POS, REQ, ROL (-)	H.3.2.1: Supported (in ROL and VAC models) H.3.2.2: Supported H.3.2.3: Supported (in COC and VAC models) H.3.5: Supported

Source: The author.

Table C5.33 summarizes the moderating effect of trade openness on the gender-institution nexus and the contextual effects of institutional quality's dimensions.

Table C5.33: Summary of findings on the moderating effect of trade openness on the gender-institution nexus

Contextual effects	Moderating effects of trade openness			Hypotheses
	GDI-Institution	GII-Institution	FLA-Institution	
Aggregated	GDI-POS (+)	GII-POS (+) GII-ROL (+) GII-VAC (+)	FLA-All (-)	H.3.3.1: Supported H.3.3.2: Supported H.3.3.3: Supported
High Institution	GDI-POS (+) GDI-VAC (+)	GII-COC (-) GII-REQ (-)	FLA-All (-)	H.3.3.1: Supported H.3.3.2: Supported H.3.3.3: Supported
Low Institution	GDI-COC (+) GDI-POS (-)	GII-COC (+) GII-GVE (+) GII-REQ (+) GII-ROL (+) GII-VAC (+)	FLA-POS (+) FLA-ROL (+) FLA-GVE (-) FLA-VAC (-)	H.3.3.1: Supported H.3.3.2: Supported H.3.3.3: Supported

Source: The author.

Table C5.34 summarizes the moderating effects of institutional quality's dimensions on the gender-liberalization nexus and the contextual effect of trade openness.

Table C5.34: Summary of findings on the moderating effect of institutional quality on the gender-liberalization nexus

Contextual effects	Moderating effects of institutional quality			Hypotheses
	GDI-Openness	GII-Openness	FLA-Openness	

Aggregated			GVE, REQ, VAC (+)	H.3.4.1: Not supported H.3.4.2: Not supported H.3.4.3: Supported
High Openness	COC (+) GVE, POS, REQ (-)	POS (+) ROL (-)	GVE, REQ (+) COC, POS, ROL, VAC (-)	H.3.4.1: Supported H.3.4.2: Supported H.3.4.3: Supported
Low Openness	COC, GVE, POS, REQ (+)	GVE (+) POS, VAC (-)	COC, GVE, REQ, VAC (+) ROL (-)	H.3.4.1: Supported H.3.4.2: Supported H.3.4.3: Supported

Source: The author.

CHAPTER 6: THE OPENNESS-BASED ENVIRONMENTAL KUZNETS CURVE APPROACH TO THE NEXUS BETWEEN ENVIRONMENTAL QUALITY, TRADE, AND INSTITUTIONAL QUALITY

6.1. Introduction

To achieve RO 4, this chapter examines the direct impacts (linear and non-linear) of trade liberalization (trade openness) and institutional quality on environmental quality, and the moderating and contextual impacts of trade liberalization (trade openness) and institutional quality on environment-institution and environment-liberalization links. Therefore, the following hypotheses have been proposed as follows:

H.4.1: Trade liberalization has a significant effect on environmental quality.

H.4.1.1: At lower levels, trade liberalization has a significant negative (positive) effect on environmental quality (CO₂ emissions).

H.4.1.2: At higher levels, trade liberalization has a significant positive (negative) effect on environmental quality (CO₂ emissions).

H.4.2: Institutional quality has a significant positive (negative) effect on environmental quality (CO₂ emissions).

H.4.3: Institutional quality significantly moderates the link between environmental quality and trade liberalization.

H.4.4: Trade liberalization has a significant contextual effect on the environment-liberalization and environment-institution links.

H.4.5: Institutional quality has a significant contextual effect on the environment-liberalization and environment-institution links.

6.2. Model specification, variable measurement, and estimation strategy

6.2.1. Model specification and variable measurement

Based on the original EKC hypothesis (Kuznets, 1955) and the most recent research of (Achuo & Ojong, 2024; Amankwa et al., 2024; Boujedra & Jebli, 2025; Caporin et al., 2024; Demiral et al., 2024; Guo & Shahbaz, 2024; Gupta et al., 2025; Gyamfi et al., 2024; Huang et al., 2024; Mahadevan & Suardi, 2024; Murad et al., 2025; Phiri et al., 2024; Polat & Cil, 2025; Rasheed & Liu, 2024; Shao et al., 2025; Wang et al., 2024; Wu et al., 2025; Zeraibi et al., 2024), the general Openness-based Environmental Kuznets Curve (OEKC) model in this chapter has been proposed as follows:

$$EQ_{it} = \rho_0 + \rho_1 EQ_{i,t-1} + \rho_2 EQ_{i,t-2} + \rho_3 Openness_{it} + \rho_4 Openness_{it}^2 + \rho_5 IQ_{it} + \rho_6 (IQ_{LEV} \cdot Openness)_{it} + \rho_7 (IQ_{LEV} \cdot Openness^2)_{it} + \sum_{m=8}^{14} \rho_m Control_{m,it} + \mu_t + \varphi_{it}$$

where i denotes the country of the observation, t denotes the year of the observation, $t-1$ and $t-2$ denote the first and second lags of the dependent variable EQ_{it} , ρ denotes the coefficients of explanatory variables (except for ρ_0 which denotes the y-intercept of the estimation), EQ_{it} denotes the environmental quality, $Openness_{it}$ and $Openness^2_{it}$ denote trade openness and its squared term, $(IQ_{LEV} \cdot Openness)_{it}$ and $(IQ_{LEV} \cdot Openness^2)_{it}$ denote the cross-terms of level of institutional quality (six dimensions) and trade openness (original and squared term), $\sum_{m=8}^{14} Control_{m,it,t}$ represents the set of control variables, μ_t is the time-fixed effect, and φ_{it} is the error term of the estimation. Based on the general model, the specific model has been proposed whose variables are interpreted in Table A.4 (the Appendices A). The six institutional quality variables (explanatory variables) are included separately in the research models in order to avoid the potential multi-collinearity. The panel data samples include the aggregated, high institutional quality, low institutional quality, high openness, and low openness. Data sources are built from the databases of The World Bank, The World Trade Organization, The United Nations Conference on Trade and Development, and The Our World in Data project of the Global Change Data Lab (for the CO₂ emissions). The panel data includes 113 worldwide countries in the 2002-2020 period. Therefore, the panel size is $113 \times 19 = 2,147$ observations.

6.2.2. Estimation strategy

To estimate the proposed models, this chapter employs the combined fixed effect (FE), random effect (RE), two-step difference generalized method of moments (DGMM-II), and two-step system generalized method of moments (SGMM-II) methods. In this chapter, the endogenous variables include trade openness in the original and squared terms as environmental quality could have the significant impact on trade openness and liberalization, which much possibly triggers the reverse causality running from environmental quality to trade liberalization (trade openness) (Amin et al., 2023; Aydin, 2023; Ben Jebil et al., 2019; Dou et al., 2021; Jamel & Maktouf, 2017; Pata et al., 2023; Rahman et al., 2020). For example, Aydin (2023) and Pata et al. (2023) have discovered the bidirectional causality between CO₂ emissions and trade openness in the case of G8 and ASEAN countries. To ensure the reliability of the findings, the dissertation has conducted a cross-comparison between FE, DGMM-II, and SGMM-II estimations. Links are not confirmed when (i) there are conflicting results between FE, DGMM-II, and SGMM-II estimations or (ii) the links are only significant in the FE estimation (except openness variables).

6.3. Summary of empirical results

Some noticeable findings of this chapter are as follows (please see Table C6.11, C6.12, and C6.13 in the Appendices of Chapter 6 for the summary of explored effects):

Table C6.11: Summary of findings on the direct effect of trade openness on environmental quality

Contextual effects	Direct effects			Hypotheses
	Openness $\rightarrow$ CO ₂ emissions	Openness ² $\rightarrow$ CO ₂ emissions	Shape of the Openness-Emissions nexus	
Aggregated	Decreasing (-) (t, t-1)	Increasing (+) (t, t-1)	U-shaped (t, t-1)	H.4.1.1: Not supported (opposite sign) H.4.1.2: Not supported (opposite sign)
High Institution	Increasing (+) (t, t-1)	Decreasing (-) (t, t-1)	Inverse U-shaped (t, t-1)	H.4.1.1: Supported H.4.1.2: Supported H.4.5: Supported

	Decreasing (-) (t-2)	Increasing (+) (t-2)	U-shaped (t-2)	H.4.1.1: Not supported (opposite sign) H.4.1.2: Not supported (opposite sign) H.4.4: Not supported
Low Institution	Decreasing (-) (t, t-2)	Increasing (+) (t, t-2)	U-shaped (t, t-2)	H.4.1.1: Not supported (opposite sign) H.4.1.2: Not supported (opposite sign) H.4.5: Not supported
High Openness	Increasing (+) (t-1)	Decreasing (-) (t-1)	Inverse U-shaped (t-1)	H.4.1.1: Supported H.4.1.2: Supported H.4.4: Not supported
Low Openness	Decreasing (-) (t)	Increasing (+) (t)	U-shaped (t)	H.4.1.1: Not supported (opposite sign) H.4.1.2: Not supported (opposite sign) H.4.4: Supported
	Increasing (+) (t-1)	Decreasing (-) (t-1)	Inverse U-shaped (t-1)	H.4.1.1: Supported H.4.1.2: Supported H.4.4: Not supported

Source: The author.

Table C6.11 summarizes the direct effect of trade openness on environmental quality and the contextual effects of institutional quality and trade openness on the environment-trade nexus. Table C6.12 summarizes the direct effects of institutional quality's dimensions on environmental quality and the contextual effects of institutional quality and trade openness on the environment-institution nexus.

Table C6.12: Summary of findings on the direct effect of institutional quality on environmental quality

Contextual effects	Direct effects of institutional quality on CO ₂ emissions	Hypotheses
Aggregated	VAC (-)	H.4.2: Supported
High Institution	COC, GVE, POS, VAC (+)	H.4.2: Not supported (opposite sign) H.4.5: Supported
	ROL (-)	H.4.2: Supported H.4.5: Not supported
Low Institution	COC, POS, VAC (+)	H.4.2: Not supported (opposite sign) H.4.5: Supported
	ROL (-)	H.4.2: Supported H.4.5: Not supported
High Openness	COC, GVE (+)	H.4.2: Not supported (opposite sign) H.4.4: Supported
Low Openness	COC (+)	H.4.2: Not supported (opposite sign) H.4.4: Supported
	GVE, ROL (-)	H.4.2: Supported H.4.4: Supported

Source: The author.

Table C6.13 summarizes the moderating effects of institutional quality's dimensions and the contextual effect of trade openness on the environment-liberalization (environment-trade) nexus.

Table C6.13: Summary of findings on the moderating effect of institutional quality on the environment-liberalization nexus

Contextual effects	Moderating effects of institutional quality		Hypotheses
	Emissions-Openness	Emissions-Openness ²	
Aggregated	COC, POS, REQ, ROL (-)	COC, POS, REQ, ROL (+)	H.4.3: Supported
High Openness	COC, GVE, POS, ROL (-)	COC, GVE, POS, ROL (+)	H.4.3: Supported H.4.4: Supported
Low Openness	COC, GVE, POS, REQ, ROL, VAC (-)	COC, GVE, POS, REQ, ROL, VAC (+)	H.4.3: Supported H.4.4: Supported

Source: The author.

CHAPTER 7: CONCLUSIONS AND POLICY IMPLICATIONS

7.1. Summary of key findings

7.1.1. Findings on the gravitational approach to the nexus between trade, gender equality, and institutional quality

7.1.1.1. Direct effects of gender equality on bilateral trade

Globally, exporter's and importer's GDI, alongside importer's GII, boost trade. In high-high institutional settings, exporter's FLA increases exports, while GII decreases them. Exporter's GDI increases exports in low-low and mixed settings, whereas importer's GDI decreases imports in mixed contexts.

7.1.1.2. Moderating effect of institutional quality on the link between bilateral trade and gender equality

Institutional quality acts as a key moderator. For exporters, COC, GVE, and VAC negatively moderate GDI, and overall IQ negatively moderates FLA; conversely, COC, REQ, and VAC positively moderate GII. Regarding importers, COC, GVE, and REQ negatively moderate GDI, while POS moderates it positively. GII is positively moderated by COC and VAC. Finally, FLA is positively moderated by COC but negatively by POS and VAC.

7.1.2. Findings on the gravitational approach to the nexus between trade, environmental quality, and institutional quality

7.1.2.1. Direct effects of environmental quality on bilateral trade

Across all institutional settings, higher CO₂ emissions consistently boost bilateral trade, implying that lower environmental quality facilitates trade flows.

7.1.2.2. Direct effect of institutional quality on bilateral trade based on the consistent findings of Chapter 3 and Chapter 4

Direct institutional impacts are nuanced: globally, exporter's VAC and EPS reduce exports. In high-high institutional pairings, exporter's GVE increases exports while VAC decreases them; conversely, importer's GVE, POS, and VAC enhance imports. In low-low settings, importer's POS and REQ hinder imports. In different institutional pairings, exporter's GVE and ROL boost exports, while importer's GVE reduces imports.

7.1.2.3. Moderating effect of institutional quality on the link between bilateral trade and environmental quality

Importer's institutional quality, specifically COC, GVE, REQ, ROL, and overall IQ, positively moderates the import-CO₂ emissions link, triggering the hampering effect of environmental quality on imports. In contrast, importer's POS facilitates the boosting effect of environmental quality on imports.

7.1.3. Findings on the Gender-based Kuznets Curve approach to the nexus between gender equality, trade, and institutional quality

7.1.3.1. Direct effects of income on gender equality

Globally, findings show N-shaped relationships for GDI (t, t-1) and GII (t), while lagged income yields inverse N-shaped (GDI_t-2, GII_t-1) or inverse U-shaped (FLA_t-2) links. In high institutional quality countries, N-shaped (GDI, GII) and inverse N-shaped (FLA) patterns prevail. Low institutional quality countries reveal an inverse U-shaped GDI link, while high openness countries confirm N-shaped (GII_t) and inverse N-shaped (GII_t-1, FLA) connections. Low openness countries display N-shaped GDI (t-1) and inverse N-shaped GII (t-1) links.

7.1.3.2. Direct effects of trade liberalization on gender equality

Trade liberalization consistently promotes gender equality worldwide by increasing GDI and FLA while reducing GII. In contexts of high institutional quality or high openness, trade liberalization increases FLA and reduces GII but hinders GDI. Low institutional quality environments see trade enhance FLA and reduce GII, whereas low openness regions specifically benefit from mitigated GII.

7.1.3.3. Direct effects of institutional quality on gender equality

Globally: GVE decreases GDI; COC, GVE, POS, REQ, and VAC mitigate GII; COC increases FLA, while POS, REQ, and ROL restrict it. **High institutional quality countries:** COC, GVE, and ROL hinder GDI; COC and REQ lower GII (ROL increases it); POS and VAC boost FLA (COC and ROL restrict it). **Low institutional quality countries:** GVE and REQ hinder GDI (ROL promotes it); COC, GVE, and REQ lower GII (POS worsens it); COC and VAC boost FLA (POS, REQ, and ROL restrict it). **High openness countries:** COC hinders GDI, while GVE, POS, and ROL improve it; COC, GVE, and VAC alleviate GII; COC and VAC enhance FLA, while GVE and POS restrict it. **Low openness countries:** GVE and POS hamper GDI, while ROL and VAC enhance it; GVE, POS, REQ, ROL, and VAC mitigate GII; COC and VAC enhance FLA, while POS, REQ, and ROL restrict it.

7.1.3.4. Moderating effects of trade liberalization on gender-institution links

Globally, trade openness facilitates POS to boost GDI but triggers POS, ROL, VAC to increase GII and all institutional dimensions to hamper FLA. **High institutional quality countries:** Trade openness facilitates POS and VAC to boost GDI, and COC and REQ to mitigate GII, but to hampers FLA. **Low institutional quality countries:** Trade openness helps COC boost GDI but triggers POS to hinder GDI, triggers COC, GVE, REQ, ROL, and VAC to increase GII, and has mixed FLA effects (helps POS/ROL; hinders GVE/VAC).

7.1.3.5. Moderating effects of institutional quality on gender-liberalization links

Globally, GVE, REQ, and VAC facilitate trade's FLA boosting. **High openness countries:** COC facilitates trade openness to boost GDI (while GVE, POS, and REQ hinder); ROL facilitates trade openness to mitigate GII (while POS worsens); GVE and REQ facilitate trade openness to boost FLA (while COC, POS, ROL, and VAC hinder). **Low openness countries:** COC, GVE, POS, and REQ facilitate trade openness to

boost GDI; POS and VAC facilitate trade openness to mitigate GII (while GVE triggers the worsening effect); COC, GVE, REQ, and VAC facilitate trade openness to boost FLA (while ROL hinders).

7.1.4. Findings on the Openness-based Environmental Kuznets Curve approach to the nexus between environmental quality, trade, and institutional quality

7.1.4.1. Direct effects of trade liberalization on environmental quality

Across the global sample, trade liberalization follows a U-shaped relationship with CO₂ emissions for current and first-lagged openness variables. *In high institutional quality countries*, this relationship is inverse U-shaped for current and first-lagged variables, but U-shaped for second-lagged variables. *Low institutional quality countries* consistently show a U-shaped link (current and second-lagged). *High openness countries* exhibit an inverse U-shaped link (first-lagged), while *low openness countries* display a U-shaped relationship initially (current) followed by an inverse U-shaped link (first-lagged).

7.1.4.2. Direct effects of institutional quality on environmental quality

Globally, only the VAC dimension significantly improves environmental quality by reducing CO₂ emissions. *In high institutional quality countries*, ROL reduces CO₂ emissions, whereas COC, GVE, POS, and VAC increase them. *Low institutional quality countries* show a similar pattern: ROL decreases CO₂ emissions, while COC, POS, and VAC deteriorate environmental quality (increase CO₂ emissions). *In high openness countries*, COC and GVE increase CO₂ emissions. *In low openness countries*, COC increases CO₂ emissions, but GVE and ROL effectively reduce them.

7.1.4.3. Moderating effect of institutional quality on the environment-liberalization link

Globally, COC, POS, REQ, and ROL facilitate trade openness to reduce CO₂ emissions during early-stage trade liberalization but trigger trade openness to increase CO₂ emissions as liberalization intensifies. This shift also occurs in *high openness countries* via COC, GVE, POS, and ROL. Most notably, in *low openness countries*, all six institutional indicators initially facilitate trade openness to consolidate environmental improvements (reduce CO₂ emissions) but eventually trigger trade openness to increase CO₂ emissions (worsen environmental quality) at advanced stages of liberalization.

7.2. Policy implications

7.2.1. Implications from the link between bilateral trade, gender equality, and institutional quality

7.2.1.1. Direct effect of gender equality on bilateral trade

To grow exports, countries should invest in gender equality and female welfare, especially in major exporting sectors. Reducing inequality also lowers imports and trade deficits. *High institutional quality nations* should prioritize gender equality and labor participation policies when trading with high institutional quality partners, while *low institutional quality nations* focus on gender development. For mixed institutional quality pairs, gender development policies boost exports and reduce imports.

7.2.1.2. Moderating effect of institutional quality on the link between bilateral trade and gender equality

For exports, enhancing COC, GVE, or VAC triggers GDI's hampering effect, while improving COC, REQ, or VAC activates GII's boosting effect. Higher overall IQ triggers FLA's hampering effect. Regarding imports, COC, GVE, and REQ trigger GDI's hampering effect, though POS boosts it. COC and VAC improvements activate GII's boosting effect. Finally, COC boosts FLA's import impact, while POS and VAC hamper it.

7.2.2. Implications from the link between bilateral trade, environmental quality, and institutional quality

7.2.2.1. Direct effect of environmental quality on bilateral trade

Findings indicate that CO₂ emissions drive bilateral trade, suggesting policies should not prioritize economic incentives over sustainability. Export-led nations must specifically avoid sacrificing environmental goals for overheated growth.

7.2.2.2. Direct effect of institutional quality on bilateral trade (based on consistent findings of Chapter 3 and Chapter 4)

In high institutional relationships, GVE boosts exports, but POS increases imports and VAC decreases exports while increasing imports, exacerbating deficits; GVE policies must ensure exports outpace imports. *For low institutional trading pairs*, POS and REQ reduce imports and improve deficits. *In different institutional relationships*, GVE and ROL drive exports, while GVE also lowers imports to strengthen trade balances.

7.2.2.3. Moderating effect of institutional quality on the link between bilateral trade and environmental quality

Enhancing COC, GVE, REQ, ROL, or overall institutional quality causes CO₂ emissions to increase imports, whereas better POS leads CO₂ emissions to reduce them. Consequently, the former group prompts high-emitting nations to increase imports, while the latter reduces their import reliance.

7.2.3. Implications from the link between gender equality, trade liberalization, and institutional quality

7.2.3.1. Direct effects of trade liberalization on gender equality

Trade liberalization generally fosters female labor force participation and reduces gender inequality. However, in *advanced institutional and highly open countries*, it may widen the gender welfare gap and undermine development. Consequently, inclusive trade frameworks and gender-specific safeguards are essential to ensure gains are distributed equitably.

7.2.3.2. Direct effects of institutional quality on gender equality

Policy impacts vary by context. In *high institutional quality countries*, enhancing COC, GVE, and ROL may exacerbate human development disparities (GDI), though COC and REQ improve gender inequality (GII). In *low institutional quality countries*, ROL enhances GDI, while COC, GVE, and REQ mitigate GII. Regarding market access, *high openness countries* benefit from GVE, POS, and ROL to improve GDI, whereas *low openness countries* rely on ROL and VAC for GDI gains. Across most environments, COC and VAC extend female labor participation (FLA), while POS, REQ, and ROL typically hinder it.

7.2.3.3. Moderating effects of trade liberalization on gender-institution links

In *high institutional quality countries*, trade liberalization should be paired with POS, VAC, COC, and REQ to maximize GDI and reduce GII, though a potential decline in FLA must be managed. In *low institutional quality countries*, extreme caution is required; deeper global integration may trigger institutional effects (COC, GVE, POS, REQ, ROL, and VAC) that unintentionally sacrifice gender equality.

7.2.3.4. Moderating effects of institutional quality on gender-liberalization links

In *high openness countries*, COC facilitates trade's positive impact on GDI, while GVE, POS, and REQ hamper it. ROL aids GII mitigation, but POS can worsen it. Furthermore, GVE and REQ facilitate trade's boost to FLA, whereas COC, POS, ROL, and VAC trigger hindering effects. In *low openness countries*, COC, GVE, POS, and REQ facilitate trade's boost to GDI. While GVE may worsen GII, POS and VAC facilitate its alleviation. Finally, COC, GVE, REQ, and VAC facilitate trade-driven FLA growth, whereas ROL hinders it.

7.2.4. Implications from the link between environmental quality, trade liberalization, and institutional quality

7.2.4.1. Direct effects of trade liberalization on environmental quality

For *countries with low institutional quality and openness*, a U-shaped CO₂-trade relationship necessitates coupling trade expansion with strict environmental regulations to prevent emissions from rising as trade scales. In *countries with high institutional quality and openness*, an inverse U-shaped link exists; these countries should pair trade liberalization with comprehensive institutional reforms to rapidly transition through the initial high-pollution phase.

7.2.4.2. Direct effects of institutional quality on environmental quality

Generally, enhancing VAC reduces CO₂ emissions by enabling media and public pressure on industrial polluters. However, other institutional gains often increase emissions: COC and POS typically boost CO₂ emissions in both *high and low institutional quality countries*, though ROL may reduce it. Similarly, while COC increases CO₂ emissions across different openness levels, GVE and ROL may help reduce CO₂ emissions specifically in *low openness countries*. Thus, institutional reforms must be environmentally focused to prevent unintended negative ecological outcomes.

7.2.4.3. Moderating effect of institutional quality on the environment-liberalization link

In *high openness countries*, early-stage improvements in COC, GVE, POS, and ROL facilitate the ability of trade openness to suppress CO₂ emissions. In later stages, these same institutional gains must be joined by stringent environmental policies to counteract trade's increasing CO₂ emissions effect. *Low openness countries* should improve all institutional dimensions in the early stage, but this must be balanced with immediate and strict environmental regulations to curb the trade-driven boosting of CO₂ emissions.

7.3. Limitations and future research directions

First, the gravity model's 32,800 observations is established from 41 countries over 20 years, expanding this requires addressing zero-trade data. *Second*, while CO₂ emissions is the standard proxy, alternatives like PM2.5 or ecological footprints are recommended for regional studies due to global data inconsistencies. Current gender (GDI, GII, FLA) and institutional (WGI) indicators also face measurement and scope limitations. *Third*, methodologically, despite using DGMM-II and SGMM-II, omitted variable bias remains, necessitating more robust instruments. *Fourth*, future GKC and OEKC research should incorporate more determinants and turning point thresholds. *Fifth*, aggregate data obscures micro-level nuances, such as those in Vietnam, therefore, firm- or household-level data would better trace transmission channels. *Finally*, future studies should use simple slopes analysis to statistically quantify the institutional moderating effects.

7.4. Conclusions

This dissertation examines the Trade-Gender-Environment-Institution nexus under the 2030 Agenda framework (SDGs 5, 13, and 17). Utilizing two decades of global data and rigorous estimations (FE, GMM, and PPML), it establishes that gender equality and environmental quality are fundamental determinants of comparative advantage. Findings validate a Gender-based Kuznets Curve (GKC) and introduce an Openness-based Environmental Kuznets Curve (OEKC), detailing non-linear trade dynamics. Key contributions include bilateral analysis of trade flows, mapping curvilinear trade-environment relationships, and identifying critical moderating and contextual factors. Ultimately, institutional quality serves as the vital catalyst for aligning economic growth with social and ecological standards to foster more inclusive and greener trade.

LIST OF AUTHOR'S PUBLICATIONS RELATED TO THE DISSERTATION

No.	Paper	Authors	Journal/Proceedings (Publisher)	Vol., No., Page	Year of publication
1	Trade, gender equality and institutional quality: Evidence from the gravitational approach	Duc Nha Le, Khanh Nam Pham	International Journal of Development Issues, Emerald	Vol. 24, No. 1, pp. 106-124	2025
2	Revisiting the Gender Kuznets Curve hypothesis: The role of trade openness and institutional quality	Duc Nha Le, Khanh Nam Pham	The International Conference on Economics, Law and Government (ELG 2025), UEH Publishing House	pp. 54-82	2025

**BỘ GIÁO DỤC VÀ ĐÀO TẠO
ĐẠI HỌC KINH TẾ THÀNH PHỐ HỒ CHÍ MINH**



LÊ ĐỨC NHÃ

**MỐI QUAN HỆ GIỮA THƯƠNG MẠI, BÌNH ĐẲNG GIỚI, MÔI TRƯỜNG, VÀ
THỂ CHẾ: GÓC NHÌN TỪ TIẾP CẬN MÔ HÌNH TRỌNG LỰC VÀ ĐƯỜNG
CONG KUZNETS**

Chuyên ngành: Kinh tế phát triển

Mã chuyên ngành: 9310105

TÓM TẮT LUẬN ÁN TIẾN SĨ

NGƯỜI HƯỚNG DẪN KHOA HỌC:

PGS. TS. PHẠM KHÁNH NAM

Thành phố Hồ Chí Minh – 2026

THÔNG TIN TỔNG QUAN

Luận án tiến sĩ này được hoàn thành tại Đại học Kinh tế Thành phố Hồ Chí Minh (UEH), Việt Nam.

Người hướng dẫn khoa học: PGS. TS. Phạm Khánh Nam

Người phản biện 1:

.....

Người phản biện 2:

.....

Người phản biện 3:

.....

Luận án tiến sĩ này được bảo vệ tại Hội đồng chấm luận án tiến sĩ cấp UEH tại Đại học Kinh tế Thành phố Hồ Chí Minh (UEH), Việt Nam.

Vào lúc....., ngày..... tháng..... năm 2026.

Luận án tiến sĩ này có thể được truy cập tại Thư viện của Đại học Kinh tế Thành phố Hồ Chí Minh (UEH), Việt Nam.

MỤC LỤC

DANH MỤC BẢNG VÀ HÌNH	vi
DANH MỤC TỪ VIẾT TẮT.....	vii
CHƯƠNG 1: GIỚI THIỆU	1
1.1. Bối cảnh và ngữ cảnh nghiên cứu.....	1
1.1.1. Môi quan hệ toàn cầu giữa thương mại, bình đẳng giới, môi trường, và thể chế ...	1
1.1.2. Môi quan hệ giữa thương mại và bình đẳng giới	1
1.1.3. Môi quan hệ giữa thương mại và môi trường.....	1
1.1.4. Môi quan hệ giữa thương mại và thể chế	1
1.1.5. Vai trò của thể chế trong các vấn đề về giới và môi trường	2
1.2. Đặt vấn đề nghiên cứu	2
1.2.1. Môi quan hệ giữa thương mại và bình đẳng giới	2
1.2.2. Môi quan hệ giữa thương mại và môi trường.....	2
1.2.3. Vai trò của thể chế trong mối quan hệ giữa thương mại, giới, và môi trường.....	3
1.3. Khoảng trống và câu hỏi nghiên cứu	3
1.4. Mục tiêu nghiên cứu	3
1.5. Phạm vi nghiên cứu	4
1.6. Phương pháp nghiên cứu	4
1.6.1. Các phương pháp ước lượng tác động cố định kết hợp.....	4
1.6.2. Các phương pháp ước lượng momen tổng quát	4
1.6.3. Phương pháp ước lượng Poisson Pseudo Maximum Likelihood kiểm tra tính bền vững của mô hình trọng lực.....	5
1.7. Đóng góp của luận án	5
1.7.1. Đóng góp về mặt lý thuyết	5
1.7.2. Đóng góp về mặt thực tiễn	5
1.8. Cấu trúc của luận án	5
CHƯƠNG 2: CƠ SỞ LÝ THUYẾT VÀ LƯỢC KHẢO TÀI LIỆU	6
2.1. Các khái niệm nghiên cứu	6
2.1.1. Thương mại và mở cửa thương mại	6
2.1.2. Bình đẳng giới	6
2.1.3. Chất lượng môi trường	6
2.1.4. Chất lượng thể chế và chất lượng thể chế liên quan đến môi trường.....	6
2.2. Mô hình trọng lực trong thương mại	6
2.3. Lý thuyết Đường cong Kuznets về Môi trường	6
2.4. Lý thuyết Đường cong Kuznets về Giới.....	6
2.5. Cơ sở lý thuyết về mối quan hệ giữa thương mại và bình đẳng giới	7

2.5.1. Tác động của bình đẳng giới đến thương mại	7
2.5.2. Tác động của thương mại đến bình đẳng giới	7
2.6. Cơ sở lý thuyết về mối quan hệ giữa thương mại và môi trường.....	7
2.6.1. Tác động của thương mại đến chất lượng môi trường	7
2.6.2. Tác động của chất lượng môi trường đến thương mại	7
2.7. Cơ sở lý thuyết về mối quan hệ giữa thương mại và thể chế	8
2.8. Vai trò điều tiết của chất lượng thể chế: Các góc độ lý thuyết.....	8
2.9. Khung phân tích của luận án.....	8
CHƯƠNG 3: TIẾP CẬN MÔ HÌNH TRỌNG LỰC ĐỐI VỚI MỐI QUAN HỆ GIỮA THƯƠNG MẠI, BÌNH ĐẲNG GIỚI, VÀ CHẤT LƯỢNG THỂ CHẾ.....	9
3.1. Giới thiệu	9
3.2. Thiết lập mô hình, đo lường biến số, và phương pháp ước lượng	10
3.2.1. Thiết lập mô hình và đo lường biến số.....	10
3.2.2. Phương pháp ước lượng	10
3.3. Tóm tắt kết quả nghiên cứu	11
CHƯƠNG 4: TIẾP CẬN MÔ HÌNH TRỌNG LỰC ĐỐI VỚI MỐI QUAN HỆ GIỮA THƯƠNG MẠI, CHẤT LƯỢNG MÔI TRƯỜNG, VÀ CHẤT LƯỢNG THỂ CHẾ ...	12
4.1. Giới thiệu	12
4.2. Thiết lập mô hình, đo lường biến số, và phương pháp ước lượng	12
4.2.1. Thiết lập mô hình và đo lường biến số.....	12
4.2.2. Phương pháp ước lượng	13
4.3. Tóm tắt kết quả nghiên cứu	13
CHƯƠNG 5: TIẾP CẬN ĐƯỜNG CONG KUZNETS VỀ GIỚI ĐỐI VỚI MỐI QUAN HỆ GIỮA BÌNH ĐẲNG GIỚI, THƯƠNG MẠI, VÀ CHẤT LƯỢNG THỂ CHẾ	14
5.1. Giới thiệu	14
5.2. Thiết lập mô hình, đo lường biến số, và phương pháp ước lượng	15
5.2.1. Thiết lập mô hình và đo lường biến số.....	15
5.2.2. Phương pháp ước lượng	16
5.3. Tóm tắt kết quả nghiên cứu	16
CHƯƠNG 6: TIẾP CẬN ĐƯỜNG CONG KUZNETS VỀ MÔI TRƯỜNG DỰA TRÊN MỞ CỬA THƯƠNG MẠI ĐỐI VỚI MỐI QUAN HỆ GIỮA CHẤT LƯỢNG MÔI TRƯỜNG, THƯƠNG MẠI, VÀ CHẤT LƯỢNG THỂ CHẾ	18
6.1. Giới thiệu	18
6.2. Thiết lập mô hình, đo lường biến số, và phương pháp ước lượng	18
6.2.1. Thiết lập mô hình và đo lường biến số.....	18
6.2.2. Phương pháp ước lượng	19
6.3. Tóm tắt kết quả nghiên cứu	19

CHƯƠNG 7: KẾT LUẬN VÀ HÀM Ý CHÍNH SÁCH	21
7.1. Tóm tắt kết quả nghiên cứu chính	21
7.1.1. Về tiếp cận mô hình trọng lực đối với mối quan hệ giữa thương mại, bình đẳng giới, và chất lượng thể chế	21
7.1.2. Về tiếp cận mô hình trọng lực đối với mối quan hệ giữa thương mại, chất lượng môi trường, và chất lượng thể chế	21
7.1.3. Về tiếp cận Đường cong Kuznets về Giới đối với mối quan hệ giữa bình đẳng giới, thương mại, và chất lượng thể chế	21
7.1.4. Về tiếp cận Đường cong Kuznets về Môi trường dựa trên Mở cửa thương mại đối với mối quan hệ giữa chất lượng môi trường, thương mại, và chất lượng thể chế	22
7.2. Hàm ý chính sách	23
7.2.1. Hàm ý từ mối quan hệ giữa thương mại song phương, bình đẳng giới, và chất lượng thể chế	23
7.2.2. Hàm ý từ mối quan hệ giữa thương mại song phương, chất lượng môi trường, và chất lượng thể chế	23
7.2.3. Hàm ý từ mối quan hệ giữa bình đẳng giới, tự do hóa thương mại, và chất lượng thể chế	24
7.2.4. Hàm ý từ mối quan hệ giữa chất lượng môi trường, tự do hóa thương mại, và chất lượng thể chế	25
7.3. Hạn chế và các hướng nghiên cứu tương lai	25
7.4. Kết luận	25
DANH MỤC CÁC CÔNG BỐ CỦA TÁC GIẢ LIÊN QUAN ĐẾN LUẬN ÁN	i

DANH MỤC BẢNG VÀ HÌNH

Hình 2.1: Khung phân tích tích hợp	9
Bảng C3.41: Tóm tắt kết quả về tác động trực tiếp của bình đẳng giới đến thương mại song phương	11
Bảng C3.42: Tóm tắt kết quả về tác động điều tiết của chất lượng thể chế đến mối quan hệ giữa bình đẳng giới và thương mại song phương	11
Bảng C4.17: Tóm tắt kết quả về tác động trực tiếp của chất lượng môi trường đến thương mại song phương	13
Bảng C4.18: Tóm tắt kết quả về tác động trực tiếp của chất lượng thể chế đến thương mại song phương (từ kết quả nhất quán giữa Chương 3 và 4).....	13
Bảng C4.19: Tóm tắt kết quả về tác động điều tiết của chất lượng thể chế đến mối quan hệ giữa chất lượng môi trường và thương mại song phương.....	14
Bảng C5.31: Tóm tắt kết quả về tác động trực tiếp của mở cửa thương mại đến bình đẳng giới.....	16
Bảng C5.32: Tóm tắt kết quả về tác động trực tiếp của chất lượng thể chế đến bình đẳng giới.....	16
Bảng C5.33: Tóm tắt kết quả về tác động điều tiết của mở cửa thương mại đến mối quan hệ bình đẳng giới-thể chế	17
Bảng C5.34: Tóm tắt kết quả về tác động điều tiết của chất lượng thể chế đến mối quan hệ bình đẳng giới-tự do hóa thương mại.....	17
Bảng C6.11: Tóm tắt kết quả về tác động trực tiếp của mở cửa thương mại đến chất lượng môi trường	19
Bảng C6.12: Tóm tắt kết quả về tác động trực tiếp của chất lượng thể chế đến chất lượng môi trường	20
Bảng C6.13: Tóm tắt kết quả về tác động điều tiết của chất lượng thể chế đến mối quan hệ môi trường-tự do hóa thương mại	20

DANH MỤC TỪ VIẾT TẮT

ASEAN	Association of Southeast Asian Nations (<i>Hiệp hội các nước Đông Nam Á</i>)
BRICS	Brazil, Russia, India, China, and South Africa
CO ₂	Carbon dioxide (<i>Khí CO₂</i>)
COC	Control of corruption (<i>Kiểm soát tham nhũng</i>)
DGMM-II	Difference Generalized Method of Moments two-step (<i>Phương pháp momen tổng quát dạng sai phân hai bước</i>)
EAC	Environmental Assimilative Capacity (<i>Khả năng hấp thụ của môi trường</i>)
EKC	Environmental Kuznets Curve (<i>Đường cong Kuznets về môi trường</i>)
EPS	Environmental Policy Stringency (<i>Sự nghiêm ngặt của Chính sách môi trường</i>)
EU	European Union (<i>Liên minh châu Âu</i>)
FE	Fixed effect (<i>Tác động cố định</i>)
FLA	Female labor force participation (<i>Tỷ lệ lao động nữ tham gia lực lượng lao động</i>)
FTA	Free Trade Agreement (<i>Hiệp định thương mại tự do</i>)
GDI	Gender development (index) (<i>Phát triển giới (Chỉ số)</i>)
GDP	Gross domestic product (<i>Tổng sản phẩm quốc nội</i>)
GII	Gender inequality (index) (<i>Bất bình đẳng giới (Chỉ số)</i>)
GKC	Gender-based Kuznets Curve (<i>Đường cong Kuznets về giới</i>)
GVE	Government effectiveness (<i>Hiệu quả chính phủ</i>)
H-O	Heckscher-Ohlin
IQ	Institutional quality (<i>Chất lượng thể chế</i>)
LCUs	Local currency units (<i>Đơn vị tiền tệ địa phương</i>)
OECD	Organisation for Economic Co-operation and Development (<i>Tổ chức Hợp tác và Phát triển Kinh tế</i>)
OEKC	Openness-based Environmental Kuznets Curve (<i>Đường cong Kuznets về môi trường dựa trên mở cửa thương mại</i>)
OWD	Our World in Data project of the Global Change Data Lab (<i>Dự án Our World in Data</i>)

POS	Political stability and absence of violence/terrorism (<i>Ổn định chính trị và không có bạo lực/khủng bố hoặc Ổn định chính trị</i>)
PPML	Poisson Pseudo Maximum Likelihood
RE	Random effect (<i>Tác động ngẫu nhiên</i>)
REQ	Regulatory quality (<i>Chất lượng của quy định</i>)
RG	Research gap (<i>Khoảng trống/Lỗ hổng nghiên cứu</i>)
RO	Research objective (<i>Mục tiêu nghiên cứu</i>)
ROL	Rule of law (<i>Thượng tôn pháp luật</i>)
RQ	Research question (<i>Câu hỏi nghiên cứu</i>)
SC	Self-constructed (variables) (<i>Tự xây dựng (biến)</i>)
SDG(s)	Sustainable Development Goals (<i>Các mục tiêu/Mục tiêu Phát triển bền vững</i>)
SGMM-II	System Generalized Method of Moments two-step (<i>Phương pháp momen tổng quát dạng hệ thống hai bước</i>)
SS	Stolper-Samuelson
UNCTAD	United Nations Trade and Development (<i>Tổ chức Thương mại và Phát triển Liên Hợp Quốc</i>)
VAC	Voice and accountability (<i>Tiếng nói và Trách nhiệm giải trình</i>)
WB	World Bank (<i>Ngân hàng Thế giới</i>)
WTO	World Trade Organization (<i>Tổ chức Thương mại Thế giới</i>)

CHƯƠNG 1: GIỚI THIỆU

1.1. Bối cảnh và ngữ cảnh nghiên cứu

1.1.1. Mối quan hệ toàn cầu giữa thương mại, bình đẳng giới, môi trường, và thể chế

Bám sát Chương trình Nghị sự 2030 về Phát triển Bền vững và năm trụ cột “5Ps” (Con người, Hành tinh, Thịnh vượng, Hòa bình, Hợp tác), luận án này nghiên cứu mối quan hệ giữa Thương mại, Thể chế, Bình đẳng giới, và Môi trường (TIGE). Nghiên cứu tìm hiểu cách thức thương mại quốc tế tương tác với bình đẳng giới (SDG 5) và chất lượng môi trường (SDG 13) trong các môi trường thể chế khác nhau trên toàn cầu (SDG 17). Luận án tiếp cận từ hai khía cạnh: Mô hình trọng lực giải thích thương mại giữa Việt Nam và 40 đối tác toàn cầu, và phân tích 113 quốc gia toàn cầu nhằm kiểm tra giả thuyết Đường cong Kuznets Môi trường (EKC). Độ mở thương mại là nhân tố then chốt của luận án, đóng vai trò động lực chủ yếu của hội nhập và phát triển. Luận án còn được dựa trên sự tranh luận lý thuyết không hồi kết xoay quanh cách tiếp cận “cuộc đua xuống đáy” – thương mại dẫn đến hệ lụy về môi trường và xã hội và “cuộc đua lên đỉnh” – thương mại thúc đẩy thịnh vượng, bình đẳng, và lan tỏa công nghệ.

1.1.2. Mối quan hệ giữa thương mại và bình đẳng giới

Thương mại quốc tế là một công cụ mạnh mẽ giúp phụ nữ nâng cao quyền lực kinh tế, thu hẹp khoảng cách thu nhập và mở rộng các cơ hội trong chuỗi giá trị toàn cầu. Các doanh nghiệp tham gia hoạt động thương mại thường trả mức lương cao hơn và điều kiện làm việc tốt hơn so với các doanh nghiệp chỉ kinh doanh ở thị trường nội địa. Ngược lại, bình đẳng giới thúc đẩy thương mại, quyền sở hữu và việc nâng cao kỹ năng của phụ nữ giúp cải thiện năng suất cũng như lợi thế so sánh quốc gia. Tuy nhiên, nếu thiếu đi các thể chế mang tính bao trùm, thương mại có thể dẫn đến sự bóc lột và bất bình đẳng. Luận án này giải quyết lỗ hổng nghiên cứu về việc chất lượng thể chế đóng vai trò điều tiết ra sao đối với mối quan hệ hai chiều giữa tự do hóa thương mại và bình đẳng giới.

1.1.3. Mối quan hệ giữa thương mại và môi trường

Mối quan hệ giữa thương mại và môi trường liên quan đến sự xung đột giữa mục tiêu thịnh vượng và tính bền vững. Trong khi “hiệu ứng quy mô” gợi ý rằng sự tăng trưởng do thương mại thúc đẩy sẽ làm gia tăng lượng phát thải khí CO₂, mô hình Đường cong Kuznets về Môi trường dựa trên độ mở thương mại (OEKC) được đề xuất bởi luận án này lại đặt ra một mối quan hệ phi tuyến, nơi phát thải có thể cuối cùng sẽ giảm xuống khi thương mại tạo điều kiện cho việc áp dụng các loại công nghệ xanh và sạch hơn. Ngược lại, tình trạng suy thoái môi trường và biến đổi khí hậu đang làm suy yếu khả năng chống chịu của thương mại bằng cách gia tăng chi phí sản xuất và giảm năng suất trong các lĩnh vực nhạy cảm với khí hậu. Các quốc gia đang phát triển và các doanh nghiệp vi mô, nhỏ, và vừa đặc biệt dễ bị tổn thương trước những thay đổi này. Mặc dù chất lượng môi trường có thể xác định lợi thế so sánh của một quốc gia, thương mại cũng đóng vai trò như một cơ chế quan trọng cho việc thích ứng khí hậu.

1.1.4. Mối quan hệ giữa thương mại và thể chế

Chất lượng thể chế, bao gồm chính sách, luật pháp và các tổ chức, là yếu tố sống còn để thúc đẩy năng suất và xây dựng niềm tin trong công chúng. Các thể chế mạnh mẽ giúp những quốc gia tránh được bẫy thu nhập trung bình và thúc đẩy tính bao trùm của sự phát triển. Mục tiêu SDG 17 nhấn mạnh rằng một hệ thống

thương mại dựa trên quy tắc và mang tính đa phương là điều hết sức thiết yếu cho sự phát triển bền vững. Luận án này xem xét các tác động điều tiết và bối cảnh thường bị bỏ qua của chất lượng thể chế đối với các mối quan hệ giữa thương mại-giới và thương mại-môi trường.

1.1.5. Vai trò của thể chế trong các vấn đề về giới và môi trường

Thể chế đóng vai trò là chất xúc tác thiết yếu quyết định liệu thương mại sẽ dẫn đến “cuộc đua lên đỉnh” hay “cuộc đua xuống đáy”. Các chính sách nhất quán và quản trị tốt tạo điều kiện thuận lợi cho việc thực thi các luật chống phân biệt đối xử và giúp giảm thiểu chi phí chuyển giao công nghệ xanh. Bằng cách định hướng các dòng đầu tư nước ngoài và nguồn vốn tài chính vào những mục tiêu bền vững, các thể chế đảm bảo tăng trưởng kinh tế sẽ bảo vệ được “nguồn vốn tự nhiên” và thúc đẩy phát triển bao trùm về giới. Cuối cùng, việc đạt được những nội dung của SDG 5 và 13 phụ thuộc vào việc tận dụng quan hệ đối tác toàn cầu và thương mại quốc tế được thúc đẩy bởi các khía cạnh thể chế hiệu quả.

1.2. Đặt vấn đề nghiên cứu

1.2.1. Mối quan hệ giữa thương mại và bình đẳng giới

1.2.1.1. Tác động của bình đẳng giới đến thương mại

Mối quan hệ giới-thương mại là một mối quan hệ phức tạp về mặt lý thuyết. Thuyết Thương mại Nữ quyền chỉ hai luồng quan điểm trái chiều: Hiệu ứng giảm cạnh tranh do bất bình đẳng trong tiếp cận nguồn lực, và Hiệu ứng cạnh tranh do khai thác lao động nữ chi phí rẻ. Ngoài ra, mô hình Heckscher-Ohlin (hiệu ứng Rybczynski) và Mô hình Kim cương của Porter gợi ý rằng tỷ lệ lao động nữ cao giúp mở rộng nguồn lực lao động, tạo lợi thế so sánh và lợi thế địa điểm. Trong khi một số nghiên cứu thực nghiệm gắn bất bình đẳng lương với tăng trưởng xuất khẩu, bằng chứng mới từ các nước ASEAN và D-8 (Bangladesh, Ai Cập, Indonesia, Iran, Malaysia, Nigeria, Pakistan, Thổ Nhĩ Kỳ) xác định bình đẳng giới là động lực chính của tăng trưởng thương mại. Dù vậy, các nghiên cứu trước đây vẫn chưa xem xét tác động của bình đẳng giới nước xuất khẩu và nhập khẩu đến dòng thương mại song phương.

1.2.1.2. Tác động của thương mại đến bình đẳng giới

Thương mại tác động bình đẳng giới qua Đường cong Kuznets về Giới (GKC), lý thuyết này đề xuất quan hệ chữ U ngược giữa hội nhập và bình đẳng. Dù một số nghiên cứu cho thấy thương mại giảm bất bình đẳng nhờ thúc đẩy chuyển giao công nghệ và giáo dục, một vài nghiên cứu khác cho thấy nó làm gia tăng cách biệt lương đối với lao động kỹ năng thấp hoặc gây ra hiện tượng chuyển dịch cơ cấu ngành, ảnh hưởng đến phúc lợi của lao động nữ giới. Luận án giải quyết lỗ hổng nghiên cứu về vai trò điều tiết và bối cảnh của chất lượng thể chế trong mối quan hệ giới-thương mại.

1.2.2. Mối quan hệ giữa thương mại và môi trường

1.2.2.1. Tác động của chất lượng môi trường đến thương mại

Mối quan hệ giữa phát thải CO₂ (biến đại diện cho chất lượng môi trường) và độ mở thương mại thường có tính nhân quả hai chiều: thương mại ảnh hưởng phát thải thông qua sản xuất, đồng thời chính sách môi trường tái định hình cơ cấu thương mại. Trong một số trường hợp, chất lượng môi trường đóng vai trò là động lực một chiều tác động đến thương mại. Dù vậy, ảnh hưởng của chất lượng môi trường của đối tác song phương lên thương mại xuyên biên giới là một khoảng trống chưa được nghiên cứu.

1.2.2.2. Tác động của thương mại đến chất lượng môi trường

Nghiên cứu về tác động của thương mại đến môi trường thường có các kết quả xung đột nhau. Một số nghiên cứu chỉ ra thương mại làm tăng suy thoái môi trường do mở rộng quy mô sản xuất và phát thải, trong khi, một vài nghiên cứu chỉ ra tác động giảm phát thải nhờ chuyển giao công nghệ và chính sách xanh hóa. Nhằm làm rõ những xung đột trên, luận án sử dụng mô hình EKC dựa trên độ mở thương mại để kiểm tra mối

quan hệ phi tuyến giữa môi trường và thương mại. Luận án cũng xem xét vai trò điều tiết và bối cảnh của thể chế trong mối quan hệ này.

1.2.3. Vai trò của thể chế trong mối quan hệ giữa thương mại, giới, và môi trường

1.2.3.1. Tác động của chất lượng thể chế đến chất lượng môi trường, độ mở thương mại, và bình đẳng giới

Chất lượng thể chế có ảnh hưởng đáng kể tới các chỉ số về môi trường, thương mại và giới. Dù thể chế mạnh giảm phát thải CO₂ tại các nước phát triển, kết quả ở nước đang phát triển còn nhiều xung đột, thậm chí một số nghiên cứu chỉ ra tác động làm tăng phát thải CO₂. Trong thương mại, thể chế đóng vai trò xúc tác nhờ giảm chi phí giao dịch và tăng hiệu lực thực thi hợp đồng. Tương tự, thể chế tốt thúc đẩy bình đẳng giới, dù quản trị yếu (tham nhũng) vẫn là nút thắt cho nữ giới tham gia lao động.

1.2.3.2. Vai trò điều tiết của chất lượng thể chế

Thể chế cũng đóng vai trò điều tiết quan trọng cho các mối quan hệ vĩ mô. Nó giúp giảm tổn hại môi trường từ thương mại, kích hoạt tác động tích cực của tự do hóa tới bình đẳng, và gia tăng hiệu quả chi tiêu công cho các vấn đề xã hội. Khoảng trống nghiên cứu còn tồn tại do đa số nghiên cứu dùng chỉ số tổng hợp thay vì các khía cạnh cụ thể. Luận án sử dụng mô hình trọng lực, EKC, và GKC để đánh giá các thành phần của chất lượng thể chế trong việc điều tiết và tạo tiền đề cho mối quan hệ giữa thương mại, giới, và môi trường.

1.3. Khoảng trống và câu hỏi nghiên cứu

❖ **RG 1:** Tác động của bình đẳng giới và chất lượng môi trường đến thương mại song phương từ cả hai phía (xuất và nhập khẩu);

❖ **RG 2:** Tác động tuyến tính và phi tuyến tính của tự do hóa thương mại lên chất lượng môi trường;

❖ **RG 3:** Tác động điều tiết và bối cảnh của chất lượng thể chế và tự do hóa thương mại đến mối quan hệ giữa thương mại, bình đẳng giới, và chất lượng môi trường.

Dựa trên ba khoảng trống nghiên cứu (RG) nêu trên, luận án đề xuất bốn câu hỏi nghiên cứu (RQ):

▪ **RQ 1: (a)** Thương mại song phương có chịu tác động bởi bình đẳng giới không? **(b)** Tác động đó có được điều tiết bởi mức độ chất lượng thể chế nước xuất khẩu và nhập khẩu không? **(c)** Tác động đó có khác biệt theo mức độ chất lượng thể chế của các đối tác thương mại (cao-cao, thấp-thấp, và hỗn hợp) không?;

▪ **RQ 2: (a)** Thương mại song phương có chịu tác động bởi chất lượng môi trường không? **(b)** Tác động đó có được điều tiết bởi mức độ chất lượng thể chế nước xuất khẩu và nhập khẩu không? **(c)** Tác động đó có khác biệt theo mức độ chất lượng thể chế của các đối tác thương mại (cao-cao, thấp-thấp, và hỗn hợp) không?;

▪ **RQ 3: (a)** Độ mở thương mại và chất lượng thể chế có tác động đến bình đẳng giới không? **(b)** Tác động điều tiết và bối cảnh của độ mở thương mại và chất lượng thể chế đến các mối quan hệ đó có tồn tại không?;

▪ **RQ 4: (a)** Độ mở thương mại và chất lượng thể chế có tác động đến chất lượng môi trường không? **(b)** Tác động điều tiết và bối cảnh của độ mở thương mại và chất lượng thể chế đến các mối quan hệ đó có tồn tại không?

1.4. Mục tiêu nghiên cứu

Để giải quyết các câu hỏi nghiên cứu, luận án đề xuất các mục tiêu nghiên cứu (RO) như sau:

Về RQ 1: RO 1.1: Đánh giá tác động trực tiếp của bình đẳng giới của nước xuất khẩu và nhập khẩu đến thương mại song phương; **RO 1.2:** Đánh giá tác động điều tiết của chất lượng thể chế (sáu khía cạnh) đến mối quan hệ giữa thương mại song phương và bình đẳng giới; và **RO 1.3:** Đánh giá tác động bối cảnh của mức

độ chất lượng thể chế các đối tác thương mại (cao-cao, thấp-thấp, và hỗn hợp) đến mối quan hệ giữa thương mại song phương và bình đẳng giới.

Về RQ 2: RO 2.1: Đánh giá tác động trực tiếp của chất lượng môi trường của nước xuất khẩu và nhập khẩu đến thương mại song phương; **RO 2.2:** Đánh giá tác động điều tiết của chất lượng thể chế (sáu khía cạnh) đến mối quan hệ giữa thương mại song phương và chất lượng môi trường; và **RO 2.3:** Đánh giá tác động bối cảnh của mức độ chất lượng thể chế các đối tác thương mại (cao-cao, thấp-thấp, và hỗn hợp) đến mối quan hệ giữa thương mại song phương và chất lượng môi trường.

Về RQ 3: RO 3.1: Đánh giá tác động trực tiếp của mở cửa thương mại và chất lượng thể chế (sáu khía cạnh) đến bình đẳng giới; **RO 3.2:** Đánh giá tác động điều tiết của mở cửa thương mại và chất lượng thể chế đến các mối quan hệ bình đẳng giới-thể chế và bình đẳng giới-mở cửa thương mại; và **RO 3.3:** Đánh giá tác động bối cảnh của mức độ mở cửa thương mại và chất lượng thể chế đến các mối quan hệ bình đẳng giới-thể chế và bình đẳng giới-mở cửa thương mại.

Về RQ 4: RO 4.1: Đánh giá tác động trực tiếp của mở cửa thương mại (tuyến tính và phi tuyến tính) và chất lượng thể chế đến chất lượng môi trường; **RO 4.2:** Đánh giá tác động điều tiết của chất lượng thể chế (bảy khía cạnh) đến mối quan hệ (tuyến tính và phi tuyến tính) giữa chất lượng môi trường và mở cửa thương mại; và **RO 4.3:** Đánh giá tác động bối cảnh của mức độ mở cửa thương mại và chất lượng thể chế đến các mối quan hệ môi trường-mở cửa thương mại và môi trường-thể chế.

1.5. Phạm vi nghiên cứu

Để giải quyết các câu hỏi và đạt được mục tiêu nghiên cứu, luận án đã đề xuất ba mô hình nghiên cứu dựa trên hai khung khái niệm, bao gồm mô hình Trọng lực thương mại (để giải quyết RQ 1 và RQ 2), mô hình GKC (để giải quyết RQ 3) và mô hình OEKC (để giải quyết RQ 4). Theo đó, do tính sẵn có của dữ liệu, ba bộ dữ liệu đã được xây dựng để kiểm chứng các giả thuyết được đề xuất trong ba mô hình. Bộ dữ liệu thứ nhất, hai và ba lần lượt áp dụng cho mô hình Trọng lực thương mại, mô hình GKC và mô hình OEKC: (i) Bộ dữ liệu thứ nhất bao gồm giai đoạn 2002-2021 với 41 nền kinh tế thương mại toàn cầu, gồm Việt Nam và 40 đối tác thương mại lớn nhất. Việc lựa chọn các nền kinh tế dựa theo kim ngạch thương mại (xuất khẩu và nhập khẩu) trong giai đoạn 2017-2021. Phạm vi không gian và thời gian của bộ dữ liệu này tạo ra 32.800 quan sát ($41 \times 40 \times 20$) do tính đối xứng của dòng thương mại; (ii) Bộ dữ liệu thứ hai (2002-2021) với 113 quốc gia, tạo ra 2.260 quan sát (113×20); và (iii) Bộ dữ liệu thứ ba (2002-2020) với 113 quốc gia, tạo ra 2.147 quan sát (113×19).

1.6. Phương pháp nghiên cứu

Luận án sử dụng kết hợp các phương pháp ước lượng tác động cố định (FE), tác động ngẫu nhiên (RE), và các phương pháp momen tổng quát dạng sai phân và dạng hệ thống hai bước (DGMM-II và SGMM-II) nhằm phân tích các mô hình đề xuất.

1.6.1. Các phương pháp ước lượng tác động cố định kết hợp

Nhằm xử lý tính không đồng nhất của dữ liệu bảng nhiều quốc gia, luận án dùng các kết hợp tác động cố định cụ thể khi ước lượng. Với mô hình trọng lực, hai loại được dùng: FE-I (cố định năm và cặp quốc gia xuất-nhập khẩu) và FE-II (cố định nước xuất khẩu, nước nhập khẩu, và năm). Với mô hình Kuznets, tác động cố định quốc gia và cố định năm được áp dụng nhằm nắm bắt các yếu tố đặc thù quốc gia không đổi theo thời gian và các cú sốc chung của kinh tế vĩ mô toàn cầu.

1.6.2. Các phương pháp ước lượng momen tổng quát

Nhằm giải quyết nội sinh trong mô hình bảng động, đặc biệt là liên quan đến hiện tượng nhân quả ngược (chênh do tác động đồng thời) và biến phụ thuộc trễ, luận án áp dụng DGMM-II và SGMM-II. Các

phương pháp này đặc biệt hiệu quả cho dữ liệu động có số đơn vị lớn (N) và thời gian ngắn (T). GMM xử lý nội sinh bằng cách dùng giá trị trễ của biến nội sinh làm công cụ nội tại sẵn có của mô hình. Chúng thỏa mãn điều kiện tương quan và điều kiện ngoại sinh, đảm bảo ước lượng không chệch.

1.6.3. Phương pháp ước lượng Poisson Pseudo Maximum Likelihood kiểm tra tính bền vững của mô hình trọng lực

Phương pháp PPML được dùng kiểm tra lại các kết quả ước lượng của mô hình trọng lực. PPML thiết yếu vì mô hình log-tuyến tính tiêu chuẩn thông thường gặp hai vấn đề: (i) các quan sát thương mại bằng không bị loại bỏ khi lấy giá trị lô-ga-rít, gây ra tình trạng chệch do sự lựa chọn, và (ii) phương sai sai số thay đổi có thể dẫn tới các ước lượng không nhất quán.

1.7. Đóng góp của luận án

1.7.1. Đóng góp về mặt lý thuyết

Luận án có năm đóng góp lý thuyết thông qua việc tích hợp bình đẳng giới, môi trường, thể chế, và thương mại trong một khung phân tích chung: (1) Xác định bình đẳng giới là yếu tố quyết định lợi thế so sánh trong mô hình trọng lực; (2) Dùng tính đối xứng mô hình trọng lực để phân tích tác động của chất lượng môi trường và vai trò điều tiết của thể chế đến thương mại song phương; (3) Áp dụng lý thuyết Đường cong Kuznets về Giới (GKC) để khám phá mối quan hệ giữa bình đẳng giới và tự do hóa thương mại; (4) Đề xuất Đường cong Kuznets về Môi trường dựa trên Mở cửa thương mại (OEKC) xác định mở cửa thương mại và thể chế định hình tác động môi trường; và (5) Phân tích tác động bối cảnh và điều tiết của thể chế và mở cửa thương mại đến các mối quan hệ giữa thương mại, bình đẳng giới, môi trường, và thể chế.

1.7.2. Đóng góp về mặt thực tiễn

Thứ nhất, với các nền kinh tế mở cửa năng động, luận án cung cấp khung phân tích dựa trên bằng chứng thực nghiệm nhằm tích hợp yêu cầu về bình đẳng giới và chất lượng môi trường vào tiến trình đàm phán các hiệp định thương mại và xây dựng chính sách xuất khẩu. Điều này đảm bảo tiến trình mở rộng tự do hóa thương mại phù hợp hệ thống với các mục tiêu SDG 5, 13 và 17. *Thứ hai*, luận án cung cấp các bằng chứng thực nghiệm giúp nhà hoạch định chính sách điều chỉnh các chính sách liên quan đến thương mại, bình đẳng giới, môi trường, và thể chế dựa trên mức độ mở cửa thương mại và chất lượng thể chế (ở các khía cạnh cụ thể). Thông qua đánh giá tác động điều tiết và bối cảnh của các khía cạnh thể chế, như vai trò thượng tôn pháp luật (ROL) giúp giảm phát thải, luận án cung cấp hàm ý cải cách thể chế có mục tiêu trọng điểm. Nhìn chung, những kết quả nghiên cứu của luận án được kỳ vọng sẽ cung cấp hàm ý cho cơ chế cân bằng hội nhập kinh tế với đảm bảo bình đẳng giới và bảo tồn môi trường thông qua các cải cách thể chế.

1.8. Cấu trúc của luận án

Cấu trúc của luận án gồm bảy chương cụ thể như sau: **Chương 1:** Giới thiệu; **Chương 2:** Cơ sở lý thuyết và lược khảo tài liệu; **Chương 3:** Tiếp cận mô hình trọng lực đối với mối quan hệ giữa thương mại, bình đẳng giới, và chất lượng thể chế; **Chương 4:** Tiếp cận mô hình trọng lực đối với mối quan hệ giữa thương mại, chất lượng môi trường, và chất lượng thể chế; **Chương 5:** Tiếp cận Đường cong Kuznets về Giới đối với mối quan hệ giữa bình đẳng giới, thương mại, và chất lượng thể chế; **Chương 6:** Tiếp cận Đường cong Kuznets về Môi trường dựa trên Mở cửa thương mại đối với mối quan hệ giữa chất lượng môi trường, thương mại, và chất lượng thể chế; và **Chương 7:** Kết luận và hàm ý chính sách.

CHƯƠNG 2: CƠ SỞ LÝ THUYẾT VÀ LƯỢC KHẢO TÀI LIỆU

2.1. Các khái niệm nghiên cứu

2.1.1. Thương mại và mở cửa thương mại

Mở cửa thương mại đo lường mức độ hội nhập kinh tế, tính bằng tổng kim ngạch xuất nhập khẩu chia cho tổng sản phẩm quốc nội (GDP). Luận án xem xét thương mại qua hai góc độ: độ mở thương mại hay mở cửa thương mại (tự do hóa thương mại) tại Chương 5 và 6 trong cách tiếp cận đường cong Kuznets, và dòng thương mại song phương tại Chương 3 và 4 dùng trong mô hình trọng lực.

2.1.2. Bình đẳng giới

Bình đẳng giới đảm bảo quyền lợi phụ nữ trong giáo dục, y tế, và việc làm. Luận án dùng ba chỉ số: Chỉ số Phát triển giới – GDI (tỷ lệ HDI nữ/nam), Chỉ số bất bình đẳng Giới – GII (đo lường các khía cạnh y tế, trao quyền, và lao động), và Tỷ lệ nữ giới tham gia lực lượng lao động – FLA (tỷ trọng lao động nữ trong lực lượng lao động).

2.1.3. Chất lượng môi trường

Do phát thải khí CO₂ là tác nhân chính gây hiệu ứng nhà kính và biến đổi khí hậu, luận án dùng lượng phát thải CO₂ bình quân đầu người làm biến đại diện cho chất lượng môi trường.

2.1.4. Chất lượng thể chế và chất lượng thể chế liên quan đến môi trường

Luận án dùng sáu Chỉ số Quản trị Toàn cầu của Ngân hàng Thế giới: kiểm soát tham nhũng (COC), hiệu quả chính phủ (GVE), ổn định chính trị (POS), chất lượng quy định (REQ), thượng tôn pháp luật (ROL), và tiếng nói và trách nhiệm (VAC). Ngoài ra, thể chế môi trường đo bằng chỉ số Sự nghiêm ngặt của chính sách môi trường (EPS) của OECD (0–6). Chỉ số gồm các biện pháp thị trường và hành chính, tác động môi trường qua chi phí phạt trực tiếp hoặc ưu đãi gián tiếp cho hoạt động xanh.

2.2. Mô hình trọng lực trong thương mại

Đề xuất bởi Poyhonen (1963) và Tinbergen (1962), mô hình trọng lực thương mại cho rằng thương mại song phương tỷ lệ thuận với quy mô kinh tế của các đối tác thương mại và tỷ lệ nghịch với khoảng cách địa lý. Nền kinh tế lớn (dựa trên quy mô GDP) thể hiện năng lực sản xuất xuất khẩu cao và thu nhập thúc đẩy nhập khẩu mạnh. Ngược lại, khoảng cách đại diện chi phí logistics và vận tải làm giảm lợi nhuận, cản trở thương mại. Trong khi mô hình gốc chỉ bao gồm GDP và khoảng cách, mô hình trọng lực mở rộng cho phép bổ sung các biến số vĩ mô của nước xuất khẩu và nhập khẩu. Mô hình này giúp phân tích các yếu tố như chất lượng thể chế, năng lượng tái tạo, bình đẳng giới, và phát thải carbon ảnh hưởng kim ngạch thương mại tổng hợp và theo ngành/sản phẩm cụ thể.

2.3. Lý thuyết Đường cong Kuznets về Môi trường

Lý thuyết Đường cong Kuznets về Môi trường (EKC) được đề xuất dựa trên đường cong Kuznets vốn dĩ ban đầu mô tả mối quan hệ chữ U ngược giữa tăng trưởng kinh tế và bất bình đẳng. Trong lĩnh vực môi trường, EKC đề xuất mối quan hệ chữ U ngược tương tự giữa tăng trưởng và suy thoái môi trường. Giai đoạn đầu, khai thác tài nguyên và mở rộng quy mô kinh tế gây tương quan thuận chiều giữa tăng trưởng và suy thoái môi trường (tăng phát thải khí CO₂). Tuy nhiên, khi nền kinh tế bước vào giai đoạn phát triển cao hơn, giai đoạn hai xuất hiện nơi mức sống cao và công nghệ hiện đại thúc đẩy việc áp dụng các công nghệ trung hòa carbon và mô hình kinh doanh bền vững. Hệ quả là tăng trưởng cao hơn cuối cùng giúp giảm thiểu suy thoái môi trường (giảm phát thải khí CO₂).

2.4. Lý thuyết Đường cong Kuznets về Giới

Dựa trên EKC và mô hình Kuznets truyền thống, mô hình GKC khám phá mối quan hệ phức tạp giữa phát triển kinh tế và bình đẳng giới, thường có hình dạng chữ N, S hoặc U. Ba quan điểm chính củng cố cho

GKC gồm: (1) Thuyết Nữ quyền: Sự phát triển kinh tế sẽ củng cố cấu trúc gia trưởng phụ hệ, thu hẹp cơ hội việc làm và thu nhập của phụ nữ; (2) Thuyết Tân tự do: Tăng trưởng kinh tế giúp cải thiện giáo dục, tiếp cận mạng xã hội, công nghệ, từ đó gia tăng bình đẳng giới; và (3) Tiếp cận mối quan hệ chữ U: Bình đẳng giới giảm lúc đầu nhưng tăng về sau khi lao động và thu nhập nữ giới gia tăng giúp cân bằng quyền lực thương lượng. Ứng dụng GKC hiện đại tích hợp các biến số vĩ mô như độ mở thương mại, FDI, và thể chế nhằm xem xét ảnh hưởng của các yếu tố này đến tính bền vững liên quan đến giới.

2.5. Cơ sở lý thuyết về mối quan hệ giữa thương mại và bình đẳng giới

2.5.1. Tác động của bình đẳng giới đến thương mại

Bình đẳng giới định hình thương mại qua nhiều lăng kính. Thuyết Thương mại Nữ quyền chỉ ra hai hướng: "hiệu ứng giảm cạnh tranh" do hạn chế tiếp cận nguồn lực cho nữ giới tham gia thương mại, và "hiệu ứng tăng cạnh tranh" nhờ khai thác lao động nữ giới chi phí thấp và xuất khẩu giá rẻ. Theo Lý thuyết của Heckscher-Ohlin và Rybczynski, gia tăng tỷ lệ lao động nữ sẽ giúp mở rộng sản xuất ngành thâm dụng lao động nữ, từ đó tăng xuất khẩu tại nước dồi dào lao động nữ. Lý thuyết cạnh tranh của Porter gợi ý bình đẳng giới làm tăng "sức hút địa điểm" qua tích tụ lao động, củng cố "yếu tố cao cấp" nhờ năng lực quản lý của nữ giới, góp phần bồi đắp lợi thế cạnh tranh quốc gia trong thương mại.

2.5.2. Tác động của thương mại đến bình đẳng giới

Tác động của thương mại đến bình đẳng giới mang tính đa diện. Định lý Stolper-Samuelson gợi ý việc tăng giá tương đối của hàng hóa thâm dụng lao động nữ giúp cải thiện lương và phúc lợi phụ nữ. Lý thuyết Hiệu ứng Ba khía cạnh (quy mô, cơ cấu, và kỹ thuật) cho thấy thương mại tạo việc làm nhưng thúc đẩy chuyển dịch cơ cấu và ứng dụng đổi mới công nghệ, kết quả là hướng tác động sẽ khác biệt tùy theo bối cảnh. Lý thuyết GKC kết nối mở cửa thương mại và bất bình đẳng. Các nghiên cứu liên quan đã chỉ ra bốn kênh tác động: Sự mở rộng cơ hội việc làm ở các ngành dịch vụ; Sự thay đổi của giá cả tiêu dùng; Sự thay đổi trong chi phí vận hành doanh nghiệp quy mô nhỏ do nữ giới sở hữu; và Tình trạng giảm phúc lợi do mất nguồn thu thuế quan. Cuối cùng, thương mại có thể giảm tình trạng phân biệt thông qua áp lực cạnh tranh hoặc gia tăng cách biệt lương khi quyền thương lượng lao động nữ giảm sút hoặc ngành thâm dụng lao động nam chiếm ưu thế trong quá trình chuyên môn hóa.

2.6. Cơ sở lý thuyết về mối quan hệ giữa thương mại và môi trường

2.6.1. Tác động của thương mại đến chất lượng môi trường

Thương mại ảnh hưởng đến phát thải qua Lý thuyết Hiệu ứng Ba khía cạnh: quy mô (tăng phát thải), cơ cấu (chuyển dịch ngành giúp giảm hoặc tăng phát thải), và kỹ thuật (công nghệ giúp giảm thải). Các cơ chế này tạo ra mối quan hệ chữ U ngược (phi tuyến tính). Giai đoạn đầu mở cửa, phát thải tăng do hiệu ứng quy mô và Giả thuyết Thiên đường Ô nhiễm chiếm ưu thế. Sau đó, điểm đảo chiều xuất hiện theo Giả thuyết Vàng hào quang Ô nhiễm; cụ thể, công nghệ xanh cho phép hiệu ứng kỹ thuật phát huy làm giảm tổng phát thải. Luận án đề xuất mô hình Đường cong Kuznets về Môi trường dựa trên Mở cửa thương mại (OEKC) để kiểm chứng mối quan hệ phi tuyến tính này.

2.6.2. Tác động của chất lượng môi trường đến thương mại

Chất lượng môi trường ảnh hưởng đến thương mại thông qua Lý thuyết Khả năng Hấp thụ của Môi trường (EAC). Theo Lý thuyết Heckscher-Ohlin, phát thải cao làm suy yếu và cạn kiệt EAC, điều này làm thay đổi lợi thế so sánh và dòng thương mại song phương. Mô hình Kim cương của Porter gợi ý suy thoái môi trường thúc đẩy thương mại thông qua thay đổi nhận thức người tiêu dùng và nhu cầu về tính thân thiện môi trường của sản phẩm/dịch vụ. Điều này buộc doanh nghiệp phải đổi mới và gia tăng năng lực cạnh tranh xuất khẩu. Các chính sách của nhà nước cũng có thể tác động đến nhu cầu tiêu dùng và cải thiện EAC. Trong Mô

hình Kim cương của Porter, EAC đóng vai trò là nhân tố nguồn lực sản xuất, còn chính sách và suy thoái là thành tố chính sách và cơ hội bên ngoài giúp định hình và củng cố năng lực cạnh tranh quốc tế.

2.7. Cơ sở lý thuyết về mối quan hệ giữa thương mại và thể chế

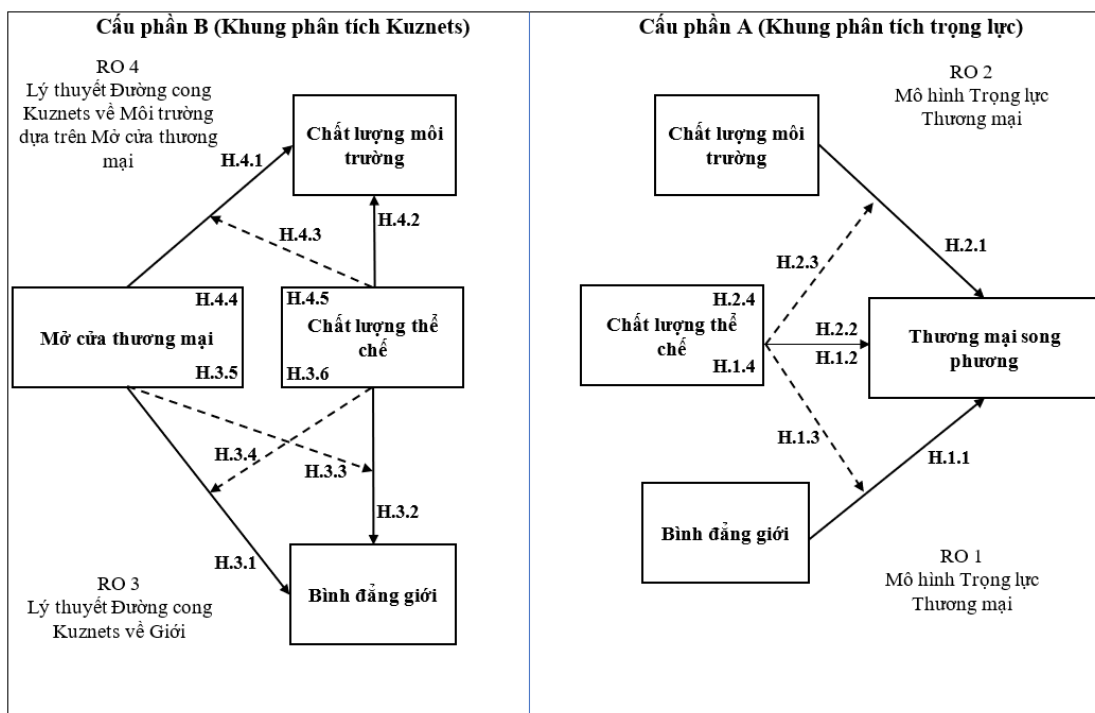
Có nhiều nghiên cứu lý thuyết giải thích cách thức thể chế tác động đến thương mại. Mô hình Kim cương của Porter (1990) chỉ ra thành tố “Chính sách”, gắn với chất lượng thể chế, rất thiết yếu cho lợi thế cạnh tranh, quyết định khả năng chuyên môn hóa và dòng thương mại song phương dựa trên lợi thế cạnh tranh quốc gia. Belloc (2006) bổ sung rằng thể chế ảnh hưởng cấu trúc các ngành công nghiệp, tài chính và chi phí giao dịch, từ đó tác động đến mở cửa thương mại. Theo Lý thuyết Chi phí giao dịch, thể chế đóng vai trò then chốt tác động đến *chi phí phối hợp* và *rủi ro giao dịch*, từ đó tác động đến chi phí giao dịch thương mại quốc tế. Hơn nữa, Levchenko (2007) khẳng định thể chế là nguồn lợi thế so sánh, quyết định mức lợi ích hoặc tổn thất của quốc gia trong thương mại toàn cầu. Nghiên cứu này dựa trên nền tảng các lý thuyết về lợi thế so sánh trong thương mại quốc tế.

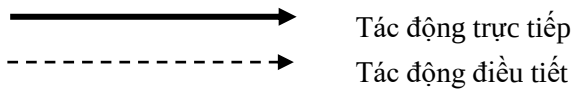
2.8. Vai trò điều tiết của chất lượng thể chế: Các góc độ lý thuyết

Thể chế đóng vai trò điều tiết quan hệ giữa thương mại, chất lượng môi trường, và bình đẳng giới. Theo Lý thuyết Chi phí giao dịch, thực thi hợp đồng và bảo hộ quyền sở hữu giúp giảm rủi ro đầu tư nước ngoài, thúc đẩy chuyển giao công nghệ xanh và sạch nhằm giảm suy thoái môi trường. Tương tự, kiểm soát tham nhũng giúp tiết kiệm chi phí cho doanh nghiệp vừa và nhỏ, từ đó mở rộng cơ hội cho lao động nữ trong thương mại. Kinh tế học Thể chế mới (North, 1990; Ménard, 2011) chỉ ra bốn thành phần thể chế điều tiết: Luật pháp, Chính thể, Hành chính và Hệ tư tưởng. Luật pháp và Chính thể thiết lập khung pháp lý cùng ưu tiên chính trị bảo vệ quyền phụ nữ và môi trường, còn Hành chính đảm bảo thực thi hiệu quả. Cuối cùng, Hệ tư tưởng là yếu tố điều tiết nền tảng, niềm tin và chuẩn mực xã hội có thể thúc đẩy tuân thủ hoặc cản trở bình đẳng và bền vững môi trường, bất chấp các quy định pháp lý chính thức có thể có sự khác biệt hoặc chưa đầy đủ.

2.9. Khung phân tích của luận án

Để giải quyết các câu hỏi nghiên cứu và kiểm tra các giả thuyết nghiên cứu, luận án đề xuất khung phân tích gồm hai cấu phần A và B như sau:



Hình 2.1: Khung phân tích tích hợp

Nguồn: Tác giả.

Như Hình 2.1, khung nghiên cứu nhằm đánh giá mối quan hệ giữa thương mại (tự do hóa/mở cửa và song phương), chất lượng môi trường, bình đẳng giới, và chất lượng thể chế (sáu khía cạnh và thể chế môi trường). Để thực hiện RO 1 và RO 2 tại Cấu phần A, mô hình trọng lực được dùng phân tích tác động trực tiếp của bình đẳng giới, chất lượng môi trường và chất lượng thể chế đến thương mại song phương. Ngoài ra, tác động điều tiết và bối cảnh của chất lượng thể chế đến các mối quan hệ thương mại-bình đẳng giới và thương mại-chất lượng môi trường cũng được nghiên cứu. Để thực hiện RO 3 tại Cấu phần B, Lý thuyết GKC được áp dụng để khám phá mối quan hệ giữa tự do hóa/mở cửa thương mại và bình đẳng giới. Các tác động điều tiết và bối cảnh của chất lượng thể chế và tự do hóa thương mại đến các mối quan hệ bình đẳng giới-tự do hóa và bình đẳng giới-thể chế cũng được nghiên cứu. Để thực hiện RO 4 tại Cấu phần B, Lý thuyết OEKC được áp dụng để khám phá mối quan hệ tuyến tính và phi tuyến tính giữa tự do hóa/mở cửa thương mại và chất lượng môi trường. Ngoài ra, tác động điều tiết và bối cảnh của thể chế đến mối quan hệ môi trường-tự do hóa thương mại cũng được nghiên cứu. Cuối cùng, tác động bối cảnh của thể chế và tự do hóa thương mại cũng được nghiên cứu qua cách tiếp cận trọng lực và Kuznets của khung phân tích.

CHƯƠNG 3: TIẾP CẬN MÔ HÌNH TRỌNG LỰC ĐỐI VỚI MỐI QUAN HỆ GIỮA THƯƠNG MẠI, BÌNH ĐẲNG GIỚI, VÀ CHẤT LƯỢNG THỂ CHẾ

3.1. Giới thiệu

Để thực hiện RO 1, chương này khám phá tác động của bình đẳng giới đến thương mại song phương từ cả hai phía (xuất khẩu và nhập khẩu). Ngoài ra, tác động điều tiết và bối cảnh của chất lượng thể chế đến mối quan hệ giữa thương mại song phương và bình đẳng giới cũng ít được các nghiên cứu trước đây xem xét. Do đó, chương đề xuất bốn giả thuyết như sau:

H.1.1: Bình đẳng giới (nước xuất khẩu và nhập khẩu) có tác động dương đến thương mại song phương

H.1.1.1: Chỉ số Phát triển giới (nước xuất khẩu và nhập khẩu) có tác động dương đến thương mại song phương.

H.1.1.2: Chỉ số Bất bình đẳng giới (nước xuất khẩu và nhập khẩu) có tác động âm đến thương mại song phương.

H.1.1.3: Tỷ lệ lao động nữ tham gia lực lượng lao động (nước xuất khẩu và nhập khẩu) có tác động dương đến thương mại song phương.

H.1.2: Chất lượng thể chế (nước xuất khẩu và nhập khẩu) có tác động dương đến thương mại song phương.

H.1.3: Chất lượng thể chế (nước xuất khẩu và nhập khẩu) tác động điều tiết có ý nghĩa thống kê đến mối quan hệ giữa thương mại song phương và bình đẳng giới.

H.1.3.1: Chất lượng thể chế (nước xuất khẩu và nhập khẩu) tác động điều tiết có ý nghĩa thống kê đến mối quan hệ giữa thương mại song phương và chỉ số Phát triển giới.

H.1.3.2: Chất lượng thể chế (nước xuất khẩu và nhập khẩu) tác động điều tiết có ý nghĩa thống kê đến mối quan hệ giữa thương mại song phương và chỉ số Bất bình đẳng giới.

H.1.3.3: Chất lượng thể chế (nước xuất khẩu và nhập khẩu) tác động điều tiết có ý nghĩa thống kê đến mối quan hệ giữa thương mại song phương và Tỷ lệ lao động nữ tham gia lực lượng lao động.

H.1.4: Chất lượng thể chế (nước xuất khẩu và nhập khẩu) tác động bối cảnh có ý nghĩa thống kê đến mối quan hệ giữa thương mại song phương và bình đẳng giới.

3.2. Thiết lập mô hình, đo lường biến số, và phương pháp ước lượng

3.2.1. Thiết lập mô hình và đo lường biến số

Để kiểm chứng các giả thuyết đã đề xuất, mô hình trọng lực thương mại động tổng quát bao gồm các biến bình đẳng giới và chất lượng thể chế đã được thiết lập như sau (Eshetu & Goshu, 2021; Golovko & Sahin, 2021; Islam & cộng sự, 2024; Lohani, 2024; Martínez-Martínez & cộng sự, 2023):

$$\begin{aligned} Trade_{ijt} = & \alpha_0 + \alpha_1 Trade_{ij,t-1} + \alpha_2 Trade_{ij,t-2} + \alpha_3 Size_{it1} + \alpha_4 Size_{it2} + \alpha_5 Size_{jt1} + \alpha_6 Size_{jt2} \\ & + \alpha_7 Distance_{ij} + \alpha_8 IQ_{it} + \alpha_9 IQ_{jt} + \alpha_{10} GE_{it} + \alpha_{11} GE_{jt} + \alpha_{12} (IQ \cdot GE)_{it} + \alpha_{13} (IQ \cdot GE)_{jt} \\ & + \alpha_{14} MRT_{it} + \alpha_{15} MRT_{jt} + \sum_{k=16}^{26} \alpha_k Control_{k,i,j,t,ij,ijt} + \sum_{m=27}^{30} \alpha_m FE_{m,i,j,ij,t} + \varepsilon_{ijt} \end{aligned}$$

Trong đó i và j lần lượt là nước xuất khẩu và nhập khẩu, t là năm quan sát, α là hệ số hồi quy của các biến giải thích (ngoại trừ α_0 là giá trị tung độ gốc của phương trình), và $t-1$ và $t-2$ lần lượt là các biến trễ 1 và 2 năm của biến phụ thuộc $Trade_{ijt}$. $Trade_{ijt}$ là thương mại song phương, $Size_{it1}$, $Size_{it2}$, $Size_{jt1}$, và $Size_{jt2}$ lần lượt là tổng sản phẩm quốc nội (quy mô kinh tế) và dân số, $Distance_{ij}$ là khoảng cách địa lý, IQ_{it} và IQ_{jt} là chất lượng thể chế, GE_{it} và GE_{jt} là bình đẳng giới, $(IQ \cdot GE)_{it}$ và $(IQ \cdot GE)_{jt}$ là các biến tương tác giữa chất lượng thể chế và bình đẳng giới, cho phép đánh giá tác động điều tiết của chất lượng thể chế đến mối quan hệ giữa thương mại song phương và bình đẳng giới, MRT_{it} và MRT_{jt} là các biến kháng trở đa phương (MRT) nhằm giải quyết hiệu ứng nước thứ ba trong thương mại song phương được đề xuất bởi Anderson và Van Wincoop (2003), Baier và Bergstrand (2009), và Head và Mayer (2014), $\sum_{k=16}^{26} \alpha_k Control_{k,i,j,t,ij,ijt}$ là tập hợp các biến kiểm soát theo quốc gia, cặp quốc gia, và thời gian, $\sum_{m=27}^{30} \alpha_m FE_{m,i,j,ij,t}$ là tập hợp các biến đại diện cho yếu tố cố định theo nước xuất khẩu (i), nước nhập khẩu (j), cặp quốc gia (ij), và thời gian (t), và ε_{ijt} là sai số ngẫu nhiên của ước lượng. Mô hình cụ thể với diễn giải các biến số chi tiết nằm tại Bảng A.1 (Phụ lục A, toàn văn luận án). Mẫu dữ liệu bảng bao gồm mẫu tổng thể, mẫu các đối tác có chất lượng thể chế cao (hướng cao-cao), thấp (hướng thấp-thấp) và mức độ chất lượng thể chế khác biệt. Nguồn dữ liệu được xây dựng từ WB và WTO; biến khoảng cách và các đặc điểm chung dựa theo Conte và cộng sự (2022). Dữ liệu bảng bao gồm 41 quốc gia (Việt Nam cùng 40 đối tác thương mại lớn nhất) trong giai đoạn 2002-2021. Quy mô bảng đạt 32.800 quan sát ($41 \times 40 \times 20$), bao gồm Việt Nam và các nền kinh tế tham gia thương mại năng động nhất được lựa chọn dựa trên tổng kim ngạch thương mại giai đoạn 2017-2021.

3.2.2. Phương pháp ước lượng

Để ước lượng các mô hình đề xuất, chương này sử dụng phương pháp tác động cố định kết hợp (FE-I và FE-II), tác động ngẫu nhiên (RE) và phương pháp momen tổng quát dạng hệ thống hai bước (SGMM-II). Các biến nội sinh bao gồm tổng sản phẩm quốc nội của nước xuất khẩu và nhập khẩu và tỷ giá hối đoái song phương (Kahouli, 2016; Le, 2022; Le & Pham, 2024). Nhằm kiểm tra tính bền vững của các kết quả, phương pháp ước lượng PPML cũng được áp dụng. Các mối quan hệ sẽ không được xác nhận/khẳng định khi: (i) có kết quả mâu thuẫn giữa FE-I, FE-II, SGMM-II và PPML; hoặc (ii) các mối quan hệ chỉ có ý nghĩa thống kê trong một trong các phương pháp FE-I, FE-II và PPML; hoặc (iii) các mối quan hệ chỉ có ý nghĩa thống kê trong duy nhất một trong hai ước lượng là FE-I và FE-II.

3.3. Tóm tắt kết quả nghiên cứu

Các kết quả nghiên cứu chính của chương trình được trình bày trong các bảng sau ở phần Phụ lục của Chương 3 (toàn văn luận án):

Bảng C3.41: Tóm tắt kết quả về tác động trực tiếp của bình đẳng giới đến thương mại song phương

Tác động bối cảnh	Tác động trực tiếp	Giả thuyết
Mẫu tổng thể	Chỉ số Phát triển giới nước xuất khẩu và nhập khẩu tác động dương đến thương mại song phương	H.1.1.1: Ủng hộ
	Chỉ số Bất bình đẳng giới nước nhập khẩu tác động dương đến nhập khẩu	H.1.1.2: Không ủng hộ (trái dấu)
Mẫu các đối tác có chất lượng thể chế cao (cao-cao)	Tỷ lệ lao động nữ tham gia lực lượng lao động nước xuất khẩu tác động dương đến xuất khẩu	H.1.1.3: Ủng hộ H.1.4: Ủng hộ
	Chỉ số Bất bình đẳng giới nước xuất khẩu tác động âm đến xuất khẩu	H.1.1.2: Ủng hộ H.1.4: Ủng hộ
Mẫu các đối tác có chất lượng thể chế thấp (thấp-thấp)	Chỉ số Phát triển giới nước xuất khẩu tác động dương đến xuất khẩu	H.1.1.1: Ủng hộ H.1.4: Ủng hộ
Mẫu các đối tác có chất lượng thể chế khác nhau (thấp-cao và cao-thấp)	Chỉ số Phát triển giới nước xuất khẩu tác động dương đến xuất khẩu	H.1.1.1: Ủng hộ H.1.4: Ủng hộ
	Chỉ số Phát triển giới nước nhập khẩu tác động âm đến nhập khẩu	H.1.1.1: Không ủng hộ (trái dấu) H.1.4: Ủng hộ

Nguồn: Tác giả.

Bảng C3.41 (Phụ lục Chương 3) tóm tắt kết quả về tác động trực tiếp của bình đẳng giới đến thương mại song phương và tác động bối cảnh của chất lượng thể chế đến mối quan hệ thương mại-bình đẳng giới. Bảng C3.42 (Phụ lục Chương 3) tóm tắt kết quả về tác động điều tiết của các khía cạnh chất lượng thể chế đến mối quan hệ giữa bình đẳng giới và thương mại song phương.

Bảng C3.42: Tóm tắt kết quả về tác động điều tiết của chất lượng thể chế đến mối quan hệ giữa bình đẳng giới và thương mại song phương

Khía cạnh thể chế	Tác động điều tiết			Giả thuyết
	Thương mại song phương – GDI	Thương mại song phương – GII	Thương mại song phương – FLA	
COC	Nước XK (-) Nước NK (-)	Nước XK (+) Nước NK (+)	Nước NK (+)	H.1.3.1: Ủng hộ H.1.3.2: Ủng hộ H.1.3.3: Ủng hộ
GVE	Nước XK (-) Nước NK (-)			H.1.3.1: Ủng hộ H.1.3.2: Không ủng hộ H.1.3.3: Không ủng hộ
POS	Nước NK (+)		Nước NK (-)	H.1.3.1: Ủng hộ H.1.3.2: Không ủng hộ H.1.3.3: Ủng hộ
REQ	Nước NK (-)	Nước XK (+)		H.1.3.1: Ủng hộ H.1.3.2: Ủng hộ H.1.3.3: Không ủng hộ
ROL				H.1.3.1: Không ủng hộ H.1.3.2: Không ủng hộ H.1.3.3: Không ủng hộ
VAC	Nước XK (-)	Nước XK (+) Nước NK (+)	Nước NK (-)	H.1.3.1: Ủng hộ H.1.3.2: Ủng hộ H.1.3.3: Ủng hộ
Overall IQ			Nước XK (-)	H.1.3.1: Không ủng hộ H.1.3.2: Không ủng hộ H.1.3.3: Ủng hộ

CHƯƠNG 4: TIẾP CẬN MÔ HÌNH TRỌNG LỰC ĐỐI VỚI MỐI QUAN HỆ GIỮA THƯƠNG MẠI, CHẤT LƯỢNG MÔI TRƯỜNG, VÀ CHẤT LƯỢNG THỂ CHẾ

4.1. Giới thiệu

Để thực hiện RO 2, chương này nghiên cứu tác động của chất lượng môi trường đến thương mại song phương từ hai phía đối tác thương mại (nước xuất khẩu và nhập khẩu). Bên cạnh đó, tác động điều tiết và bối cảnh của chất lượng thể chế đến mối quan hệ giữa thương mại song phương và chất lượng môi trường cũng chưa được các nghiên cứu trước quan tâm. Vì vậy, chương này đề xuất các giả thuyết sau:

H.2.1: Chất lượng môi trường (nước xuất khẩu và nhập khẩu) có tác động dương đến thương mại song phương.

H.2.2: Chất lượng thể chế (nước xuất khẩu và nhập khẩu) có tác động dương đến thương mại song phương.

H.2.3: Chất lượng thể chế (nước xuất khẩu và nhập khẩu) tác động điều tiết có ý nghĩa thống kê đến mối quan hệ giữa thương mại song phương và chất lượng môi trường.

H.2.4: Chất lượng thể chế (nước xuất khẩu và nhập khẩu) tác động bối cảnh có ý nghĩa thống kê đến mối quan hệ giữa thương mại song phương và chất lượng môi trường.

4.2. Thiết lập mô hình, đo lường biến số, và phương pháp ước lượng

4.2.1. Thiết lập mô hình và đo lường biến số

Để kiểm tra các giả thuyết, luận án đề xuất mô hình trọng lực thương mại mở rộng với sự tích hợp của chất lượng môi trường và chất lượng thể chế (Eshetu & Goshu, 2021; Golovko & Sahin, 2021; Guo & Mai, 2023; Islam & cộng sự, 2024; Lohani, 2024; Martínez-Martínez & cộng sự, 2023) như sau:

$$\begin{aligned} Trade_{ijt} = & \beta_0 + \beta_1 Trade_{ij,t-1} + \beta_2 Trade_{ij,t-2} + \beta_3 Size_{it1} + \beta_4 Size_{it2} + \beta_5 Size_{jt1} + \beta_6 Size_{jt2} \\ & + \beta_7 Distance_{ij} + \beta_8 IQ_{it} + \beta_9 IQ_{jt} + \beta_{10} EQ_{it} + \beta_{11} EQ_{jt} + \beta_{12} (IQ.EQ)_{it} + \beta_{13} (IQ.EQ)_{jt} \\ & + \beta_{14} MRT_{it} + \beta_{15} MRT_{jt} + \sum_{k=16}^{26} \beta_k Control_{k,i,j,t,ij,ijt} + \sum_{m=27}^{30} \beta_m FE_{i,j,t} + \eta_{ijt} \end{aligned}$$

Trong đó, i và j lần lượt là nước xuất khẩu và nhập khẩu, t là năm quan sát, β đại diện cho hệ số hồi quy của các biến giải thích (ngoại trừ β_0 là giá trị tung độ gốc của phương trình ước lượng), và $t-1$ và $t-2$ lần lượt là độ trễ 1 và 2 năm của biến phụ thuộc $Trade_{ijt}$. $Trade_{ijt}$ là thương mại song phương, $Size_{it1}$, $Size_{it2}$, $Size_{jt1}$, và $Size_{jt2}$ là tổng sản phẩm quốc nội (quy mô kinh tế) và dân số, $Distance_{ij}$ là khoảng cách địa lý, IQ_{it} và IQ_{jt} là chất lượng thể chế (bảy khía cạnh), EQ_{it} và EQ_{jt} là chất lượng môi trường, $(IQ.EQ)_{it}$ và $(IQ.EQ)_{jt}$ là các biến tương tác giữa chất lượng thể chế và chất lượng môi trường, cho phép đánh giá tác động điều tiết của chất lượng thể chế đến mối quan hệ giữa thương mại song phương và chất lượng môi trường, MRT_{it} và MRT_{jt} là các biến kháng trở đa phương (MRT) nhằm giải quyết hiệu ứng nước thứ ba trong quan hệ thương mại song phương được đề xuất bởi Anderson và Van Wincoop (2003), Baier và Bergstrand (2009), và Head và Mayer (2014), $\sum_{k=16}^{26} \beta_k Control_{k,i,j,t,ij,ijt}$ là tập hợp các biến kiểm soát đại diện cho các đặc điểm của đối tác, cặp đối tác, và thời gian, $\sum_{m=27}^{30} \beta_m FE_{i,j,t}$ là tập hợp các biến kiểm soát tác động cố định theo nước xuất khẩu (i), nước nhập khẩu (j), cặp đối tác (ij), và thời gian (t), và η_{ijt} là sai số ngẫu nhiên của phương trình ước lượng. Dựa trên mô hình tổng quát, mô hình cụ thể với diễn giải các biến số chi tiết nằm tại Bảng A.2 (Phụ lục A, toàn văn luận án). Các biến chất lượng thể chế (biến giải thích) được đưa riêng biệt vào các mô hình nghiên cứu nhằm tránh khả năng đa cộng tuyến tiềm ẩn. Các mẫu dữ liệu bảng bao gồm mẫu tổng

thể, các đối tác có chất lượng thể chế cao (hướng cao-cao), thấp (hướng thấp-thấp) và các mức độ chất lượng thể chế khác biệt. Nguồn dữ liệu được xây dựng từ cơ sở dữ liệu của WB, WTO và dự án Our World in Data thuộc Global Change Data Lab (đối với phát thải CO₂). Các biến khoảng cách và đặc điểm chung dựa theo Conte và cộng sự (2022). Bộ dữ liệu bảng bao gồm 41 quốc gia (Việt Nam và 40 đối tác thương mại lớn nhất) trong giai đoạn 2002-2021. Quy mô bảng đạt 32.800 quan sát (41 x 40 x 20), bao gồm Việt Nam và các nền kinh tế thương mại năng động nhất được lựa chọn dựa trên tổng kim ngạch thương mại giai đoạn 2017-2021.

4.2.2. Phương pháp ước lượng

Để ước lượng các mô hình đề xuất, chương này sử dụng các phương pháp tác động cố định kết hợp (FE-I và FE-II), tác động ngẫu nhiên (RE) và phương pháp momen tổng quát dạng hệ thống hai bước (SGMM-II). Các biến nội sinh bao gồm tổng sản phẩm quốc nội của nước xuất khẩu và nhập khẩu và tỷ giá hối đoái song phương (Kahouli, 2016; Le, 2022; Le & Pham, 2024). Nhằm kiểm tra tính bền vững, phương pháp ước lượng PPML được áp dụng. Các mối quan hệ sẽ không được khẳng định khi: (i) có kết quả mâu thuẫn giữa các ước lượng FE-I, FE-II, SGMM-II và PPML; hoặc (ii) các mối quan hệ chỉ có ý nghĩa thống kê trong một trong các phương pháp FE-I, FE-II và PPML; hoặc (iii) các mối quan hệ chỉ có ý nghĩa thống kê trong duy nhất một trong hai ước lượng là FE-I và FE-II.

4.3. Tóm tắt kết quả nghiên cứu

Các kết quả nghiên cứu chính của chương trình được trình bày trong các bảng sau ở phần Phụ lục của Chương 4 (toàn văn luận án):

Bảng C4.17: Tóm tắt kết quả về tác động trực tiếp của chất lượng môi trường đến thương mại song phương

Tác động bối cảnh	Tác động trực tiếp	Giả thuyết
Mẫu tổng thể	Phát thải CO ₂ nước xuất khẩu tác động dương đến xuất khẩu Phát thải CO ₂ nước nhập khẩu tác động dương đến nhập khẩu	H.2.1: Không ủng hộ (trái dấu)
Mẫu các đối tác có chất lượng thể chế cao (cao-ca)	Phát thải CO ₂ nước xuất khẩu tác động dương đến xuất khẩu Phát thải CO ₂ nước nhập khẩu tác động dương đến nhập khẩu	H.2.1: Không ủng hộ (trái dấu) H.2.4: Không ủng hộ
Mẫu các đối tác có chất lượng thể chế thấp (thấp-thấp)	Phát thải CO ₂ nước xuất khẩu tác động dương đến xuất khẩu Phát thải CO ₂ nước nhập khẩu tác động dương đến nhập khẩu	H.2.1: Không ủng hộ (trái dấu) H.2.4: Không ủng hộ
Mẫu các đối tác có chất lượng thể chế khác nhau (thấp-ca và cao-thấp)	Phát thải CO ₂ nước xuất khẩu tác động dương đến xuất khẩu Phát thải CO ₂ nước nhập khẩu tác động dương đến nhập khẩu	H.2.1: Không ủng hộ (trái dấu) H.2.4: Không ủng hộ

Nguồn: Tác giả.

Bảng C4.17 tóm tắt kết quả về tác động trực tiếp của chất lượng môi trường đến thương mại song phương và tác động bối cảnh của chất lượng thể chế đến mối quan hệ thương mại-môi trường. Bảng C4.18 tóm tắt kết quả (tổng hợp các kết quả nhất quán của Chương 3 và 4) về tác động trực tiếp của các khía cạnh chất lượng thể chế đến thương mại song phương.

Bảng C4.18: Tóm tắt kết quả về tác động trực tiếp của chất lượng thể chế đến thương mại song phương (từ kết quả nhất quán giữa Chương 3 và 4)

Khía cạnh thể chế	Tác động trực tiếp				Giả thuyết
	Tổng thể	Cao-Cao	Thấp-Thấp	Khác biệt	
COC					H.2.2 & H.1.2: Không ủng hộ H.2.4: Không ủng hộ

GVE		XK (+) NK (+)		XK (+) NK (-)	H.2.2 & H.1.2: Ủng hộ (tùy bối cảnh) H.2.4: Ủng hộ
POS		NK (+)	NK (-)		H.2.2 & H.1.2: Ủng hộ (tùy bối cảnh) H.2.4: Ủng hộ
REQ			NK (-)		H.2.2 & H.1.2: Không ủng hộ (trái dấu) H.2.4: Ủng hộ
ROL				XK (+)	H.2.2 & H.1.2: Ủng hộ (tùy bối cảnh) H.2.4: Ủng hộ
VAC	XK (-)	XK (-) NK (+)			H.2.2 & H.1.2: Ủng hộ (tùy bối cảnh) H.2.4: Ủng hộ
EPS	XK (-)				H.2.2: Không ủng hộ (trái dấu) H.2.4: Không ủng hộ
IQ					H.2.2 & H.1.2: Không ủng hộ H.2.4: Không ủng hộ

Nguồn: Tác giả.

Bảng C4.19 tóm tắt kết quả về tác động điều tiết của các khía cạnh chất lượng thể chế đến mối quan hệ thương mại-môi trường.

Bảng C4.19: Tóm tắt kết quả về tác động điều tiết của chất lượng thể chế đến mối quan hệ giữa chất lượng môi trường và thương mại song phương

Khía cạnh thể chế	Tác động điều tiết	Giả thuyết
	Thương mại song phương – Phát thải CO ₂	
COC	Nước NK (+)	H.2.3: Ủng hộ
GVE	Nước NK (+)	H.2.3: Ủng hộ
POS	Nước NK (-)	H.2.3: Ủng hộ
REQ	Nước NK (+)	H.2.3: Ủng hộ
ROL	Nước NK (+)	H.2.3: Ủng hộ
VAC		H.2.3: Không ủng hộ
EPS		H.2.3: Không ủng hộ
IQ	Nước NK (+)	H.2.3: Ủng hộ

Nguồn: Tác giả.

CHƯƠNG 5: TIẾP CẬN ĐƯỜNG CONG KUZNETS VỀ GIỚI ĐỐI VỚI MỐI QUAN HỆ GIỮA BÌNH ĐẲNG GIỚI, THƯƠNG MẠI, VÀ CHẤT LƯỢNG THỂ CHẾ

5.1. Giới thiệu

Để thực hiện RO 3, chương này nghiên cứu tác động trực tiếp của tự do hóa thương mại (mở cửa thương mại) và chất lượng thể chế đến bình đẳng giới, và tác động điều tiết và bối cảnh của tự do hóa thương mại (mở cửa thương mại) và chất lượng thể chế đến các mối quan hệ bình đẳng giới-thể chế và bình đẳng giới-tự do hóa thương mại. Vì vậy, chương này đề xuất các giả thuyết sau đây:

H.3.1: Tự do hóa thương mại có tác động dương đến bình đẳng giới.

H.3.1.1: Tự do hóa thương mại có tác động dương đến Chỉ số Phát triển giới.

H.3.1.2: Tự do hóa thương mại có tác động âm đến Chỉ số Bất bình đẳng giới.

H.3.1.3: Tự do hóa thương mại có tác động dương đến Tỷ lệ lao động nữ tham gia lực lượng lao động.

H.3.2: Chất lượng thể chế có tác động dương đến bình đẳng giới.

H.3.2.1: Chất lượng thể chế có tác động dương đến Chỉ số Phát triển giới.

H.3.2.2: Chất lượng thể chế có tác động âm đến Chỉ số Bất bình đẳng giới.

H.3.2.3: Chất lượng thể chế có tác động dương đến Tỷ lệ lao động nữ tham gia lực lượng lao động.

H.3.3: Tự do hóa thương mại tác động điều tiết có ý nghĩa thống kê đến mối quan hệ giữa bình đẳng giới và chất lượng thể chế.

H.3.3.1: Tự do hóa thương mại tác động điều tiết có ý nghĩa thống kê đến mối quan hệ giữa Chỉ số Phát triển giới và chất lượng thể chế.

H.3.3.2: Tự do hóa thương mại tác động điều tiết có ý nghĩa thống kê đến mối quan hệ giữa Chỉ số Bất bình đẳng giới và chất lượng thể chế.

H.3.3.3: Tự do hóa thương mại tác động điều tiết có ý nghĩa thống kê đến mối quan hệ giữa Tỷ lệ lao động nữ tham gia lực lượng lao động và chất lượng thể chế.

H.3.4: Chất lượng thể chế tác động điều tiết có ý nghĩa thống kê đến mối quan hệ giữa bình đẳng giới và tự do hóa thương mại.

H.3.4.1: Chất lượng thể chế tác động điều tiết có ý nghĩa thống kê đến mối quan hệ giữa Chỉ số Phát triển giới và tự do hóa thương mại.

H.3.4.2: Chất lượng thể chế tác động điều tiết có ý nghĩa thống kê đến mối quan hệ giữa Chỉ số Bất bình đẳng giới và tự do hóa thương mại.

H.3.4.3: Chất lượng thể chế tác động điều tiết có ý nghĩa thống kê đến mối quan hệ giữa Tỷ lệ lao động nữ tham gia lực lượng lao động và tự do hóa thương mại.

H.3.5: Tự do hóa thương mại tác động bối cảnh có ý nghĩa thống kê đến các mối quan hệ bình đẳng giới-tự do hóa thương mại và bình đẳng giới-thể chế.

H.3.6: Chất lượng thể chế tác động bối cảnh có ý nghĩa thống kê đến các mối quan hệ bình đẳng giới-tự do hóa thương mại và bình đẳng giới-thể chế.

5.2. Thiết lập mô hình, đo lường biến số, và phương pháp ước lượng

5.2.1. Thiết lập mô hình và đo lường biến số

Mô hình tổng quát Đường cong Kuznets về Giới trong chương này được đề xuất như sau (Anyanwu, 2016; Ghosh, 2022; Nguyen & Su, 2021; Nguyen 2022; Nguyen & Nguyen, 2023):

$$GE_{it} = \gamma_0 + \gamma_1 GE_{i,t-1} + \gamma_2 GE_{i,t-2} + \gamma_3 Income_{it} + \gamma_4 Income_{it}^2 + \gamma_5 Income_{it}^3 + \gamma_6 Openness_{it} + \gamma_7 IQ_{k,it} + \gamma_8 (IQ_{LEV,k} \cdot Openness)_{it} + \gamma_9 (Openness_{LEV} \cdot IQ_k)_{it} + \sum_{m=10}^{16} \gamma_m Control_{m,it} + \delta_t + \theta_{it}$$

Trong đó i là nước quan sát, t là năm quan sát, $t-1$ và $t-2$ lần lượt là độ trễ 1 và 2 năm của biến phụ thuộc GE_{it} , γ đại diện cho hệ số hồi quy của các biến giải thích (ngoại trừ γ_0 là giá trị tung độ gốc của phương trình ước lượng), GE_{it} là bình đẳng giới, $Income_{it}$ là thu nhập, $Openness_{it}$ là mở cửa thương mại (tự do hóa thương mại), $IQ_{k,it}$ đại diện cho sáu Chỉ số Quản trị Toàn thể giới (WGI) và cũng là sáu khía cạnh của chất lượng thể chế ($k = 1, \dots, 6$), $(IQ_{LEV,k} \cdot Openness)_{it}$ là các biến tương tác giữa các biến mức độ khía cạnh thể chế và mở cửa thương mại, $(Openness_{LEV} \cdot IQ_k)_{it}$ là các biến tương tác giữa các biến khía cạnh thể chế và mức độ mở cửa thương mại, $\sum_{m=10}^{16} \gamma_m Control_{m,it}$ là tập hợp các biến kiểm soát, δ_t là biến tác động cố định theo thời gian, và θ_{it} là sai số ngẫu nhiên của phương trình ước lượng. Dựa trên mô hình tổng quát, mô hình cụ thể với các biến số được diễn giải tại Bảng A.3 (Phụ lục A, toàn văn luận án). Các mẫu dữ liệu bảng bao gồm mẫu tổng thể, mẫu có chất lượng thể chế cao, chất lượng thể chế thấp, độ mở cao và độ mở thấp. Nguồn dữ liệu được xây dựng từ các cơ sở dữ liệu của WB, WTO, và UNCTAD. Dữ liệu bảng bao gồm 113 quốc gia trên toàn thế giới trong giai đoạn 2002-2021. Do đó, quy mô bảng đạt $113 \times 20 = 2.260$ quan sát.

5.2.2. Phương pháp ước lượng

Để ước lượng các mô hình đề xuất, chương này sử dụng các phương pháp tác động cố định kết hợp (FE), tác động ngẫu nhiên (RE), phương pháp momen tổng quát dạng sai phân hai bước (DGMM-II) và momen tổng quát dạng hệ thống hai bước (SGMM-II). Trong chương này, các biến nội sinh bao gồm tổng sản phẩm quốc nội bình quân đầu người (thu nhập bình quân) ở các dạng nguyên bản, bình phương và lập phương do bình đẳng giới có thể có tác động đáng kể đến thu nhập bình quân và tăng trưởng kinh tế (Akhtar & cộng sự, 2023; Klasen & Lamanna, 2009; Mitra & cộng sự, 2015; Nandan & Mallick, 2020), điều này nhiều khả năng gây ra hiện tượng nhân quả ngược từ bình đẳng giới đến thu nhập. Nhằm đảm bảo độ tin cậy của các kết quả, luận án đã thực hiện so sánh chéo giữa các kết quả ước lượng từ FE, DGMM-II và SGMM-II. Các mối quan hệ sẽ không được khẳng định khi: (i) có kết quả mâu thuẫn giữa các ước lượng FE, DGMM-II và SGMM-II; hoặc (ii) các mối quan hệ chỉ có ý nghĩa thống kê trong ước lượng FE (ngoại trừ các biến thu nhập).

5.3. Tóm tắt kết quả nghiên cứu

Các kết quả nghiên cứu chính của chương trình được trình bày trong các bảng sau ở phần Phụ lục của Chương 5 (toàn văn luận án):

Bảng C5.31: Tóm tắt kết quả về tác động trực tiếp của mở cửa thương mại đến bình đẳng giới

Tác động bởi cảnh	Tác động trực tiếp			Giả thuyết
	GDI	GII	FLA	
Mẫu tổng thể	Tăng (+)	Giảm (-)	Tăng (+)	H.3.1.1: Ủng hộ H.3.1.2: Ủng hộ H.3.1.3: Ủng hộ
Chất lượng thể chế cao	Giảm (-)	Giảm (-)	Tăng (+)	H.3.1.1: Không ủng hộ (trái dấu) H.3.1.2: Ủng hộ H.3.1.3: Ủng hộ H.3.6: Ủng hộ (trong các mô hình GDI)
Chất lượng thể chế thấp		Giảm (-)	Tăng (+)	H.3.1.1: Không ủng hộ H.3.1.2: Ủng hộ H.3.1.3: Ủng hộ H.3.6: Ủng hộ (trong các mô hình GDI)
Độ mở thương mại cao	Giảm (-)	Giảm (-)	Tăng (+)	H.3.1.1: Không ủng hộ (trái dấu) H.3.1.2: Ủng hộ H.3.1.3: Ủng hộ H.3.5: Ủng hộ (trong các mô hình GDI và FLA)
Độ mở thương mại thấp		Giảm (-)		H.3.1.1: Không ủng hộ H.3.1.2: Ủng hộ H.3.1.3: Không ủng hộ H.3.5: Ủng hộ (trong các mô hình GDI và FLA)

Nguồn: Tác giả.

Bảng C5.31 tóm tắt kết quả về tác động trực tiếp của mở cửa thương mại đến bình đẳng giới và tác động bối cảnh của các khía cạnh chất lượng thể chế và mở cửa thương mại đến mối quan hệ bình đẳng giới-thương mại. Bảng C5.32 tóm tắt kết quả về tác động trực tiếp của các khía cạnh chất lượng thể chế đến bình đẳng giới và tác động bối cảnh của các khía cạnh chất lượng thể chế và mở cửa thương mại đến mối quan hệ bình đẳng giới-thể chế.

Bảng C5.32: Tóm tắt kết quả về tác động trực tiếp của chất lượng thể chế đến bình đẳng giới

Tác động bởi cảnh	Tác động trực tiếp			Giả thuyết
	GDI	GII	FLA	
Tổng thể	GVE (-)	COC, GVE, POS, REQ, VAC (-)	COC (+) POS, REQ, ROL (-)	H.3.2.1: Không ủng hộ (trái dấu) H.3.2.2: Ủng hộ

				H.3.2.3: Ủng hộ (với mô hình COC)
Chất lượng thể chế cao	COC, GVE, ROL (-)	COC, REQ (-) ROL (+)	COC, ROL (-) POS, VAC (+)	H.3.2.1: Không ủng hộ H.3.2.2: Ủng hộ (với các mô hình COC và REQ) H.3.2.3: Ủng hộ (với các mô hình POS và VAC) H.3.6: Ủng hộ
Chất lượng thể chế thấp	GVE, REQ (-) ROL (+)	COC, GVE, REQ (-) POS (+)	POS, REQ, ROL (-) COC, VAC (+)	H.3.2.1: Ủng hộ (với mô hình ROL) H.3.2.2: Ủng hộ (với các mô hình COC, GVE, và REQ) H.3.2.3: Ủng hộ (với các mô hình COC và VAC) H.3.6: Ủng hộ
Độ mở thương mại cao	COC (-) GVE, POS, ROL (+)	COC, GVE, VAC (-)	COC, VAC (+) GVE, POS (-)	H.3.2.1: Ủng hộ (với các mô hình GVE, POS, và ROL) H.3.2.2: Ủng hộ H.3.2.3: Ủng hộ (với các mô hình COC và VAC) H.3.5: Ủng hộ
Độ mở thương mại thấp	GVE, POS (-) ROL, VAC (+)	GVE, POS, REQ, ROL, VAC (-)	COC, VAC (+) POS, REQ, ROL (-)	H.3.2.1: Ủng hộ (với các mô hình ROL và VAC) H.3.2.2: Ủng hộ H.3.2.3: Ủng hộ (với các mô hình COC và VAC) H.3.5: Ủng hộ

Nguồn: Tác giả.

Bảng C5.33 tóm tắt kết quả về tác động điều tiết của mở cửa thương mại đến mối quan hệ bình đẳng giới-thể chế và các tác động bối cảnh của các khía cạnh chất lượng thể chế.

Bảng C5.33: Tóm tắt kết quả về tác động điều tiết của mở cửa thương mại đến mối quan hệ bình đẳng giới-thể chế

Tác động bối cảnh	Tác động điều tiết của mở cửa thương mại			Giả thuyết
	GDI-Thể chế	GII-Thể chế	FLA-Thể chế	
Tổng thể	GDI-POS (+)	GII-POS (+) GII-ROL (+) GII-VAC (+)	FLA-All (-)	H.3.3.1: Ủng hộ H.3.3.2: Ủng hộ H.3.3.3: Ủng hộ
Chất lượng thể chế cao	GDI-POS (+) GDI-VAC (+)	GII-COC (-) GII-REQ (-)	FLA-All (-)	H.3.3.1: Ủng hộ H.3.3.2: Ủng hộ H.3.3.3: Ủng hộ
Chất lượng thể chế thấp	GDI-COC (+) GDI-POS (-)	GII-COC (+) GII-GVE (+) GII-REQ (+) GII-ROL (+) GII-VAC (+)	FLA-POS (+) FLA-ROL (+) FLA-GVE (-) FLA-VAC (-)	H.3.3.1: Ủng hộ H.3.3.2: Ủng hộ H.3.3.3: Ủng hộ

Nguồn: Tác giả.

Bảng C5.34 tóm tắt kết quả về tác động điều tiết của các khía cạnh chất lượng thể chế đến mối quan hệ bình đẳng giới-tự do hóa thương mại và tác động bối cảnh của mở cửa thương mại.

Bảng C5.34: Tóm tắt kết quả về tác động điều tiết của chất lượng thể chế đến mối quan hệ bình đẳng giới-tự do hóa thương mại

	Tác động điều tiết của chất lượng thể chế	Giả thuyết

Tác động bối cảnh	GDI-Mở cửa thương mại	GII-Mở cửa thương mại	FLA-Mở cửa thương mại	
Tổng thể			GVE, REQ, VAC (+)	H.3.4.1: Không ủng hộ H.3.4.2: Không ủng hộ H.3.4.3: Ủng hộ
Độ mở thương mại cao	COC (+) GVE, POS, REQ (-)	POS (+) ROL (-)	GVE, REQ (+) COC, POS, ROL, VAC (-)	H.3.4.1: Ủng hộ H.3.4.2: Ủng hộ H.3.4.3: Ủng hộ
Độ mở thương mại thấp	COC, GVE, POS, REQ (+)	GVE (+) POS, VAC (-)	COC, GVE, REQ, VAC (+) ROL (-)	H.3.4.1: Ủng hộ H.3.4.2: Ủng hộ H.3.4.3: Ủng hộ

Nguồn: Tác giả.

CHƯƠNG 6: TIẾP CẬN ĐƯỜNG CONG KUZNETS VỀ MÔI TRƯỜNG DỰA TRÊN MỞ CỬA THƯƠNG MẠI ĐỐI VỚI MỐI QUAN HỆ GIỮA CHẤT LƯỢNG MÔI TRƯỜNG, THƯƠNG MẠI, VÀ CHẤT LƯỢNG THỂ CHẾ

6.1. Giới thiệu

Để thực hiện RO 4, chương này nghiên cứu tác động trực tiếp (tuyến tính và phi tuyến tính) của tự do hóa thương mại (mở cửa thương mại) và chất lượng thể chế đến chất lượng môi trường, và các tác động điều tiết và bối cảnh của tự do hóa thương mại (mở cửa thương mại) và chất lượng thể chế đến các mối quan hệ môi trường-thể chế và môi trường-tự do hóa thương mại. Do đó, chương này đề xuất các giả thuyết sau:

H.4.1: Tự do hóa thương mại có tác động mang ý nghĩa thống kê đến chất lượng môi trường.

H.4.1.1: Ở giai đoạn tự do hóa thấp, tự do hóa thương mại có tác động âm (dương) đến chất lượng môi trường (phát thải CO₂).

H.4.1.2: Ở giai đoạn tự do hóa cao, tự do hóa thương mại có tác động dương (âm) đến chất lượng môi trường (phát thải CO₂).

H.4.2: Chất lượng thể chế có tác động dương (âm) đến chất lượng môi trường (phát thải CO₂).

H.4.3: Chất lượng thể chế tác động điều tiết có ý nghĩa thống kê đến mối quan hệ giữa chất lượng môi trường và tự do hóa thương mại.

H.4.4: Tự do hóa thương mại tác động bối cảnh có ý nghĩa thống kê đến các mối quan hệ môi trường-tự do hóa thương mại và môi trường-thể chế.

H.4.5: Chất lượng thể chế tác động bối cảnh có ý nghĩa thống kê đến các mối quan hệ môi trường-tự do hóa thương mại và môi trường-thể chế.

6.2. Thiết lập mô hình, đo lường biến số, và phương pháp ước lượng

6.2.1. Thiết lập mô hình và đo lường biến số

Dựa vào mô hình EKC ban đầu (Kuznets, 1955) và nhiều nghiên cứu gần đây (Achuo & Ojong, 2024; Amankwa & cộng sự, 2024; Boujedra & Jebli, 2025; Caporin & cộng sự, 2024; Demiral & cộng sự, 2024; Guo & Shahbaz, 2024; Gupta & cộng sự, 2025; Gyamfi & cộng sự, 2024; Huang & cộng sự, 2024; Mahadevan & Suardi, 2024; Murad & cộng sự, 2025; Phiri & cộng sự, 2024; Polat & Cil, 2025; Rasheed & Liu, 2024; Shao & cộng sự, 2025; Wang & cộng sự, 2024; Wu & cộng sự, 2025; Zeraibi & cộng sự, 2024), chương này đề xuất mô hình OEKC như sau:

$$EQ_{it} = \rho_0 + \rho_1 EQ_{i,t-1} + \rho_2 EQ_{i,t-2} + \rho_3 Openness_{it} + \rho_4 Openness_{it}^2 + \rho_5 IQ_{it} + \rho_6 (IQ_{LEV} \cdot Openness)_{it} + \rho_7 (IQ_{LEV} \cdot Openness^2)_{it} + \sum_{m=8}^{14} \rho_m Control_{m,it} + \mu_t + \varphi_{it}$$

Trong đó, i là nước quan sát, t là năm quan sát, $t-1$ và $t-2$ lần lượt là độ trễ 1 và 2 năm của biến phụ thuộc EQ_{it} , ρ đại diện cho hệ số hồi quy của các biến giải thích (ngoại trừ ρ_0 là giá trị tung độ gốc của phương trình ước lượng), EQ_{it} là chất lượng môi trường, $Openness_{it}$ và $Openness^2_{it}$ lần lượt là biến bậc một và bậc hai của mở cửa thương mại, $(IQ_{LEV} \cdot Openness)_{it}$ và $(IQ_{LEV} \cdot Openness^2)_{it}$ đại diện cho các biến tương tác giữa mức độ chất lượng thể chế và mở cửa thương mại (biến bậc 1 và bậc 2), cho phép đánh giá tác động điều tiết của chất lượng thể chế đến mối quan hệ môi trường-tự do hóa thương mại, $\sum_{m=8}^{14} Control_{m,it,t}$ là tập hợp các biến kiểm soát của mô hình, μ_t là hiệu ứng cố định theo thời gian, và φ_{it} là sai số ngẫu nhiên của phương trình ước lượng. Dựa trên mô hình tổng quát, mô hình cụ thể với các biến số được diễn giải tại Bảng A.4 (Phụ lục A, toàn văn luận án). Các biến khía cạnh chất lượng thể chế được đưa vào riêng biệt trong các mô hình nghiên cứu nhằm tránh hiện tượng đa cộng tuyến tiềm ẩn. Các mẫu dữ liệu bảng bao gồm mẫu tổng hợp, mẫu có chất lượng thể chế cao, chất lượng thể chế thấp, độ mở thương mại cao, và độ mở thương mại thấp. Nguồn dữ liệu được xây dựng từ các cơ sở dữ liệu của WB, WTO, UNCTAD, và dự án Our World in Data (đối với phát thải CO₂). Dữ liệu bảng bao gồm 113 quốc gia trên toàn thế giới giai đoạn 2002-2020, tạo ra 2.147 quan sát (113 x 19).

6.2.2. Phương pháp ước lượng

Để ước lượng các mô hình đề xuất, chương này sử dụng các phương pháp tác động cố định kết hợp (FE), tác động ngẫu nhiên (RE), momen tổng quát dạng sai phân hai bước (DGMM-II) và momen tổng quát dạng hệ thống hai bước (SGMM-II). Trong chương này, các biến nội sinh bao gồm độ mở thương mại ở dạng nguyên bản và bình phương do chất lượng môi trường có thể có tác động đáng kể đến tự do hóa thương mại, điều này nhiều khả năng gây ra hiện tượng nhân quả ngược (Amin & cộng sự, 2023; Aydin, 2023; Ben Jebil & cộng sự, 2019; Dou & cộng sự, 2021; Jamel & Maktouf, 2017; Pata & cộng sự, 2023; Rahman & cộng sự, 2020). Ví dụ, Aydin (2023) và Pata và cộng sự (2023) đã khám phá ra mối quan hệ nhân quả hai chiều giữa phát thải CO₂ và độ mở thương mại tại các nước G8 và ASEAN. Nhằm đảm bảo độ tin cậy, luận án thực hiện so sánh chéo giữa các kết quả ước lượng từ FE, DGMM-II và SGMM-II. Các mối quan hệ không được khẳng định khi: (i) có kết quả mâu thuẫn giữa các ước lượng FE, DGMM-II và SGMM-II; hoặc (ii) các mối quan hệ chỉ có ý nghĩa thống kê trong ước lượng FE (ngoại trừ các biến mở cửa thương mại).

6.3. Tóm tắt kết quả nghiên cứu

Các kết quả nghiên cứu chính của chương trình được trình bày trong các bảng sau ở phần Phụ lục của Chương 6 (toàn văn luận án):

Bảng C6.11: Tóm tắt kết quả về tác động trực tiếp của mở cửa thương mại đến chất lượng môi trường

Tác động bối cảnh	Tác động trực tiếp			Giả thuyết
	Mở cửa thương mại → Phát thải CO ₂	Mở cửa thương mại ² → Phát thải CO ₂	Hình dạng đồ thị mối quan hệ phát thải-tự do hóa thương mại	
Tổng thể	Giảm (-) (t, t-1)	Tăng (+) (t, t-1)	Chữ U (t, t-1)	H.4.1.1: Không ủng hộ (trái dấu) H.4.1.2: Không ủng hộ (trái dấu)
Chất lượng thể chế cao	Tăng (+) (t, t-1)	Giảm (-) (t, t-1)	Chữ U ngược (t, t-1)	H.4.1.1: Ủng hộ H.4.1.2: Ủng hộ H.4.5: Ủng hộ
	Giảm (-) (t-2)	Tăng (+) (t-2)	Chữ U (t-2)	H.4.1.1: Không ủng hộ (trái dấu) H.4.1.2: Không ủng hộ (trái dấu) H.4.4: Không ủng hộ

Chất lượng thể chế thấp	Giảm (-) (t, t-2)	Tăng (+) (t, t-2)	Chữ U (t, t-2)	H.4.1.1: Không ủng hộ (trái dấu) H.4.1.2: Không ủng hộ (trái dấu) H.4.5: Không ủng hộ
Độ mở thương mại cao	Tăng (+) (t-1)	Giảm (-) (t-1)	Chữ U ngược (t-1)	H.4.1.1: Ủng hộ H.4.1.2: Ủng hộ H.4.4: Không ủng hộ
Độ mở thương mại thấp	Giảm (-) (t)	Tăng (+) (t)	Chữ U (t)	H.4.1.1: Not supported (opposite sign) H.4.1.2: Not supported (opposite sign) H.4.4: Supported
	Tăng (+) (t-1)	Giảm (-) (t-1)	Chữ U ngược (t-1)	H.4.1.1: Ủng hộ H.4.1.2: Ủng hộ H.4.4: Không ủng hộ

Nguồn: Tác giả.

Bảng C6.11 tóm tắt kết quả về tác động trực tiếp của mở cửa thương mại đến chất lượng môi trường và các tác động bối cảnh của chất lượng thể chế và mở cửa thương mại đến mối quan hệ môi trường-tự do hóa thương mại. Bảng C6.12 tóm tắt kết quả về tác động trực tiếp của các khía cạnh chất lượng thể chế đến chất lượng môi trường và các tác động bối cảnh của chất lượng thể chế và mở cửa thương mại đến mối quan hệ môi trường-thể chế.

Bảng C6.12: Tóm tắt kết quả về tác động trực tiếp của chất lượng thể chế đến chất lượng môi trường

Tác động bối cảnh	Tác động trực tiếp của chất lượng thể chế đến phát thải CO ₂	Giả thuyết
Tổng thể	VAC (-)	H.4.2: Ủng hộ
Chất lượng thể chế cao	COC, GVE, POS, VAC (+)	H.4.2: Không ủng hộ (trái dấu) H.4.5: Ủng hộ
	ROL (-)	H.4.2: Ủng hộ H.4.5: Không ủng hộ
Chất lượng thể chế thấp	COC, POS, VAC (+)	H.4.2: Không ủng hộ (trái dấu) H.4.5: Ủng hộ
	ROL (-)	H.4.2: Ủng hộ H.4.5: Không ủng hộ
Độ mở thương mại cao	COC, GVE (+)	H.4.2: Không ủng hộ (trái dấu) H.4.4: Ủng hộ
Độ mở thương mại thấp	COC (+)	H.4.2: Không ủng hộ (trái dấu) H.4.4: Ủng hộ
	GVE, ROL (-)	H.4.2: Ủng hộ H.4.4: Ủng hộ

Nguồn: Tác giả.

Bảng C6.13 tóm tắt kết quả về tác động điều tiết của các khía cạnh chất lượng thể chế và tác động bối cảnh của mở cửa thương mại đến mối quan hệ môi trường-tự do hóa thương mại.

Bảng C6.13: Tóm tắt kết quả về tác động điều tiết của chất lượng thể chế đến mối quan hệ môi trường-tự do hóa thương mại

Tác động bối cảnh	Tác động điều tiết của chất lượng thể chế		Giả thuyết
	Phát thải-Mở cửa thương mại	Phát thải-Mở cửa thương mại ²	
Tổng thể	COC, POS, REQ, ROL (-)	COC, POS, REQ, ROL (+)	H.4.3: Ủng hộ
Độ mở thương mại cao	COC, GVE, POS, ROL (-)	COC, GVE, POS, ROL (+)	H.4.3: Ủng hộ H.4.4: Ủng hộ

Độ mở thương mại thấp	COC, GVE, POS, REQ, ROL, VAC (-)	COC, GVE, POS, REQ, ROL, VAC (+)	H.4.3: Ủng hộ H.4.4: Ủng hộ

Nguồn: Tác giả.

CHƯƠNG 7: KẾT LUẬN VÀ HÀM Ý CHÍNH SÁCH

7.1. Tóm tắt kết quả nghiên cứu chính

7.1.1. Về tiếp cận mô hình trọng lực đối với mối quan hệ giữa thương mại, bình đẳng giới, và chất lượng thể chế

7.1.1.1. Tác động trực tiếp của bình đẳng giới đến thương mại song phương

Xét trên phạm vi toàn cầu, GDI của nước xuất khẩu và nhập khẩu, cùng GII nước nhập khẩu thúc đẩy thương mại. Trong bối cảnh thể chế cao-cao, FLA nước xuất khẩu tăng xuất khẩu, trong khi GII làm giảm. GDI nước xuất khẩu tăng xuất khẩu ở bối cảnh thể chế thấp-thấp và hỗn hợp, trong khi GDI nước nhập khẩu giảm nhập khẩu ở bối cảnh hỗn hợp.

7.1.1.2. Tác động điều tiết của chất lượng thể chế đến mối quan hệ giữa thương mại song phương và bình đẳng giới

Chất lượng thể chế đóng vai trò là biến điều tiết then chốt. Nước xuất khẩu: COC, GVE, và VAC điều tiết âm GDI; IQ tổng thể điều tiết âm FLA; COC, REQ, và VAC điều tiết dương GII. Nước nhập khẩu: COC, GVE, và REQ điều tiết âm GDI; POS điều tiết dương. GII được điều tiết dương bởi COC và VAC. FLA được điều tiết dương bởi COC nhưng âm bởi POS và VAC.

7.1.2. Về tiếp cận mô hình trọng lực đối với mối quan hệ giữa thương mại, chất lượng môi trường, và chất lượng thể chế

7.1.2.1. Tác động trực tiếp của chất lượng môi trường đến thương mại song phương

Trong mọi bối cảnh thể chế, phát thải CO₂ cao hơn sẽ thúc đẩy thương mại song phương, hàm ý chất lượng môi trường thấp tạo thuận lợi cho dòng chảy thương mại quốc tế.

7.1.2.2. Tác động trực tiếp của chất lượng thể chế đến thương mại song phương (dựa trên các kết quả nhất quán giữa Chương 3 và 4)

Tác động trực tiếp mang yếu tố bối cảnh: Ở phạm vi toàn cầu, VAC và EPS của nước xuất khẩu làm giảm xuất khẩu. Ở bối cảnh thể chế cao-cao, GVE của nước xuất khẩu tăng xuất khẩu trong khi VAC làm giảm; ngược lại, GVE, POS, và VAC của nước nhập khẩu làm tăng nhập khẩu. Ở bối cảnh thể chế thấp-thấp, POS và REQ của nước nhập khẩu cản trở nhập khẩu. Ở bối cảnh thể chế khác biệt, GVE và ROL của nước xuất khẩu thúc đẩy xuất khẩu, còn GVE của nước nhập khẩu giảm nhập khẩu.

7.1.2.3. Tác động điều tiết của chất lượng thể chế đến mối quan hệ giữa thương mại song phương và chất lượng môi trường

Thể chế nước nhập khẩu (COC, GVE, REQ, ROL, và IQ tổng thể) điều tiết dương mối quan hệ nhập khẩu-phát thải CO₂, kích hoạt hiệu ứng cản trở của chất lượng môi trường lên nhập khẩu. Ngược lại, POS của nước nhập khẩu kích hoạt tác động thúc đẩy của chất lượng môi trường lên nhập khẩu.

7.1.3. Về tiếp cận Đường cong Kuznets về Giới đối với mối quan hệ giữa bình đẳng giới, thương mại, và chất lượng thể chế

7.1.3.1. Tác động trực tiếp của thu nhập đến bình đẳng giới

Trên quy mô toàn cầu, kết quả cho thấy quan hệ dạng chữ N đối với GDI (t, t-1) và GII (t), trong khi biến thu nhập trễ tạo ra các quan hệ dạng chữ N ngược (GDI_{t-2}, GII_{t-1}) hoặc U ngược (FLA_{t-2}). Ở các

nước chất lượng thể chế cao, các quan hệ chữ N (GDI và GII) và chữ N ngược (FLA) chiếm ưu thế. Các nước chất lượng thể chế thấp cho thấy quan hệ dạng chữ U ngược với GDI, trong khi các nước độ mở thương mại cao cho thấy các quan hệ dạng chữ N (GII_t) và chữ N ngược (GII_t-1, FLA). Các nước độ mở thương mại thấp cho thấy các quan hệ dạng chữ N với GDI (t-1) và chữ N ngược với GII (t-1).

7.1.3.2. Tác động trực tiếp của tự do hóa thương mại đến bình đẳng giới

Tự do hóa thương mại thúc đẩy nhất quán bình đẳng giới trên phạm vi toàn thế giới bằng cách tăng GDI và FLA, đồng thời giảm GII. Trong bối cảnh chất lượng thể chế cao hoặc độ mở thương mại cao, tự do hóa thương mại làm tăng FLA và giảm GII nhưng cản trở GDI. Các nước chất lượng thể chế thấp cho thấy thương mại cải thiện FLA và giảm GII, trong khi các nước độ mở thương mại thấp hưởng lợi từ việc giảm thiểu GII nhờ vào tự do hóa thương mại.

7.1.3.3. Tác động trực tiếp của chất lượng thể chế đến bình đẳng giới

Toàn cầu: GVE làm giảm GDI; COC, GVE, POS, REQ và VAC giảm nhẹ GII; COC tăng FLA, trong khi POS, REQ và ROL hạn chế FLA. **Các nước chất lượng thể chế cao:** COC, GVE và ROL cản trở GDI; COC và REQ hạ thấp GII, trong khi ROL làm tăng GII; POS và VAC thúc đẩy FLA, trong khi COC và ROL hạn chế FLA. **Các nước chất lượng thể chế thấp:** GVE và REQ cản trở GDI, trong khi ROL thúc đẩy GDI; COC, GVE và REQ hạ thấp GII, trong khi POS làm tệ hơn GII; COC và VAC thúc đẩy FLA, trong khi POS, REQ và ROL hạn chế FLA. **Các nước độ mở thương mại cao:** COC cản trở GDI, trong khi GVE, POS và ROL cải thiện GDI; COC, GVE và VAC làm giảm GII; COC và VAC tăng cường FLA, trong khi GVE và POS hạn chế FLA. **Các nước độ mở thương mại thấp:** GVE và POS cản trở GDI, trong khi ROL và VAC tăng cường GDI; GVE, POS, REQ, ROL và VAC giảm nhẹ GII; COC và VAC tăng cường FLA, trong khi POS, REQ và ROL hạn chế FLA.

7.1.3.4. Tác động điều tiết của tự do hóa thương mại đến các mối quan hệ bình đẳng giới-thể chế

Toàn cầu: Độ mở thương mại tạo điều kiện cho POS thúc đẩy GDI nhưng kích hoạt POS, ROL, VAC làm tăng GII và khiến cho tất cả khía cạnh thể chế cản trở FLA. **Các nước chất lượng thể chế cao:** Độ mở thương mại hỗ trợ POS và VAC thúc đẩy GDI, cùng COC và REQ giảm nhẹ GII, nhưng cản trở FLA. **Các nước chất lượng thể chế thấp:** Độ mở thương mại giúp COC thúc đẩy GDI nhưng kích hoạt POS cản trở GDI, kích hoạt COC, GVE, REQ, ROL và VAC làm tăng GII, và có tác động hỗn hợp đến FLA (hỗ trợ POS/ROL; cản trở GVE/VAC).

7.1.3.5. Tác động điều tiết của chất lượng thể chế đến các mối quan hệ bình đẳng giới-tự do hóa thương mại

Toàn cầu: GVE, REQ, và VAC hỗ trợ mở cửa thương mại thúc đẩy FLA. **Các nước độ mở thương mại cao:** COC hỗ trợ mở cửa thương mại thúc đẩy GDI (trong khi GVE, POS và REQ gây cản trở); ROL hỗ trợ mở cửa thương mại giảm nhẹ GII (trong khi POS làm tệ hơn); GVE và REQ hỗ trợ mở cửa thương mại thúc đẩy FLA (trong khi COC, POS, ROL, và VAC gây cản trở). **Các nước độ mở thương mại thấp:** COC, GVE, POS và REQ hỗ trợ mở cửa thương mại thúc đẩy GDI; POS và VAC hỗ trợ mở cửa thương mại giảm nhẹ GII (trong khi GVE kích hoạt tác động làm tệ hơn); COC, GVE, REQ, và VAC hỗ trợ mở cửa thương mại thúc đẩy tăng trưởng FLA (trong khi ROL gây cản trở).

7.1.4. Về tiếp cận Đường cong Kuznets về Môi trường dựa trên Mở cửa thương mại đối với mối quan hệ giữa chất lượng môi trường, thương mại, và chất lượng thể chế

7.1.4.1. Tác động trực tiếp của tự do hóa thương mại đến chất lượng môi trường

Trên quy mô toàn cầu, tự do hóa thương mại có quan hệ dạng chữ U với phát thải CO₂ ở các biên mở cửa thương mại hiện tại và trở bậc một. Tại **các nước chất lượng thể chế cao,** quan hệ này là dạng chữ U

ngược ở biên hiện tại và trở bậc một, nhưng là dạng chữ U ở biên trở bậc hai. **Các nước chất lượng thể chế thấp** nhất quán cho thấy quan hệ dạng chữ U (biên hiện tại và trở bậc hai). **Các nước độ mở thương mại cao** cho thấy quan hệ dạng chữ U ngược (biên trở bậc một), còn **các nước độ mở thương mại thấp** cho thấy quan hệ chữ U lúc đầu (biên hiện tại) rồi sau đó đến dạng chữ U ngược (biên trở bậc một).

7.1.4.2. Tác động trực tiếp của chất lượng thể chế đến chất lượng môi trường

Ở quy mô toàn cầu, chỉ có VAC cải thiện đáng kể môi trường nhờ giảm phát thải CO₂. Tại **nước chất lượng thể chế cao**, ROL giảm phát thải, trong khi COC, GVE, POS, và VAC làm tăng phát thải. **Nước chất lượng thể chế thấp** cho thấy tác động gần tương tự: ROL giảm phát thải, còn COC, POS, và VAC làm tăng phát thải. Tại **nước độ mở thương mại cao**, COC và GVE làm tăng phát thải. Tại **nước độ mở thương mại thấp**, COC tăng phát thải, nhưng GVE và ROL giúp giảm phát thải hiệu quả.

7.1.4.3. Tác động điều tiết của chất lượng thể chế đến mối quan hệ môi trường-tự do hóa thương mại

Ở phạm vi toàn cầu, COC, POS, REQ, và ROL giúp mở cửa thương mại giảm phát thải CO₂ giai đoạn đầu tự do hóa nhưng kích hoạt mở cửa thương mại làm gia tăng phát thải CO₂ khi tự do hóa nhiều hơn. Sự chuyển dịch này cũng xảy ra tại **nước độ mở thương mại cao** thông qua các khía cạnh COC, GVE, POS, và ROL. Đặc biệt, ở **nước độ mở thương mại thấp**, cả sáu chỉ số thể chế lúc đầu giúp mở cửa thương mại cải thiện môi trường (giảm phát thải CO₂) nhưng sau đó lại kích hoạt mở cửa thương mại làm gia tăng phát thải CO₂ (làm tệ hơn chất lượng môi trường) ở các giai đoạn tự do hóa sâu rộng hơn.

7.2. Hàm ý chính sách

7.2.1. Hàm ý từ mối quan hệ giữa thương mại song phương, bình đẳng giới, và chất lượng thể chế

7.2.1.1. Tác động trực tiếp của bình đẳng giới đến thương mại song phương

Để tăng xuất khẩu, các nước nên đầu tư vào bình đẳng giới và phúc lợi phụ nữ, nhất là ở các ngành xuất khẩu chủ lực. Giảm bất bình đẳng giới cũng giúp giảm nhập khẩu và thâm hụt thương mại. **Nước thể chế cao** nên ưu tiên chính sách bình đẳng giới và tăng cường tham gia lao động của nữ giới khi giao thương với đối tác có cùng trình độ thể chế; **nước thể chế thấp** nên tập trung tăng cường và củng cố chỉ số phát triển giới. Với **các đối tác có chất lượng thể chế khác biệt**, chính sách củng cố chỉ số phát triển giới giúp tăng xuất khẩu và giảm nhập khẩu.

7.2.1.2. Tác động điều tiết của chất lượng thể chế đến mối quan hệ giữa thương mại song phương và bình đẳng giới

Với xuất khẩu, tăng COC, GVE hoặc VAC kích hoạt hiệu ứng cản trở thương mại của GDI; cải thiện COC, REQ hoặc VAC kích hoạt hiệu ứng thúc đẩy thương mại của GII. IQ tổng thể cao kích hoạt hiệu ứng cản trở thương mại của FLA. Với nhập khẩu, COC, GVE và REQ kích hoạt hiệu ứng cản trở thương mại của GDI, dù POS lại kích hoạt tác động thúc đẩy thương mại của GDI. Cải thiện COC và VAC kích hoạt hiệu ứng thúc đẩy thương mại của GII. Sau cùng, COC kích hoạt tác động thúc đẩy thương mại của FLA, còn POS và VAC kích hoạt tác động cản trở thương mại của FLA.

7.2.2. Hàm ý từ mối quan hệ giữa thương mại song phương, chất lượng môi trường, và chất lượng thể chế

7.2.2.1. Tác động trực tiếp của chất lượng môi trường đến thương mại song phương

Kết quả cho thấy phát thải CO₂ thúc đẩy thương mại song phương, vì vậy chính sách không nên ưu tiên các lợi ích kinh tế hơn sự bền vững. Các nước tăng trưởng dựa trên xuất khẩu cần đặc biệt tránh đánh đổi mục tiêu môi trường lấy tăng trưởng nóng về kinh tế và thương mại.

7.2.2.2. Tác động trực tiếp của chất lượng thể chế đến thương mại song phương (dựa trên kết quả nhất quán giữa Chương 3 và 4)

Trong quan hệ đối tác thể chế cao-cao, GVE thúc đẩy xuất khẩu, nhưng POS tăng nhập khẩu và VAC giảm xuất khẩu đồng thời tăng nhập khẩu gây thâm hụt thương mại; chính sách tăng cường GVE phải đảm bảo xuất khẩu vượt nhập khẩu. Với **cặp đối tác thể chế thấp-thấp**, POS và REQ giúp giảm nhập khẩu và cải thiện thâm hụt thương mại. Ở **các quan hệ đối tác có thể chế khác biệt**, GVE và ROL thúc đẩy xuất khẩu, đồng thời GVE cũng giảm nhập khẩu giúp củng cố cán cân thương mại.

7.2.2.3. Tác động điều tiết của chất lượng thể chế đến mối quan hệ giữa thương mại song phương và chất lượng môi trường

Việc nâng cao COC, GVE, REQ, ROL hoặc IQ tổng thể khiến phát thải CO₂ làm tăng nhập khẩu, trong khi POS tốt hơn dẫn đến phát thải CO₂ kéo giảm nhập khẩu. Do đó, nhóm các khía cạnh thể chế đầu sẽ thúc đẩy các quốc gia phát thải cao tăng nhập khẩu, còn POS sẽ giúp họ giảm sự phụ thuộc vào nhập khẩu.

7.2.3. Hàm ý từ mối quan hệ giữa bình đẳng giới, tự do hóa thương mại, và chất lượng thể chế

7.2.3.1. Tác động trực tiếp của tự do hóa thương mại đến bình đẳng giới

Nhìn chung, chính sách tự do hóa thương mại thường thúc đẩy tỷ lệ tham gia lực lượng lao động của nữ giới và giảm bất bình đẳng giới. Tuy nhiên, tại **các nước có thể chế và độ mở thương mại cao**, nó có thể nói rộng khoảng cách phúc lợi giới và làm suy yếu sự phát triển. Do đó, các khung thương mại bao trùm và biện pháp bảo vệ đặc thù giới là thiết yếu để đảm bảo lợi ích được phân phối công bằng.

7.2.3.2. Tác động trực tiếp của chất lượng thể chế đến bình đẳng giới

Tác động chính sách thay đổi theo bối cảnh cụ thể. Ở **nước thể chế cao**, tăng cường COC, GVE và ROL có thể làm trầm trọng chênh lệch phát triển con người (GDI), dù COC và REQ giúp cải thiện bất bình đẳng giới (GII). Tại **nước thể chế thấp**, ROL nâng cao GDI, còn COC, GVE và REQ giảm thiểu GII. Về thị trường, **nước độ mở thương mại cao** hưởng lợi từ GVE, POS và ROL để cải thiện GDI; trong khi **nước độ mở thương mại thấp** dựa vào ROL và VAC cho các mục tiêu này. Trong hầu hết các bối cảnh, COC và VAC thúc đẩy tham gia lao động nữ (FLA), còn POS, REQ và ROL lại gây cản trở.

7.2.3.3. Tác động điều tiết của tự do hóa thương mại đến các mối quan hệ bình đẳng giới-thể chế

Ở **nước thể chế cao**, tự do hóa thương mại nên kết hợp cùng POS, VAC, COC và REQ để tối đa hóa GDI và giảm GII, dù cần chuẩn bị cho khả năng sụt giảm của FLA. Ở **nước thể chế thấp**, cần cực kỳ thận trọng; hội nhập toàn cầu sâu hơn có thể kích hoạt các hiệu ứng thể chế (COC, GVE, POS, REQ, ROL và VAC) vô tình gây tổn hại bình đẳng giới.

7.2.3.4. Tác động điều tiết của chất lượng thể chế đến các mối quan hệ bình đẳng giới-tự do hóa thương mại

Tại **nước độ mở thương mại cao**, COC hỗ trợ tác động tích cực của thương mại tới GDI, còn GVE, POS và REQ gây cản trở. ROL hỗ trợ mở cửa thương mại giảm GII, nhưng POS có thể làm tình hình trở nên tệ hơn. Ngoài ra, GVE và REQ hỗ trợ mở cửa thương mại thúc đẩy FLA, trong khi COC, POS, ROL và VAC kích hoạt hiệu ứng cản trở FLA. Ở **nước độ mở thương mại thấp**, COC, GVE, POS và REQ hỗ trợ mở cửa thương mại làm tăng GDI. Dù GVE có thể khiến mở cửa thương mại làm tệ hơn GII, POS và VAC hỗ trợ mở cửa thương mại giảm thiểu GII. Cuối cùng, COC, GVE, REQ và VAC hỗ trợ mở cửa thương mại gia tăng sự tham gia của lao động nữ, trong khi ROL lại cản trở mở cửa thương mại gia tăng FLA.

7.2.4. Hàm ý từ mối quan hệ giữa chất lượng môi trường, tự do hóa thương mại, và chất lượng thể chế

7.2.4.1. Tác động trực tiếp của tự do hóa thương mại đến chất lượng môi trường

Tại *nước có chất lượng thể chế và độ mở thương mại thấp*, quan hệ CO₂-thương mại dạng chữ U đòi hỏi kết hợp mở rộng giao thương với quy định môi trường chặt chẽ để ngăn phát thải tăng theo quy mô thương mại. Ở *nước có chất lượng thể chế và độ mở thương mại cao*, tồn tại mối quan hệ dạng chữ U ngược; các nước này nên kết hợp tự do hóa thương mại với cải cách thể chế toàn diện để nhanh chóng vượt qua giai đoạn ô nhiễm cao ban đầu.

7.2.4.2. Tác động trực tiếp của chất lượng thể chế đến chất lượng môi trường

Nhìn chung, chính sách gia tăng VAC giúp giảm phát thải CO₂ nhờ gia tăng áp lực công luận lên các bên gây ô nhiễm. Tuy nhiên, các cải thiện khía cạnh thể chế khác thường làm tăng phát thải: COC và POS thường thúc đẩy phát thải CO₂ tại *cả nước thể chế cao và thấp*, dù ROL có thể làm giảm. Tương tự, COC tăng phát thải ở *mọi mức độ mở cửa thương mại (cao và thấp)*, còn GVE và ROL giúp giảm phát thải CO₂ riêng tại *nước độ mở thương mại thấp*. Do đó, cải cách thể chế phải chú trọng các tác động đến môi trường để tránh những hệ quả tiêu cực không mong muốn.

7.2.4.3. Tác động điều tiết của chất lượng thể chế đến mối quan hệ môi trường-tự do hóa thương mại

Tại *nước độ mở thương mại cao*, cải thiện COC, GVE, POS và ROL giai đoạn đầu giúp mở cửa thương mại kiềm chế phát thải CO₂. Ở giai đoạn sau, các tiến bộ này cần đi kèm chính sách môi trường nghiêm ngặt để đối phó tác động tăng phát thải. *Nước độ mở thương mại thấp* nên cải thiện mọi khía cạnh thể chế ở giai đoạn đầu, nhưng song song đó điều này phải cân bằng với các quy định môi trường nhằm hạn chế gia tăng phát thải do mở cửa thương mại.

7.3. Hạn chế và các hướng nghiên cứu tương lai

Thứ nhất, mô hình trọng lực được ước lượng trên mẫu gồm 32.800 quan sát (41 quốc gia trong 20 năm); việc mở rộng đòi hỏi xử lý dữ liệu thương mại bằng không. *Thứ hai*, dù phát thải CO₂ là đại diện tiêu chuẩn, các biến như PM2.5 hoặc dấu chân sinh thái được khuyến nghị cho nghiên cứu khu vực do dữ liệu toàn cầu thiếu nhất quán và thường không đầy đủ. Các chỉ số về bình đẳng giới (GDI, GII, và FLA) và chất lượng thể chế hiện nay cũng tồn tại hạn chế về phương pháp đo lường và phạm vi áp dụng. *Thứ ba*, về phương pháp, dù dùng DGMM-II và SGMM-II, sai số do biến bị bỏ sót vẫn tồn tại, cần các biến công cụ mạnh hơn. *Thứ tư*, nghiên cứu dùng mô hình GKC và OEKC trong tương lai nên bổ sung thêm các biến vĩ mô khác và ngưỡng điểm đảo chiều. *Thứ năm*, dữ liệu tổng cấp quốc gia thường không phản ánh các hiện tượng và mối quan hệ ở cấp độ vi mô như tại Việt Nam; vì thế, dữ liệu cấp doanh nghiệp hoặc hộ gia đình sẽ giúp phân tích các kênh truyền dẫn tác động hiệu quả hơn. *Cuối cùng*, nghiên cứu tương lai nên thực hiện bổ sung phân tích độ dốc đơn giản để định lượng thống kê tác động điều tiết của các khía cạnh chất lượng thể chế.

7.4. Kết luận

Luận án nghiên cứu mối quan hệ Thương mại-Giới-Môi trường-Thể chế theo Chương trình nghị sự 2030 (SDGs 5, 13, và 17). Qua hai thập kỷ dữ liệu toàn cầu và các ước lượng chặt chẽ (FE, GMM, và PPML), nghiên cứu khẳng định bình đẳng giới và chất lượng môi trường là các yếu tố cốt lõi của lợi thế so sánh. Kết quả nghiên cứu khẳng định sự tồn tại của Đường cong Kuznets về Giới (GKC) và giới thiệu Đường cong Kuznets về Môi trường dựa trên Mở cửa thương mại (OEKC) đánh giá mối quan hệ phi tuyến tính giữa môi trường và mở cửa thương mại. Đóng góp chính của luận án bao gồm phân tích thương mại song phương với yếu tố bình đẳng giới và môi trường, mô hình hóa quan hệ môi trường-tự do hóa thương mại dạng phi tuyến tính, và chỉ rõ các nhân tố điều tiết và bối cảnh trong các mối quan hệ. Sau cùng, luận án khẳng định thể chế

là chất xúc tác then chốt để gắn tăng trưởng kinh tế với công bằng xã hội và bền vững sinh thái, hướng tới nền thương mại xanh và bao trùm hơn.

DANH MỤC CÁC CÔNG BỐ CỦA TÁC GIẢ LIÊN QUAN ĐẾN LUẬN ÁN

TT	Bài báo	Tác giả	Tạp chí/Kỷ yếu (NXB)	Tập, Số, Trang	Năm công bố
1	Trade, gender equality and institutional quality: Evidence from the gravitational approach	Duc Nha Le, Khanh Nam Pham	International Journal of Development Issues, Emerald	Tập 24, Số 1, Trang 106-124	2025
2	Revisiting the Gender Kuznets Curve hypothesis: The role of trade openness and institutional quality	Duc Nha Le, Khanh Nam Pham	The International Conference on Economics, Law and Government (ELG 2025), UEH Publishing House	Trang 54-82	2025

SOCIALIST REPUBLIC OF VIETNAM
Independence – Freedom – Happiness

Ho Chi Minh City, July 30th 2026

CONTRIBUTIONS OF THE DOCTORAL DISSERTATION

Title of the dissertation: The nexus between trade, gender equality, environment, and institution: Insights from the gravitational and Kuznets curve approach

Major: Development Economics

Major Code: 9310105

PhD Candidate: Le Duc Nha

Intake: 2021-1

PhD Host University: University of Economics Ho Chi Minh City (UEH), Vietnam

Academic Supervisor: Assoc. Prof. Dr. Pham Khanh Nam

Theoretical Contributions:

The dissertation generates several primary theoretical advancements by integrating gender, trade, environment, and institution into a single cohesive research framework.

First, it proposes an integrated analytical framework that advances existing theories by exploring the complex trade-gender-environment nexus under the overarching influence of institution. This addresses a notable gap in integrated research that rarely considers these three pillars of sustainability in a single framework.

Second, the dissertation advances the Trade Gravity model by conducting a bilateral analysis of how gender equality and environmental quality influence trade flows from both the exporting and importing perspectives simultaneously. While prior studies predominantly focused on unilateral impacts running from aggregated trade to gender equality and environmental quality, this dissertation establishes that gender-related and environmental factors are critical determinants of national comparative advantage and bilateral trade rather than peripheral concerns.

Third, the dissertation introduces and identifies a new Openness-based Environmental Kuznets Curve (OEKC). Unlike traditional EKC models that focus on per capita GDP as the proxy for economic growth, this new approach shifts the focus to

trade openness dynamics to capture the specific non-linear relationship between trade liberalization and environmental quality. This allows for a direct examination of the U-shaped or inverse U-shaped pattern of environmental degradation as greener technologies are adopted through trade liberalization.

Fourth, the dissertation applies a Gender-driven Kuznets Curve (GKC), which explores the linear and curvilinear relationships between gender equality and income levels within the context of trade and institutions. In addition, the dissertation has explored the impact of trade liberalization on gender equality under the GKC framework.

Fifth, a significant theoretical contribution of the dissertation is the multi-dimensional conceptualization of institutional quality and trade liberalization as both moderating and contextual factors. By moving beyond aggregate indices to analyze six distinct institutional dimensions, the dissertation provides a granular understanding of how specific institutional dimensions shape social and ecological outcomes. This framework enables the identification of contextual effects by categorizing trading relationships and national economies into high or low institutional and openness settings, revealing that the nexuses are not uniform but contingent upon specific socio-political environments. Consequently, the dissertation establishes trade liberalization and institutional quality as critical catalysts that can either facilitate a “race to the top” in social and environmental standards or exacerbate a “race to the bottom” during the process of liberalization.

Practical Contributions:

The practical contributions are contextualized within two strategic dimensions to assist global and national policymakers.

First, for major trading economies, the dissertation provides an evidence-based framework for integrating gender-responsive and environmental mandates into bilateral trade negotiations and national export policies. This ensures that economic growth and liberalization (SDG 17) align with gender equality (SDG 5) and climate action (SDG 13).

Second, on a global scale, the findings offer a tailored roadmap for policymakers to navigate the trade-gender-environment nexus based on their specific degrees of openness and institutional settings. By identifying the critical moderating role of specific institutional dimensions, such as the rule of law in mitigating carbon emissions, the dissertation assists governments in designing targeted institutional reforms.

Furthermore, the dissertation highlights that achieving sustainable development goals necessitates a holistic policy approach where trade and institutional reforms are strategically synchronized. The findings assist national governments in balancing economic incentives with gender inclusion and environmental preservation. Ultimately, these contributions serve as a practical guide for aligning trade liberalization with the 2030 Agenda for Sustainable Development, providing mechanisms to ensure that economic integration serves as a primary engine for positive social and ecological transformation. Through its rigorous multi-method estimation strategy, including combined fixed effects and generalized method of moments, the dissertation provides reliable empirical evidence to support these policy formulations across diverse worldwide economies.

PhD Candidate

Le Duc Nha

CỘNG HÒA XÃ HỘI CHỦ NGHĨA VIỆT NAM
Độc lập – Tự do – Hạnh phúc

TP. Hồ Chí Minh, ngày 30 tháng 07 năm 2026

ĐÓNG GÓP MỚI CỦA LUẬN ÁN TIẾN SĨ

Tựa đề luận án: Mối quan hệ giữa thương mại, bình đẳng giới, môi trường, và thể chế:
Góc nhìn từ tiếp cận mô hình trọng lực và đường cong Kuznets

(The nexus between trade, gender equality, environment, and institution: Insights from the gravitational and Kuznets curve approach)

Chuyên ngành: Kinh tế phát triển

Mã số: 9310105

Nghiên cứu sinh: Lê Đức Nhã

Khóa: 2021 – Đợt 1

Nơi đào tạo tiến sĩ: Đại học Kinh tế Thành phố Hồ Chí Minh (UEH), Việt Nam

Người hướng dẫn khoa học: PGS. TS. Phạm Khánh Nam

Đóng góp về mặt lý thuyết:

Về mặt tổng thể, từ các SDG 5, 13, và 17, luận án đã tích hợp bình đẳng giới, thương mại, môi trường, và thể chế vào một khung nghiên cứu thống nhất.

Thứ nhất, luận án đề xuất một khung phân tích tích hợp giúp phát triển các lý thuyết hiện hữu thông qua việc khám phá mối quan hệ thương mại-giới-môi trường dưới tác động bao trùm của thể chế. Điều này giải quyết khoảng trống đáng kể trong các nghiên cứu tích hợp vốn hiếm khi xem xét ba trụ cột bền vững này trong cùng một khung phân tích.

Thứ hai, luận án đã phát triển mô hình Trọng lực Thương mại bằng cách thực hiện phân tích song phương về tác động của bình đẳng giới và chất lượng môi trường đến các dòng thương mại từ cả hai góc độ nước xuất khẩu và nhập khẩu. Trong khi các nghiên cứu trước đây chủ yếu tập trung vào tác động một chiều từ thương mại đến bình đẳng giới và chất lượng môi trường, luận án đã chỉ ra rằng các yếu tố liên quan đến bình đẳng giới và chất lượng môi trường là những thành tố then chốt quyết định lợi thế so sánh quốc gia và thương mại song phương thay vì các yếu tố hỗ trợ bên ngoài.

Thứ ba, luận án đã đề xuất và kiểm chứng mô hình Đường cong Kuznets Môi trường dựa trên Mở cửa thương mại (OEKC). Khác với các mô hình EKC truyền thống tập trung vào GDP bình quân đầu người như một đại diện cho tăng trưởng kinh tế, cách tiếp cận mới này chuyển trọng tâm sang động lực mở cửa thương mại để nắm bắt mối quan hệ phi tuyến tính cụ thể giữa tự do hóa thương mại và chất lượng môi trường. Điều này cho phép xem xét trực tiếp mối quan hệ môi trường-tự do hóa thương mại dạng chữ U hoặc chữ U ngược khi các công nghệ xanh hơn được áp dụng thông qua tiến trình tự do hóa thương mại.

Thứ tư, luận án áp dụng Đường cong Kuznets về Giới (GKC) để kiểm chứng các mối quan hệ tuyến tính và phi tuyến tính giữa bình đẳng giới và thu nhập trong các bối cảnh tự do hóa thương mại và thể chế khác nhau. Ngoài ra, luận án đã khám phá tác động của tự do hóa thương mại đối với bình đẳng giới trong khung phân tích GKC.

Thứ năm, một đóng góp lý thuyết quan trọng của luận án là việc khái niệm hóa đa chiều chất lượng thể chế và tự do hóa thương mại dưới vai trò vừa là yếu tố điều tiết vừa là yếu tố bối cảnh. Bằng cách vượt ra ngoài các chỉ số tổng hợp để phân tích các khía cạnh chất lượng thể chế riêng biệt, luận án cung cấp cái nhìn chi tiết về cách các khía cạnh thể chế cụ thể định hình các hệ quả xã hội và môi trường. Khung khổ này cho phép xác định các tác động bối cảnh bằng cách phân loại các đối tác thương mại và nền kinh tế quốc gia vào các nhóm chất lượng thể chế và độ mở thương mại cao hoặc thấp, cho thấy các mối quan hệ không đồng nhất mà phụ thuộc vào từng bối cảnh chính trị-xã hội cụ thể. Do đó, luận án đã chỉ ra tự do hóa thương mại và chất lượng thể chế là những chất xúc tác quan trọng có thể thúc đẩy “cuộc đua lên đỉnh” về các tiêu chuẩn xã hội và môi trường hoặc làm trầm trọng thêm “cuộc đua xuống đáy” trong quá trình tự do hóa thương mại ngày càng sâu rộng.

Đóng góp về mặt thực tiễn:

Các đóng góp thực tiễn được đặt trong hai khía cạnh chiến lược nhằm hỗ trợ các nhà hoạch định chính sách quốc gia và toàn cầu.

Thứ nhất, đối với các nền kinh tế quy mô thương mại lớn và tự do hóa năng động, luận án cung cấp một khung phân tích dựa trên bằng chứng thực nghiệm để tích hợp các quy định về bình đẳng giới và bảo vệ môi trường vào các cuộc đàm phán thương

mại song phương và chính sách xuất khẩu quốc gia. Điều này đảm bảo tăng trưởng kinh tế và tự do hóa thương mại (SDG 17) phù hợp với bình đẳng giới (SDG 5) và hành động khí hậu (SDG 13).

Thứ hai, trên quy mô toàn cầu, các kết quả nghiên cứu đưa ra một lộ trình phù hợp để các nhà hoạch định chính sách tác động đến các mối quan hệ thương mại-bình đẳng giới-môi trường dựa trên mức độ mở cửa thương mại và chất lượng thể chế cụ thể. Bằng cách xác định vai trò điều tiết quan trọng của các khía cạnh chất lượng thể chế, chẳng hạn như thượng tôn pháp luật trong việc giảm phát thải carbon, luận án hỗ trợ các chính phủ thực hiện những cải cách thể chế với mục tiêu và ưu tiên rõ ràng và cụ thể hơn.

Hơn nữa, luận án cũng chỉ ra rằng việc đạt được các mục tiêu phát triển bền vững đòi hỏi một cách tiếp cận chính sách toàn diện, nơi các cải cách thương mại và thể chế được đồng bộ hóa một cách chiến lược. Các kết quả nghiên cứu góp phần hỗ trợ chính phủ các nước cân bằng các lợi ích kinh tế với đảm bảo bình đẳng giới và bảo tồn môi trường. Cuối cùng, những kết quả nghiên cứu của luận án này góp phần như một hướng dẫn thực tiễn để gắn kết tự do hóa thương mại với Chương trình Nghị sự 2030 về Phát triển Bền vững, cung cấp các cơ chế để đảm bảo rằng hội nhập kinh tế đóng vai trò là động lực chính cho sự chuyển đổi tích cực về xã hội và môi trường. Thông qua các phương pháp ước lượng cụ thể, bao gồm kết hợp các tác động cố định và phương pháp momen tổng quát, luận án cung cấp bằng chứng thực nghiệm đáng tin cậy để hỗ trợ việc hoạch định chính sách cho các quốc gia.

Nghiên cứu sinh

Lê Đức Nhã