Indonesia's integration into the regional and global economies

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Declaration

I declare that this is my own original work except where otherwise indicated or acknowledged in the thesis.

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Abstract

This study analyses Indonesia's engagement with the regional and global economies in terms of trade and investment. It aims to answer three research questions: 1) What are the impediments to Indonesia's trade flows? 2) Does trade protection applied to Indonesia's manufacturing products have an impact on the export performance in manufacturing sectors? and 3) What factors determine foreign direct investment (FDI) bilateral flows in Indonesia? The gravity model is used to answer these questions. The results show that Indonesia's trade flows are sensitive to trade impediments such as tariffs and non-tariff measures as well as to a lack of trade facilitation measures. Behind-the-border non-tariff measures are found to be particularly harmful to trade flows, while providing better trade facilitations at-the-border such as seaport and time to trade has greater impact on trade flows than that of behind-the-border provisions such as container transportation and shipping. The results also suggest that Indonesia's export measures such as export taxes, export quotas and export licencing requirements are negatively associated with manufacturing exports. This study shows that trade protection remains high in Indonesia due to the increasing use of non-tariff measures (NTMs). Furthermore, the lack of trade facilitation contributes to increasing costs of trade, especially those related to trade logistics and administration (red tape). The proliferation of NTMs and the lack of trade facilitation can inhibit Indonesia's further integration its economy into the regional and global economies. The results of the FDI study show that both horizontal (market access motivation) and vertical FDI (low cost inputs motivation) co-exist in the bilateral aggregate data of Indonesia's FDI flows, but the horizontal FDI appears to be more dominant. The dominance of the horizontal type of FDIs in Indonesia's bilateral FDI flows may deny the country's benefits from vertical FDI gains, which can otherwise help Indonesia to participate more in global production networks and thus create more jobs for the Indonesian workforce. Policy focuses on a reduction in Indonesia's NTMs, improving trade facilitation and encouraging vertical FDI is thus suggested in order to increase Indonesia's trade and FDI flows. If these policies can be consistently conducted, they should become powerful drivers of Indonesia's participation in the regional and global economies.

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List of Abbreviations

AANZFTA	ASEAN-Australia-New Zealand Free Trade Area
ABB	At the Border Barriers
ACTA	Anti-Counterfeiting Trade Agreement
ADB	Asian Development Bank
AVE	Ad-Valorem Equivalents
AEC	ASEAN Economic Community
AFTA	ASEAN Free Trade Area
AHS	Effectively Applied Tariff
APEC	Asian Pacific Economic Cooperation
AR	Autoregressive
ARIC	Asia Regional Integration Centre
BBB	Behind the Border Barrier
BKPM	*Badan Koordinasi Penanaman Modal* (Indonesian Investment Board)
BLUE	Best Linear Unbiased Estimator
BPS	*Badan Pusat Statistik* (Indonesian Statistics Agency)
CEPII	*Centre d'Etudes Prospectives et d'Informations Internationales*
CEPT	Common Effective Preferential Tariff
CES	Constant Elasticity of Substitution
CET	Common External Tariff
CU	Custom Union
Comtrade	Commodity Trade Statistics Database
DBI	Doing Business Index
DiD	Difference in Difference
EEC	European Economic Community
EFI	Economic Freedom Index
EFTA	European Free Trade Area
EU	European Union
FDI	Foreign Direct Investment
FE	Fixed Effects

FGLS	Feasible Generalized Least Square
FTA	Free Trade Agreement
GATT	General Agreement on Tariffs and Trade
GCI	Global Competitiveness Index
GDP	Gross Domestic Product
GMM	Generalised Method of Moments
GPA	Agreement on Government Procurement
GPML	Gamma Pseudo-Maximum-Likelihood
GPN	Global Production Networks
GTA	Global Trade Alert
GSTP	Global System of Trade Preferences among Developing Countries
HKTDC	Hong Kong Trade Development Council
HS	Harmonised System
IA-CEPA	Indonesia-Australia Comprehensive Economic Partnership
ICRG	International Country Risk Guide
IJ-CEP	Indonesia-Japan Comprehensive Economic Partnership
INSW	Indonesian National Single Window
IPR	Intellectual Property Right
ITA	Information Technology Agreement
KC	Knowledge-Capital
KPC	Knowledge-Physical-Capital
KPMG	*Klynveld Peat Marwick Goerdele*
LADIHKI	Intellectual Property Data and Information Service System (LADIHKI)
LPI	Logistic Performance Index
Malari	*Malapetaka Lima Belas Januari 1974* (Indonesian political chaos event)
MFN	Most-Favoured-Nation
MNE	Multinational National Enterprise
MP-CEPA	Malaysia-Pakistan Closer Economic Partnership Agreement
MR	Multilateral Resistance
NAFTA	North American Free Trade Agreements
NLS	Non-Linear Square
NTB	Non-Tariff Barriers

NTM	Non-Tariff Measures
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Squares
PPML	Pseudo-Poisson Maximum Likelihood
PPP	Public-Private Partnership
PTA	Preferential Trade Arrangement
PwC	PricewaterhouseCoopers
RCEP	Regional Comprehensive Economic Partnerships
RE	Random Effects
ROO	Rules of Origin
RPN	Regional Production Network
RTA	Regional Trade Agreement
SITC	Standard International Trade Classification
SNI	*Standar Nasional Indonesia* (Indonesian National Standard)
SPS	Sanitary and Phytosanitary
TBT	Technical Barriers to Trade
TFA	Trade Facilitation Agreement
TFM	Trade Facilitation Measure
TPP	Trans-Pacific Partnership
TRAINS	Trade Analysis Information System
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UNCTADStat	United Nations Conference on Trade and Development Statistic
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNMAST	United Nations-Multi-Agency Support Team
UK	United Kingdom
US	United States
WDI	World Development Indicator
WEF	World Economic Forum
WGI	Worldwide Governance Indicator
WITS	World Integrated Trade Solution
WTO	World Trade Organization

VIF	Variance Inflation Factor

Chapter 1: Introduction

1.1 Why is economic integration important for Indonesia?

Balassa (1961) defines economic integration as 'both a process and state of affairs' (p.1). A process means 'measures designed to abolish discrimination between economic units belonging to different national states, while a state of affairs is absence of various forms of discrimination between national economies' (p.1). Balassa (1976) explains that there are five stages of economic integration: a free trade area, a custom union, a common market, an economic union, and complete economic integration. We will discuss further these stages of economic integration in Chapter 3. Economic integration has become an important driver of global economy, especially over the last three decades. It has enabled countries, especially the developing ones, to benefit from more trade and investment flows, allowing higher economic growth and hence helping eradicate poverty, and the ability to specialize in comparative advantage.

Armstrong and Rahardja (2014) point out that economic integration can help Indonesia to restructure the economy and increase its growth potential. They also note that Indonesia's commitments in economic integration can help this country to reinforce domestic reforms and make itself more competitive. Economic integration can increase the participation of Indonesia in regional and global production networks (Lipsey and Sjoholm, 2010; Armstrong and Rahardja, 2014). Being involved in regional and global production networks allows Indonesia to specialize more and realize its trade potential derived from its underlying comparative advantage (Armstrong and Rahardja, 2014). Economic integration also helps Indonesia to reduce its tariff protections, improve its trade facilitation and increase its investment climate (Pangestu and Ing, 2016; Pangestu and Armstrong, 2017).

Indonesia under Joko Widodo's administration also sees the importance of economic integration for Indonesia's economy and sets the priorities for expansion its economic integration agenda. The Indonesian government concluded the Indonesia-Australia Comprehensive Economic Partnership (IA-CEPA) in 2019 and it entered into force on 5 July 2020. This bilateral economic integration increasingly reinforces economic cooperation

between the two countries. Prior to the IA-CEPA, Indonesia and Australia have conducted economic cooperation through the Asian Pacific Economic Cooperation (APEC) that established in 1994 and the ASEAN-Australia-New Zealand Free Trade Area (AANZFTA) that concluded in 2009. The Indonesian government also has a short-term target to conclude trade pacts with the European Union. Indonesia also actively participates in Regional Comprehensive Economic Partnerships (RCEP) negotiation. By expanding its trade agreements, Indonesia firmly intends to gain more from economic integration.

On the other hand, the Jokowi administration has faced global economic uncertainty such as the Brexit phenomenon and Donald Trump being the President of the USA in 2016. The USA under the Trump government canceled a mega multilateral partnership in the first year of the presidency, the Trans-Pacific Partnership (TPP). Trump has also been in a trade dispute with China since 2018. The British exit from the European Union (EU) eventually took effect on 31 January 2020[1] and now supports an inward-looking policy. Another external factor that can also influence Indonesia's economy is economic slowdown in China where growth continued to fall from 6.4% in 2018 to 6% in 2019.[2]

On one hand, the inward-looking policy that has been implemented by the USA and the British and the economic slowdown in China might adversely affect Indonesia's trade and investment. On the other hand, it can give a great opportunity for Indonesia to increasingly engage with economic integration in its own region, which is among the most dynamic globally. An economic integration scheme can be used by Indonesia as a major vehicle to access a greater market and further realize its comparative advantage. The expansion of economic integration with more countries and regions could diversify Indonesia's exports and attract more FDI from a variety of resources.

1.2 A review of Indonesia's economic integration

Like the other emerging countries in East Asia, Indonesia participates in various types of economic integration: unilateral, bilateral, regional, and multilateral/global. The Indonesian

[1] On 31 January 2020, the UK entered a transition period, scheduled to complete on 31 December 2020, to allow enough time to agree to the terms of a new trade deal (as reported by the BBC news, 30 December 2020, available at: https://www.bbc.com/news/uk-politics-32810887).
[2] We do not discuss the effect of the Covid-19 in this study since our research has started long before Covid-19 outbreak.

government sees integration platforms as opportunities for the country to further expand its trade and investment growth. However, each mode of economic integration has advantages and disadvantages.

Indonesia has been a General Agreement on Tariffs and Trade (GATT) member since 1950 and has had automatic the membership of the World Trade Organization (WTO) since its establishment in 1995. The WTO has played a vital role in transforming emerging nations from economic autarky to economic openness. The participation of countries in the WTO implies that those countries have a strong inclination to further integrate their economies into the regional and global economies (Molders and Volz, 2011). However, the main issue of multilateral economic integration through the WTO was the slow progress of multilateral trade negotiation for over many years since the Doha Round in 2001.

Unilateral liberalization is key for Indonesia to keep its trade and investment regime open to the regional and the global economies. Indonesia has thus been implementing unilateral liberalization to restructure its domestic economy since the late 1960s. Patunru and Rahardja (2015) emphasize that unilateral liberalization had helped Indonesia in dealing with the significant drop in oil revenue in the 1980s and with the Asian financial crisis in the late 1990s. Unilateral liberalization played an important role at that time in restoring Indonesia's economy after being hit by these two crisis events. Unilateral liberalization also fits with the Bogor Goal developed by APEC that recommends voluntary action from each member to remove its trade impediments and investment restrictions.

Damuri (2012) suggests that reciprocal integration agreements at bilateral, regional or multilateral levels are more suitable in obtaining efficient results of trade flows, especially for Indonesia. Damuri's argument (2012) is based on the situation where a series of unilateral liberalizations successfully worked when Indonesia faced and then overcame crisis in the early 1980s and the late 1990s but diminished when the economy growth peaked at around 8%. This is in line with a 'Sadli's law' that the good policy happened when Indonesia deals with crisis, the bad policy comes up when Indonesia in a good economic circumstance (Patunru and Rahardja, 2015; Basri and Rahardja, 2012).

Indonesia has a bilateral FTA with Japan that has been in effect since 2008. The current Indonesia-Japan Comprehensive Economic Partnership (Indonesia-Japan CEP) provides an advantage for Indonesia to access Japan's market widely with low costs. However, in practice, Indonesia's goods failed to meet Japan's standards (Damuri, 2014). Indonesia's bilateral FTA with Pakistan came into force in 2013. Indonesia's main trade interest in this case is accessing Pakistan's market with its palm oil goods via FTA, competing with Malaysia's palm oil, which already enjoyed Pakistan's market since 2008 through the Malaysia-Pakistan Closer Economic Partnership Agreement (MP-CEPA).

The latest Indonesian bilateral FTA is with Australia. Indonesia and Australia ratified the Indonesia-Australia Comprehensive Economic Partnership Agreement (IA-CEPA) in February 2020 and it came into effect in July 2020. With respect to trade, Indonesia will eliminate 10,813 tariff lines of import goods from Australia. As a result, Australia will gain the benefit of preferential tariff rates for feed grains, citrus fruits, dairy, carrots and potatoes, sheep meat, frozen beef, and live cattle. Australia will impose zero percent tariff to eliminate 6,474 tariff lines of import goods from Indonesia. Indonesia will enjoy zero tariff rates for various sectors such as automotive (electric and hybrid cars), textiles, textiles products, rubber products, communication equipment, machinery, pharmaceutical products, food and beverages, electronics and e-commerce.

In addition, Indonesia is engaged in negotiations of bilateral FTAs with Turkey, Peru, Colombia European Union, South Korea and many other countries (see Table 1.1). Expanding economic integration through bilateral FTA may reduce Indonesia's tariffs protection and non-tariff measures (NTMs) but this can also contribute to the 'spaghetti bowl' effect to some extent (Petri, 1997). When nations join with multiple free trade agreements at bilateral and regional levels, they will deal with different rules of origin (ROO). The ROO is that every good that flows within free trade areas must originate from members with specific criteria and specification according to agreements. These different ROOs can be crisscrossing each other, inducing the 'spaghetti bowl' effect. We will discuss this effect in more details in Chapter 3.

In the Southeast Asian region, Indonesia played a significant role by initiating the ASEAN Free Trade Area (AFTA) in 1992. Indonesia also played a crucial part in transforming AFTA

into the ASEAN Economic Community (AEC) that was enforced at the end of 2015. The AEC aims to create ASEAN as a single production base and market. The AEC incorporates ten members, an area which provides an enormous market for trade transactions. Indonesia also made an active contribution toward the 1994 Bogor meeting that created the 'Bogor Goal' as a baseline for Asian-Pacific Economic Cooperation (APEC) to liberalize trade and investment among 21 members. Indonesia is a member of the ASEAN plus scheme, that is the ASEAN plus three (China, Japan, and South Korea) and the ASEAN plus one with China, India, Japan, Korea, Australia, and New Zealand. Indonesia also participates in negotiating the mega-RTA RCEP. The RCEP expects to integrate markets in Southeast Asia, East Asia, Australia, and New Zealand. Table 1.1 provides all Indonesia's economic integration agreements that have been in effect, in negotiations and proposed/under consultation and study.

Table 1.1 Indonesia's economic integration agreements

Country	Economic integration agreements (bilateral, regional, and multilateral)	Status	Year
Indonesia	Asian Pacific Economic Cooperation (APEC)	Signed and In Effect	1989
Indonesia	Global System of Trade Preferences-UNCTAD	Signed and In Effect	1989
Indonesia	ASEAN Free Trade Area	Signed and In Effect	1993
Indonesia	World Trade Organization (WTO)	Signed and In Effect	1995
Indonesia	Indonesia-United States Free Trade Agreement	Proposed/Under consultation and study	1997
Indonesia	East Asia Free Trade Area (ASEAN+3)	Proposed/Under consultation and study	2004
Indonesia	ASEAN-People's Republic of China Comprehensive Economic Cooperation Agreement	Signed and In Effect	2005
Indonesia	Comprehensive Economic Partnership for East Asia (CEPEA/ASEAN+6)	Proposed/Under consultation and study	2005
Indonesia	ASEAN-Republic of Korea Comprehensive Economic Cooperation Agreement	Signed and In Effect	2007
Indonesia	ASEAN-Japan Comprehensive Economic Partnership	Signed and In Effect	2008
Indonesia	Indonesia-Japan Economic Partnership Agreement	Signed and In Effect	2008
Indonesia	ASEAN-Pakistan Free Trade Agreement	Proposed/Under consultation and study	2009
Indonesia	ASEAN-Australia and New Zealand Free Trade Agreement	Signed and In Effect	2010
Indonesia	ASEAN-India Comprehensive Economic Cooperation Agreement	Signed and In Effect	2010
Indonesia	India-Indonesia Comprehensive Economic Cooperation Arrangement	Negotiations launched	2011
Indonesia	Indonesia-Taipei, China FTA	Proposed/Under consultation and study	2011
Indonesia	Preferential Tariff Arrangement-Group of Eight Developing Countries	Signed and In Effect	2011
Indonesia	Indonesia-Republic of Korea Free Trade Agreement	Negotiations launched	2012
Indonesia	Indonesia-Pakistan Free Trade Agreement	Signed and In Effect	2013
Indonesia	Regional Comprehensive Economic Partnership	Negotiations launched	2013
Indonesia	Free Trade Area of the Asia Pacific	Proposed/Under consultation and study	2014
Indonesia	Indonesia-Peru FTA	Proposed/Under consultation and study	2014
Indonesia	Trade Preferential System of the Organization of the Islamic Conference	Signed but not yet In Effect	2014
Indonesia	ASEAN-EU Free Trade Agreement	Proposed/Under consultation and study	2015
Indonesia	ASEAN-Eurasian Economic Union Free Trade Agreement	Proposed/Under consultation and study	2016
Indonesia	Indonesia-Eurasian Economic Union	Proposed/Under consultation and study	2016
Indonesia	Indonesia-European Union Comprehensive Economic Partnership Agreement	Negotiations launched	2016
Indonesia	Indonesia-Ukraine Free Trade Agreement	Proposed/Under consultation and study	2016
Indonesia	ASEAN-Canada FTA	Proposed/Under consultation and study	2017
Indonesia	Indonesia-Nigeria Preferential Trade Agreement	Proposed/Under consultation and study	2017
Indonesia	Indonesia-Turkey FTA	Negotiations launched	2017
Indonesia	Indonesia-European Free Trade Association Free Trade Agreement	Signed but not yet In Effect	2018
Indonesia	Indonesia-Gulf Cooperation Council Free Trade Agreement	Proposed/Under consultation and study	2018
Indonesia	Indonesia-Kenya Free Trade Agreement	Proposed/Under consultation and study	2018
Indonesia	Indonesia-South Africa Free Trade Agreement	Proposed/Under consultation and study	2018
Indonesia	Indonesia-Sri Lanka Free Trade Agreement	Proposed/Under consultation and study	2018
Indonesia	Indonesia-Tunisia Preferential Trade Agreement	Negotiations launched	2018
Indonesia	ASEAN-Hong Kong, China Free Trade Agreement	Signed and In Effect	2019
Indonesia	Indonesia-Chile Free Trade Agreement	Signed and In Effect	2019
Indonesia	Indonesia-Colombia Free Trade Agreement	Proposed/Under consultation and study	2019
Indonesia	Indonesia-Morocco Preferential Trade Agreement	Negotiations launched	2019
Indonesia	Indonesia-Mozambique Free Trade Agreement	Signed but not yet In Effect	2019
Indonesia	Australia-Indonesia Comprehensive Economic Partnership Agreement	Signed and In Effect	2020

Source: ARIC ADB, WTO, and UNCTAD.

Engaging more with a variety of economic integration agreements helped Indonesia to expand its trade. For instance, the value of Indonesia's trade (exports plus imports)

increased around seven-fold from USD 54.3 billion in 1990 to USD 372 billion in 2019.[3] This number indicates that Indonesia's trade scales were vast and significant to economic integration agreements in the last two decades.

1.3 Major impediments to Indonesia's economic integration

Empirical evidence (which will be discussed in detail in Chapter 2) suggests that trade and FDI has helped Indonesia improve its manufacturing sectors, create more jobs, upgrade technology, increase income per capita, and attain higher economic growth. Trade and FDI, in particular, can lead Indonesia to further engage its economy in the regional and the global economies. Indonesia also actively participates in economic integration. However, it is not easy for Indonesia to exploit the potentials of open economy strategy through economic integration due to obstacles faced by its trade and FDI flows.

Even though tariff rates in Indonesia have been lower[4], protection in general has been rising again, mostly in the form of non-tariff measures. Pangestu et al. (2015) argue that trade protection is rising in Indonesia's international trade policy due to a sharp decline in world commodity prices and at the same time as defending local firms from tight international competition. Furthermore, the 20th report of the Global Trade Alert (2016) shows that the Jokowi government had implemented a number of 'red measures'[5] that increased significantly from 181 in 2014 to 226 in 2015, rising to 241 in 2016. The recent update of the GTA database showed that 968 tariff lines, 53 sectors, and 190 trading partners have been affected by the red measures of Indonesia's trade protection policy.[6]

Table 1.1 shows that during 2008-2016 the most used form of trade protection in Indonesia were non-tariff barriers (NTBs). Indonesia has applied 23 NTBs over this period. This number is the highest among its peers. Marks (2015) and Patunru and Rahardja (2015) discuss how the sources of Indonesia's NTBs mostly come from the requirements for pre-shipment, licences, permits, new labeling, letters of credit, quarantine costs and documentation costs.

[3] Author's calculation based on the WDI database compiled by the World Bank.
[4] Indonesia's MFN tariffs on simple average for all products have decreased significantly from 15.3% in 1995 to 6.9% in 2014 (WDI, World Bank, and WTO, 2016), while Indonesia's preferential tariffs, particularly with ASEAN integration, 99.5% of tariff lines have been down almost zero.
[5]The 'red' here refers to measure that has been implemented and almost certainly discriminates against foreign commercial interests (http://www.globaltradealert.org, accessed 12 June 2017).
[6] The latest accessed to the GTA database on 12 June 2017.

The lack of bureaucratic coordination among ministries and the rigid procedures also contribute to Indonesia's NTBs. Another important issue for Indonesia's trade protection is high export taxes or restrictions. Indonesia has realized 22 export taxes or restrictions. It is also the highest in comparison with Malaysia, Singapore, Thailand, China, and South Korea. On the other hand, Indonesia has implemented 14 local content requirements, higher than those of Malaysia, China, and South Korea.

Table 1.2 Trade protection in 'red' measures, 2008-2016

	Number of Implemented Measures (red)					
Measure Type	**Indonesia**	**Malaysia**	**Thailand**	**Singapore**	**China**	**South Korea**
Bail out / state aid measure	17	3	3	5	13	10
Competitive devaluation	0	0	0	0	0	0
Consumption subsidy	0	0	0	0	1	0
Export incentive	4	0	1	1	26	2
Export taxes or restriction	22	2	1	0	7	0
Import ban	10	0	0	0	3	0
Import quota	6	0	0	0	2	1
Import subsidy	0	0	0	0	0	0
Import tariff	12	1	0	2	18	2
Intellectual property protection	0	0	0	0	1	1
Investment measure	19	1	3	4	10	4
Localization requirement	14	2	0	0	5	2
Migration measure	4	1	1	11	1	3
Non-tariff barrier (NTB)	23	5	0	1	7	0
Other service sector measure	3	0	0	0	3	1
Public procurement, nes	0	0	0	0	0	0
Public procurement localization	8	0	0	0	2	0
Public procurement preference	2	0	0	0	1	0
Sanitary and Phytosanitary	3	0	0	0	0	0
State trading enterprise	1	0	0	0	0	0
State-controlled company	0	0	0	0	1	0
Sub-national government measure	0	0	0	0	0	0
Technical Barrier to Trade	0	0	0	0	1	0
Trade defence measure (AD, CVD, safeguard)	20	11	20	0	48	16
Trade finance	2	0	0	0	3	23
Total	**170**	**26**	**29**	**24**	**153**	**65**

Source: http://www.globaltradealert.org, accessed 12 June 2017

The degree of trade protection measures is often regarded as an important indication of the level of a country's integration into the regional and the global economies. Higher trade protection would restrict free flows of goods. Thanks to its higher trade protection, Indonesia remains less integrated with the regional and the global economies. A study by Marks (2015) suggests that the imposition of various trade regulations significantly affects Indonesia's tariff lines in a significant way. The number of NTBs within Indonesia's import tariff lines increased dramatically from 3,714 in 2009 to 5,138 in 2015. The NTBs within Indonesia's export tariff lines rose from 386 in 2009 to 954 in 2014.

Those trade protections were mostly issued in the era of the Susilo Bambang Yudhoyono (SBY) administration during 2004-2014. Patunru and Rahardja (2015) recognise that the sources of Indonesia's trade-restriction mostly come from trade laws on mineral and coal mining[7], horticulture[8], food, protection and empowerment of farmers, industry, trade, and standardization and conformity assessment[9]. Furthermore, beef is another product that incurs higher trade protection due to quota (Viohl, 2015; Armstrong and Rahardja, 2014). Unfortunately, the Jokowi government seems likely to continue these trade laws applied to its international trade policy, resulting in a higher level of Indonesia's trade protection.

Indonesia's investment policy also comes up with restrictions. Table 1.2 shows that the OECD's FDI regulatory restrictiveness index indicates that Indonesia's FDI restrictions increased over time from 0.308 in 2010 to 0.315 in 2016. Compared with East Asian and ASEAN neighboring countries, the level of Indonesia's FDI restriction is higher that it is in India, Malaysia and Vietnam in the exception of the Philippines in 2016. This suggests that some obstacles to invest in Indonesia still exist although the Negative Investment List has been revised by the SBY administration (2010-2014) and then by the Jokowi government throughout 2014-2016. The Negative Investment List is a law that regulates the list of business sectors in Indonesia which allows foreign firms to invest.

Table 1.3 The OECD's FDI regulatory restrictiveness index for selected countries, 2010-2016

Year	Indonesia	Japan	Korea	India	Malaysia	Philippines	Vietnam
2010	0.308	0.052	0.143	0.283	0.243	0.423	0.294
2011	0.308	0.052	0.143	0.284	0.243	0.419	0.294
2012	0.315	0.052	0.143	0.269	0.214	0.423	0.288
2013	0.322	0.052	0.135	0.253	0.214	0.423	0.277
2014	0.336	0.052	0.135	0.252	0.211	0.408	0.276
2015	0.336	0.052	0.135	0.237	0.211	0.408	0.115
2016	0.315	0.052	0.135	0.212	0.211	0.398	0.114

Source: The OECD
Note: This index measures foreign equity restrictions, screening and approval restrictions and foreign employee restrictions and operational restrictions. Index takes 0 as open and 1 as closed.

[7]Vohl (2015) and Armstrong and Rahardja (2014) also discuss the same thing about mineral export bans.
[8]Previously, Basri and Patunru (2012) criticize Indonesian trade protection on rice, cloves, and salt, where domestic firms are only allowed for obtaining this special import licencing.
[9]Damuri and Day (2015) argue that the Indonesian National Standard (SNI) policy can inhibit the flow of import goods into Indonesia, although the reason behind the SNI policy is to protect consumers and to improve the quality of Indonesia's goods.

Major impediments to Indonesia's trade and investment are not only trade protection and FDI regulatory restrictions: other types of impediments factors are importantly taking into account. For example, Indonesia faces higher logistics costs due to poor logistics infrastructure (Armstrong and Rahardja, 2014; Basri et al., 2016). Higher logistical costs may impede Indonesia's international trade, competitiveness and FDI (OECD, 2016). The ASEAN Investment Report (2015) notes that Indonesia's logistics costs are higher by around 24% of GDP than those of Thailand, which is only 16% of its GDP (ASEAN Investment Report, 2015). The World Bank (2016) points out that Indonesia's logistic costs (20% of total sales) is higher than Malaysia (13% of total sales) and Thailand (15% of total sales). Indonesia's logistic costs of 20% of total sales could further be decomposed into 17% of administration costs, 17% of warehousing costs, 26% of inventory costs, and 40% of transport and cargo handling costs. Basri et al. (2016) suggest that geographical constraints (Indonesia as an archipelagic country) also contribute to higher logistics costs. The process of goods flows in Indonesia is quite difficult. As an illustration, much handlings of freight in Indonesia must be conducted from sea to land, and the other way around. On the other hand, it is not easy to connect one domestic market to other domestic markets, or from domestic markets to international markets.

Typically, an institution in emerging countries including Indonesia is still poor, causing high-cost activities on trade and FDI. Some factors may contribute to poor institutions in Indonesia such as unnecessary custom procedures, higher costs to register property, higher corruption, poor enforcement of property rights, the complex bureaucracy, lack of inter-agency coordination, and slow execution of land clearing for infrastructure development. KPMG (2015) reports that it takes ten steps of procedures such as applying for business licences, permits, and certifications via four different ministries, spending around 52.5 days to set up a business in Indonesia. Comparatively, Singapore and Malaysia only take around six days. Elms (2017) also suggests that a poor institution can generate inappropriate regulations, leading to uncertain conditions in trade and investment.

Previous studies and recent data (Table 1.2 and 1.3) discussed above indicate that trade protection, FDI regulatory restrictions, higher logistics costs and poor institutions being the main factors that could discourage Indonesia to gain more benefits from the economic integration.

1.4 The role of the ASEAN Economic Community (AEC)

As noted, Indonesia plays a central role in forming regional economic integration such as ASEAN and APEC. This is important since this strategy can help Indonesia to promote trade flows as well as to attract more FDI. However, can regional economic integration help Indonesia's economy further integrated with global economy as the WTO rounds have been stalled. Earlier studies as conducted by Soesatro (2005) and Aswicahyono and Soedjito (2016) suggested that the AEC could be an important vehicle for Indonesia as it can help Indonesia to integrate more into global economy. The next question then is, Why the AEC? The following discussion will elaborate on both questions.

1.4.1 Can regional integration bring Indonesia to global integration?

Regional integration can be used by Indonesia to restructure the economy and push its domestic reforms (Armstrong and Rahardja, 2014). But this remains debatable since the connection of Indonesia into regional blocs might not carry significant reforms to overcome the domestic constraints (Basri and Patunru, 2012). The main reason behind this obstacle is that Indonesia has not been able to make the best use of free trade, and at the same time it faces the 'spaghetti bowl' effect. As mentioned above, the spaghetti bowl effect exists due to overlapping the ROO within the multiple FTAs.

Indonesia's trade and investment scales are vast and significant to regional integration mainly with ASEAN and APEC. Indonesia accounted for 22% and 69% shares of exports to ASEAN and APEC respectively in 2015.[10] It received a vast amount of FDI from ASEAN and APEC countries in 2015 by 31% and 51% respectively in 2015 (BKPM, 2016). It is expected that there is a significant potential trading and investment relationship in the future with ASEAN and APEC, helping Indonesia expands its trade and investment.

Damuri (2014) suggests that Indonesia should take the option of implementing either unilateral liberalization or multilateral integration to gain more benefits from economic integration. Basri and Patunru (2012) also support multilateral integration. However, they also note that in the time of the WTO stagnation, Indonesia may still increase its engagement in economic integration and domestic reforms by connecting with FTA. Moreover, FTA can facilitate Indonesia to reach the expected level of its competitiveness,

[10] Author calculation based on the Trade Map database.

but unilateral liberalization can be critical to keep Indonesia's economy open to the regional and the global economies.

It is important to address how regional integration helps Indonesia's engagement into the global economy. Some previous studies suggested that regional integration can be a building block, a pathway to form multilateral/global integration (Wei and Frankel, 1996; Baldwin, 2006; Trogtinon, 2010). On the other hand, Hayakawa et al. (2017) suggest that the role of mega-RTAs would be increasing in the future. Mega-RTAs such as the RCEP, Trans-Pacific Partnership (also known as TPP11 excluding the US)[11], and the Trans-Atlantic Trade and Investment Partnership (TTIP)[12] have rapidly developed as the multilateral/global trade negotiation of WTO's Round in a deadlock for years since Doha Round (Urata, 2015). Baldwin (2014) claims that mega-regional integration is the key to tidy up the spaghetti bowl effect. However, how the role of regional and mega-regional integration could be a building block to global integration remains debatable. Multilateralists argue that regionalism can fragment the world trading system, eroding the role of multilateral integration such as the WTO and leading to stumbling blocks. We further discuss this debate between building blocks and stumbling blocks in Chapter 3.

1.4.2 Why the AEC?

The expansion of economic integration is likely to be one of the leading challenges for Indonesia in the coming years. One of the vehicles for integration is the ASEAN Economic Community (AEC). The AEC came into effect at the end of 2015. This is the new route of economic integration for the Southeast Asian members after evolution from the ASEAN Free Trade Area (AFTA) in 1992. The AEC plays a critical role in creating a single market in the Southeast Asian region and in generating the ASEAN factory by incorporating a free flow of goods, investments and capital, services, and labor across the ten member states.

The AEC is unique in that it is not a traditional FTA. It is true that the baseline of the AEC is Preferential Trade Agreements (PTAs) via AFTA. Prior to the AEC being formed, ASEAN contributed to APEC development and further developed into ASEAN plus three with China,

[11] TPP11 includes Canada, Australia, Brunei, Chile, Japan, Malaysia, Mexico, New Zealand, Peru, Singapore and Vietnam. TPP11 came into force on 30 December 2018 for all members except Vietnam that came into force on 14 January 2019.

[12] TTIP includes the USA and the European Union countries and still under negotiation

Japan, and South Korea (Soesastro, 2003). Later, ASEAN regionalism substantially expanded by taking India, Australia, New Zealand, the US and the EU into account. ASEAN formally brought these countries to the ASEAN summit to talk about trade and investment cooperation and agreements. ASEAN has now expanded dramatically, an effort to conclude the RCEP as mega-RTA. In addition, ASEAN mechanisms might follow the plurilateral[13] PTA rather than a normative PTA that was widely applied in regional and the global economies. The plurilateral PTAs[14] have emerged in ASEAN since each member, the same subsets of ASEAN members, and ASEAN as a whole are allowed to conduct multiple negotiations with other economic integration agreements beyond ASEAN. This dynamic integration pattern is allowed since this strategy remains in line with the AEC's goal. The AEC's goal is not limited to Southeast Asian regionalism but also appears in the pursuit of more connection to global economy. Thus, ASEAN is not as binding as other PTAs. The extension role of the AEC will provide its members preferential access to new markets (exports of goods and FDI)[15], deeper integration within and inter-regional, and a vehicle to strengthen participation in global integration. Hence, it is crucial for Indonesia to utilize the AEC to be the most important instrument to have more trade benefits from regional economic integration, and at the same time, to be a stepping-stone to connect with global economy.

Soesastro (2005) argues that the AEC can be a significant vehicle for Indonesia. The AEC can help Indonesia to reduce its trade and investment impediments. The ASEAN single market requires no barriers to the flow of goods among members. Therefore, every member of ASEAN including Indonesia must boost its domestic reforms to reduce its trade and investment impediments. Another notable issue is that the ASEAN factory can connect local Indonesian companies to regional production networks and global production networks. The ASEAN factory might play critical roles in increasing Indonesia's firm's competitiveness and specialization in production (Soesatro, 2005; Aswicahyono and Soedjito, 2016).

[13] Saner (2012) points out that the plurilateral agreement is an agreement in specific sector under the WTO framework rather than covered many fields like RTA. For instance, the Tokyo Rounds in 1980 resulted four plurilateral agreements: the Agreement on Trade in Civil Aircraft, the Agreement on Government Procurement (GPA), the International Dairy Agreement, and the International Bovine Meat Agreement. Plurilateral agreements outside the WTO framework were then expanded through the Information Technology Agreement (ITA) in 1997 and the Anti-Counterfeiting Trade Agreement (ACTA) in 2011.

[14]However, the study follows Acharya et al.'s (2011) suggestion in order to define a plurilateral PTA. The plurilateral PTA based on Acharya et al. (2011) is appropriate in explaining ASEAN integration phenomena that closes to open regionalism terminology.

[15]Aswicahyono and Soedjito (2016) claim that the AEC can facilitate Indonesia to diversify its export destination as well as its export baskets.

However, since the basis of the AEC is a PTA, and ASEAN members expand PTAs beyond the Southeast Asian regional, therefore the AEC might face risks of welfare loss due to trade diversion, and trade and FDI costs increase owing to overlapping rules of origin or the spaghetti bowl effect.

1.5 Research questions and contributions

To understand the barriers to further integrate Indonesia into the regional and the global economies, we set three main research questions in this study. The first, What are the impediments to Indonesia's trade flows? These impediments can be encountered and experienced either at-the-border or behind-the-border. Therefore, the first research question will be framed to address impediments at the Indonesian border (at-the-border barriers) and behind the Indonesian border (behind-the-border barriers). The classification of the two types of barriers will be discuss more in Chapter 5.

The second research question is Does trade protection applied to Indonesia's manufacturing products have an impact on its export performance in manufacturing sectors? The third research question is What factors determine foreign direct investment (FDI) flows in Indonesia?

This study contributes to the literature in five ways. First, we cover three aspects of trade impediments, i.e., tariffs, NTMs, and lack of trade facilitations in one model, and categorised them into at-the-border barriers and behind-the-border barriers in order to investigate their effect on Indonesia's aggregate trade flows. To the best of our knowledge, the existing studies mainly focus either on tariffs, or NTMs, but none discuss the effects of trade impediments in terms of at-the-border barriers and behind-the-border barriers, especially for Indonesia's case.

Second, this research assesses trade protection effects on Indonesia's manufacturing exports. We use the data of export measures (NTM) imposed by the Indonesian government on export products in manufacturing sectors. The contribution of this analysis is to provide a better understanding of how export measures adversely affect the performance of Indonesia's manufacturing exports.

Third, to investigate the determinants of Indonesia's FDI flows, we use the FDI model derived from the combination of gravity model and the theory of the firm. Our contribution is how this FDI model makes a difference in results mainly in terms of determining the types of Indonesia's FDI flows and how institutional factors affecting Indonesia's FDI flows.

Fourth, the contribution to trade and FDI literature, especially with the case of Indonesia, is in the form of the model development and specifications that we use in the study. The study exploits a gravity equation as the workhorse model applied to a panel data structure in order to answer the research questions.

Finally, the study results can help the Indonesian government to think through the priorities and challenges for its policies in terms of trade and investment (FDI) as well as to set a proper strategy for its engagement more with the regional and the global economies through the mechanisms of economic integration.

1.6 Scope of study and thesis outline

The gravity model is largely employed as a workhorse model to answer the three main research questions mentioned above. The theoretical foundations of the gravity model in trade literature are well established in investigating trade effects. In terms of FDI, the use of the gravity model is increasing in the FDI literature due to the introduction of the knowledge-capital (KC) model advanced by Markusen (1997,2001) and knowledge-physical-capital (KPC) developed by Bergstrand and Egger (2007, 2013). The KC model is derived from the gravity equation by taking the theory of FDI (firms) into account, while the KPC model is an extension of the KC model by including the physical factor and the third country effects. We will elaborate upon the KC model and the KPC model in Chapters 3 and 4.

We assess the progress of Indonesia's integration into the regional and the global economies based on three aspects, i.e., the significance of trade protection, the quality of trade facilitation measures and the types of FDI flows in Indonesia. When these three aspects are empirically revealed, this will help the study to examine the progress of Indonesia's integration.

The remainder of the thesis consists of seven chapters. Chapter 2 overviews the profile of Indonesia's economy from the Soekarno era to the Jokowi government to give a better understanding of Indonesia's economy. The discussion focuses on trade and investment issues, along with their current challenges and policy reponses. Chapter 3 elaborates the conceptual framework of the thesis. The theoretical models are built from gravity equation to provide the workhorse model.

Chapter 4 develops the empirical models of the study. We construct the empirical models of trade impediments and the determinant of FDI flows based on the gravity model in the previous chapter. Chapter 5 investigates the effect of different types of trade impediment on Indonesia's trade flows. The analysis examines tariff measures, non-tariff measures, and a lack of trade facilitation measures and group them into at-the-border barriers and behind-the-border barriers. In this chapter, the analyses are conducted at the aggregate level, or the country level. Chapter 6 analyses the impact of Indonesia's trade protection on its manufacturing export performance. The examinations are conducted at the disaggregated level or the products level of Indonesia's manufacturing exports. The analysis of Chapter 7 focuses on what factors can determine the types of Indonesia's FDI flows, and how the role of institutional factors could be important in affecting Indonesia's bilateral FDI flows.

Chapter 8 summarises the study and the key findings, makes a conclusion, draws policy implications, discusses limitation of the study, and gives suggestion to future research.

Chapter 2: An overview of Indonesia's economy, trade and investment

2.1 The profile of Indonesia's economy

As Indonesia broke free from colonialism and imperialism in 1945, Soekarno became the first president of Indonesia, with his government period being known as the Old Order regime. Indonesia experienced political instability for more than two decades during the Soekarno era, and it deteriorated the Indonesian economy to the lowest point. In the early 1960s, inflation skyrocketed from 20% in 1960 to 135% in 1964 and rose again to 594% in 1965 (Hill, 2000). Government income also deteriorated at that time due to the lack of tax earnings, declining export revenues, and low levels of foreign investment.

The New Order government led by Soeharto as a new leader began to develop Indonesia's economy after the Old Order regime eventually collapsed in 1965-1966. During this period, economic reforms played a vital role in restoring Indonesia's economy. Economic rehabilitation started in 1967, and an oil bonanza between 1972 and 1982 helped Indonesia to spur its economic growth at 7.5% up to 8% on average throughout 1968-1982. In the New Order regime, agricultural commodities and oil, as well as minerals, played an essential role in supporting Indonesia's exports. Oil became Indonesia's leading sector accounting for 70%-85% of Indonesia's total exports (Arndt and Hill, 1988). Due to the adverse effects of the oil boom, Indonesia suffered from 'Dutch Disease' in which other sectors, mainly the manufacturing sectors, lagged behind the oil sector (Arndt and Hill, 1988; Pangestu et al., 2015).

However, the oil boom era did not last long as the decline in oil prices after 1982 resulted in a considerable fall in Indonesia's economic growth. This circumstance forced Indonesia to undertake dramatic reforms in 1983. The structural change in the economy was made to increase economic efficiency by relying on the role of Indonesia's manufacturing sectors. Labour intensive manufacturing sectors helped Indonesia to elevate its economic growth post-oil bonanza. These structural reforms also affected other sectors such as trade, investment, banking, and financial sectors. The government liberalized these sectors to

diversify Indonesia's exports other than oil and agricultural commodities. Strengthened labor-intensive sectors and significant reforms helped Indonesia to continue its rapid growth at 7.2 % on average during 1983-1996. Higher economic growth made Indonesia confident to about participating in economic integration through the ASEAN Free Trade Area (AFTA) in 1992, the Asian Pacific Economic Cooperation (APEC) in 1994 and being involved more in the WTO in 1995.

The period of 1983-1996 was also known as the golden era for the Indonesian economy since at some point in this period the level of Indonesia's productivity significantly increased (Basri and Patunru, 2012) and Indonesia's economy increasingly integrated with the regional and the global economies (Elias and Noone, 2011). One of the most important milestones in this era occurred when Indonesia was considered one of the 'Newly Industrialized Countries' among the East Asian economies, along with Malaysia and Thailand in the early 1990s. However, whereas Indonesia's economy was in relatively good shape, trade protection and investment restrictions increased significantly, turning Indonesia's economy into an inefficient and vulnerable state in the lead up to the Asian financial crisis. When the crisis came to Indonesia in 1997-1998, the economy could not withstand it, resulting in a significant drop in economic growth at minus 13%. Forced by this Asian financial crisis, Soeharto stepped down after 32 years in power.

The Reform Order began in 1998 by implementing economic reforms under the IMF's supervision. Such reforms included tariffs cuts, investment deregulations, state-owned enterprise privatization, banking restructuring, and so forth. These reforms helped Indonesia to turn its economic growth from negative (at -6.4% on average during 1997-1999) to positive (at 4% on average in the early of 2000s).

This positive trend of Indonesia's economic growth was then continued by two consecutive terms of President Susilo Bambang Yudhoyono (SBY) from 2004-2009 and from 2009-2014. In his first presidential term, Indonesia's economic growth climbed from 4.3% in 2004 to 6.1% in 2008, indicating Indonesia's long recovery from the Asian financial crisis (Linbald, 2015). In terms of the global financial crisis that occurred in 2008, the impact was relatively mild compared to that in Western countries. Less exposure to world capital market fluctuations and greater supervision of the financial sector at home prevented Indonesia

from a significant fall in GDP. GDP growth slightly fell to 4.6% in 2009 but rose back to 6.2% in 2010. In the era of SBY, Indonesia's comparative advantage seemed to be in commodities and natural resources (Patunru and Rahardja, 2015), and Indonesia's economy was more stable and resilient towards the 2008 global financial crisis (Linbald, 2015). However, Pangestu et al. (2015) argue that commodity and natural resource booms undermined the performance of Indonesia's export in manufacturing sectors, leading to 'Dutch Disease'. During this era, Indonesia's economy grew significantly at above 6 percent on average and this mostly occurred owing to global commodity booms.

In 2014, Joko Widodo (or 'Jokowi') was elected to be the new President of Indonesia for 2014-2019. The Jokowi government faced the end of the commodity and natural resources bonanza. Indonesia's economic growth was 5 % in 2014. This is less than the economic growth in 2013 of 5.6% due to weak exports and underinvestment. Jokowi focused on boosting the infrastructure development. Most infrastructure projects addressed Indonesia's geographic constraints as an archipelagic country by narrowing the infrastructure gap between western Indonesia and eastern Indonesia and connecting them via the Maritime Connectivity program. By doing this, the Jokowi government expected that logistic costs would decline from 24% of GDP in 2015 to 19% of GDP in 2019. Moreover, the Jokowi government issued a series of economic policy packages that have been unveiled since 2015 to relax institutional and regulatory barriers.

Massive infrastructure projects and reforms were projected to make Indonesia's economy more efficient, competitive and productive. However, the benefits cannot be realized in the short run. Indonesia's economic growth declined to 4.8% in 2015, lower than 5 % in 2014, but it climbed to around 5% in 2016. The stagnation of economic growth at around 5% was then continued until 2019. In addition, Indonesia's current expansion in infrastructure projects has not yet been followed by an increase in Indonesia's productivity and output levels. Therefore, the progress of Indonesia's economic growth under Jokowi after his first government appeared to be sluggish and struggled to reach at the level of economic growth that the SBY era and the New Order had achieved. Instead, Negara (2020) argues that the role of infrastructure development in Jokowi's first period of government only maintained Indonesia's economic growth at the stable level rather than fostering its economic growth.

On the the other hand, Indonesia will face a demographic bonus in coming years. Statistics Indonesia (BPS) revealed that the number of Indonesia's labour force increased from 116.5 million to 127.7 million in 2010. Furthermore, the BPS also projected that Indonesia would enjoy a demographic bonus in 2020-2035.[16] The ratio of productive age would be 64% of the total population in which the estimation of Indonesia's total population in 2020 is around 270 million and 300 million in 2035.[17] Labour abundant in Indonesia would drive the price of labour wages to become more competitive than in other emerging countries. Therefore, this is an advantage for Indonesia to gain competitiveness from its labour sectors as well as to reinforce its labor-intensive manufacturing sectors. ADB (2016) also notes that it is essential for Indonesia to invest more in education and training if Indonesia wants to take full benefit of its demographic bonus. However, the demographic bonus can turn sour if employment opportunities are lacking and improvement in people's skills is limited.

2.2 The international trade and foreign direct investment (FDI) in Indonesia

As noted, Indonesia's comparative advantage generally lies in commodities and natural resources. In the mid-1960s, Indonesia's trade was dominated by oil and agriculture products. Arndt and Hill (1988) noted that oil exports with minerals and metals accounted for above 70% on average of Indonesia's total export during the oil boom era in 1974-1984. Agriculture contributed to around 15-20% of total exports, and only around 1% to 10% for the manufacturing sectors (Arndt and Hill, 1988). Both the oil and agriculture sectors drove Indonesia's economic growth over this period. Also, most FDI inflows into Indonesia were largely in the oil and agriculture sectors.[18]

When the era of the oil bonanza finished in 1982, Indonesia's comparative advantage shifted to producing manufacturing industries. Major deregulations had been taken in various sectors including trade and investment allowing manufacturers to operate more efficiently, and at the same time, brought a vast amount of FDI into this sector. As a result, Indonesia could maintain its rapid economic growth after the global oil boom at above 7%-

[16]Source: https://www.kemenkeu.go.id/en/Berita/demographic-bonus-indonesia%E2%80%99s-opportunity-accelerate-economic-development, accessed on 9 June 2017.
[17]Source: http://worldpopulationreview.com/countries/indonesia-population/, accessed on 9 June 2017.
[18] The 1967 Investment law attracted more FDI coming to the oil and agriculture sectors.

8% on average. Trade and FDI during that era (1982-1996) led Indonesia's economy to be more efficient and increasingly integrated with the regional and the global economies. However, the Asian financial crisis 1997-1998 caused Indonesia's trade and FDI in manufacturing sectors to dramatically fall. Around five years after the Asian crisis, the prices of global commodities reached their peak. This event turned Indonesia's comparative advantage back to commodities and natural resources. Automatically, trade and FDI were high in commodity and natural resource sectors, helping Indonesia to restore its economy from the Asian financial crisis 1997-1998.

The discussion above suggests that the roles of trade and FDI are significant in enhancing Indonesia's economy. A large number of earlier studies such as those conducted by Nabende et al. (2001), Lipsey and Sjoholm (2010), Van Dierman et al. (2011) and Lindbald (2015) confirmed those benefits that Indonesia already enjoyed from the realization of its comparative advantage through trade and FDI. Evidence demonstrates that trade and FDI help Indonesia to create more jobs, increase living standards, improve technology and wages, and reduce poverty in Indonesia. Other studies also found that trade and FDI have contributed to increasing Indonesia's productivity in the manufacturing sectors (Sjoholm, 1997), developing Indonesia's industrialization since in the mid-1980s and integrating Indonesia's economy with the regional and the global economies (Elias and Noone, 2011).

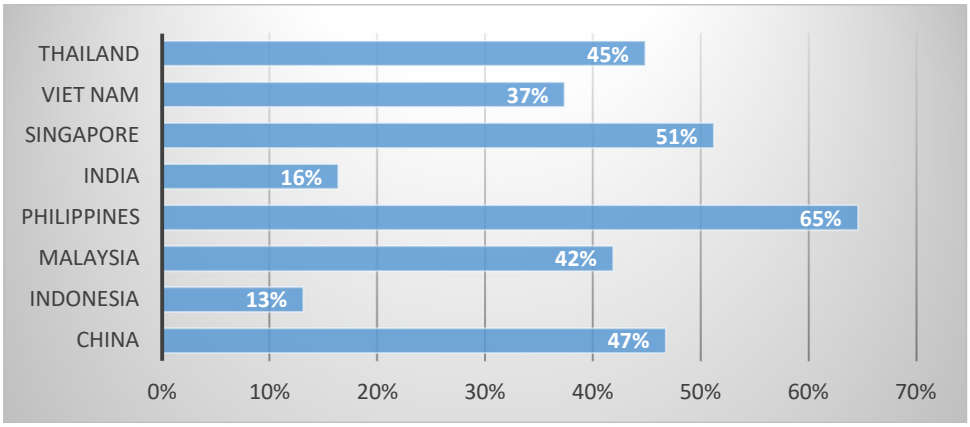
It is also important to examine how trade and FDI can help Indonesia to integrate more with the regional and global economies. Indonesia's trade openness can be early indicators of measuring the progress of Indonesia's integration into the regional and the global economies. Table 2.1 shows that Indonesia's trade opennes seems to decline over the years on average, from 65% throughout 1995-2000 to 39% throughout 2016-2019. Trade openness during 2016—2019 pointed out that Indonesia's trade openness is lower than its ASEAN peers and the East and the Asia Pacific on average. Furthermore, the trade openness of Thailand, Malaysia and Vietnam is over 110% on average, while Singapore's trade openness is exceptionally high over 300% due to the economy of this country depending much on international trade. Indonesia's low trade openness relative to selected ASEAN members indicates its lesser integration with the regional and global economies.

Table 2.1 Trade Openness (in %)[19]

Year	1995-2000	2001-2005	2006-2010	2011-2015	2016-2019
Indonesia	65	61	52	48	39
East Asia & Pacific	47	57	64	62	56
Philippines	93	85	70	58	68
Thailand	99	123	130	133	118
Malaysia	201	202	178	143	128
Vietnam	95	123	147	167	201
Singapore	336	123	397	361	317

Source: World Development Indicator, the World Bank

Pangestu et al. (2015) claim that the share of machinery and transport equipment could be used as a broad measure of a country's participation level in global production networks (GPNs). Figure 2.1 shows that Indonesia's share of machinery and transport equipment is relatively low, at 13% of total exports in 2015. In comparison with Vietnam, Indonesia is behind Vietnam and other ASEAN members such as Singapore, Malaysia, the Philippines, and Thailand. Furthermore, this share is also inferior to China and India. The low performance of Indonesia's share of machinery and transport equipment can be an early indicator of Indonesia low involvement in a global production network.



Source: Author's calculation based on the UN Comtrade data (SITC 7) and Trade Map data

Figure 2.1 Share of machinery and transport equipment (SITC 7) in 2015[20]

Table 2.1 and Figure 2.1 also indicate that Indonesia's economy has not relied much on trade and FDI. Rather, private consumption played central roles in driving Indonesia's

[19] Trade openness is the ratio of total trade (exports and imports) to GDP.
[20] The details of the SITC 7 can be viewed at https://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=14, accessed on 7 January 2017.

economy.[21] However, both trade and FDI remain important for Indonesia's economy in the future. The ASEAN emerging countries such as Thailand, Malaysia, and Vietnam have recently shown that trade and investment have a significant impact on their economies (see Table 2.1 and Figure 2.1).

This is reflected in Indonesia's top ten exports during the Jokowi government period in 2014-2016 that oil and gas, agricultural sectors (palm oil, rubber, and copra), mining and minerals commodities (coal, metal, and copper), and forestry products (plywood) were still dominant (Table 2.2). Exports in Indonesia's manufacturing sectors were particularly strong in the transport industry such as motor cars and other vehicles but their shares relative low compared to total exports of natural resources and commodities.

Table 2.2 Indonesia's top ten exports 2014-2016 in HS4 (USD thousand)

	Product label	2014	2015	2016	Share 2014	Share 2015	Share 2016	Growth 2014-2016
No	**All products**	**176,036,194**	**150,366,281**	**144,494,206**				
1	Palm oil and its fractions, whether or not refined (excluding chemically modified)	17,464,905	15,385,275	14,365,422	9.9%	10.2%	9.9%	-18%
2	Coal; briquettes, ovoids and similar solid fuels manufactured from coal	18,697,800	14,717,265	12,898,710	10.6%	9.8%	8.9%	-31%
3	Petroleum gas and other gaseous hydrocarbons	17,180,283	10,340,778	7,036,767	9.8%	6.9%	4.9%	-59%
4	Petroleum oils and oils obtained from bituminous minerals, crude	9,271,214	6,479,432	5,196,717	5.3%	4.3%	3.6%	-44%
5	Articles of jewelry and parts thereof, of precious metal or of metal clad with precious metal	2,114,581	3,287,913	4,078,828	1.2%	2.2%	2.8%	93%
6	Copper ores and concentrates	1,683,588	3,277,158	3,481,557	1.0%	2.2%	2.4%	107%
7	Natural rubber, balata, gutta-percha, guayule, chicle and similar natural gums, in primary .	4,744,753	3,701,478	3,372,319	2.7%	2.5%	2.3%	-29%
8	Coconut "copra", palm kernel or babassu oil and fractions thereof, whether or not refined	2,484,350	2,378,262	2,726,686	1.4%	1.6%	1.9%	10%
9	Motor cars and other motor vehicles principally designed for the transport of persons	2,641,590	2,430,597	2,565,831	1.5%	1.6%	1.8%	-3%
10	Plywood, veneered panel and similar laminated wood (excluding sheets of compressed wood, cellular)	2,372,471	2,345,947	2,211,610	1.3%	1.6%	1.5%	-7%

Source: Author's calculation based on data from Trade Map

As Indonesia's economy heavily depends on commodities and natural resources rather than manufacturing sectors, this could constrain Indonesia's economy from further innovation.

[21] CEIC data shows that the contribution of Indonesia's private consumption for Indonesia's economy (GDP) is more than 50% in the last decade (https://www.ceicdata.com/en/indicator/indonesia/private-consumption--of-nominal-gdp, accessed on 10 March 2018).

Innovation can substantially contribute to improving Indonesia's competitiveness in the future (Basri and Rahardja, 2016). Import of parts and components is essential for assembling motor cars and other motor vehicles before they can be exported to the rest of the world. It can be seen from Table 2.3 that the share of Indonesia's imports in parts and components increased from 1.6% in 2014 to 1.9% in 2016, but its growth was negative at 11%. The same condition is also seen in the share of Indonesia's export vehicles (see Table 2.2), rose from 1.5% in 2014 to 1.8% in 2016, but it had negative growth at 3%. As argued earlier, the low performance of Indonesia's trade in parts and components indicates the lesser integration of Indonesia's trade into the global production networks.

Table 2.3 Indonesia's top ten imports 2014-2016 in HS4 (USD thousand)

	Product label	2014	2015	2016	Share 2014	Share 2015	Share 2016	Growth 2014-2016
No	**All products**	**178,179,340**	**142,694,802**	**135,652,914**				
1	Petroleum oils and oils obtained from bituminous minerals (excluding crude)	26,717,296	14,008,541	9,940,940	15.0%	9.8%	7.3%	-63%
2	Petroleum oils and oils obtained from bituminous minerals, crude	13,072,429	8,063,264	6,730,579	7.3%	5.7%	5.0%	-49%
3	Telephone sets, incl. Telephones for cellular networks or for other wireless networks	4,855,425	4,315,535	4,185,387	2.7%	3.0%	3.1%	-14%
4	Parts and accessories for tractors, motor vehicles for the transport of ten or more persons	2,908,464	2,456,675	2,593,543	1.6%	1.7%	1.9%	-11%
5	Wheat and meslin	2,387,262	2,082,768	2,408,210	1.3%	1.5%	1.8%	1%
6	Petroleum gas and other gaseous hydrocarbons	3,024,967	2,012,952	1,668,942	1.7%	1.4%	1.2%	-45%
7	Automatic data-processing machines and units thereof; magnetic or optical readers, machines	2,106,789	1,911,012	1,642,270	1.2%	1.3%	1.2%	-22%
8	Oilcake and other solid residues, whether or not ground or in the form of pellets	2,194,935	1,814,026	1,573,862	1.2%	1.3%	1.2%	-28%
9	Semi-finished products of iron or non-alloy steel	1,879,769	1,469,546	1,534,132	1.1%	1.0%	1.1%	-18%
10	Cane or beet sugar and chemically pure sucrose, in solid form	1,328,936	1,256,038	2,090,125	0.7%	0.9%	1.5%	57%

Source: Author's calculation based on data from Trade Map

The current profile of Indonesia's FDI growth shows that the group of secondary (manufacturing) sectors in Indonesia grew incredibly by 252.5% on average during 2010-2015 (see Table 2.4). This growth is the highest compared to Indonesia's primary sector (105.6%) and tertiary sector (14.6%). This suggests that the increase in FDI inflows into Indonesia's secondary (manufacturing) sectors should contribute to Indonesia's realizing its comparative advantage in manufacturing sectors. However, trade data (see Table 2.2 and Table 2.3), by contrast, show that the realization of Indonesia's current comparative advantage is large for the primary sectors (commodities and natural resources) but low for manufacturing sectors.

Table 2.4 Indonesia's FDI growth per sector and sub-sector on average 2010-2015

Sector and Sub-Sector	2010	2011	2012	2013	2014	2015	Average Growth (%)
Primary Sector (in million USD)	***3,034***	***4,883***	***5,933***	***6,472***	***6,991***	***6,236***	***105.6%***
Food Crops & Plantation	751	1,222	1,602	1,605	2,207	2,072	175.9%
Livestock	25	21	20	11	31	75	200.2%
Forestry	39	10	27	29	53	19	-51.8%
Fishery	18	10	29	10	35	53	194.7%
Mining	2,201	3,619	4,255	4,816	4,665	4,017	82.6%
Secondary Sector (in million USD)	***3,337***	***6,790***	***11,770***	***15,859***	***13,019***	***11,763***	***252.5%***
Food Industry	1,026	1,105	1,783	2,118	3,140	1,521	48.3%
Textile Industry	155	497	473	751	422	433	180.0%
Leather Goods & Footwear Industry	130	255	159	96	211	162	23.9%
Wood Industry	43	51	76	39	64	47	9.4%
Paper and Printing Industry	46	258	1,307	1,169	706	707	1423.2%
Chemical and Pharmaceutical Industry	793	1,467	2,770	3,142	2,323	1,956	146.5%
Rubber and Plastic Industry	104	370	660	472	544	694	565.8%
Non-Metallic Mineral Industry	28	137	146	874	917	1,303	4488.0%
Metal, Machinery & Electronic Industry	590	1,773	2,453	3,327	2,472	3,092	424.6%
Medical Preci. & Optical Instru, Watches & Clock Industry	-	42	3	26	7	7	-83.6%
Motor Vehicles & Other Transport Equip. Industry	394	770	1,840	3,732	2,061	1,757	346.3%
Other Industry	28	65	100	112	152	83	201.9%
Tertiary Sector (in million USD)	***9,844***	***7,802***	***6,862***	***6,287***	***8,519***	***11,276***	***14.6%***
Electricity, Gas & Water Supply	1,429	1,865	1,515	2,222	1,249	3,029	112.0%
Construction	618	354	240	527	1,384	955	54.4%
Trade & Repair	774	826	484	606	867	625	-19.2%
Hotel & Restaurant	347	242	768	463	513	650	87.6%
Transport, Storage & Communication	5,072	3,799	2,808	1,450	3,001	3,290	-35.1%
Real Estate, Ind. Estate & Business Activities	1,050	199	402	678	1,168	2,434	131.7%
Other Services	554	517	646	342	338	294	-46.9%
Total	**16,215**	**19,475**	**24,565**	**28,618**	**28,530**	**29,276**	**80.6%**

Source: Author's calculation based on BKPM database

2.3 Current challenges and policy responses

The acceleration of domestic reforms can help Indonesia to expand its trade flows and attract more FDI. Domestic reforms might require a substantial improvement in institutions, regulation and infrastructure. The Jokowi government in its first term (2014-2019) considerably took on this challenge. In the first step, the Jokowi administration slashed large portions of subsidies in the energy sector and then allocated these funds for infrastructure development, particularly infrastructure related to how to reduce logistics costs. The current government was constructing several new deep seaports and upscaling the existing seaports across islands to support the sea toll project in Indonesia as a part of the Maritime

Connectivity program. The Maritime Connectivity program has been developed to tackle Indonesia's geographic constraints.

Dwelling time[22] in Indonesia's largest seaport, namely Tanjung Priok in Jakarta, would further improve from 2.9 days in 2016 to 2 days in 2017.[23] Indonesia seeks to get closer to Singapore's seaport whose dwelling time is 1.5 days. The Jokowi government is also building new roads, new highways, and new railway lines of 2,650 kilometers, 1,000 kilometers, and 2,150 kilometers respectively. This roads infrastructure is expected to be completed by 2019.[24] The Improvement of transport infrastructure on land and sea has an objective to reduce logistics costs from 24% of GDP in 2015 to 19% of GDP in 2019. By doing this, Indonesia can save its logistic costs a year by around USD 70 to USD 80 billion (ASEAN investment report, 2015).

In his second term of administration (2019-2024), Jokowi will connect existing infrastructures with new economic centres in several of Indonesia's regions in order to boost economic growth.[25] Jokowi in the second term will also continue to build infrastructure projects in terms of 2,500 kilometers of toll roads (the trans-Sumatra, Kulonprogo-Yogyakarta-Solo toll road, and the Balikpapan-Samarinda toll road), mass-rapid transportation and light rail transit in several urban areas in Indonesia (Pwc, 2019).

However, Perez and Wilson (2010) argue that a large scale of infrastructure projects alone cannot decrease logistics costs in a faster way. They explain that anti-competition in the trade logistics service firms can lead to high markups resulting in transport prices remaining higher although infrastructure to support a reduction in logistics costs has been built in a significant way. Perez and Wilson (2010) suggest that the improvement of logistics infrastructure is likely to generate better results in a more competitive environment among trade logistics service providers.

[22] Dwelling time in seaport relates to processes of pre-customs clearance of goods, customs clearance, and post clearance.
[23] As reported by the Jakarta Post on 4 January 2017.
[24] As reported by the Hong Kong Trade Development Council or HKTDC (2017).
[25] As reported by Pwc Indonesia on 15 November 2019, available at: https://www.pwc.com/id/en/media-centre/infrastructure-news/november-2019/president--infrastructure-and-human-capital-as-foundation-for-go.html, accessed 7 August 2020. For example, the airport in Labuan Bajo in Nusa Tenggara Timur Province must connect with tourism centres by improving the road facilities. Toll roads around Indonesia must also connect to production, agriculture, and tourism centres.

From September 2015 to September 2017, the Jokowi government unleashed 16 economic policy packages to accelerate domestic reforms. Most of these policy packages (Table 2.5) are used to improve Indonesia's trade and investment performance. For example, speeding up investment licencing for investment in industrial estates in the second package has an objective in attracting FDI inflows, while reducing costs for logistics service providers in the 15th package is essential for increasing the trade flows. The 16th package accelerated the implementation of Doing Business in promoting trade and FDI flows. Pardede and Zahro (2017) argue that these series of reforms are a good initiative, but the implementation of these reforms is still lagging.[26] They further argue that a series of reforms by the Jokowi government is excessive because of too many policy initiatives with unclear priorities and timelines.

[26] Their argument is based on the discussion with the head of district, professionals, politicians, ministers, and high-ranking party leaders.

Table 2.5 Economic reform packages of the Indonesian government 2015-2017

Package	Unveiled	Main Points
1st	9 September 2015	• Boost industrial competitiveness through deregulation • Curtail red tape • Enhance law enforcement and business certainty
2nd	30 September 2015	• Interest rate tax cuts for exporters • Speed up investment licensing for investment in industrial estates • Relaxation import taxes on capital goods in industrial estates & aviation
3rd	7 October 2015	• Cut energy tariffs for labor-intensive industries
4th	15 October 2015	• The fixed formula to determine increases in labor wages • Soft microloans for >30 small & medium, export-oriented, labor-intensive businesses
5th	22 October 2015	• Tax incentive for asset revaluation • Scrap double taxation on real estate investment trusts
6th	5 November 2015	• Tax incentives for investment in special economic zones
7th	4 December 2015	• Waive income tax for workers in the nation's labor-intensive industries • Free leasehold certificates for street vendors operating in 34 state-owned designated areas
8th	21 December 2015	• Scrap income tax for 21 categories of airplane spare parts • Incentives for the development of oil refineries by the private sector • One-map policy to harmonize the utilization of land
9th	27 January 2016	• Single billing system for port services conducted by SOEs • Integrate National Single Window system with 'inaportnet' system • Remove price difference between private commercial and state postal services
10th	11 February 2016	• Removing foreign ownership cap on 35 businesses
11th	29 March 2016	• The lower tax rate on property acquired by local real estate investment trusts • Harmonization of customs checks at ports (to curtail dwell time) • The government subsidizes loans for export-oriented small & medium enterprises • Roadmap for the pharmaceutical industry
12th	28 April 2016	• Enhancing the ease of doing business in Indonesia by cutting procedures, permits and costs
13th	24 August 2016	• Deregulation of residential property projects for low-income families
14th	10 November 2016	• creating a roadmap for the nation's e-commerce industry: • easing and widening access to funding • offer tax incentives • harmonize regulations and gradually develop a national payment gateway • promote e-commerce awareness campaigns and improve e-commerce education • accelerate the development of high-speed broadband network • improve the e-commerce logistics system
15th	15 June 2017	• enhancing the role of transportation insurance, • reducing costs for logistics service providers, • strengthening the Indonesia National Single Window (INSW) authority • reducing the number of prohibited and restricted goods.
16th	1 September 2017	• Acceleration of the implementation of Doing Business

Source:https://www.indonesia-investments.com/news/todays-headlines/indonesia-to-release-15th-economic-policy-package-soon/item7379?, accessed 19 July 2017

The 15th policy package notes that Indonesia has strengthened the Indonesian National Single Window (INSW) that has become an integral part of institution improvement. The INSW has a function to improve coordination among relevant ministers and other government institutions. The INSW intends to make Indonesia's bureaucracy more efficient for business, trade, and investment purposes. Furthermore, the one-stop service center or *Pelayanan Terpadu Satu Pintu* (PTSP) was created by the Indonesia Investment Coordinating Board (BKPM) in 2015 is designed to enhance the investment climate in Indonesia that

integrated Indonesia's 22 ministries and government agencies into one online system with the intention of relaxing licencing process for all business sectors.

The Jokowi government established a land bank institution in 2015. In this case, three ministries (the ministries of finance, public works, and transportation) are involved in managing a land bank institution to boost the infrastructure development without worrying about the land clearing process. The role of public-private partnerships (PPP) is also strengthened to support the lack of budget which covers only 40% of the total infrastructure funding. The participation of the private sector in the PPP scheme would be enough to support 12 significant projects in Indonesia such as airports, seaports, toll roads, a monorail, waste management and water supply (BKPM, 2016). However, these institutional improvements more effectively work in the central government, but not at the regional level (in the district or city) due to lack of coordination between the central and the regional governments and lack of coordination among institutions (Pardede and Zahro, 2017).

The Indonesian government is also concerned with the improvement in regulations. For example, in 2015, the Indonesia government founded an agency, namely the Intellectual Property Data and Information Service System (LADIHKI). The LADIHKI is designed to protect patents, trademarks, and industrial designs. The LADIHKI has set a regulation in 2016 in helping the intellectual property rights (IPR) holders to enforce breaches of their IPR. The LADIHKI plays a curial role in increasing the level of investment climate in Indonesia. The government also amended the Land Acquisition Law of 2012 to give incentives for private sectors participating in land clearing for infrastructure purposes.[27] Nonetheless, local governments in Indonesia on many occasions issue regulations that are counterproductive to central government regulations, leading to inconsistent regulations across different regions (Pardede and Zahro, 2017).

Unfortunately, Jokowi's series of reforms seem to have been discontinued in his second period of government. Rather than keep his first period economic reform packages on track, Jokowi has introduced another ad-hoc reform package, namely the omnibus bill. This bill

[27]Ministerial Regulation No. 4 of 2015 that issued by the Indonesian Ministry of National Development Planning has a function to simplify the implementation procedures for PPP in infrastructure provision and to enlarge the role of private sectors in Indonesia's infrastructure development.

deregulates labor and investment laws and passed into law in the House of Representative on 5 October 2020. With this new law, it is hoped that Indonesia can attract more foreign investment, increase manufacturing exports and create jobs in accommodating its demographics.

A number of efforts were made by Indonesia to reduce its trade protection throughout 2014-2015. The Indonesia Bogor Goals Progress Report (APEC, 2016) notes that import licences have been removed for products such as cooling systems, printers and photocopying machines, and textile products in 2014. Additionally, the requirement of import licences has been wiped out for food and beverages, traditional medicines, and health supplements. The government also scrapped an import ban on sugar outside the milling season.

In 2015, the Indonesian Ministry of Trade loosened the regulation of the use of Indonesian language for labeling on imported products. In the same year, the Indonesian government also loosened export bans, especially for bauxite ore, where it was allowed to be exported again. In 2016, the Ministry of Trade relaxed import restrictions on mobile phones and tablets.[28] On the other hand, the Ministry of Trade claimed that licences related to Indonesia's export and import had been improved by the implementation of an online system that integrated with the Indonesian National Single Window (INSW).

The INSW incorporates 18 licences organizations in Indonesia, and the INSW also connects to the ASEAN Single Window.[29] In that manner, the Ministry of Trade has cut the number of licences in exports and imports from 169 licenses to 45 licences. This significant reform has aimed to reduce non-tariff barriers (NTBs) in linkage to excessive regulations and bureaucracy.[30] Although Indonesia has made significant progress in loosening its export and import restrictions, the Global Trade Alert previously shows that the level of trade protection is relatively high compared to its Southeast Asian partners (see Table 1.1).

[28] http://www.globaltradealert.org, accessed 12 June 2017.
[29] The Indonesian Ministry of Trade Performance Report 2015.
[30] The Indonesian Ministry of Trade press released 25 October 2016.

The factor of foreign ownership in Indonesia's business sectors is vital to attracting more FDI flows into Indonesia. The role of foreign ownership in Indonesia's manufacturing sectors plays a crucial role in generating efficiency in production. By using the data of foreign firms in manufacturing industries during 1997-2001, Takii and Ramstetter (2005) found that there is a positive relationship between the degree of foreign ownership and an increase in productivity in Indonesia, particularly in chemicals, metals, transport equipment, textiles, and footwear industry.

The SBY government issued the 2007 Negative List law in order to improve the regulation of foreign ownerships and the national ownerships. However, the 2007 Negative List failed to meet foreign investor expectations as this law resulted in a lack of improvement in investment climate (LinBlad, 2015). To overcome such drawbacks, then the 2014 Negative List law was launched by the SBY administration to enhance the 2007 Negative list law. Damuri and Day (2015) emphasize that some investment restrictions still existed in the 2014 Negative List. Foreign investors still find it difficult to own business with majority shares, especially in Indonesia's shipping industries. In this case, the government only allowed foreign ownership under 50% in shipping industries. This regulation is not in accordance with the AEC. The AEC allows foreign and ASEAN investors to have 70% of ownership in the same industry.

During the Joko Widodo administration, the 2014 Negative List was then reformed by issuing the 2016 Negative List. The Presidential Regulation Number 44 of 2016 (the 2016 Negative List) has a purpose of relaxing foreign ownership protection.[31] Some significant changes in liberalizing investment have been made based on the Presidential Regulation Number 44 of 2016. This regulation has been designed to be more open to investment activities, simplified the investment procedures, and protected investors' interest. Some sectors and sub-sectors were previously not regulated and closed to foreign investments. In the 2014 Negative List became regulated and more open to foreign investors. For example, e-commerce under the trading sector was unregulated in the 2014 Negative list, and was regulated in the 2016 Negative list. Foreign investors are allowed to own 100% shares in the e-commerce sector. Foreign investors are also allowed to possess 85% of shares in

[31] The 2016 Negative List was a part of the 10th Economic Package that has been announced by the government on 11 February 2016.

Indonesia's financial sector. Power construction under the energy and mineral sector was closed to foreign investors in the 2014 Negative List; now foreign investors can own shares up to 49%.

Another notable improvement from the Presidential Regulation Number 44 of 2016 is that some sub-sectors have been in line with the AEC measures. For example, ASEAN investors can be owners of marine cargo handling services firms in Indonesia up to 70%. This regulation is in accordance with the AEC measures. Although the 2016 Negative List reduces investment restrictions in Indonesia, some sectors and sub-sectors remain closed to foreign investors while others open with terms and conditions. The OECD FDI Restrictiveness Index previously shows that the trend of Indonesia's FDI restriction rose from 0.308 in 2010 to 0.315 in 2016 (See Table 1.2). This index suggests that the 2016 Negative List might not yet contribute to a reduction in Indonesia's FDI restrictions.

In its second term, the Jokowi government has a plan to replace the 2016 Negative List with the Positive List regulation in 2020.[32] Government drafted a presidential regulation in 2020 to amend the 2016 Negative List to be the Positive List. In doing so, the government has eased foreign investment restrictions and promotes more FDI inflows. The Positive List regulation will open for all business sectors to foreign investors, especially for priority industries. Some selected business sectors remain prohibited such as gambling, cannabis cultivation, chemical weapons production and wildlife trade. At the same time, a omnibus bill has submitted to the House of Representatives in February 2020 to be passed into the Omnibus Law.[33] The new law would make Indonesia one of the easiest countries for investment. Not only that, but also this new investment law will connect industries to global production networks and boost job opportunities and economic growth. However, there is a possibility that the Positive List regulation and the Omnibus law would overlap each other and make foreign investors hold back their investment. It is important to ensure that both

[32] As reported by the Jakarta Post on 12 November 2019. Available at: https://www.thejakartapost.com/news/2019/11/12/government-to-replace-negative-investment-list-with-positive-list-for-priority-industries.html, accessed 7 August 2020.
[33] As reported by the Jakarta Post on 3 June 2020. Available at: https://www.thejakartapost.com/news/2020/06/03/government-expects-house-to-vote-on-omnibus-bill-next-month-luhut.html, accessed 7 August 2020.

the Positive List regulation and the Omnibus law should complement each other, resulting in a more conducive investment climate in Indonesia.

2.4 Summary

This chapter has demonstrated that the stage of Indonesia's trade and FDI was dynamic in the last few decades since the 1960s. The oil bonanza in the Soeharto era, in particular from 1974 to 1984, made the oil industry being the leading sector in Indonesia, accounting for around 70% of total exports. The number of FDI inflows into Indonesia were also significant to the oil sector. However, the Indonesian economy's reliance on the oil sector made other sectors, especially the manufacturing sector, less developed than that of the oil sector, creating a 'Dutch Disease' phenomenon. A sharp decline in the global oil price in 1982 forced the Soeharto government to reform its economy. This reform allowed manufacturing sectors, especially labour-intensive sectors, to increasingly develop and became the leading sectors for Indonesia's trade and FDI during 1982-1996. In this period, Indonesia also increasingly engaged its economy with the global economy with confidence. As Indonesia was at the very peak of its economy (economic growth was around 8%), by contrast, the degree of trade protection and investment restriction in Indonesia significantly increased, weakening the fundamentals of Indonesia's economy. As the Asian financial crisis hit Indonesia in 1997/1998, it also crushed the performance of Indonesia's trade and FDI.

Around five years after the Asian financial crisis, Indonesia found its momentum to regain its trade and FDI through a sharp increase in the prices of global commodities and natural resources. The SBY government (2004-2014) reaped lucrative trade and FDI from the commodities and natural resources boom. However, the commodity and natural resources boom that was enjoyed by the SBY government led to Indonesia's economy again undergoing 'Dutch Disease' as experienced by the Soeharto government in the oil boom era.

When Jokowi governed Indonesia in 2014-2019, the commodity and natural resources boom ended. However, the roles of commodities and natural resources have been still important for Indonesia's trade and FDI, while the performance of trade in manufacuring sectors (parts and components and vehicles) were low (see Tables 2.2 and 2.3). The growth

of FDI manufacturing sectors (the secondary sectors) was significant but there was a failure to realize Indonesia's comparative advantage in the manufacturing sectors (see Table 2.4).

Indonesia's trade opennes from 1995 to 2019 overall has declined on average compared to selected ASEAN countries, suggesting less integration with the regional and the global economies (see Table 2.1). This is also worsened by the condition that there was an increased in trade in commodites and natural resources sectors rather than manufacturing sectors since SBY (and continued by Jokowi), resulting in the low level of Indonesian participation in a global production network.

Chapter 3: Economic integration: A conceptual framework

3.1 Introduction

This chapter begins with a discussion of the economic integration framework. Economic integration is an important element in this research as it provides the thesis's main perspective in examining trade and FDI.

The Economic integration framework basically derives from international trade theory. The theory of comparative advantage and the theory of factor endowment play an important role in driving the development of the economic integration framework.[34] However, after the World War II, international trade among nations saw higher tariff rates, leading to inefficiency in international trade flows. Therefore, the General Agreement on Tariffs and Trade (GATT) was founded in 1947. It was the first multilateral agreement that implemented the economic integration framework in the global trading system. The GATT was established to address higher tariff rates across nations. Multilateral negotiation rounds were facilitated by this institution in order to reduce tariff rates across nations. Since then, economic integration has played a critical role in fostering economic growth around the world through trade and investment. Economic integration can increase trade by the reallocation of resources. As a result, this can help a country to take advantage of its comparative advantage.

Many economic integration agreements have developed into deep integration beyond tariffs. In fact, an economic integration agreement that only focuses on tariff reduction on goods is now regarded as a 'shallow integration' (Lawrence, 1997; Birdsall and Lawrence,

[34] The theory of comparative advantage was first advanced by David Ricardo in the nineteenth century as an explanation of international trade. A country has a comparative advantage when its autarkic relative prices in producing a good is lower than that of other countries. International trade occurs when that country exports goods of which it has a comparative advantage and imports goods of which has not. The theory was further developed by Heckscher (1919) and Ohlin (1933). The Heckscher-Ohlin (HO) explained that comparative advantage is shaped by differences in relative factor endowments among countries such as labour and capital. When trade opens, a labour abundant country exports labour-intensive goods and imports capital-intensive goods, while a capital abundant country does the opposite. Ricardo's and HO's explanation of comparative advantage are useful to understand the basic pattern of trade.

1999). Because of this shift, the efforts to eliminate non-tariff barriers and to improve trade facilitation have received more attention than tariff reduction alone.

However, the progress of multilateral trade negotiations is slow, giving rise to the creation of regional economic integration. This regional economic integration in implementation is known as preferential trade arrangements (PTAs) or regional trade agreements (RTAs). PTAs (or RTAs) are legal under Article XXIV of the GATT. Article XXIV of the GATT allows the formation of PTAs (free trade areas or FTAs/Custom Unions or CU) as a special exception to the rules against discrimination. Under PTAs, the role of economic integration is proliferated to boost trade and investment.

Most PTAs currently include not only conventional trade provisions beyond tariffs but also investment provisions, making them a deep integration. Economic integration also helps countries to liberalize their investment regime. Low costs trade due to economic integration can attract more foreign direct investment (FDI). FDI will be reallocated from non-member countries to member countries of PTAs. FDI in an economic integration framework can be a powerful driver of investment-led growth.

However, some issues have been arising mainly due to the implementation of regional economic integration (PTAs). Discrimination against non-members has been generated by PTAs (FTAs/CUs). A PTA creates trade diversion that can affect the level of welfare. Additionally, a PTA erodes the role of the WTO since most of the countries engage with PTAs. More importantly, the rules of origin (ROO) that come from multiple PTA can be overlapping each other, resulting in new costs of trade and creating the 'spaghetti bowl' effect. These problems mentioned above raise a debate about the building blocks versus the stumbling blocks. This classic debate, which emerged in the mid-1990s, remains relevant to the present since each perspective has a solid argument to describe the current fact of economic integration.

The gravity equation has become one of the main workhorses to explain the phenomenon of international trade flows and trade integration. The basic gravity equation describes how the economic mass between two countries attract trade flows between them, while distance discourages them. The rapid progress of trade integration around the world is also

followed by further liberalization in investments. The theoretical models of FDI are based on the behavior of multinational national enterprises (MNEs) and derived from the gravity equation. In these contexts, the theoretical models of FDI are decomposed into two approaches.

The first is the general equilibrium approach. Horizontal FDI (motivated by market access) and vertical FDI (motivated by resource seeking) can be explained through this general equilibrium approach. In the process, the theoretical models of horizontal FDI and vertical FDI have been developed to be FDI models derived from the gravity equation. In practice, these FDI models incorporate both horizontal FDI and vertical FDI into one equation. For example, the knowledge-capital (KC) model advanced by Markusen and Maskus (2001) and the knowledge-physical-capital (KPC) model developed by Bergstrand and Egger (2007, 2013) are essentially FDI models derived from the gravity equation.

The Second is the partial equilibrium approach. This partial equilibrium approach mostly examines the partial determinants of FDI flows. In the construction of empirical models, both approaches can be used together as these have been specified in the KC model and the KPC model.

There are various obstacles to policy reforms towards economic integration. Though tariffs have been brought down significantly through the multilateral negotiations, impediments beyond tariffs still exist through the increasing of non-tariff measures (NTMs). Impediments to trade also increasingly emerge from a lack of trade facilitation measures (TFMs). Lack of TFMs contributes to generating more costs of international trade in regards to logistics and administration (read tape) costs at-the-border and behind-the-border countries, especially for developing countries.

3.2 The framework of economic integration

3.2.1 The concept of economic integration

The Uruguay Round that concluded in 1995 has been crucial event for the development of economic integration around the world.[35] One of the most important results of the Uruguay Round was transforming the General Agreement on Tariffs and Trade (GATT) that was

[35] Uruguay Round started from 1986 until 1994 and concluded in 1995, with 123 countries participating.

established in 1947 into a new form of multilateral/global trade integration known as the World Trade Organization (WTO). The role of the GATT, then continued by the WTO, was successful in reducing trade barriers across nations. A massive reduction in trade barriers is the key to expanding trade around the world.

Not far from the GATT establishment in 1947, there were two initiatives of economic integration foundation in Western Europe. The First was the Treaty of Rome 1957 that created the European Economic Community (EEC), and second was the Stockholm Convention 1960 that developed the European Free Trade Area (EFTA).[36] Both the EEC and the EFTA then merged into what became the European Union in 1993, while in North America, the North American Free Trade Agreement (NAFTA) came into force in January 1994 and involved the US, Canada, and Mexico. These significant three crucial economic events (the WTO, the EU, and NAFTA) drive the world economic system, especially the global trading system, to become increasingly integrated.

Economic integration was defined by Balassa (1961) as 'both a process and state of affairs' (p.1). A process means 'measures designed to abolish discrimination between economic units belonging to different national states, while a state of affairs is 'absence of various forms of discrimination between national economies' (p.1). Balassa (1976) also introduced 'stages of integration' which distinguished economic integration into five levels in forming a sequential process of integration, namely a free trade area (FTA), a customs union (CU), a common market, an economic union, and complete economic integration.[37]

Economic integration provides various instruments and platforms. Most-favored-nation (MFN) tariffs and preferential tariff agreements (PTAs) are important instruments to further

[36] The members of the EEC are Belgium, France, Germany, Italy, Luxemburg, and Netherland, while the members of EFTA are Austria, Denmark, Norway, Portugal, Sweden, Switzerland, and the UK. The EU has 27 members now, as UK exited in 2016.

[37] Custom Union (CU) is characterised by an abolition or a reduction of tariffs (and other barriers) in a union but complemented by external tariffs against imports from non-union members, while Free Trade Area (FTA) is the same as CU, except that every member can impose its own tariffs (external tariffs) on imports from non-members. When input factors such as labour and capital or investment are freely mobile, this is a common market. An economic union is a common market plus the harmonization of national economic policy among members. A complete economic integration is the unification of monetary, fiscal, social, and countercyclical policies, and the setting up of supra-national authority whose decisions are binding the member states.

reduce tariffs barriers and to further develop economic integration across the globe.[38] MFN rates are commonly applied among the WTO members, while PTAs are the key drivers for reducing tariffs in the FTA and the CU. With respect to economic integration platforms, nations may use the multiple platforms of economic integration in order to increasingly gain from free trade and investments. For example, if a unilateral integration scheme (as non-reciprocal integration) is applied, a county should reform its economy without expecting its counterpart doing the same thing. At the same time, nations may also use multiple economic integration platforms such as reciprocal platforms of economic integration at the bilateral, regional and multilateral levels.

The theory of economic integration in the literature strongly relates to the analysis of welfare impacts. The welfare impact of economic integration was first advanced by Viner (1950) by introducing the terms of trade creation and trade diversion. Trade creation occurs when members can create new trade with low costs. Trade diversion, by contrast, diverts trade from low-cost outsiders (non-members) to high cost within the union (members). The theory of trade creation and trade diversion implies that economic integration through free trade may result in gain, or otherwise, in loss. If trade creation effects are dominant, then this can bring a trade bloc into gain. However, if trade diversion exceeds trade creation (Krugman (1991a) defines this as an excessive trade diversion) then a trade bloc is no longer efficient.

Nevertheless, trade diversion can be avoided in some ways. Summers (1991) argues that the risk of trade diversion is minimized as members in an integration area are essentially 'natural trading partners' in which each already trades a lot in the same area or is geographically proximate. Panagariya (1996) and Bhagwati and Panagariya (1996) argue that Summers's argument is weak since 'the natural trading partners hypothesis' that can minimize trade diversion risk has no analytic basis. Richardson (1993) suggests that reducing external tariffs against non-members can tackle trade diversion risks, and this could only be

[38]MFN tariffs are what countries promise to impose on import tariffs from other members of the WTO. A PTA is giving another country's products lower tariffs than their MFN tariffs. In a custom union or a free trade area, the preferential tariffs is zero for all products. These agreements are reciprocal: all parties agree to give each other the benefits of lower tariffs. Some agreements specify that members will receive a percentage reduction from the MFN tariffs, but not necessarily zero tariffs. Preferences therefore differ between partners and agreements. Available at: (https://wits.worldbank.org/wits/wits/witshelp/content/data_retrieval/p/intro/c2.types_of_tariffs.htm, accessed 7 November 2017).

done through an FTA and not through a CU. APEC (2015) also suggests that trade diversion risks can be reduced by increasing the number of members. However, increasing the number of members is not a simple undertaking (Panagariya, 1999). Panagariya argues that the EU needs 40 years to expand its members from 6 to 15 countries, while NAFTA took ten years to include Mexico to be the third member of NAFTA after the US and Canada. An empirical study by Baier and Bergstrand (2007) confirms Panagariya's argument that the expansion of free trade agreements is very slow. It takes 10 years on average for a trade block to get new members (two new members on average). The evidence of previous studies mentioned above implies that the expansion of economic integration on a reciprocal basis at the level of regional essentially takes a long process of negotiation. In these contexts, unilateral integration could be better in opening countries' economies to the world as this can be done by the own country's government (or the one-sided policy) without conducting a complex negotiation with other countries.

3.2.2 Why is economic Integration important?

Balassa and Stoutjesdik (1975) explain that economic integration could expand international markets. Economic integration can extend product specialization and exploit economies of scale. They also point out that economic integration increases the level of competition, which is good for innovation and technology improvement. Baldwin and Venables (1995) suggest that members can obtain several advantageous from economic integration schemes: the output effects (or the production shifting effects), the scale effects, and the variety effects. Baldwin and Venables (1995) then explain these three effects as follows. Since trade barriers are reduced due to economic integration agreements, this allows the cost of production to be cheaper. Hence, members will move their plant facilities from outsiders (non-members) to insiders (members), generating 'the output effects'. This circumstance increases the number of firms placed in a free trade zone, leading to 'the scale effects' and at the same time 'the variety effects' due to the production of goods with more diversity.

Melitz (2003) argues that a trade bloc could deliver benefits to members through two channels: an increase in trading partners and a decrease in trade costs. When the number of trading partners increases along with a decrease in trade cost, this forces inefficient firms out of the market. In the process, the remaining resources and market shares from

inefficient firms can be reallocated to efficient firms. As a result, profits and aggregate productivities of the most efficient firms rise significantly.

Krugman et al. (2015) argue that economic integration provides a greater incentive for entrepreneurs either in seeking new ways to export or in competing with import goods. Krugman et al. (2015) also argue that consumers can also enjoy a broader range of goods choices with low prices because of economic integration. Economic integration locks members' domestic reforms. In detail, external pressures from economic integration can force members to reform their economies by adjusting their internal trade policies in line with economic integration goals. Domestic reforms under economic integration, particularly on a reciprocal basis, is a way for easing trade impediments and investment restrictions. The reduction of trade impediments and investment restrictions can make the implementation of economic integration more efficient, leading to trade expansion.

The issues of reforms under economic integration currently cause great concern to NTMs and lack of TFMs. Most of these NTMs and lack of TFMs are commonly practised under the national treatment, or known this as behind-the-border barriers.[39] Economic Integration, in this case, can play a leading role in disciplining NTMs (UNCTAD, 2013). In detail, the regulatory convergence through harmonization and mutual recognition can help to narrow NTMs among members of trade agreements (WTO, 2012; UNESCAP, 2015).[40]

Economic integration can also improve the problem of lack of TFMs. The Bali Round in 2013 agreed to conclude the WTO Trade Facilitation Agreement (TFA).[41] The TFA is expected to reduce the total of trade costs by around 14%, 15% and 13% for low-income countries, lower-middle-income countries and upper-middle-income countries respectively. UNESCAP (2015) suggests that the sharp decline of trade costs through trade facilitation reforms can lead to deep integration in the Asia Pacific region. The OECD Trade Policy Studies (2009)

[39]NTMs and the lack of TFMs can also be encountered at-the-border such as technical barriers to trade (NTMs) and port inefficiency (TFMs).
[40]Harmonization can be defined as common standards or minimum standards (Lloyd, 2010).
[41]The TFA has an ambition to increase global trade flows by up to US$ 1 trillion per annum, which entered into force on 22 February 2017. The document of the TFA can be viewed at https://www.wto.org/English/docs_e/legal_e/tfa-nov14_e.htm. To date, 121 members or two-third of 164 members have ratified the TFA. Since trade facilitation is crucial for trade expansion, therefore the trade facilitation issue is also adopted by several PTAs in their agreements such as the AEC with the AEC's Blueprint in 2004 and APEC with the APEC Supply Chain Connectivity Framework Action Plan (SCFAP) in 2010.

demonstrates that the effects of trade facilitation reforms across countries are varied. For example, emerging countries enjoy up to 75% of total gains from trade facilitation reforms, while OECD countries reap less than emerging countries.

3.2.3 From shallow integration to deep integration

The formation of PTAs around the world currently adopts deep integration rather than shallow integration. The definition of shallow integration and deep integration rapidly emerged when Lawrence (1997) argues that multilateral integration such as the WTO tends to promote 'shallow integration', in which a tariff reduction (at-the-border barrier) of goods becomes the main agenda of reforms. PTAs, by contrast, promote 'deeper integration' that brings standards and other domestic policies such as product standards, intellectual property rights, internal competition policy, government procurement, and labour and environmental standards into the agreements.

Birdsall and Lawrence (1999) point out that since tariff barriers have been reduced significantly, different domestic policies among members have become apparent. Therefore, deeper integration is necessary to be conducted by harmonizing and reconciliating these different domestic policies among members and bring them into the agreements. Deep integration can also improve the international markets for both developing countries and advanced countries through realizing economies of scale, restricting monopoly practiced by large firms, and enhancing domestic reforms. Ghoneim et al. (2011) describe shallow integration as tariff removal, but if this includes non-tariff measures removal, then the level of integration increases with deeper integration. Aichele et al. (2014) argue that the vital point to distinguish between shallow integration and deep integration is a degree of trade costs reduction. Deep integration provides stronger trade cost reduction than a shallow integration by addressing tariffs as well as the costs of non-tariff measures (NTMs).

Nevertheless, the claim that deep integration is a good thing is still debatable. Panagariya (1999) argues that deep integration can lead to uneven bargaining power where rich countries dominate the agenda of deep integration over developing countries. Whether this is proper or not, developing countries must adjust their standards to those of advanced countries. As a result, this gives advanced countries more benefits to penetrate developing

countries' markets but not the other way around.[42] Given this reality, deep integration is unlikely to be welfare-enhancing. Thus, it is important for PTAs to carry mutual benefits among countries that being involved in deep integration agreements in order to avoid what Panagariya's argument above as uneven bargaining position in deep integration.

3.2.4 Possible downsides of economic integration

The drawback of economic integration

Economic integration, particularly in the form of PTAs, is not always a good thing.[43] Krugman (1991b) claims that PTAs might hurt non-member countries, even without an increase in protection. The reason behind this is deterioration of non-members' terms of trade as the members maintain their external tariff for non-members. PTAs can also cause trade warfare. Krugman (1991b) points out that trade warfare occurs when regional trade blocs across the world exploit their market powers by raising tariffs to each other. This condition may lead to more aggressive trade policies. As a result, it can damage trade among regional blocs and may leave every country worse off.

The stagnation of the Doha Round in 2008 contributed to the proliferation of PTAs.[44] Krugman (1991b) predicted this phenomenon by arguing that the erosion of a multilateral process can lead to PTA, and Bhagwati and Panagariya (1996) call this stagnation 'Hobson's choice': 'if the multilateral trade negotiation could not be used to continue lowering trade barriers, then PTAs would need to be used instead' (p.85). Hence, regionalism now becomes more attractive than multilateralism. Panagariya (1999) argues that regionalism can fragment the global trading system unless this regionalism opens up to outsiders (non-members). However, this would not happen since discrimination against non-members at any point in time remains in place and Article XXIV of the GATT could not ensure that regionalism in the implementation can freely open to non-members.

[42] In the case of NAFTA, Panagariya (1999) argues that the ROO impeded Mexico's goods penetration in the US markets. In the case of Indonesia-Japan FTA, Damuri (2014) argues that Indonesia's goods failed to meet the Japan's standard. As a result, a high quality of products required by Japan causes Indonesia's goods difficult to access Japan's markets.

[43] Panagariya (1996) argues that a preferential means discriminatory.

[44]The WTO records that as the Doha Round has been stagnated since 2008, there are 209 additional RTAs from 2009 to 2017 have notified to the WTO (https://www.wto.org/english/tratop_e/region_e/regfac_e.htm, accessed 7 November 2017). RTAs, either through FTA or CU, have a legal framework based on Article XXIV of the GATT (see https://www.wto.org/english/tratop_e/region_e/region_art24_e.htm).

Building blocks versus stumbling blocks

There is intense attention about the role of PTAs in global economic integration. The debate about PTAs versus multilateral agreements (such as the WTO) is an old issue but still relevant in present time. Proponents of regionalism argue that PTAs are building blocks, promoting global economic integration. By contrast, multilateralists argue that PTAs can fragment the global trading system, leading to stumbling blocks. Each perspective has its own valid arguments.

It is true that economic integration can help to reduce trade barriers across the world, thus allowing trade to expand significantly. However, when nations join with several FTAs, they deal with different rules of origins (ROOs). In this case, the ROO is where every good that flows within FTA must originate from members with specific criteria and specifications according to agreements. These different ROOs can be crisscrossing each other, inducing the 'spaghetti bowl' effect (Bhagwati, 1995).[45]

Multiple ROOs can increase trade costs that include administration (paperwork) costs, standardization costs due to fulfilling the ROO requirements, and costs related to proof of origin of goods (Crook and Gordon, 2017). Overlapping ROOs can also lead to low utilisation in using the preferential trade schemes (Tumbarello, 2006).[46] In the case of the integration between developed and developing countries, the ROO is used to protect advanced countries' markets from developing countries' product penetration, leading to discrimination as well, but in this case, the victim is members from developing countries (Panagariya, 1999).

Many FTAs strictly enforce the rules of origin (ROO) to avoid trade deflection.[47] Trade deflection emerges because the FTA members impose different external tariffs on non-members countries. These different external tariffs give great opportunities to non-member countries to enter the FTA zone through a member country that offers the lowest external

[45] Panagariya (1999) argues that the elimination of ROO is the key to erase the spaghetti bowl effect.
[46] It is still debatable, the current studies by Hayakawa et al. (2017) argue that the membership of countries in multiple PTAs can give benefits for exporters due to more choices of tariff schemes. Exporters are likely to utilise tariff schemes that offer larger margins (difference between MFN and PTA tariff rates) and less restrictive of ROOs.
[47] See Balassa (1961), Baldwin and Venables (1995), and Panagariya (1999) for trade deflection detail explanations.

tariffs. When the entrance of non-member countries to the FTA zone succeeds, they can access the other FTA members' markets with zero tariffs. For these reasons, multilateralists claim that PTAs can turn into a stumbling block to global economic integration.

However, the claim by multilateralists that regionalism is bad for global integration, remains debatable. The advocates of regionalism have arguments that PTAs can promote global integration. Summers (1991) argues that since most of the PTAs are natural blocks, PTAs can induce more trade creation than trade diversion, leading to multilateralism. Baldwin (1995) introduces the theory of 'domino effects' in which economic incentives of PTAs are the crucial factors that can make all countries eventually seek to enter into existing PTAs. This process leads to global integration. Wei and Frankel (1996) argue that a PTA can be used as an intermediate step to pursue global integration, and this is called 'the stepping-stone effects.'

3.2.5 Economic integration effects on FDI flows

Economic integration is not only facilitating the flows of trade but also those of investments. Blonstrom and Kokko (1997) suggest that investment liberalizations under economic integration mechanisms would have a more substantial effect if some key factors are satisfied as follows: the reduction of FDI restrictions, provisions on the property rights of foreign investments, and reforms inside countries (domestic).[48] Antras and Foley (2009) demonstrate that the increase of multinational firms' activities in integration zones could lead to benefits for trade blocks in terms of a higher level of productivity and wages, and positive spillovers for other firms.

Feenstra (1998) points out that economic integration is the key driver of the vertically integrated mode of production or vertical integration in which production activities are dispersed accross countries. Vertical integration could lead to rapid growth of trade in intermediate inputs. This vertical integration substantially occurs when there is a significant gap of input factor costs among members, allowing FDI inflows from a higher production cost member to a lower production cost member (Kim, 2007).

[48]Blonstrom and Kokko (1997) also argue that the implementation of domestic reform is critical for the host country since this induces a more predictable policy environment for foreign investors.

Lipsey and Sjoholm (2011) point out that vertical integration is not only advantageous for large country members, but also for small ones. A small country member can participate in vertical integration by specializing in a single stage of production for eventual use in many markets. Thus, when economic integration drives vertical integration, this can create regional and global production networks (RGPNs/GPNs). When economic integration has been in deep integration as discussed earlier, this can reduce FDI restrictions regarding contractual frictions (Antras and Helpman, 2008; Osnago et al., 2015). Reduction in contractual frictions matters since this can guarantee the property right of foreign investors, which is important for aiming for higher values of vertical FDI. Osnago et al. (2016) suggest that vertical firms are likely to choose deep integration for securing and raising the profitability of their investments. Damuri (2012) also argues that vertical firms support deep integration because this can facilitate them to get further integration into global production networks (GPN). Moreover, Damuri (2012) points out that deep integration is crucial for GPN business operations, as deep integration can provide a point of agreements (or provisions) in relation to the easing of FDI restrictions. Most of these FDI restrictions relate to domestic policy issues (behind-the-border restrictions). Poor domestic policies would cause a lack of property rights, anti-competition policy, and behind-the-border market access restrictions (or discrimination against foreign investors). In addition, Damuri (2012) highlights the importance of trade facilitation to accelerate GPNs.

Brooks and Stone (2010) argue that the improvement of logistic services via supply chains plays an important role in fostering Asian global competitiveness. The high quality of logistic services not only increases trade volumes but also promotes FDI inflows. However, Baldwin (2014) argues that deep integration is not necessarily required to attract FDI. For example, some large emerging countries such as China, India, and Brazil receive a vast amount of FDI inflows without signing a deep integration agreement. Lypsey and Sjoholm (2010) argue that FDI only seeks cheap labour wages and large markets.

3.3 Theoretical models of economic integration

The gravity model is the most widely used approach by a large number of previous empirical studies to predict international trade flows. The model explains trade flows based on how the factor of economic mass between the two countries can make trade more significant, and how distance between the two countries can restrict their trade flows. When economic

integration is introduced, the gravity model also fits to explain free trade patterns. However, the original gravity model suffers from a lack of theoretical foundations. This section reviews how a series of previous gravity studies contributed to establish the theoretical grounds of the gravity model.

Most of these studies used microeconomic foundations to build the theoretical foundations of the gravity model. Others used the relative differences of factor endowments of the Heckscher-Ohlin (HO) model as a basis to develop the theory. However, this study will emphasize the discussion of the gravity model with trade barriers, as this theoretical model is important in addressing research questions. Another aspect that this study covers in this section is the theory of FDI. The theory of FDI is built according to the behavior of multinational enterprises (MNEs). The characteristic of FDI, essentially, is more sensitive than that of trade. The level of sensitivity of FDI will depend on particular factors that can affect FDI activities. In the theory of FDI, therefore, those particular factors can be termed the FDI determinants. These FDI determinants can be used to examine FDI flows by using the general equilibrium approach and the partial equilibrium approach.

3.3.1 The gravity model

Tinbergen (1962) was the first to develop the gravity equation, inspired by Newton's law of gravity in physics. In the gravity equation for trade flows, the attraction of the two countries positively relates to the economic mass factors (GDP) but inversely relates to distance between the two countries.[49] The first gravity model by Tinbergen is expressed as follows:

$$F_{ij} = G\frac{M_i^{\beta_1} M_j^{\beta_2}}{D_{ij}^{\beta_3}} \tag{3.1}$$

where F_{ij} is trade flows between country *i* and country *j*; $M_i^{\beta_1} M_j^{\beta_2}$ denote the economic size of country *i* and country *j*; and $D_{ij}^{\beta_3}$ is a proxy of distance between the two countries. The basic intuition of this original model is that bigger countries tend to trade more while distant countries tend to trade less (Shepherd, 2016). Although the gravity equation has consistently high statistical explanatory power in its application, this original model essentially suffers from a lack of theoretical foundation (Bergstrand, 1985).

[49] The Newton's law of gravity mentions that the gravity force between two objects is proportional to the product of the masses of the two objects divided by the distance squared between them.

Anderson (1979) was the first to derive the theoretical grounds of the gravity equation. He worked with the microeconomic foundations, particularly the use of expenditure properties.[50] The main aggregate gravity equation by Anderson (1979) is formulated as follows:

$$M_{ij} = \frac{m_i \phi_i Y_i \phi_j Y_j}{\sum_j \phi_j Y_j} * \frac{1}{f(d_{ij})} * \left[\sum_j \frac{\phi_j Y_j}{\sum_j \phi_j Y_j} * \frac{1}{f(d_{ij})} \right]^{-1} U_{ij} \quad (3.2)$$

where $f(d_{ij})$ is transit costs (τ_{ijk}) or $f(d_{ij}) = \tau_{ijk}$, which reflects transit costs that increase with distance across commodities.

Bergstrand (1985) postulated a general equilibrium model of world trade derived from the utility and profit-maximizing function. Bergstrand (1985) termed his gravity equation the 'generalized gravity equation' since the incomes of exporting and importing countries are assumed exogenous, where country *j* is an importing country and country *i* is an exporting country. His main gravity equation framework is expressed as follows:

$$PX_{ij} = Y_i^{\frac{\sigma-1}{\gamma+\sigma}} * Y_j^{\frac{\gamma+1}{\gamma+\sigma}} * C_{ij}^{-\frac{\sigma(\gamma+1)}{\gamma+\sigma}} * T_{ij}^{-\frac{\sigma(\gamma+1)}{\gamma+\sigma}} * E_{ij}^{\sigma\frac{\gamma+1}{\gamma+\sigma}} * \left(\Sigma' P_{ik}^{1+\gamma}\right)^{-\frac{(\sigma-1)(\gamma-\eta)}{(1+\gamma)(\gamma+\sigma)}} *$$
$$\left(\Sigma'' P_{kj}^{1-\sigma}\right)^{\frac{(\gamma+1)(\sigma-\mu)}{(1-\sigma)(\gamma+\sigma)}} * \left[\left(\Sigma' P_{ik}^{1+\gamma}\right)^{\frac{(1+\eta)}{(1+\gamma)}} + P_{ii}^{1+\eta} \right]^{-\frac{(\sigma-1)}{(\gamma+\sigma)}} * \left[\left(\Sigma'' P_{kj}^{1-\sigma}\right)^{\frac{(1-\mu)}{(1-\sigma)}} + P_{jj}^{1-\mu} \right]^{-\frac{(\gamma+1)}{(\gamma+\sigma)}} \quad (3.3)$$

where PX_{ij} is trade flows from country *i* to country *j*; Y_i and Y_j are nominal GDP in the USD of country *i* and country *j*; T_{ij} is a proxy of one plus *j*'s tariff on *i*'s product; C_{ij} denotes the transport costs (c.i.f/f.o.b) factor to ship *i*'s product to country *j*; $E_{ij}$is the spot value of *j*'s currency in terms of *i*'s currency; P_{kj} is the *k*'s currency price of *k*'s product sold in *j* market (importable goods price); $P_{jj}$is the *j*'s currency price of *j*'s product sold in *j* market (domestic goods price); P_{ik} is the *i's* currency price of good *k* exporting to country *j*; P_{ii} is the domestic

[50] Anderson (1979) divides his basic gravity model into the pure expenditure system with homothetic preference, where each nation is perfectly specialized, tariffs and transport costs are assumed to be zero, and products are differentiated from the country of origin (Armington assumption (1969)). This first model is expressed as follows: $M_{ij} = Y_i Y_j / \sum Y_j$, where M_{ij} is trade flows from country *i* to country *j*; Y_i and Y_j reflect incomes in country *i* and country *j* respectively. The second model is the trade share expenditure system with constant elasticity of substitution (CES) preference. This model is formulated as follows: $M_{ij} = \frac{m_i \phi_i Y_i \phi_j Y_j}{\sum_i \sum_i M_{ij}}$, where M_{ij} denotes demand for country *i*'s tradeable good in country *j*; m_i is $m(Y_i N_i)$; and N_i is population in country *i*; $\phi_i = F(Y_i N_i)$ and $\phi_j = F(Y_j N_j)$ represent the share of expenditures on all traded goods in total expenditure of country *i* and *j* respectively.

supply price of good *i* in country *i;* σ is the constant elasticity of substitution (CES) among importable goods in country *j*; μ is the CES between domestic and importable goods in country *j*; η is the constant elasticity of transformation (CET) between production for home and foreign markets in country *i*, and γ is country i's CET for production among export markets.[51]

Deardorff (1998) argues that the gravity equation frameworks built by Anderson (1979) and Bergstrand (1985) were too complex and opaque. Therefore, he built a simpler theoretical ground with trade impediments, deriving from the Heckscher-Ohlin (HO) model with complete specialization.[52] The primary assumption of building a gravity framework with impeded trade is that barriers to trade existed for all goods in terms of transport costs and each country produces different goods. Deardorff expresses a gravity framework with impeded trade as follows:

$$T_{ij}^{fob} = \frac{Y_i Y_j}{Y_w} \frac{1}{t_{ij}} \left[\frac{\rho_{ij}^{1-\sigma}}{\sum_h \theta_h \rho_{ih}^{1-\sigma}} \right] \tag{3.4}$$

where T_{ij}^{fob} reflects the free on board (f.o.b) value of exports from country *i* to *j*; t_{ij} is transport costs following Samuelson's iceberg (one plus the transport costs); ρ_{ij}denotes the relative distance from suppliers (exporter) or $\rho_{ij} = \frac{t_{ij}}{\delta_j^S}$, where δ_j^S is average distance from supplier (or exporter); and δ_j^S is coming from $\delta_j^S = \left(\sum_i \beta_i t_{ij}^{1-\sigma}\right)^{1/(1-\sigma)}$, where σ is a CES index for average distance from supplier; ρ_{ih} is a single price of product *h* in all markets; and θ_h is product *h*'s share of world income.[53] This gravity framework with impeded trade implies that transportation costs can be significantly reduced when transportation technology improves.

The inclusion of border effects in the gravity equation that was introduced by McCallum (1995) brought a significant improvement of the theoretical grounds of the gravity model. McCallum's estimation results on Canada's trade using the gravity model were controversial due to the finding that cross-provincial trade in Canada was 22 times larger (or 2,200

[51] For details, see Bergstrand (1985). In his further study, Bergstrand (1989) innovates the gravity equation based on a general equilibrium model of the world trade by incorporation relative factor endowments with monopolistic competition assumption to examine industry trade flows.
[52] See Deardorff (1995) for details.
[53] The detail derivation of a gravity with impeded trade can be seen in Deardorff (1998).

percent) than cross-border trade between the US states and Canadian provinces.[54] Although McCallum's finding was potentially biased, this study led the way for following studies to improve the theoretical models of the gravity equation in regards to the bias of border effects. These next studies, especially those by Anderson and van Wincoop (2003, 2004), who first advanced the multilateral trade resistances in the gravity equation and Feenstra (2002) with the role of the fixed effects method in the gravity equation, become the basic framework of the gravity model with trade barriers.

Anderson and van Wincoop (2003, 2004) argue that McCallum's gravity specification omits the factor of the multilateral resistance (MR). In order to improve McCallum's gravity model, Anderson and van Wincoop then derive a micro-founded gravity equation with the multilateral resistance (MR) variables. Anderson and van Wincoop (2003) define the MR terms as changes in trade costs on one bilateral trade route can affect trade flows in all other routes due to relative price effects.

Initially, Anderson and van Wincoop modify McCallum' gravity equation by appending remoteness variables, reflecting the average distance of region *i* (or *j*) from all trading partners other than *j* (or *i*) as following:

$$lnx_{ij} = \alpha_1 + \alpha_2 lny_i + \alpha_3 lny_j + \alpha_4 lnd_{ij} + \alpha_5 lnREM_i + \alpha_6 lnREM_j + \alpha_7 \delta_{ij} + \varepsilon_{ij} \quad (3.5)$$

where $REM_i = \sum_{m \neq j} \frac{d_{im}}{Y_m}$ indicates the remoteness of region *i*. However, Anderson and van Wincoop argue that the remoteness variables are less significant to change the border coefficient estimates with low adjusted R^2. They attempt to derive a gravity framework with multilateral trade resistances. In this case, trade resistances are divided into the bilateral trade barrier between region *i* and region *j*: region *i*'s resistance to trade with all regions, and region *j*'s resistance to trade with all regions. The gravity framework with multilateral trade resistances formulates as follows:

[54] McCallum's (1995) gravity model is formulated as follows: $lnx_{ij} = \alpha_1 + \alpha_2 lny_i + \alpha_3 lny_j + \alpha_4 lnd_{ij} + \alpha_5 \delta_{ij} + \varepsilon_{ij}$, where x_{ij} is exports from region *i* to region *j*; y_i and y_j are gross domestic production in regions *i* and *j*; d_{ij} is distance between the two regions, i.e., region *i* and *j*; and δ_{ij} is a dummy variable: for interprovincial trade in Canada is one and for state-province trade between the US and Canada is zero. McCallum employs the 1998 data for all 10 provinces in Canada and 30 states in the US that account for 90% of the US-Canada trade.

$$x_{ij} = \frac{y_i y_j}{y^W}\left(\frac{t_{ij}}{P_i P_j}\right)^{1-\sigma} \quad (3.6)$$

where t_{ij} is trade cost factors between country *i* and country *j*; $P_j = \left[\sum_i \left(\beta_i p_i t_{ij}\right)\right]^{\frac{1}{(1-\sigma)}}$ indicates the consumer price index of *j*, where p_i is exporter's supply price; $P_i = \left(\sum_j \left(\frac{t_{ij}}{P_j}\right)^{1-\sigma} \theta_j\right)^{\frac{1}{(1-\sigma)}}$ denotes the price indices of *i* or termed 'multilateral resistance' variables that depend on t_{ij}, so then an increase in trade barriers with all trade partners will increase the multilateral resistance indexes, while θ_j is income shares *j*, and σ is a CES index.[55]

The most important part from the Anderson and van Wincoop study is that they incorporate the MR variables into McCallum's empirical gravity model as follows:

$$lnz_{ij} \equiv ln\left(\frac{x_{ij}}{y_i y_j}\right) = k + \alpha_1 lnd_{ij} + \alpha_2\left(1 - \delta_{ij}\right) - lnP_i^{1-\sigma} - lnP_j^{1-\sigma} + \varepsilon_{ij} \quad (3.7)$$

where $\alpha_1 = (1-\alpha)\rho$; $\alpha_2 = (1-\sigma)lnb_{ij}$; b_{ij}denotes an international border between *i* and *j* that has notation $b_{ij} = b^{(1-\delta_{ij})}$ in which $(b-1)$ indicates the tariff equivalent between *i* and *j*; δ_{ij} is one if *i* and *j* are the same country and zero otherwise; and $P_j^{1-\sigma} = \sum_i P_i^{\sigma-1}\theta_i e^{\alpha_1 lnd_{ij} + \alpha_2\left(1-\delta_{ij}\right)}$. Estimation results suggested that the MR variables contribute to improve McCallum's overstating result (bias), giving a consistent estimate of the average border effects.

Feenstra (2002) confirms Anderson and van Wincoop's (2003, 2004) work that the empirical results of McCallum's estimation are highly upwardly biased regarding the border effects. However, Feenstra argues that Anderson and van Wincoop's estimation process requires a custom programming to perform the constrained minimization and to obtain standard errors. This technique is relatively complicated. For this reason, Feenstra introduces a

[55]To motivate the gravity framework with multilateral trade resistance, Anderson and van Wincoop assume each region is specialized in the production for only of one good, the supply of each good is fixed, a CES index with homothetic preferences is used and prices are different between locations owing to trade costs in which trade costs are not directly observable. They also argue that this gravity framework with MR implies trade between the two regions depending on the bilateral trade barrier relative to average trade barriers that both regions deal with all their trading partners.

gravity model with the fixed effects (FE) method to address bias in McCallum's gravity specification. The model is formulated as follows:

$$ln\frac{X^{ij}}{Y^iY^j} = \alpha\ ln\ d^{ij} + \Upsilon(1 - _{\delta^{ij}}) + \beta_1^i\delta_1^i + \beta_2^i\delta_2^j + (1-\sigma)\varepsilon_{ij} \quad (3.8)$$

where $\frac{X^{ij}}{Y^iY^j}$ denotes bilateral trade between countries depending on their GDP; d^{ij} is distance between region *i* and region *j*; δ^{ij} is equal one if trade occurs between the two Canadian provinces and zero otherwise; $(1 - _{\delta^{ij}})$ is equal one for trade between the US state and Canadian province and zero otherwise; δ_1^i is an indicator variable that is equal to one if region *i* is exporters and zero otherwise; δ_2^j is an indicator variable that one if region *j* is importers and zero otherwise; σ is a CES index; Υ is the coefficient of average trade border effects; $\beta_1^i = \ln\left(\acute{P}^i\right)^{\sigma-1}$ and $\beta_2^i = ln\left(\acute{P}^j\right)^{\sigma-1}$ are the coefficient of the multilateral indexes.[56] Evidence suggests that the FE method is consistent in estimating average trade border effects.[57]

Anderson and van Wincoop (2004) further derive a gravity equation with trade costs. They argue that the gravity equation can facilitate the connection between trade barriers and trade flows. Anderson and van Wincoop suggest that trade costs must take both domestic costs and international trade costs into account. They also explain that trade costs could be decomposed threefold: policy barriers (tariff and non-tariff barriers), transport costs (freight costs and time costs), and local distribution costs (wholesale and retail distribution costs).[58]

They also argue that trade costs are varied across both goods and countries depending on the quality of institutions and infrastructure. Trade barriers in emerging countries are relatively higher than in advanced countries. Anderson and van Wincoop demonstrate that the theoretical grounds of the gravity equation with trade costs can be expressed as follows:

$$X_{ij}^k = \frac{E_j^k Y_i^k}{Y^k}\left(\frac{t_{ij}^k}{P_j^k \Pi_i^k}\right)^{1-\sigma_k} \quad (3.9)$$

[56] See Feenstra (2002) for the elaboration of multilateral index.
[57] See Feenstra (2002) for detail results and analysis.
[58] Anderson and van Wincoop (2004) are defined trade costs as all costs incurred in getting a good to a final user other than the marginal cost of producing the good itself. They claim that advanced countries expend 170% of trade costs in terms of ad-valorem tax equivalent that comprise into 44% of border-related trade barriers, 21% of transportation costs, and 55% of retail and wholesale distribution costs.

where (E_j^k, Y_i^k) is the value of production and expenditure in country *i* for product *k*; Y^k is the world output in sector *k*; $\left(\Pi_i^k\right)^{1-\sigma_k} = \sum_j \left(\frac{t_{ij}^k}{P_j^k}\right)^{1-\sigma_k} \frac{E_j^k}{Y^k}$ indicates an outward MR that is resistant to shipments from *i* to its other markets; $\left(\mathrm{P}_j^k\right)^{1-\sigma_k} = \sum_i \left(\frac{t_{ij}^k}{\Pi_i^k}\right)^{1-\sigma_k} \frac{Y_i^k}{Y^k}$ reflects an inward MR that trade costs are proportional to trade; t_{ij}^k is the trade costs from *i* to *j* of product *k*; and $\sigma_k$is the elasticity of substitution among brands (the CES index). Anderson and van Wincoop state that $\left\{P_j^k, \Pi_j^k\right\}$ is the multilateral indices, measuring trade costs for country *j* with all its trading partners, where P_j^k denotes an average export trade cost including exports from oneself; and Π_j^k represents an average import trade cost including imports from oneself.

Therefore, the final form of gravity model of Anderson and van Wincoop with trade costs can be expressed as follows:

$$x_{ij} = y_i + y_j + \sum_{m=1}^{M} \lambda_m \ln\left(z_{ij}^m\right) - (1-\sigma)\ln(\Pi_i) - (1-\sigma)\ln\left(P_j\right) + \varepsilon_{ij} \quad (3.10)$$

where $x_{ij} = \ln\left(X_{ij}\right)$; $y_i = lnY_i$; $\lambda_m = (1-\sigma)\gamma_m$; x_{ij} and y_i are observables; z_{ij}^m $(m = 1, \ldots, M)$ is a set of observable variables that relates to bilateral trade barriers (bilateral distance and dummy variables for international borders); and ε_{ij} is the error term.[59]

Anderson and van Wincoop also point out that border barriers can be decomposed into language barriers, currency barriers, information barriers, contracting costs and insecurity, and non-tariff barriers.

In sum, a series of earlier studies above show that the theoretical foundations of the gravity equation have made significant progress since Tinbergen (1962) first introduced it with consistently high statistical explanatory powers but lack the theoretical foundations. The microeconomics foundations play a key role in establishing the gravity equation theoretical

[59] The empirical gravity model with trade costs based on the theoretical grounds as constructed by Anderson and van Wincoop (2004) has an objective to improve the traditional gravity with bilateral trade barriers (without theoretical based) that expresses as: $x_{ij} = \alpha_1 y_i + \alpha_2 y_j + \sum_{m=1}^{M} \beta_m \ln\left(z_{ij}^m\right) + \varepsilon_{ij}$, where x_{ij} is the log of exports from *i* to *j*; y_i and y_j are the log GDP of exporter (country *i*) and the importer (country *j*); z_{ij}^m $(m = 1, \ldots, M)$ is a set of observables variables that relates to bilateral trade barriers.

framework. On the other hand, the theoretical foundations of the gravity equation can be derived as well from the HO model.[60]

3.3.2 Theory of FDI

The theory of FDI is theoretically built from the theory of the multinational firms. The gravity model plays an important role in translating the theory of FDI being a proper FDI model. The gravity model for trade, however, needs to be modified in accounting for the firm's theory and in the construction of the FDI model. The earlier work of the FDI model in the literature was determined by two approaches: the general equilibrium approach and the partial equilibrium approach. We need to review both approaches in this case in order to have a better understanding of the theory of FDI and how these approaches have been important for developing the FDI model based on the gravity euqation.

The general equilibrium approach

The general equilibrium approach plays a crucial role in explaining MNE behavior. The types of FDI in the general equilibrium approach can be decomposed twofold: horizontal FDI and vertical FDI.

Horizontal FDI

In horizontal FDI, multinational enterprise (MNE) sets FDI into multi-plants to produce the same goods in multiple countries (Markusen, 1984). Market proximity motivates this horizontal FDI. Markusen (1984) argues that multi-plant operations can be designed to seek efficiency in production by avoiding the duplication of research and development (R and D) and other activities (marketing, finance, technology and so forth). In horizontal MNE, R and D and these other activities must be centralized in the corporate headquarters.

Brainard (1993a) expands this horizontal FDI theory and termed this to be 'the proximity-concentration hypothesis'. Brainard (1993a) defines the proximity-concentration hypothesis as firms' option whether to export or to install overseas production. If firms choose to be exporters, then they can obtain a benefit from economies of scale in production. Otherwise,

[60]Besides the gravity framework based on the microeconomic foundations and the HO model, the gravity equation can also be derived from the Ricardian model that emphasizes the supply side (see Eaton and Kortum, 2002), and from heterogenous firms model or a new trade theory model (see Melitz, 2003 and Chaney, 2008).

if firms build overseas production facilities, then they can gain market access advantage or proximity to consumers. Brainard argues that the decision of firms either to export or to produce abroad depends on the variable of transport costs (as transport costs increase by distance) and the size of economic scale.

In order to seek the evidence of this hypothesis, Brainard (1993a) modifies the traditional gravity model and then applies this modified model to the US's FDI data. Instead using the trade data as the dependent variable as in the traditional gravity model, Brainard employs the US foreign affiliated sales (the US multinational sales) in country *i* (the host country) for good *j* ($OUTSH_i^j$) to be the dependent variable. Other important aspects that characterised Brainard's model as being the FDI model are the inclusion of the plant-level scale economies of the US's multinational firms in the production of good *j* ($PSCL^j$) and the replacing of distance factor as used in the traditional gravity model by the freight factor (FF_i^j) for good *j* transported between the US and country *i*. Control variables that capture investment restrictions are also included in Brainard's gravity model such as country *i's* tax rate (EXR_i), trade openness in country *i* ($TOPN_i$) and FDI openness in country *i* ($FOPN_i$). The use of these control variables also accentuates that Brainard's gravity model is a FDI model, while the variable of country *i's* per capita income (PCY_i) and the average import tariff of good *j* in country *i* (FAT^j) are parallel with the traditional gravity model.

Given the modification above, Brainard's gravity model specification becomes the FDI model as follows:

$$OUTSH_i^j = \alpha_0 + \alpha_1 FF_i^j + \alpha_2 FAT^j + \alpha_3 PCY_i + \alpha_4 EXR_i + \alpha_5 TAX_i + \alpha_6 TOPN_i + \alpha_7 FOPN_i + \alpha_8 PSCL^j + \mu_i^j \quad (3.11)$$

where country *i* and country *j* are considered under the monopolistic competition in which the demand is identical and homothetic across a class of goods, and constant elasticity of substitution.

The results suggest that the proximity-concentration hypothesis is robust to explain horizontal FDI in the case of the US MNE activities. Foreign affiliate sales (as a proxy of horizontal FDI) increases in trade barriers and transport costs in the host country (the proximity strategy or production abroad decision). Horizontal FDI, by contrast, decreases

owing to high investment restrictions in the host country, and at the same time, the parent country reaches the scale of economies in production. Thus, concentration strategy or export decision is better than that of investing in horizontal FDI in the host country. However, the variable of freight costs in Brainard's gravity model as a proxy of distance is relatively weak to explain horizontal FDI.

Vertical FDI

The concept of vertical FDI is motivated by exploiting cross-country differences in input prices or differences in relative factor endowments (Helpman, 1984). In vertical FDI, some parts of production are dispersed to several low-cost locations. Helpman argues that vertical FDI plays a crucial part in shaping global trade patterns. This can also reinforce inter-sectoral trade owing to relative factor endowment differences and intra-industry trade due to product differentiation. Vertical FDI also leads to intra-firm trade in which a parent country can import from the host country, and vice versa, in the form of intermediate goods and general-purpose inputs (management, distribution, and product-specific research and development). The key to Helpman's vertical FDI is MNE activities will arise between countries that possess significant differences in relative factor endowments, leading countries to be specialized in production.

The theory of vertical FDI is then further elaborated into 'the factor proportion model', introduced by Brainard (1993b). The study attempted to provide evidence of vertical FDI through the factor proportion model by using US data. In the estimation of the factor proportion model, Brainard uses a modified gravity model as well. The model is formulated as follows:

$$lnOXSH_i^j\left(and\ lnOLSH_i^j\right) = \lambda_1 CAP_i + \lambda_2 LAB1_i + \lambda_3 LAB2_i + \lambda_4 LAB3_i + \lambda_5 LAND_i + \lambda_6 GDP_i + \lambda_7 USGDP + \lambda_8 FF_i^j + e_i^j \quad (3.12)$$

where both $OXSH_i^j$ and $OLSH_i^j$ denote the share of total outward sales that comprises as follows. The notation of $OXSH_i^j$ is the share of outward sales in the form of goods production in the host countries exports back to the US as the parent country. The $OLSH_i^j$ is the share of outward sales in the form of production in the host countries allocated for the host countries markets. CAP_i is a proxy of relative difference of the capital endowment. $LAB1_i$, $LAB2_i$ and $LAB3_i$ represent skilled labour differences, literate-unskilled labour

differences, and illiterate-labour differences respectively. $LAND_i$, GDP_i, $USGDP$, and FF_i^j are arable land, GDP country *i*, the US GDP, and the freight factors respectively.[61]

The model above is built based on an assumption that two-sectors, two factors, two countries in which relative factor proportions differences and incomes exist under the Chamberlinian monopolistic competition and increasing returns to scale; identical demand and homothetic with constant returns to scale; and homogeneous goods. In the factor proportion theory, the firm headquarters (parent) locates in one market with relatively more capital intensive, and production facilities located in another market (host) with the relatively labour abundant economy.

Evidence based on the study above suggests that the factor proportion theory is significant to explain vertical FDI in seeking factor price differences in the case of the US affiliation firms in the host country. This host country produces for the US market (or exports back to the US market). However, the factor proportion theory could not significantly explain the aspect of outputs produced by the US affiliation firms in the host country are sold for local (host) market. For vertical FDI, US MNEs choose host countries that are relatively poor in capital, arable land, and unskilled labour, but abundant in illiterate labour.

The partial equilibrium approach

The partial equilibrium approach in the FDI theory is basically used to investigate MNE's decisions to invest based on partial determinants of FDI flows. The use of the partial equilibrium approach is intense in the number of empirical studies as the use of the general equilibrium approach is limited to some extent. Blonigen (2005) argues that the general equilibrium approach does not provide a closed-form solution. He also argues that it is not an easy task to translate the general equilibrium approach into an established empirical model and specification. Another problem with the general equilibrium approach is the data availability specific to horizontal FDI and vertical FDI. These specific data are difficult to find; hence most of FDI data are in the form of the aggregate FDI dataset.

[61] See Brainard (1993b) for the details.

One of the most comprehensive reviews of the partial equilibrium approach is presented by Blonigen (2005). Blonigen (2005) points out that the baseline of the partial equilibrium analysis of FDI derives from three aspects: industrial organization, the theory of finance, and the role of macroeconomics factors. Chakrabarti (2001), by using Extreme Bound Analysis (EBA), demonstrates that market size, trade openness, wage, net exports, growth rate, taxes, tariffs, and exchange rate have a robust partial correlation with FDI flows. Blonigen (2005) confirms Chakrabarti's finding and adds the importance of how institutional factors can affect FDI flows. The partial equilibrium approach has an advantage regarding data availability since this approach mostly requires aggregate FDI data. However, this approach also has a drawback. For example, the earlier studies estimated the partial equilibrium model by only using the estimating equations, suggesting lack of theoretical underpinnings. When applied, these estimating equations are commonly regressed by using a panel data analysis such as fixed effects, random effects, and the other panel data methods.

3.4 Measuring impediments to trade beyond tariffs

In the last three decades, economic integration has played a crucial role in causing a gradual decline in tariff rates. Economic integration facilitates trade in low cost and open markets around the world. When tariffs go down, other trade barriers increasingly emerge such as non-tariff measures (NTMs). That is why it is important to look at them.

3.4.1 Non-tariff measures (NTMs)

UNCTAD (2009) defines 'NTMs are policy measures, other than ordinary custom tariffs, that can potentially have an economic effect on international trade in goods, changing quantities traded, or prices or both'(p.XVI). This definition implies that NTM is a neutral concept and it can be used for protecting consumer health, the environment, and national security by a country. However, in practice NTMs often inhibit trade or to promote trade but distorts international market. When NTMs are issued as a policy for protectionist (discriminatory) purposes by countries, they turn into non-tariff barriers (NTBs) (UNESCAP, 2019; Ahamat and Manaf, 2019). It can be said that NTBs are essentially subsets of NTMs (Basu, 2012; Heal and Palmioli, 2015; International Trade Centre; European Commission, 2016). Nevertheless, the term NTM is widely used in trade literature, referring to measures that potentially impede trade in their application (UNESCAP, 2019). The Global Trade Alert (GTA) also defines NTMs in three categories: 'red measures' as the NTMs that almost certainly

discriminate against foreign commercial interests, 'amber measures' as the NTMs are likely involved in discrimination against foreign commercial interests, and 'green measures' as the NTMs that liberalise on a non-discriminatory (that is most-favoured-nation) basis; or improves the transparency of a relevant policy (Evenett and Fritz, 2018). By the GTA's definition, NTMs are neutral when they fall into 'green measures', but NTMs can be harmful to trade in particular if they become 'red measures' (we follow the 'red measures' category to define our NTMs variable later in chapter analysis, especially in Chapter 5 and Chapter 6). In NTMs literature, the classification of NTMs mostly refers to the UNCTAD version as follows.

Table 3.1 Non-tariff measures classification

No	NTMs Classification	NTMs Sub-Classification	Chapter Classification
1	**Import Measures**	1.1 Technical Measure	A Sanitary and Phytosanitary (SPS) measures
			B Technical Barriers to Trade (TBT)
			C Pre-shipment Inspection and Other Formalities
		1.2 Non-technical Measures	D Contingent Trade-Protective Measures
			E Non-Automatic Licensing, Quotas, Prohibitions and Quantity-Control Measures other than for SPS or TBT reasons
			F Price Control Measures, including additional Taxes and Charges
			G Finance Measures
			H Measures affecting competition
			I Trade-Related Investment Measures
			J Distribution Restrictions
			K Restrictions on Post-Sales Services
			L Subsidies (Excluding export Subsidies under P7)
			M Government Procurement Restrictions
			N Intellectual property
			O Rules of Origin
2	**Export Measures**		P Export Related Measures

Source: The UNCTAD International Classification of Non-Tariff Measures 2012 Version (2015)

Alternatively, the WTO and the Global Trade Alert (GTA) also unveiled their NTMs classification (Table 3.2). NTMs classification among the UNCTAD, the WTO, and the GTA are essentially the same but some measures are distinctive. Different NTM classifications and measures leads to a lack of consensus of NTMs among the institutions mentioned above. This raises a critical question of what exactly do NTMs constitute and how they should be classified (Heal and Palmioli, 2015). Pomfret (1997) points out that the baseline effects of NTMs can be recognized as being twofold: they can generate rents by allowing a markup price over costs, or they can escalate costs of doing business.

Table 3.2 NTMs classification based on the GTA and the WTO

Global Trade Alert	WTO				
	Part 1	**Part II**	**Part III**	**Part IV**	**Part V**
Measure Type	**Government participation in trade and restrictive practice tolerated by governments**	**Customs and administrative entry procedure**	**Technical barriers to trade**	**Specific limitations**	**Charges in import**
Bail out / state aid measure	Government aids	Anti-dumping duties	General	Quantitative restrictions and import licensing	Prior import deposits
Competitive devaluation	Countervailing duties	Valuation	Technical regulations and standards	Embargoes and other restrictions of similar effect	Surcharges, port taxes, statistical taxes, etc
Consumption subsidy	Government procurement	Customs classification	Testing and certification arrangements	Screen time quotas and other mixing regulations	Discriminatory film taxes, use taxes, etc
Export incentive	Restrictive practices tolerated by government	Consular formalities and documentation		Exchange control	Discriminatory credit restrictions
Export taxes or restriction	State trading, government monopoly practices, etc	Samples		Discrimination resulting from bilateral agreements	Border tax adjustments
Import Ban		Rules of origin		Discriminatory sourcing	Emergency Actions
Import quota		Customs formalities		Export restraints	
Import subsidy				Measures to regulate domestic prices	**Others**
Import tariff				Tariff quotas	
Intellectual property protection				Export taxes	
Investment measure				Requirements concerning marking, labeling, and packaging	
Localization requirement				Other specific limitations	
Migration measure					
Non-tariff barrier (NTB)					
Other service sector measure					
Public procurement, nes					
Public procurement localization					
Public procurement preference					
Sanitary and Phytosanitary					
State trading enterprise					
State-controlled company					
Sub-national government measure					
Technical Barrier to Trade					
Trade defence measure (AD, CVD, safeguard)					
Trade finance					

Source: http://www.globaltradealert.org, accessed 12 June 2017 and World Trade Report (WTO, 2012)

The distinct features of NTMs have a strong motive to protect local producers from foreign producers and to address consumer concerns in relation to the quality of products (Lamy in the World Trade Report, 2012). Ferrantino (2006) argues that the effects of NTMs on trade can be detected through the increasing prices of domestic goods (the price effects), or the decreasing of imports volumes (the quantity effects). Measuring NTMs is difficult since their forms are substantially divergent across countries. Some methods only use index and ratio, but lack theoretical underpinnings. Other measurements have theoretical grounds and are robust to quantify the effect of NTMs on trade flows. However, these measuring techniques with theoretical foundations still suffer from drawback at some points.

Ing et al. (2016) argue that NTMs do not only affect trade flows, but also the market structure. They explain that NTMs induce enforcement costs, sourcing costs, and process adaptation costs. Enforcement costs are costs based on administration in complying with NTMs. Since enforcement costs are administratively based, these types of costs are fixed. These costs are disadvantages for small industries, but beneficial for large industries. Sourcing costs are used to upgrade the standardization of goods from low quality to high quality. Types of sourcing costs are variable, and these can affect the cost of production significantly, particularly for large firms, while changing capital equipment to fulfill NTMs standards would lead to process-adaptation costs. These costs are fixed, with much particularly affecting small firms. When NTMs induce an increase in a fixed cost, this can lead firms out of a market structure, while an increase in a variable cost would diminish firms' aggregate trade flows.

Unlike tariffs, the feature of NTMs is unique. The prevalence of NTMs can be recognized from various regulations specific to countries, resulting in asymmetrical information in the global trading system (Beghin et al., 2015). NTMs are applied to a broad range of public policy objectives (not really a trade policy) and those frequently changed depending on NTMs characteristics. Hence, NTMs are entirely less transparent than tariffs (Dee and Ferrantino, 2005). NTMs are mostly set as policy substitutions to compensate for loss from tariff revenue due to trade integration mechanisms (Basu, 2012; Ederington and Ruta, 2016; Ing et al., 2016).

Since there are various methods to measure NTMs, the study only focuses on the discussion of the frequency index, the coverage ratio, the ad-valorem equivalents (AVEs) approach, and the direct approach. These methods have been widely applied in some past studies.[62] First, the frequency index and the coverage ratio have been mainly used by the UNCTAD-TRAINS to provide an updated incident of NTMs for each country. Second, the AVEs technique by Kee et al. (2009) is introduced to measure the aggregate effect of NTMs on trade flows. In this case, Kee et al. convert the quantity effects of NTMs to the price effects of NTMs and treat NTMs as tariff equivalent rates. Third, the direct approach proposed by Chen and Novy (2012) is used to measure the specific effects of one or some NTMs on trade

[62] Many tools of measuring of NTMs have been introduced in the past studies such as tariff equivalent rates, price equivalents, coefficient of variation of tariffs, the effective rate of protection, simulation (CGE) and others. For detail explanations, see Bora et al. (2002) and Cipolini and Salvatici (2008).

flows. Both AVEs and the direct approach have a different technique for how to measure the NTMs effects on trade flows but both use the gravity equation as a baseline to construct the empirical models.

The inventory measures use the aggregate indicators and the incidence of NTMs. The inventory measures consist of the frequency index and the coverage ratio. The frequency index simply calculates the existence of NTMs attached to goods. The scale of the frequency index is in percentage. The frequency index for country *i* is expressed as follows:

$$F_i = \left[\frac{\sum D_j M_j}{\sum M_j}\right].100 \tag{3.13}$$

where D_j is a dummy variable proxying the existence of NTMs; and M_j is also a dummy variable capturing the presence of imports on product *j*.

The coverage ratio measures the percentage of imports values subject to NTMs. The coverage ratio for country *i* is calculated as follows:

$$C_i = \left[\frac{\sum D_j MV_j}{\sum V_j}\right].100 \tag{3.14}$$

where V_j denotes the value of imports in product *j*. The inventory measures help to update the progress of the NTMs' presence. However, the inventory measures suffer from a lack of theoretical foundation (Kee et al., 2009). The inventory measures are inadequate to be a proxy of quantifying the effects of NTMs on trade flows (Carrere and De Melo, 2011). The inventory measures also could not assess how restrictive each barrier is to trade flows (Cipolini and Salvatici, 2008).

In addressing the lack of theoretical foundation for the inventory measures and the coverage ratio, Kee et al. (2009) introduce the ad-valorem equivalents (AVEs) of non-tariff measures. Basically, the AVEs bring a broad range of NTMs into a single measure or a common metric at the tariff line level.[63] The AVEs model is expressed as follows:

$$lnm_{n,c} = \alpha_n + \sum_k \alpha_{n,k} C_c^k + \beta_{n,c}^{Core} Core_{n,c} + \beta_{n,c}^{DS} lnDS_{n,c}$$

[63] Kee et al. (2009) argue that NTMs in trade are complicated since their measures take many different forms with a different unit of measurements. They illustrate that it is not easy to bring a 1000-ton quota, non-automatic licencing procedures, and 1 million USD subsidy in a single measure.

$$+\varepsilon_{n,c}\ln(1+t_{n,c})+\mu_{n,c} \quad (3.15)$$

where $m_{n,c}$ is the import values of good *n* in country *c* treated as exogenous world prices with the assumption that all prices are normalised to unity; therefore imported quantities are equal with $m_{n,c}$. α_n denotes tariffs lines dummies that depict any good-specific effect. $\alpha_{n,k}$ is a proxy of country characteristics; C_c^k is relative factor endowments of countries[64] (the ratio of agricultural land to GDP, the ratio of capital to GDP, and ratio of labour to GDP); $\beta_{n,c}^{Core}$ is the parameter that represents the impact of a core NTM imposed on an import good *n* in country c; $Core_{n,c}$ is a dummy variable that shows the existence of a core NTB; $\beta_{n,c}^{DS}$ is the parameter that captures the impact of agricultural domestic support granted by an import good *n* in country *c*; $lnDS_{n,c}$ is the log of agriculture domestic support which is continuous and measured in dollars; $\epsilon_{n,c}$ is import demand elasticity of good *n* in country *c*; $t_{n,c}$ is import tariff a good *n* in country c; and $\mu_{n,c}$ denotes an *i.i.d.* error terms.

Making NTMs comparable with ad-valorem tariffs is important. Thus, Kee et al. transform the quantity effect model into the price-effect model (AVE). Therefore, the AVEs formula can be expressed as follows:

$$ave_{n,c}^{Core}=\frac{e^{\beta_{n,c}^{Core}}-1}{\epsilon_{n,c}};\ ave_{n,c}^{DS}=\frac{\beta_{n,c}^{DS}}{\epsilon_{n,c}} \quad (3.16)$$

where $ave_{n,c}^{Core}$ is a proxy of the AVE of NTMs on import good *n* in country *c*. $ave_{n,c}^{DS}$ denotes agricultural domestic support on import good *n* in country *c*. $\beta_{n,c}^{Core}$ is the parameter that captures the impact of a core NTM imposed on import good *n* in country *c*. $\beta_{n,c}^{DS}$ is the parameter that captures the impact of agricultural domestic supporting granted by import good *n* in country *c*. $\epsilon_{n,c}$ is import demand elasticity of good *n* in country *c*. In the application, both $ave_{n,c}^{Core}$ and $ave_{n,c}^{DS}$ are simply added and are denoted as the '$ave_{n,c}$'. AVEs can be used to examine NTMs' imposition on import goods in each country at tariff line levels (HS-6 digits). The estimation of AVEs is non-negative. The AVEs are estimated positive when an NTM is binding to an import good, and equal to zero when an NTM is not binding to an import good.

[64] Kee et al. also suggest that a dummy variable for island and import weighted distance to each trading variable can be used to be alternative proxies of relative factor endowment.

However, measuring NTMs using the AVE also has some drawbacks. Ing et al. (2016) point out that the AVE only focuses on measuring the gross costs of NTMs, disregarding the societal benefit of NTMs. Regarding the societal benefit of NTMs, Heal and Palmioli (2015) argue that NTMs are not necessary to remove and would be useful when they have a function for consumer protection. Another problem in the use of the AVE is that the technical procedures of estimating the AVE is complicated, because in the AVE method, each tariff line must be estimated in spite of the number of tariff lines being in the thousands.

Chen and Novy (2012) introduce the method for how to estimate specific NTMs, namely the 'direct approach'. The theoretical foundations of this approach mainly refer to the gravity equation based on Anderson and Wincoop's (2004) work and is formulated as follows:

$$x_{ij}^{k} = \frac{y_i^k e_j^k}{y^k}\left(\frac{t_{ij}^k}{\Pi_i^k P_j^k}\right)^{1-\sigma_k} \tag{3.17}$$

where x_{ij}^{k} is bilateral trade flows in industry *k* dependent on output y_i^k of the exporting country *i* in industry k; and expenditure e_j^k of the importing country *j* relative to global output y^k in industry *k*; Π_i^k and P_j^k are multilateral resistance variables, a proxy of average trade barriers; $1-\sigma_k$ or $\sigma_{k>1}$ denotes the elasticity of substitution of product varieties in industry *k*. The innovation of Chen and Novy (2012) in their direct approach is that this approach contributes to specify a trade cost not only for unobservable trade cost such as distance, cultural, historical, but also observables trade costs such as the inclusion of specific NTMs.

The direct approach has been translated by a number of studies such as those conducted by WTO (2012), Fugazza (2013), Brat (2015), and Ederington and Ruta (2016) into the gravity equation. In their gravity specification, specific NTMs are treated as dummies. For instance, the direct approach model is expressed as follows:

$$lnm_{sij,t} = \theta_s ln\left(1 + t_{sij,t}\right) + \gamma_s\, NTM_{sij,t} + \sum_z \delta_z X_{ij,z} + \varepsilon_{sij,t} \tag{3.18}$$

where $m_{sij,t}$ is a proxy of import good *s* of country *i* from country *j* at time *t*; $t_{sij,t}$ reflects as an import tariff of good *s* of country *i* from country *j* at time *t*; $NTM_{sij,t}$ is the incidence of NTMs using the frequency index or the WTO notifications informed by its members (if data

are not available, dummies can be used to be a proxy of NTM variables); and $X_{ij,z}$ is a set of gravity variables such as GDP, distance, and other trade costs. However, the direct approach possesses drawbacks in relation to the data consistency of countries. As not every country regularly submits its NTMs implementation to the WTO.

The effect of NTMs on international trade flows is evident. A number of past studies have discussed how NTMs can impede trade flows. For instance, NTMs can decrease the number of imports, and at the same time, increase domestic prices (Ferrantino, 2005). Heal and Palmioli (2015) claim that NTMs can reduce the level of competition, economies of scale, and participation in GPNs. NTMs can also raise the costs of trade and restrict trade expansion. Additionally, NTMs can reduce exporters' profits, making trade grow at a lower rate (Evenett and Fritz, 2016). Other studies found that NTMs' effects on trade are higher than tariff effects on trade (Kee et al., 2009; Hoekman and Nicita, 2012; UNCTAD, 2012).

Economic integration schemes, mainly the PTAs, play an important role in reducing NTMs by implementing harmonization and mutual recognition policy. However, harmonization policy is not an easy task to apply as this would take a long and complicated process (UNESCAP, 2015). Harmonization policy would be also difficult to implement for political reasons (Baldwin, 2014). On the other hand, mutual recognition policy is not easy to adapt as this requires trusts among members. The degree of mutual recognition is only higher among advanced member states since they have a high level of regulatory standards, compliances, and enforcements (Baldwin, 2014).

3.4.2 Lack of trade facilitation measures (TFMs)

The issue of trade facilitation was an important agenda item in the WTO rounds at Doha in 2001. Since then, the empirical study of TFMs, especially the lack of TFMs, has been rapidly developed. Trade facilitation is a relatively new subject in the trade literature. When tariff rates and NTMs have been established to be the main components of trade protection, trade facilitation is essentially not part of them but can impede global trade flows when TFMs are lacking.

Perez and Wilson (2010) define TFMs as follows: 'in a narrow sense, trade facilitation is associated with the reduction of on-the-border transaction costs other than tariff cuts,

which essentially involves the simplification and standardization of customs formalities and administrative procedures related to international trade. In a broader sense, trade facilitation includes not only the border issues, but also beyond-the-border issues, dealing for instance with the business environment, the quality of infrastructure, transparency, and domestic regulations. All of these factors have an impact on export performance through the cost channel' (p.2).

Hoeckman and Nicita (2011) use the terms of 'the domestic trade constraints' excluding NTMs and tariff barriers in order to describe a lack of TFMs. They argue that the factors of institutions, regulations, and infrastructure facilities play important roles in measuring the quality of TFMs. Wilson et al. (2003) measure the lack of TFMs by using the indicator of port inefficiency and poor customs environments, excessive regulatory environments and lack of e-business usage. The factor of time delay can be also used to measure the lack of TFMs (Djankov et al., 2006; Persson, 2008; Brook and Stone, 2010). For data, these previous studies mostly used datasets from the Logistic Performance Index (LPI) and the Doing Business Database (DB) compiled by the World Bank, the Global Competitiveness Index (GCI) compiled by the World Economic Forum, the Economic Freedom Index (EFI) compiled by the Heritage Foundation and the IMD World Competitiveness ranking compiled by the IMD. These types of data are accesible and regularly updated. These indexes can also be used to measure the TFM performance of countries. Previous studies mentioned above also used the gravity model to estimate the impact of TFMs on trade flows. The use of the gravity equation has been expanded in TFM studies since the model can accommodate TFM variables accordingly. We will elaborate upon this more in Chapter 5.

3.5 Analysing the determinants of FDI flows

Blonigen and Piger (2011) demonstrate that the basic gravity variables such as GDP for both exporting countries and importing countries, and distance, have a higher probability (above 90%) to explain cross-country FDI flows.[65] This result led the study to discuss how the adoption of a gravity equation is essential in modelling FDI flows in the general equilibrium context. Basically, FDI is different from trade. For this reason, the basic framework of the gravity equation is not yet adequate for examining the determinants of FDI flows. Therefore,

[65]Blonigen and Piger (2011) employ the Bayesian technique to estimate the probability of factors affecting the FDI flows.

some previous studies suggested that the basic gravity equation for trade flows needs to be modified accordingly. For instance, the economic mass (GDP) variables in the gravity equation should appropriately be transformed into the sum GDP ($SumGDP_{ij}$) where GDP_i is the parent country's (source FDI country) GDP and GDP_j is the host country's (FDI recipient country) GDP. This strategy has been applied by Markusen and Maskus (2001) and Carr et al. (2001) in the Knowledge-Capital (KC) model. They argue that the sum GDP plays an important role in measuring the total bilateral economic size (market size) of both countries that affect FDI flows. Bergstrand and Egger (2007, 2013) also use the sum GDP in the Knowledge-Physical-Capital (KPC) model. They also suggest that the sum GDP factor should be accompanied by the 'similarity index' where the formula is expressed as follows:

$$Similarity_{ijt} = \left[\frac{GDP_i}{(GDP_i + GD\ \ _j)}\right] x \left[\frac{GDP_j}{(GDP_i + GDP_j)}\right] \quad (3.19)$$

These previous studies suggested that both the sum GDP and the similarity index become important factors to determine the types of FDI flows whether horizontal FDI or vertical FDI.

Another important determinant that should be included in the gravity equation for FDI is relative factor endowments. With respect to the KPC model, relative factor endowments decompose into relative unskilled-labour endowment, relative skilled-labour endowment, and physical-capital endowment between the parent country and the host country. According to Bergstrand and Egger (2007, 2013), and also adopted by Baltagi et al. (2007) and Egger (2008), relative factor endowments are constructed as follows: the parent-to-host unskilled labour endowment ratio ($u_{ijt} = \frac{u_{it}}{u_{jt}}$), the parent-to-host skilled labour endowment ratio ($h_{ijt} = \frac{h_{it}}{h_{jt}}$), and the parent-to-host physical capital endowment ratio ($k_{ijt} = \frac{k_{it}}{k_{jt}}$).

The relative factor endowment can also be used to determine the types of FDI flows whether horizontal FDI or vertical FDI. In sum, the basic gravity equation after modification provides several important factors for examining the determinants of FDI flows, i.e., the sum GDP (the bilateral economic size), the similarity index (the similar GDP size), and the relative factor endowments. We will discus these variables and their implementation in the KC model and the KPC model further in Chapter 4 and Chapter 6.

In the KC model and the KPC model, the investment cost factors are also incoporated. The investment cost factors are mostly part of partial determinants (Blonigen, 2005). In this

study, we assume that investment costs are strongly associated with the institutional determinants of FDI. Davis and North (1971) define the institutional environment as follows: 'the set of fundamental political, social and legal ground rules that establishes the basis for production, exchange and distribution' (p.6).This definition helps the study to assume that strong institutions might produce effective policies and regulations that affect FDI flows performance.

A vast number of previous studies have found that institutional roles are important to affect FDI flows. Blonigen (2005) and Kinda (2010) argue that the quality of institutions is critical to attracting more FDI inflows, particularly for emerging countries. Poor institutions discourage incoming FDI since this can lead to an increase in the cost of doing business as well as the costs of production. These costs are magnified because poor institutions can contribute to disturbing the process of supply chain (Ali et al., 2010). Also, weak institutions can decline the rate of return of FDI (Doytch and Eren, 2012). Other studies argue that poor institutions can lead to inefficient bureaucracy, making it difficult for foreign firms to obtain investment approval. As a result, this can drive an economy to be less attractive to FDI (World Bank, 2010; Arita and Tanaka, 2013).

Previous studies have pointed out that some factors can be used to examine the institutional determinants of FDI. For instance, Ali et al. (2010) suggest that the factor of bureaucracy, corruption and property rights should be included in the analysis of the institutional determinants of FDI. Walsh and Yu (2010) and the UNESCAP (2015) confirm Ali et al.'s (2010) suggestion. To enrich the insight, Walsh and Yu (2010) also add the variable of judicial and legal systems in the analysis of the institutional determinants of FDI. Other studies such as those conducted by Sekkat and Veganzones-Varoudakis (2007), Hayakawa et al. (2013), and UNCTAD (2015) demonstrate that political risk (political instability) factors could be a major restriction for FDI flows, while Doytch and Eren (2012) argue that the variable of investment risks and democratic accountability are also important in examining the institutional determinants of FDI. It is important to note that all institutional determinants explained above can be meaured by using indexes, mostly the index from Kaufmann et al.'s (1999) governance indicators, the International Country Risk Guide (ICRG), the Freedom index compiled by the Heritage Foundation, and the Global Competitiveness Index (GCI) compiled by the World Economic Forum.

The institutional determinants of FDI would be robust if they are combined with other control variables as suggested by Blonigen (2005) and Chakrabarti (2001). These are trade opennes, GDP growth, and corporate taxes. Other studies suggest that education as a proxy of human capital (Globerman and Shapiro, 2002; Ali et al., 2010) and physical infrastructure (Sekkat and Varoudakis, 2007; Kinda, 2009; Khadaroo and Seetanah, 2009) should be also included in the analysis as well. The study will explain these variables further in Chapter 6.

Chapter 4: Methodology

4.1 Introduction

In this chapter, the study develops three empirical approaches based on the gravity model as discussed in previous chapter. The first two models are for trade flows that estimate the gravity specifications with trade impediment factors. Both empirical models are used to investigate the impact of trade impediments on Indonesia's trade flows with different types of data. The first model in Chapter 5 applies to Indonesia's aggregate trade flows data (merchandise exports plus merchandise imports), while the second in Chapter 6 applies to Indonesia's disaggregate data of manufacturing exports.

The third empirical model is for analysing the determinants of FDI flows in Indonesia. This takes the form of Knowledge-Physical-Capital (KPC) model, applied to Indonesia's aggregate FDI flows (FDI inflows and FDI outflows) in Chapter 7.

4.2 Gravity equation for trade flows

4.2.1 The empirical gravity model with multilateral resistance (MR) factor

At the beginning, we set the basic gravity model as follows:

$$X_{ij} = \alpha_0 Y_i^{\beta_1} Y_j^{\beta_2} D_{ij}^{\beta_3} \varepsilon_{ij}, \quad (4.1)$$

where X_{ij} is trade flow from country *i* to country *j*; X_{ij} is proportional to the product of the two countries' GDPs (Y_i, Y_j) and inversely proportional to their distance (D_{ij}); and ε_{ij}denotes an error term. In the trade literature, this equation is commonly transformed into a log-linear equation and is used to estimate the parameters of interest by ordinary least squares (OLS) as follow:

$$lnX_{ij} = ln\beta_0 + \beta_1 lnY_i + \beta_2 lnY_j + \beta_3 lnD_{ij} + ln\ \varepsilon_{ij} \quad (4.2)$$

Anderson and van Wincoop (2003) argue that the basic form of the gravity equation in equation (4.1) and (4.2) is not correctly specified since this basic gravity equation omits the 'multilateral resistance' (MR) factor. Anderson and van Wincoop (2003) define the MR factor as how changes in trade costs on one bilateral trade route can affect trade flows on

all other routes due to relative price effects. In other words, the MR can be interpreted as 'average trade costs.' To overcome this omission, Anderson and van Wincoop (2003) introduce a gravity equation with trade costs as follows:

$$X_{ij} = \left(\frac{Y_i Y_j}{Y^W}\right)\left(\frac{t_{ij}}{\Pi_i P_j}\right)^{1-\sigma} \tag{4.3}$$

By taking logs, equation (4.3) becomes:

$$\ln\ X_{ij} = k + ln\ Y_i + \ln\ Y_j + (1-\sigma)\rho\ ln\ D_{ij} + (1-\sigma)\ln\ b_{ij}$$
$$+(\sigma-1)ln\Pi_i + (\sigma-1)ln\ P_j + (1-\sigma)\varepsilon_{ij} \tag{4.4}$$

where X_{ij} is nominal trade volume from *i* to *j*. Y_i and $Y_j$are nominal income of country *i* and country *j*. Y^W denotes the world income. σ is the elasticity of substitution across goods. Π_i is the outward multilateral resistance that captures the exports from country *i* to *j* depending on trade costs of all other partners. P_j denotes the inward multilateral resistance that captures imports into country *i* from country *j* depending on trade costs across all possible suppliers. The outward MR and the inward MR may be specified as follows:

$$\Pi_i = \sum_{j=1}\left(\frac{t_{ij}}{P_j}\right)^{1-\sigma}\frac{Y_j}{Y^W} \tag{4.5}$$

$$\mathrm{P}_j = \sum_{i=1}\left(\frac{t_{ij}}{\Pi_i}\right)^{1-\sigma}\frac{Y_i}{Y^W}. \tag{4.6}$$

Anderson and van Wincoop's model assumes that trade costs (t_{ij}) are the function of a border barrier (b_{ij}) and geographical distance (D_{ij}^{ρ}) or $t_{ij} = b_{ij}D_{ij}^{\rho}$. By inclusion of the MR factors, the gravity model is now correctly specified. However, the indexes of MR are unobserved. Anderson and van Wincoop (2003) demonstrate an implicit solution for MR by assuming that bilateral trade costs are symmetrical, that is $t_{ij} = t_{ji}$. As a result, the outward MR and the inward MR are the same, that is, $\Pi_i = \mathrm{P}_j$.

Rather than calculating these unobserved MR terms according to equation (4.5) and (4.6), Feenstra (2002) introduces the fixed effects (FE) technique to measure the MR terms as the coefficient of source and destination country fixed effects. To capture the MR terms of Anderson and van Wincoop, he expresses $\delta_1 i$ as an indicator variable that is one if country *i* is the exporter, and zero otherwise. While $\delta_2 j$ denotes an indicator variable that is one if

country *j* is the importer, and zero otherwise; then the gravity equation in (4.4) can be re-formulated as follows:

$$\ln X_{ij} = k + ln\, Y_i + \ln\, Y_j + (1-\sigma)\rho\, ln\, D_{ij} + (1-\sigma)\ln\, b_{ij}$$
$$+\beta_{1i}\delta_{1i} + \beta_{2j}\delta_{2j} + (1-\sigma)\varepsilon_{ij} \quad (4.7)$$

where the coefficient $\beta_{1i} = (\sigma-1)ln\Pi_i$ and $\beta_{2j} = (\sigma-1)ln\, P_j$ on the source and destination indicator variables account for the Anderson and van Wincoop's MR terms. Feenstra (2002) argues that both the gravity model with MR terms and the gravity model with FE are correctly specified and the results are consistent.

Potential endogeneity problem

The inclusion of bilateral trade costs in the gravity model is common practice according to traditional trade literature. Baldwin and Taglioni (2006) point out that bilateral trade costs depend on natural barriers (bilateral distance and common land borders), cultural barriers (common language and same colony) and various measures of manmade trade costs such as free trade agreements (FTAs). With respect to FTAs, the inclusion of this variable in the gravity model as one of independent variables could be problematic since this might induce biases associated with endogeneity. Baeir and Bergstrand (2007) argue that potential endogeneity of FTAs comes up due to omitted variables (selection bias). In particular, when two countries have been engaging in large numbers of trade transactions for many years, both countries tend to self-select to form a trade agreement in order to gain more benefits from trade. As a result, error terms in the gravity model might correlate with the FTAs factor.

As noted, Anderson and van Wincoop (2003) and Feenstra (2002) claim that the gravity model with MR factors is correctly specified and would yield a consistent result in estimation. However, this model is inadequate to counter the endogeneity problem due to the FTAs variable. Thus, Baier and Bergstrand (2007) suggest that the use of panel data with bilateral (pair) fixed effects (FE) in the gravity model is proper to reduce such bias. In that sense, the empirical gravity model as shown in equation (4.7) is necessarily augmented by taking traditional bilateral trade costs choices (common land borders, colony ties, common language and FTAs) into account in order to reduce omitted variable bias. Bilateral (pair) FE in the panel data setting (a combination of cross-sectional and time series data) should be

accommodated in such augmented gravity models to reduce self-selection biases following Baier and Bergstrand (2007). Thus, the augmentation of equation (4.7) can be expressed as follows:

$$l\,n\,X_{ijt} = k + ln\,Y_{it} + l\,n\,Y_{jt} + (1-\sigma)\rho ln\,D_{ij} + (1-\sigma)l\,n\,b_{ij} + \tau_1 Lang_{ij} + \tau_2 Col_{ij} + \tau_3 FTA_{ij} + \beta_{1i}\delta_{1i} + \beta_{2j}\delta_{2j} + \beta_{3i}\,\delta_{3ij} + (1-\sigma)\varepsilon_{ijt} \quad (4.8)$$

If equation (4.8) is applied to panel data, the empirical gravity model now accounts for time-varying dependent variable (X_{ijt}) and time varying independent variables (Y_{it} and Y_{jt}). It is important to note that Anderson and van Wincoop's (2003) gravity model already includes distance (D_{ij}) and border barriers (b_{ij}) as bilateral trade costs. In equation (4.8), we add more factors related to bilateral trade costs such as common language ($Lang_{ij}$), common colony (Col_{ij}), and FTA_{ij}. Equation (4.8) also includes some necessary fixed effects (FE) factors such as exporting country FE (δ_{1i}), importing country FE (δ_{2i}) and bilateral (pair) FE (δ_{3ij}). Exporting country FE (δ_{1i}) and importing country FE (δ_{2i}) have a function to reduce biases due to the MR factors, while bilateral (pair) FE (δ_{3ij}) plays a role in reducing bias due to the FTA variable.

Once the empirical model represented by equation (4.8) is correctly specified, the estimation results of this model should yield a consistent result. Thus, equation (4.8) would be our main equation and will be elaborated in more detail in Chapter 5 to address our first research question.

Heteroskedasticity and autocorrelation

Nevertheless, the application of panel data in the gravity model as equation (4.8) might still induce a potential problem due to heteroskedasticity and autocorrelation.

Heteroskedasticity might arise due to changing variances between cross-sectional units over time. Autocorrelation, on the other hand, exists when error terms within units are serially correlated due to time series data. Both should be controlled for, or otherwise the standard error estimates would be biased, resulting in the invalidity of the test statistics, and the precision of the coefficient of estimates would be diminished.

In this context, the standard OLS is no longer valid (Wooldridge, 2013). A robust variance matrix can help OLS to yield consistent estimates but the coefficients are still not significant (Bertrand et al., 2004). The fixed effects (FE) estimator including difference-in-difference (DiD) estimator might remain biased. Hansen (2007), Hausman and Kuersteiner (2008) and Reed and Ye (2011) argue that the FE and the DiD estimators are inadequate to simultaneously account for heteroskedasticity and autocorrelation. These previous studies suggest that we apply a feasible generalized least square (FGLS) as this estimator is more proper to use than the FE model and the DiD model in the presence of heteroskedasticity and autocorrelation within a panel.

In order to estimate the empirical gravity model with MR by using the FGLS method, the study first needs to simplify the cross-section gravity model of equation (4.7) to be as follows:

$$lnX_{ij} = \alpha_0 + \alpha_1 W'_{ij} + \upsilon_{ij} \quad (4.9)$$

where W'_{ij} denotes the vector of exporting GDP (Y_i), importing GDP (Y_j), distance (D_{ij}) and border barriers (b_{ij}). The term υ_{ij} is the composite error terms that contain the fixed effect factors, where $\upsilon_{ij} = \delta_{1i} + \delta_{2j} + \varepsilon_{ij}$. Under the Gauss-Markov assumption, the error terms should have a constant variance (homoskedasticity), that is $Var(\varepsilon_{ij}|W'_{ij}) = \sigma^2 I_{ij}$ where $I_{ij} = 1$. However, when $I_{ij} \neq 1$, the variance of error is no longer constant anymore, hence heteroskedastic.

In many cases, we do not know which independent factors in the right-hand-side (RHS) of equation can drive the variance of error, so the value of $\sigma^2 I_{ij}$ is initially unknown. It is thus necessary to estimate $\sigma^2 I_{ij}$ in order to correct for heteroskedasticity. Equation (4.9) should first run on OLS to get the estimated residuals $\widehat{e_{ij}}$. We then use the estimated OLS residual ($\widehat{e_{ij}}$) as the proxy for the unknown variance $\sigma^2 I_{ij}$, and run an auxiliary model as follows: $ln\hat{e}_{ij}^2 = ln\sigma^2 + \alpha_1 W' + \mu_{ij}$ to get $\widehat{\alpha_1}$. We can reveal the unknown variance ($\sigma^2 I_{ij}$) by giving this the value of $exp\ (W'\widehat{\alpha_1})$. For simplicity, the study rearranges $\sigma^2 I_{ij}$ with its known value now as $h_{ij} = exp\ (W'\widehat{\alpha_1})$, and use h_i to weight equation (4.9) model : $\frac{lnX_{ij}}{h_{ij}} = \left(\frac{W_{ij}}{h_{ij}}\right)' \alpha_1 + \frac{\upsilon_{ij}}{h_{ij}}$. The transformation model of equation (4.9) can be expressed as follows:

$$lnX*_{ij} = \alpha_0 + \alpha_1 W*_{ij} + \upsilon*_{ij} \quad (4.10)$$

It is assumed now that the heteroskedasticity problem is due to cross-section data no longer existing in equation (4.10). However, the problem associated with autocorrelation has not been tackled yet. Given the time series dimension of panel data, we also rearrange equation (4.9) as follows:

$$lnX_t = \alpha_0 + \alpha_1 W'_t + \varepsilon_{ijt} \quad (4.11)$$

where $cov\ (\varepsilon_t, \varepsilon_{t-1}) \neq 0$. This leads to a serial correlation such as $\varepsilon_t, \varepsilon_{t-1}, \varepsilon_{t-2}, \ldots, \varepsilon_{t-j}$. To correct this autocorrelation, we consider the first-order autocorrelation or AR(1) error model: $\varepsilon_t = \phi\varepsilon_{t-1} + \mu_t$, where μ_t is a white noise, that is $\mu_t \sim (0, \sigma_\mu^2)$ and $cov\ (\mu_t, \mu_{t-1}) = 0$, also $cov\ (\mu_t, \mu_{t-j}) = 0$ for all *j* > 0. The series become stationary (weak covariance) if the mean, variance and serial covariances are all constant along the series. Suppose we do not know ϕ, we can estimate ϕ using OLS residuals e_t as substitute for the observed errors (ε_t), therefore $e_t = \phi e_{t-1} + \mu_t$ to get $\hat{\phi}$. We know the value of ϕ through $\hat{\phi}$, in this case, $lnX_t = \alpha_0 + \alpha_1 W'_t + \varepsilon_t$, where $\varepsilon_t = \hat{\phi}\varepsilon_{t-1} + \mu_t$ to be $ln(X_t - \hat{\phi}X_{t-1}) = \alpha_1(W'_t - \hat{\phi}W'_{t-1}) + (\varepsilon_t - \hat{\phi}\varepsilon_{t-1})$, or equation (4.11) becomes:

$$lnX*_t = \alpha_0 + \alpha_1 W*_t + \mu_t \quad (4.12)$$

The standard error of equation (4.12) now is white noise, that is, the error is not correlated with itself anymore, nor there is correlation along the series. When the problem of heterokedasticity and autocorrelation have properly been tackled, our empirical gravity model as in equation (4.8) should be the best linear unbiased estimator (BLUE).

4.2.2 The empirical gravity model with zero trade flows

The basic assumption of the gravity model states that trade flows of countries pairs are strictly positive, or bilateral trade flows do not generate zero trade flows (Silva and Tenreyro, 2006; Head and Mayer, 2014; Martin and Pham, 2015). Given this assumption, the estimation problem increasingly emerges when trade datasets mostly exhibit a large number of zero trade flows. The number of zero trade flows becomes more frequent when disaggregated trade data (or products level trade data) are used (Head and Mayer, 2014). And as the data are logged, the process removes zero observations. Silva and Tenreyro (2006) define this circumstance as the problem of undefined logs of zeros. The presence of zero trade flows might provide important information. Once these zero trade flows decline

in observations (or are truncated due to logarithms), we may have systematic selection bias (Silva and Tenreyro, 2006; Head and Mayer, 2014), or misleading results (Martin and Pham, 2015).

In fact, zero trade flows occur for a number of reasons. First, zero trade observations are simply dropped because some pairs of countries never do trade for a given of time (Silva and Tenreyro, 2006; Helpman et al., 2008). Second, missing trade flows may be wrongly recorded as zero (Silva and Tenreyro, 2006; Head and Mayer, 2014). Third, the value of trade is registered as zero once bilateral trade values never reach the minimum value of trade or threshold (let's say at a minimum USD 500) or rounding errors (Silva and Tenreyro, 2006; Baltagi et al., 2014). Finally, zero trade flows likely come up due to low trade flows between the two distant and/or small countries (Helpman et al., 2008; Baldwin and Harrigan, 2011).

Zero trade flows estimators

As discussed, when zero observations are frequent and they are treated simply by dropping them from a dataset, or they get truncated due to logging, the estimation results would be biased. In most cases, the $ln(1 + X_{ij})$ is alternatively applied as a dependent variable in order to retain the zero trade flows in the estimation. Eichengreen and Irwin (1995) introduce this strategy and argue that this transformation adequately deals with zero trade flows under the log-log form in the gravity equation. They also point out that coefficient estimates remain interpreted as elasticities when trade values are large, as $ln(1 + X_{ij}) \approx ln(X_{ij})$. However, the current study demonstrates that the application of $ln(1 + X_{ij})$ might lead to inconsistent estimates (Silva and Tenreyro, 2006). The practice of adding one to observed trade flows and then taking logs should thus be avoided since the estimation results will depend on units of measurements (Head and Mayer, 2014). Martin and Pham (2015) point out that when $ln(1 + X_{ij})$ is used as the dependent variable without altering the procedure of estimation in the gravity model, the estimation result might yield biased.

Eaton and Tamura (1994) propose the formula of $ln(a + X_{ij})$ as the dependent variable in the gravity model to account for zero trade flows. This is known as the Eaton-Tamura (ET) Tobit estimator. Instead of setting $a = 1$, Eaton and Tamura (1995) treat a as a parameter to be estimated. Head and Mayer (2014) argue, however, that the coefficient of estimate a (or

$\hat{a}$) in the ET Tobit possesses lack interpretation and are difficult to implement. In addition, the Monte Carlo simulation done by Silva and Tenreyro (2006) shows that the performance of the ET Tobit was less satisfactory in dealing with the zeros of dependent variable. Head and Mayer (2014) also demonstrate that the ET tobit is biased under the assumption of the log-normal errors, and the result is still inconsistent under the assumption of a constant variance-to-mean ratio.

Eaton and Khartoum (2001) attempt to fix the problem of the ET-Tobit by introducing the Eaton-Khartoum (EK) Tobit estimator. In the EK-Tobit estimator, the dependent variable of trade values (X_{ij}) now has a minimum level of trade. Suppose this minimum level of trade is set by the value of a. When trade values (X_{ij}) fall below the value of a, therefore (X_{ij}) will observe as zero ($X_{ij} = 0$). But otherwise, when $X_{ij} > a$, therefore (X_{ij}) will be observed as $X_{ij} = X_{ij}^{*}$ or $\ln (X_{ij}^{min})$ for zeros. Head and Mayer (2014) point out that the EK-Tobit is a preferred estimator for estimating the zero trade flows of the dependent variable under the log-normality assumption but not under a constant variance-to-mean ratio.

Other earlier studies employed a different technique such as a Heckman-based approach to incorporate zero trade flows (Helpman et al., 2008). This strategy involves a two-step estimation. In the first step, a probit estimator is used to estimate the probability of country *i* and contry *j* to have positive trade flows. In the second step, the gravity equation is deployed to estimate the positive trade flow observations including a selection correction from the first-step estimation.[66]

However, Head and Mayer (2014) argue that the main problem with using the Heckman-based technique is how to find an appropriate exclusion restriction as this is difficult to find. Helpman et al. (2008) apply exogenous variables such as a common religion factor and an entry barrier factor between the two countries to be dyadic in nature with the country fixed effects. These dyadic factors in consort with the country fixed effects apply in both equations in order to reduce endogeneity bias in their two-step Heckman estimation model. Both a common religion factor and an entry barrier factor in this context indicate determinants that can influence the probability of a country pair to trade but there is no effect on trade

[66] See Helpman et al. (2008) for details.

volumes. Nevertheless, Head and Mayer (2014) argue that Helpman et al. (2008) model-based Heckman is inappropriate for dealing with zero trade flows since Helpman et al. design the model to deal much with intensive margin effects rather than to deal with zero trade flows.

Silva and Tenreyro (2006) have made a significant improvement in the development of the gravity model with frequent zero trade flows. The model is derived under the framework of a non-linear equation but established in the form of constant elasticity model, and they named this model the Pseudo-Poisson Maximum Likelihood (PPML). This gravity model with PPML can be applied to cross-sectional trade data and panel trade data. This model has also been tested and the results have shown to be consistent in the presence of major zero trade flows and heteroskedasticity as well. In detail, we discuss further the elaboration of the gravity model with PPML in following sections and conclude later this model as our preferred model rather than other zero trade flows estimators as already discussed above.

The Pseudo-Poisson Maximum Likelihood (PPML) estimator

Silva and Tenreyro (2006) point out that when zero trade flows are frequent, estimating them by taking a logarithm in the gravity model would lead to inconsistent estimates due to greater dispersion (the heteroskedastic problem). For this reason, they introduce a non-linear estimator, namely the Pseudo-Poisson Maximum Likelihood (PPML). In the PPML, zero trade flows as the dependent variable in the gravity model are treated in levels rather than in logs. In that manner, Silva and Tenreyro (2006) argue that the information of zero trade flows could be important when identifying the parameters of interest. Silva and Tenreyro (2006) also demonstrate that estimation results under the PPML remain consistent even in the presence of heteroskedasticity.

To construct our PPML model, we recall equation (4.9) in the form of PPML model as follows:

$$X_{ij} = exp(\alpha_0 + \alpha_1 W'_{ij}) + \upsilon_{ij} \qquad (4.13)$$

Where X_{ij} is now in levels to account for zero trade flows with $X_{ij} \geq 0$. W'_{ij} denotes the vector of exporting GDP (Y_i), importing GDP (Y_j), distance between the two countries (D_{ij})

and border barriers (b_{ij}). v_{ij} is the composite error terms that contain the fixed effects where $v_{ij} = \delta_{1i} + \delta_{2j} + \varepsilon_{ij}$.

Silva and Tenreyro (2006) then argue that when the dependent variable (suppose *x*) and explanatory variables (suppose *y*) are linked by a constant-elasticity model of the form $x_i = exp(y_i\beta)$, the function of $exp(y_i\beta)$ is interpreted as the conditional expectation of x_i given y, denoted by $E[x_i|y]$. With respect to our PPML model as described in equation (4.13), the exponential function of $exp(\alpha_0 + \alpha_1 W'_{ij})$ can be also interpreted as the conditional expectation of X_{ij} given W'_{ij}, or $E(X_{ij}|W'_{ij})$ following Silva and Tenreyro (2006).

Some assumptions are required to estimate the PPML model in order to be consistent. Baltagi et al. (2014) point out that Silva and Tenreyro's PPML model is properly estimated by assuming that fixed effect factors and error terms (in our case is v_{ij}) are statistically independent of explanatory variables (in our case is W'_{ij}). Silva and Tenreyro (2006) also assume that the conditional variance of the PPML model should be proportional to conditional means, and in our case: $V(X_{ij}|W'_{ij}) \propto E(X_{ij}|W'_{ij}) = exp(\alpha_1 W'_{ij})$. Hence, explanatory variables (in our case, W'_{ij}) now can be estimated by solving the first-order conditions as follows: $\sum_{i=1}^{n}\sum_{j=1}^{n}[X_{ij} - exp(\alpha_1 W'_{ij})]W'_{ij} = 0$, which gives the same weight to all observations (all observations have the same information on the parameter of interests). Even suppose that $E(X_{ij}|W'_{ij})$ is not proportional to $V(X_{ij}|W'_{ij})$, the PPML estimator remains efficient when heteroskedasticity rises with the conditional means. Silva and Tenreyro (2006) also point out that once the PPML model is correctly specified by conditional mean, count data (the observations can take only non-negative integer values such as 0, 1, 2, 3, …) that are commonly used in PPML estimator do not have to be Poisson at all.

Martines-Zarzoso (2013) and Baltagi et al. (2014) demonstrate that the PPML model can also be applied to panel data. When equation (4.13) is applied to panel data, it becomes:

$$X_{ijt} = exp(\alpha_0 + \alpha_1 W'_{ijt} + \delta_{ij}) + \varepsilon_{ijt} \qquad (4.14)$$

where X_{ijt} is nominal trade volumes in levels ($X_{ijkt} \geq 0$) from country *i* to country *j* at time *t*. W'_{ijt} denotes the vector of explanatory variables at time *t* such as exporting GDP (Y_{it}), importing GDP (Y_{jt}) and bilateral trade impediment factors at time *t* (such as NTMs). In our

equation (4.14), the vector of W'_{ijt} also includes W'_{ij}, that is the vector of traditional time-invariant gravity variables such as bilateral distance, common land border, common official language, common colony and common free trade agreement (FTA). δ_{ij} and ε_{ijt} are fixed effect factors and error terms respectively. Our fixed effects PPML estimator as in equation (4.14) will have strong robustness properties once $(X_{ijkt}|W'_{ijt}, \delta_{ij}) = exp(\delta_{ij})e^{\alpha_1 W'_{ijt}}$, as argued by Baltagi et al. (2014). Equation (4.14) is now consistent under the conditional assumption. We will use the empirical gravity model as equation (4.14) to answer our second research question that we will discuss further in Chapter 6.

Why the PPML?

Why do we need PPML instead of other estimators in order to adequately deal with zero trade flows and at the same time tackle heteroskedasticity in the gravity model? Based on simulation evidence from Silva and Tenreyro (2006), the use of PPML that treats the dependent variable in levels $(X_{ij} \geq 0)$ shows better results than other estimators such as a standard Non-Linear Square (NLS), and Gamma Pseudo-Maximum-Likelihood (GPML). The result of the PPML model is also better than a truncated OLS, ET-Tobit estimator in the form of $ln(a + X_{ij})$, and OLS with $ln(1 + X_{ij})$. Silva and Tenreyro (2006) also found that PPML performance is relatively robust under the different patterns of heteroskedasticity.[67] The bias of PPML is always small. Even the PPML estimator appears to be consistent when this model faces not only zero trade flows but also the measurement of error of the dependent variable due to rounding errors.[68]

In their next study, Silva and Trenreyro (2011) review the performance of the PPML estimator against other estimators as mentioned above. They assess the consistency of each estimator when sample size increases from 1,000 to 10,000 observations in response to heteroscedasticity. They also demonstrate that the PPML and the GPML are both consistent when sample size increases. Both remain consistent with high zero trade flows frequencies

[67] Silva and Tenreyro (2006) simulate the PPML and other estimators using the four cases of the heteroskedasticity patterns. The variance of ε_{ij} is constant in Case 1. The conditional variance of the dependent variable is equal to its conditional means in Case 2, as described in the PPML model assumption. The variance is homoskedasticity in Case 3 following the OLS model assumption. In Case 4, the conditional variance of dependent variable does not depend on conditional mean, meaning heteroskedasticity exists. For details, see Silva and Tenreyro (2006).

[68] Silva and Tenreyro (2006) point out that rounding errors mean rounding down (close to zero) is much more frequent that rounding up.

(Silva and Tenreyro set the number of zeros between 62% and 83%). However, the GPML possesses a large bias when sample size is relatively small but not for the PPML. The other estimators have shown inconsistently that, as the sample size is raised, the bias remains large.

Martines-Zarzoso's (2013) Monte Carlo simulation results confirmed Silva and Tenreyro's (2006, 2011) arguments that PPML is less affected by heteroskedasticity. In the presence of zero trade flows even in large percentage (40% and 60%), Martines-Zarzoso found that the PPML shows consistent results. Also, the PPML estimation results remain consistent when this applies to cross-sectional data and panel data. Although the PPML estimator yields the most robust result compared with other estimators including the FGLS estimator with respect to heteroskedasticity, Martines-Zarzoso (2013) emphasizes that the performance of PPML is relatively similar to the Feasible Generalized Least Squares (FGLS) estimator performance regarding bias and standard errors.[69]

Head and Mayer (2014) investigate the consistency of the PPML estimator in the gravity equation using the Monte Carlo Simulation by applying six estimation methods such as the LSDV on $ln(X_{ij})$, the ET-Tobit estimator of $ln(a + X_{ij})$, the EK-Tobit estimator of $\ln(X_{ij}^{min})$ for 0s, the PPML model, the GPML model, and the Multinomial-PML. All of them use data generating processes (DGPs). They assess the performance of each estimator under two cases: a homoskedasticity log-normal term and a constant variance-to-mean ratio (heteroskedasticity). The percentage of zero trade flows in the dependent variable is 25% applying to a cross-sectional dataset. To identify the level of bias from each estimator, Head and Mayer (2014) set the parameters of the gravity model focusing on a distance variable (where the true parameter is -1) and a regional trade agreement (RTA) variable (where the true parameter is 0.5).[70]

[69]Martinez-Zarzoso (2013) uses the same method as shown in Silva and Tenreyro (2006, 2011). The original contribution of Martines-Zarzoso (2013) study to the literature is that she adds the FGLS model in the Monte Carlo simulation. In the process, the FGLS model follows the OLS model in which the zero values of the dependent variables must be truncated. Martinez-Zarzoso assumes that zero trade flows in her study occur due to the absence of trade rather than due to rounding errors that have been employed by Silva and Tenreyro (2006).

[70] See Head and Mayer (2014) for details.

Head and Mayer (2014) show that the PPML (or the Multinomial-PML) results are consistent in the presence of heteroskedasticity (or under a constant variance-to-mean ratio assumption), while others are biased. They also confirm Silva and Tenreyro's (2011) evidence that the coefficient of estimates approaches the true value when the number of sample sizes increases. A number of recent studies also used the PPML estimator as their main gravity estimation method in the presence of zero trade flows and heteroskedasticity (see, for example, Anderson et al. (2015) and Kinzius et al. (2019)). This implies that the PPML estimator has now become a new workhorse in the gravity literature as it can adequately deal with frequent zero trade flows and with heteroskedasticity under a constant-elasticity model (Silva and Tenreyro, 2006).

4.3 Gravity equation for foreign direct investment (FDI)

4.3.1 Vertical FDI and horizontal FDI

The Gravity equation for FDI is theoretically built from the general equilibrium trade theory of multinational firms (Markusen and Maskus, 2001). The earlier works generated two main models, that is the vertical model of FDI (Helpman, 1984) and the horizontal model of FDI (Markusen, 1984). These models have different assumptions and empirical implications. For instance, Helpman (1984) models vertical FDI by assuming that a sector (X) has two main activities. The first is a headquarter activity that mainly produces blueprints, management and technology, and is usually placed at the parent country (FDI sources countries). The second is a production activity that is located in the host country (FDI recipient countries). Both activities have different factor intensities that give firms an incentive to geographically separate headquarters from their production facilities. This strategy is undertaken in order to seek international differences in factor prices or to exploit low cost factor inputs for production. In the vertical model of FDI, trade costs are assumed to be zero, and vertical FDI emerges when countries have substantial differences in their relative factor endowments.

On the other hand, the model of horizontal FDI that was introduced by Markusen (1984) assumes that the firm-level scale of economies is an important factor in driving horizontal FDI flows. In that manner, multinational firms will produce the same product in multiple plants in different countries. In other words, horizontal FDI is essentially a market-seeking type of FDI. Multinational firms need to access the host countries' markets, thereby they can expand their business. In horizontal FDI, trade costs (in this case import tariff rates) are

assumed to be relatively high. The implication of high import tariffs, for multinational firms, setup plants is giving more trade benefits than conducting exports from parent country to host country. Markusen (1984) argues that setting up headquarters in a parent country and production plants in both parent and host countries would incur an expensive investment. Hence, the horizontal model would work well when the two countries are symmetrical either in their economic size or in their relative factor endowments. In this setting, skilled-labour endowments play an important role in supporting the existence of the horizontal type.

4.3.2 The knowledge-capital model

Brainard (1993a, 1993b) tries to translate the vertical FDI model based on Helpman's (1984) work and the horizontal FDI model based on Markusen's (1984) research into proper gravity specifications. The results show that the vertical model of FDI is essentially a factor proportion theory, while the horizontal model of FDI is the proximity-concentration hypothesis.[71] However, Brainard's (1993a, 1993b) empirical studies still could not accommodate both types of FDI, vertical and horizontal, into a model. Also, the use of a traditional gravity equation and modified this model to be the FDI models as Brainard's studies (1993a, 1993b) substantially lacks association with the theory of multinational enterprise or MNE (Blonigen and Davies, 2000).

Markusen (1997, 2001) introduces the Knowledge-Capital (KC) model that incorporates both horizontal and vertical FDI in a model. The KC model described by Markusen and Maskus (2001) and Carr et al. (2001) is a model with two countries involved: a parent country (*i*) and a host country (*j*); two factor endowments, i.e., unskilled-labour (*L*) and skilled-labour (*S*); and two homogeneous goods, i.e., good *X* and good *Y*. In this case, the two factor endowments are internationally immobile. Good *Y* is unskilled-labour intensive sector and is produced with constant returns to scale in a perfectly competitive market. Good *X* is skilled-labour intensive sector and is produced with increasing returns to scale under the Cournot competition assumption with free entry and exit. Accordingly, there are three types of firm in the KC model based on the work of Markusen and Maskus (2001) and Carr et al. (2001):

[71] See Chapter 3 for reviews.

horizontal multinational enterprises (MNEs), vertical MNEs and national firms. The latter solely produce locally and serve foreign markets by exports.

Markusen and Maskus (2001) also point out that the KC model is substantially based on the assumptions that knowledge-based (intangible) assets location (or headquarters) may be not in the same place as production facilities; knowledge-based assets in the parent country are developed by using much with skilled-labour factors, which is important to generate knowledge-intensive (R & D) then transforming the R & D output into a final product; and knowledge-based assets services (management and technology) can be fully (or partially) used by multiple production facilities in different host countries (there is replication in production). Markusen and Maskus (2001) suggest that the first two assumptions lead to vertical-type firms and the third assumption associates with horizontal-type firms.

Markusen and Maskus (2001) argue that the KC model can properly accommodate both types of FDI, but their existence depends on country sizes, relative endowments, trade costs, and investment costs. In such settings, the KC model is essentially derived from the gravity model in which economic mass factors such as GDP and distance between the two countries (parent and host country) remain important in determining the types of FDI. Blonigen and Davies (2000) point out that the KC model is more grounded in the formal theories of MNE activity than a traditional gravity model.

In that sense, the KC model empirically fits with FDI activity and this can be expressed as follows:

$$FDI_{ij} = f(SUMGDP_{ij}, GDPDIFSQ_{ij}, SKDIFF_{ij}, GDPDIFSQ_{ij} * SKDIFF_{ij}, INV_j, TC_j, TC_j * SKDIFF_{ij}, TC_i, DIST_{ij}) \quad (4.15)$$

where $SUMGDP_{ij}$ is total GDP between parent country (*i*) and host country (*j*). This variable should have a positive sign (Markusen and Maskus, 2001; Carr et al., 2001). This positive sign reflects how when joint markets size of both countries become larger, this leads to similar economic size and factor endowments. In such cases, there is no difference in factor prices between the two countries, therefore this increases horizontal FDI. $GDPDIFSQ_{ij}$ is the square of the difference in country size. The predicted sign of this independent variable is negative. This implies that FDI has an inverted U-shaped relationship to differences in

country size.[72] $SKDIFF_{ij}$ denotes the difference of relative skilled labour endowments between the two countries and the sign should be positive. The positive sign of $SKDIFF_{ij}$ implies that parent country is slightly more skilled-labour abundance than that of host country. $GDPDIFSQ_{ij} * SKDIFF_{ij}$ is the interaction variables between the total GDP and skill differences. The sign of $GDPDIFSQ_{ij} * SKDIFF_{ij}$ is predicted to be negative due to the combination a negative sign of $GDPDIFSQ_{ij}$ and a positive sign of $SKDIFF_{ij}$, suggesting that the parent country is a small country with skilled-labour abundance. This parent country characteristic induces an inverted FDI inflow.

INV_j is the variable of host country's investment cost. This variable should be negative since it is a burden to FDI flows. TC_j is the variable of a host country's trade costs. This variable is predicted to be positive. A positive trade costs suggests that higher trade costs encourage more horizontal FDI. $TC_j * SKDIFF_{ij}$ is the product of trade costs in the host country and skill differences. Markusen and Maskus (2001) and Carr et al. (2001) argue that this interaction term indicates that trade costs may encourage horizontal FDI, and this type of FDI might rise more when skill differences are small. The coefficient of $TC_j * SKDIFF_{ij}$ should have a negative sign due to the negative impact of the host country's trade costs.[73] TC_i represents trade costs in the parent country. The sign of TC_i should be negative, suggesting higher trade costs in the parent country lowering incentives to place production facilities abroad for shipment back to the parent country. $DIST_{ij}$ is distance between the two countries. Markusen and Maskus (2001) suggest a negative sign of distance factor, capturing transaction costs.

4.3.3 The knowledge-physical-capital model

However, the KC model possesses some drawbacks. First, there is a misspecification error due to the variable of skilled labour differences ($SKDIFF_{ij}$) that is supposed to have a positive sign. Blonigen et al. (2003) argue that $SKDIFF_{ij}$, in the case of the US FDI inflows or the US inbound affiliate sales (used by Carr et al., 2001), is always negative due to the fact that foreign countries investing in the US have definitely less-skilled labour than the US's

[72] See Markusen and Maskus (2001) and Carr et al. (2001) for details.
[73] Carr et al. (2001) point out that a negative sign of this interaction variable essentially is not supported by a theoretically sharp hypothesis. In addition, Braconier et al. (2005) argue that a negative sign of $TC_j * SKDIFF_{ij}$ in the KC model could be problematic since the sign of this interaction variable has a weak argumentation.

skilled labour. For this reason, $SKDIFF_{ij}$ in the KC model appears with an erroneous sign. Blonigen et al. (2003) suggest that a misspecification error in the KC model would no longer exist if Carr et al. (2001) only use the US FDI outflows (or the US outbound affiliate sales) datasets. In that manner, $SKDIFF_{ij}$ turns out to be a positive sign of coefficient estimate. This suggests that the US FDI outflows (or the US outbound affiliate sales) increase as labour skill differences increase. Blonigen et al. (2003) also suggest that the KC model should separately estimate the US FDI inflows and the US FDI outflows. Alternatively, the sign of the coeffcicient of the estimate of a skill difference should be treated as an absolute value; hence, there is no negative sign for this variable (or the sign of this variable is always positive). Either one of them or both mentioned above can be applied in order to fix a misspecification error in the KC model.

Second, the KC model fails to provide significant evidence of vertical FDI.[74] Blonigen et al. (2003) argue that this is due to a misspecification error noted above. Bergstrand and Egger (2013) argue that the KC model omits other important factors that should be included into the model, namely the physical (physical plant and equipment) factor and the third country effects (similar to the multilateral resistance factor in the gravity model for trade explained by Anderson and van Wincoop (2004)). Omitting these factors might potentially induce an endogeneity problem in the KC model. Thus, Bergstrand and Egger (2007, 2013) introduce the extension of the KC model, namely the knowledge-physical-capital (KPC) model.

A number of earlier studies suggested that MNEs tend to be physical-capital intensive as well as skilled-labour intensive companies and set their headquarters in countries with physical-capital that have abundance as well as skilled-labour abundance (Bernard et al., 2005, Helpman et al., 2004; Helpman, 2006). The importance of physical factors in the MNEs theory is confirmed when Blonigen and Piger (2011) show evidence that bilateral FDI outflows are positively associated with parent countries' physical factor per worker. These

[74] When the KC model was estimated by Carr et al. (2001), their finding revealed that horizontal FDI motives is more dominance than vertical FDI motives. They summarize their finding as follows. First, the increasing trade costs of the host countries lead to concentration in production in the parent country (in this case the US), capturing more horizontal type. Second is a similar size in GDP between the US and the host countries rises FDI in both directions, suggesting horizontal FDI. Third, the US FDI outflows are significantly attracted by skilled-labour abundance in the host countries, suggesting horizontal FDI flows. The only result that can support the existence of vertical FDI is when there are significant differences in income levels and in skilled-labours endowments between the US and the host countries. For details, see Carr et al. (2001).

suggestions give a substantial insight to Bergstrand and Egger (2007, 2013) that the physical-capital factor should be included in the FDI model derived from the gravity equation.

On the other hand, Baltagi et al. (2007) suggest that the inclusion of third country effects is critical since the average country pair of FDI flows is relatively small compared to the rest of the world. They also point out that the third country effects or the rest of the world (RoW) effects can affect bilateral FDI flows either through world aggregate demand or through production costs related to the world aggregate supply. In model our KPC model, we set first the empirical KPC model of Bergstrand and Egger (2007, 2013) as follows:

$$Flow_{ijt} = GDP_{it} * GDP_{jt}/GDP_t^W \quad (4.16)$$

where $Flow_{ijt}$ denotes trade or investment flows from country *i* to country *j* in year *t* and GDP^W is the world GDP. Equation (4.16) is the standard frictionless gravity equation. It assumes that there are N countries (>2), one final differentiated good, and no trade costs; and that labour and/or capital is internationally immobile. Then, Bergstrand and Egger (2007, 2013) change the right-hand side of equation (4.16) with the product between 'the squared bilateral GDP' and 'similarity', and divide it by world GDP:

$$Flow_{ijt} = \frac{GDP_{it}GDP_{jt}}{GDP_t^W} = \left(GDP_{it} + GDP_{jt}\right)^2 (s_{it}s_{jt})/GDP_t^W \quad (4.17)$$

where $s_i = GDP_i/(GDP_i + GDP_j)$ and $s_j = GDP_j/(GDP_i + GDP_j)$. 'Similarity' reflects similar income per capita following Helpman (1987). When both s_{it} and s_{jt} are 0.5, they are similar in income per capita. In such a case ($s_{it}s_{jt}$) is at the maximum. Therefore, in log-linear form, equation (4.17) becomes:

$$lnFlow_{ijt} = -lnGDP^W + 2\ln\left(GDP_i + lnGDP_j\right) + \ln\left(s_i s_j\right) \quad (4.18)$$

Bergstrand and Egger (2013) call this equation (4.18) the frictionless gravity equation in log-linear form. Because there is no distance factor included yet in the equation (4.18) that reflects traditional trade/or investment barriers. In addition, the value of GDP^W variation is assumed to be almost zero due to the existence of large cross-section countries involved in equation (4.18). This becomes easier when a panel data structure is applied, as changes in GDP^W are absorbed into time fixed effects.

To construct the empirical KPC model, Bergstrand and Egger (2007, 2013) then add a distance factor and three important aspects of relative factor endowments in equation (4.18) as follows:

$$lnFDI_{ijt} = \ln(SumGDP_{ijt}) + \ln(Similarity_{ijt}) + lnDistance_{ij} + u_{ijt} + h_{ijt} + k_{ijt} + \varepsilon_{ijt} \quad (4.19)$$

where the $SumGDP_{ijt}$ and $Similarity_{ijt}$ capture the presence of horizontal FDI. When the two markets in both countries grow larger ($SumGDP_{ijt}$) and their incomes per capita become more similar ($Similarity_{ijt}$), this should raise horizontal FDI (Baltagi et al., 2008). In the case of horizontal FDI, it is costly to set up a single plant in the parent country and to duplicate this plant in several host countries to produce the same product. Therefore, this requires a similar factor endowment of both countries in which they should have abundance in skilled-labour endowments and physical-capital endowments (Baltagi et al., 2007; Bergstrand and Egger, 2013). $Distance_{ij}$ is the bilateral distance between the two countries.

Baltagi et al. (2007), Egger (2008), and Bergstrand and Egger (2007, 2013) suggest that relative factor endowments should be formulated as follows: u_{ijt} is the ratio of the parent country's unskilled labour endowment to the host country's ($u_{ijt} = \frac{u_{it}}{u_{jt}}$), h_{ijt} is the ratio of parent country's skilled labour endowment to the host country's ($h_{ijt} = \frac{h_{it}}{h_{jt}}$) , and k_{ijt} is the ratio of the parent country's physical-capital endowment to the host country's ($k_{ijt} = \frac{k_{it}}{k_{jt}}$). ε_{ijt} is the error term.

In this setting, Bergstand and Egger (2013) argue that the variables of relative factor endowments are important to examining the type of FDI. They point out that the amount of horizontal FDI based in the parent country (*i*) with plants in the host country (*j*) would be maximized when parent country (*i*) is physical-capital abundance relative to its skilled-labour abundance (also to unskilled-labour) relative to that of the host country (*j*). This is due to the multi-plant structure of horizontal FDI, where headquarters are set up by utilizing physical-capital (skilled-labour) intensive factors. On the other hand, since the headquarters of vertical FDI are set up by using skilled-labour services and plants are set up by using physical-capital services, the amount of vertical FDI based in the parent country (*i*) with a

plant in the host country (*j*) would be maximized when parent country (*i*) is abundant in skilled-labour and physical-capital relative to the host country (*j*) assuming unskilled-labour constant at the mean.

Bergstrand and Egger (2013) predict that when the coefficient of estimate u_{ijt} has a negative sign and is significant (holding h_{ijt} constant), it suggests the existence of vertical FDI. When the unskilled labour endowment ratio (u_{ij}) variable sign is negative, this implies that the comparative advantage of the host country is increased through its abundance in unskilled-labour endowment. Therefore, this will drive MNEs in the parent country to further exploit low-cost inputs related to vertical FDI (Egger, 2008; Bergstrand and Egger, 2013). By contrast, when the coefficient of estimate h_{ijt} has a positive sign and is significant (holding u_{ijt} constant), the presence of horizontal FDI is indicated.

Bergstrand and Egger (2007, 2013) point out that the empirical KPC model as in equation (4.19) allows augmentation by adding traditional gravity variables such as contiguity, language and colony. The investment cost factor in the host country and trade cost in the parent and host countries are also appropriately included as these factors also apply in the KC model.

Equation (4.19) is an important empirical model for our study. Especially, this empirical KPC model can help us to answer the third research question related to FDI flows. In order to have a proper KPC model specification, we will add some appropriate variables into equation (4.19) such as bilateral time-invariant variables (contiguity and the same colony dummy), institutional factors of FDI to capture investment cost variables and control variables (macroeconomic factors, policy factors and infrastructure factors) as suggested by previous studies. We will also add a time effects factor to control for third country effects following Bergstrand and Egger (2007). Trade costs in both countries in our model specification would be accommodated by bilateral distance factor. We will discuss this more about in Chapter 7.

4.4 Conclusion

We will apply equation (4.8) in the next chapter in the form of a gravity model specification to Indonesia's aggregate trade flows in panel data setting in order to answer the first research question: What are the impediments to Indonesia's trade flows and their relative impacts in terms of at-the-border barriers and behind-the-border barriers to trade?

We expect that our trade datasets (particularly export values) in a disaggregate panel data structure would have a lot of zero trade values. Therefore, we specify the empirical gravity model in equation (4.14) to be our main model specification and estimate this model using the PPML technique. This strategy is important to answer our second research question: Does trade protection applied to Indonesia's manufacturing products have an impact on its export performance in manufacturing sectors?

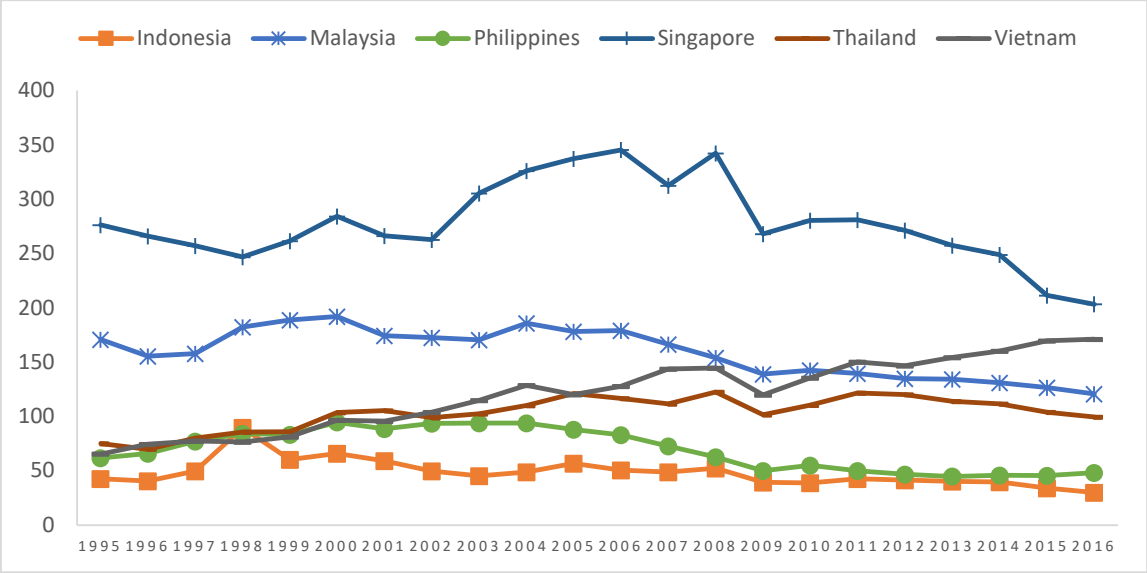
The empirical KPC model of FDI as equation (4.19) that would be specified into an estimating KPC model can help us to answer the third research question, that is, What factors determine foreign direct investment (FDI) flows in Indonesia?

Chapter 5: Analysing Trade impediments in Indonesia

5.1 Introduction

International trade brings several benefits to the Indonesian economy in that it helps the country in utilizing its comparative advantage, increasing its specialization, and maximizing the roles of its labour force for manufacturing production. In order to make the most out of international trade, Indonesia actively engages in economic integration as a way to aim for greater trade.

However, Indonesia's involvement in trade is still relatively low. For example, in 2016, Indonesia's merchandise trade to GDP ratio was 30% (see Figure 5.1). This percentage is the lowest among its ASEAN main neighbors, such as Singapore, Vietnam, Malaysia, Thailand, and the Philippines, that had merchandise trade to GDP ratio of 203%, 171%, 121%, 99%, and 48% respectively. In fact, this relative position of Indonesia has remained rather stagnant at least since 1995.



Source: World Development Indicator database.

Figure 5.1. Merchandise trade (total exports and imports in goods) to GDP, Indonesia and its main ASEAN partners, 1995-2016.

The General Agreement on Tariffs and Trade (GATT) established in 1947 played a crucial role in negotiation of a reduction in tariff barriers across countries. The World Trade Organization (WTO) then continued the GATT task in 1995. The work of the WTO along with the proliferation of preferential trade agreements (PTAs) and unilateral liberalization has had a great deal of success in decreasing tariff barriers across nations. But whereas tariff barriers have come down, the implementation of trade protection such as non-tariff measures (NTMs), by contrast, has dramatically increased. The role of these NTMs is rapidly emerging as a factor inhibiting international trade flows.

There are other impediments to trade apart from tariffs and NTMs. These include bad logistics and connectivity, or poor management or systems in export/import clearance. In this regard, policymakers around the world have introduced a series of what is known as 'trade facility measures' (TFMs) to help deal with such impediments. The WTO defines trade facilitation as the simplification, modernization, and harmonization of export and import processes. [75] This definition implies that trade facilitation is an attempt to reduce trade costs, which is good for cross-border trade flows. In practice, proper trade facilitation is akin to reduction in distance of trade between countries. [76]

In most cases, however, trade facilitation involves costly investments.[77] For example, to set up new infrastructure in trade customs such as ICT equipment, requires not only the technology but also new regulations and institutional improvement. Due to these expensive requirements, many financially constrained developing countries would underinvest in trade facilitation. Other factors such as lack of political will from member countries (WTO, 2015) and a low speed and pace of implementation (Moise, 2013) also contribute to lack of trade facilitation. The UNCTAD emphasizes how such a lack of trade facilitation could prolong the existence of obstacles to global trade flow such that long waiting times at borders,

[75] See https://www.wto.org/english/tratop_e/tradfa_e/tradfa_e.htm (accessed 18 December 2018) for detail of The WTO's Trade Facilitation Agreement (TFA).
[76] Lee and Park (2007) define a lack of reform in trade facilitation as an institutional distance in trade.
[77] However, Perez and Wilson (2010) argue that reforms in trade facilitation need a vast amount of investments in order to improve physical infrastructure (or transport infrastructure) such as roads, railways, airports, and seaports. Moise (2013) confirms Perez and Wilson's (2010) argument by giving an illustration that trade facilitation reforms incur $ 450,000 to make new customs law in Lao, while costs another $450,000 to set up a training center to improve people specific skills in operating customs management.

inappropriate fees, cumbersome formalities, and inadequate or unclear rules and regulations can all become serious impediments to trade'.[78]

The requirement of large investment projects would make some developing countries, and all least-developed countries face difficulty in reforming their trade facilitation under the trade facilitation agreement (TFA) by the WTO. On the other hand, the WTO (2015) also argues that a satisfactory rate of TFA implementation will depend on the political will of member countries, especially developing and the least-developed members. Thus, TFA implementation in the short-run is very challenging.

In sum, failure to reduce tariffs, or to remove NTMs and to provide proper TFMs, could both make trade costs significantly increase. These impediments can be encountered and experienced either at-the-border or behind-the-border. For the purpose of this study, we classify any types of impediments accordingly as at-the-border barriers (ABBs) or behind-the-border barriers (BBBs). We hypothesise at the outset that it is the latter that hinders trade flows more, and so policy, under resource constraints, should focus more on tackling BBBs. We motivate this hypothesis by providing the discussion of Indonesia's trade impediments in the following section (section 5.2). The main finding of this chapter shows that Indonesia's trade flows are sensitive to trade impediments such as tariffs and NTMs as well as the lack of TFMs. Furthermore, the behind-the-border NTMs are more harmful to Indonesia's trade flows than tariff measures and at-the-border NTMs. Finally, with regards to trade facilitation, providing TFMs at the border turns out to be more effective than that of provision behind-the-border.

The rest of this chapter is organized as follows. Section 5.2 summarizes Indonesia's trade impediments, followed by the research questions; section 5.3 sets out model specification, data explanation, and estimation strategy; section 5.4 discusses the empirical results and their policy implications; section 5.5 lays out a series of robustness check; and section 5.6 concludes and provides implications of the research findings.

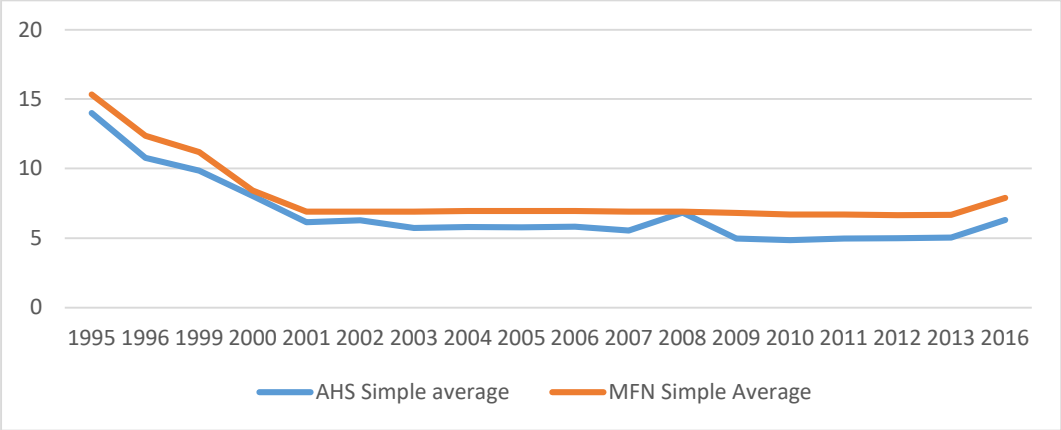
[78] See https://unctad.org/en/Pages/DTL/TTL/Trade-Facilitation.aspx, accessed 10 December 2018. See also Brooks and Stone (2010) and Brooks (2016) that low level in trade facilitation can induce barriers to trade.

5.2 Indonesia's trade impediments

As noted, like that of other countries, Indonesia's tariffs have significantly been reduced, while the number of NTMs has tended to increase. Furthermore, Indonesia's progress in providing trade facilitation appears slow relative to other selected Asian countries. This section provides an update on Indonesia's recent trade impediments, in terms of tariffs and non-tariff measures as well as the lack of trade facilitation.

5.2.1 Tariff measures

From the 1990s until recently (see Figure 5.2), Indonesia's import tariffs have substantially decreased in terms of both effectively applied tariffs (or known as AHS)[79] and most-favored-nation tariffs (MFNs)[80] for all products. The applied tariff in terms of simple average fell from 14% in 1995 to around 6% in 2016. The MFN tariff shows a similar pattern, that is, this percentage was down from 15% to 8% over the same period.



Note: The data for 1997, 1998, 2014 and 2015 are not available.
Source: World Development Indicator, the World Bank.

Figure 5.2 Indonesia's applied tariff (AHS) and most favored nation (MFN) 1995-2016 (in %)

Nevertheless, the increases in import tariffs on steel products, luxury products, some consumer goods, and tobacco products during 2013-2016 contributed to the current rise in

[79] The World Integrated Trade Solution (WITS) uses the concept of effectively applied tariff, which is defined as the lowest available tariff. If a preferential tariff exists, it will be used as the effectively applied tariff. Otherwise, the MFN applied tariff will be used.
[80] The WITS defines MFN tariffs are what countries promise to impose on imports from other members of the WTO, unless the country is part of a preferential trade agreement (such as a free trade area or customs union). This means that, in practice, MFN rates are the highest (most restrictive) that WTO members charge one another.

the aggregate tariff.[81] In terms of preferential tariffs, the pattern also shows a general decline. For example, almost all tariff lines have reduced to zero under the common effective preferential tariff (CEPT) scheme of ASEAN economic integration.

5.2.2 Non-tariff measures (NTMs)

Table 5.1 summarises the recent non-tariff measures implemented by Indonesia. The Global Trade Alert (GTA) categorizes NTMs as 'green', 'amber', and 'red' to measure their degree of harmfulness, where 'red' indicates the most harmful trade protection measure.[82] As shown, the red (harmful) measures applied by Indonesia have significantly increased after the global financial crisis in 2008.[83] In the second term of his presidency (2009-2014), Susilo Bambang Yudhoyono (SBY) significantly imposed more harmful NTMs, from three measures in 2008 to thirteen measures in 2009. The number of Indonesia's trade partners affected by Indonesia's red measures also increased, from 48 countries affected in 2008 to 109 countries in 2009. The number of trade protections in Indonesia rose again in 2012 with 17 red measures implemented, and 153 partner countries affected. Table 5.2 shows that these harmful measures in non-tariffs are mostly applied to Indonesia's commodity and natural resources industries (for example minerals, palm oil, wood, horticulture) and labour-intensive industries (such as textiles, footwear, and leather). Table 5.1 also shows that trade protection in terms of NTMs also rose under President Joko Widodo (Jokowi) who took office in 2014. Indonesia's trade protection in 2015 jumped to fifteen red measures with 127 countries impacted. According to Table 5.2, it appears that these red measures are mostly associated with natural resources and commodity industries such as forestry, tin, sugar, and fisheries. Industries that depend heavily on labour forces such as automotive and construction, were also affected.

[81] According to the Global Trade Alert data (accessed 18 April 2018). It is unclear what was motivation behind the increasing of import tariffs during that period, whether to get more revenue from import tariffs and at the same time to reduce current account deficit or just simply to protect domestic producers.

[82] Evenett and Fritz (2018) define red measures as the NTMs that almost certainly discriminate against foreign commercial interests. Amber measures mean that the NTMs that likely involve discrimination against foreign commercial interests, while green measures reflect the NTMs that liberalise on a non-discriminatory (that is most-favoured-nation) basis; or improves the transparency of a relevant policy.

[83] This is not uniquely the case for Indonesia only. Henn and McDonald (2011) demonstrate that the world trade was declined by 5% to 8% due to the trade protection policy in response to the global financial crisis in 2008.

Table 5.1 Number of red (harmful) measures in Indonesia's NTMs and number of affected countries by Indonesia's harmful NTMs [84]

Year	Number of Red Measures	Number of Affected Countries
2008	3	48
2009	13	109
2010	10	80
2011	7	83
2012	17	153
2013	13	94
2014	13	112
2015	15	127
2016	10	97

Source: Author's calculation based on the Global Trade Alert database.

[84] The number of measures in non-tariff are only for trade in goods. This study excludes FDI measures and migration measures.

Table 5.2 Types of NTMs implemented in Indonesia for selected years[85]

Year	Type of NTMs Based on the GTA	UN-MAST ID	Affected Industry and Others
2009	Export-related NTMs, nes	P9	Exporters of certain products must be supported by letters of credit issued by domestic banks
	Import related NTMs,nes	X	Steel and iron, fruit and vegetables, meat
	Financial grant	L	Sugar
	Export quota	P12	Mineral and coal
	Export ban	P11	Rattan
	Production Subsidy	L	Textile and leather
	Export tax	P5	Rattan, leather, timber and crude palm oil
	Localization incentives	I1	LPG steel tubes & gas stoves
	Import licensing requirement	E1	Non-hazardous and non-toxic waste goods
	Tax or social insurance relief	L	Inputs to locally produced machinery
	Public procurement preference margin	M2	Electricity infrastructure, oil and natural gas
	Safeguard	D31	Dextrose Monohydrate (DMH), Wire nail/wire of iron/non-alloy steel (not plated), Porcelain and non-porcelain ceramic tableware
	Anti-dumping	D1	Bi-axially oriented polypropylene film from Thailand
2012	Safeguard	D31	Iron and steel wire
	Anti-dumping	D1	Ceramic tableware from China, Hot-rolled plate from China, Singapore and Ukraine, Cold rolled coil/sheet from China, Chinese Taipei, Japan, South Korea and Vietnam
	Sanitary and phytosanitary measure	A	Horticulture
	The import-related non-tariff measure, nes	X	The new import regime for finished goods, Temporary import regulations for used capital goods, Reduced number of gateways for horticulture imports
	Import ban	E3	US beef imports, consumption salt, certain fruits and vegetables
	Import quota	E2	Beef, Live cattle
	Safeguard	D31	Wheat flour
	Export tax	P5	Mineral ores, palm oil, cocoa beans, wood and leather products
	Export ban	P11	Metals and minerals
	Local sourcing	I1	LCR in defence industry; Motorised vehicles
	Export quota	P12	Certain Fertilizers
	Localisation incentive	I1	Increased LCR in textile & footwear revitalisation
	Import licensing requirement	E1	Import provisions on seeds
	Import-related non-tariff measure, nes	X	Pre-shipment inspection requirement on tire imports
	Export licensing requirement	P13	Export restrictions on silver and gold; Metal waste and scrap
	Public procurement localization	M3	The defense industry
	State aid, nes	L	The defense industry
2015	Safeguard	D31	Alloy steel, coated paper and paperboard (not including banknotes paper)
	Anti-dumping	D1	Spin drawn yarn from Malaysia, Partially oriented yarn from Malaysia and Thailand, Biaxially oriented polyethylene from China, India, and Thailand
	Local sourcing	I1	Automotive industry; machinery; and materials used in construction
	Export licensing requirement	P13	Forestry products, fuel trade
	Production subsidy	L	Subsidies for bioethanol and biodiesel, revitalisation of traditional markets, lowered jet fuel prices at Jakarta airport
	Export quota	P12	SOE tin producer imposes export quotas
	Tax or social insurance relief	F7	Extended investment-related income tax reduction
	State loan	L	Maritime and fisheries, labour-intensive industries facing layoffs
	The export-related non-tariff measure, nes	P9	Restrictions on tin exports
	Trade payment measure	G	Letters of credit as a mandatory payment method for certain goods
	Interest payment subsidy	L	Interest rate cut on SME loans
	Import quota	E2	Live cattle
	Import ban	E3	Used clothing, corn
	The import-related non-tariff measure, nes	X	Stricter import regulations for animal products
	Export ban	P11	Refined sugar

Source: The Global Trade Alert database (accessed 18 April 2018).

The impact of NTMs on Indonesia has been reported elsewhere. For example, the World Bank (2016) found that the prices of milled rice, sugar, meat, and fruit in 2015 rose more

[85] The types of NTMs in the Global Trade Alert (the GTA) follow the United Nations-Multi-Agency Support Team (the UN-MAST) international classification of NTMs, the 2012 version. This study excludes the FDI measures and the migration measures.

than 20% in comparison with the prices of these products in 2008.[86] On the other hand, the prices of processed foods, beverages, and tobacco in 2015 were 13.7% higher than their prices in 2008. This indicates that NTMs make a substantial contribution to increasing Indonesia's domestic prices of several major products.

5.2.3 Lack of trade facilitation measures (TFMs)

This study adopts the criteria of trade facilitation indicators of the WTO.[87] Based on some correlation tests, the WTO (2015) found that costs to export/import, time to export/import and customs are significant to trade flows and hence can serve as trade facilitation indicators. We also include other trade facilitation indicators based on earlier empirical studies such as seaports, airports, land transport (road), and maritime transport (shipping).[88]

Some previous studies have shown that an improvement in the quality of a seaport has a positive impact on trade flows (Blonigen and Wilson, 2008; Havemen et al., 2009; Feenstra and Ma, 2014). Furthermore, trade increases in a range of 0.7% up to 8% on average when an improvement in time to trade is aimed by improvement in time reduces the number of days to export or to import (Djankov et al., 2006; Persson, 2012; Zaki, 2015; Ismail and Mahyideen, 2015).

Jacoby and Hodge (2008) argue that the improvement in transportation infrastructure could help firms to reduce their operating costs, resulting in efficiencies in sourcing costs, fleets, warehousing, inventory, and transit time visibility. Shepherd et al. (2011) demonstrate that APEC members gain more trade in export due to reforms in transportation infrastructure by an average of 4% in overall, or 2% up to 6 % for each APEC member. The evidence of TFMs' effects on Indonesia's trade flows has also been demonstrated by Shepherd and Wilson

[86] The World Bank estimates the effect of trade protection in Indonesia using the nominal rate of protection based on the estimation of Marks and Rahardja (2012).
[87] See the WTO (2015) for reviews.
[88] See Wilson et al. (2003), Lee and Park (2007) and Feenstra and Ma (2014) for using the quality of seaport as one of trade facilitation indicators. Air transport factor has been suggested by Shepherd and Wilson (2009) and Brooks (2016). Shepherd et al. (2011) and Brooks (2016) suggested shipping indicator as a proxy of maritime transport. Shepherd et al. (2011) and Iwanow and Kirkpatrick (2007) used road as a proxy of land transport factor.

(2009). An improvement in Indonesia's seaports relatively raises its imports and exports by 17.5% and 13.3% respectively.

Table 5.3 shows that Indonesia's costs to export and import in 2015 were relatively low. Indonesia's costs are less than those of India and China, comparable to those of Malaysia but higher than those of Singapore. All this suggests that Indonesia has made significant reforms to lower its costs to export and import. Table 5.3 also shows the number of days needed to clear export and import. An improvement in time to trade by reduced number of days could prevent additional delays and costs, resulting in increased trade. Indonesia's time to export and time to import are relatively competitive against China, India, and Vietnam. However, they are slower than those of Singapore, Malaysia, and even the Philippines. This indicates that Indonesia should put more effort into improving its time to trade, to be comparable to its neighbours.

Table 5.3 Cost to trade and time to trade for selected countries, 2015

Selected Countries	The cost to export (USD per container deflated)	The cost to import (USD per container deflated)	Time to export (days)	Time to import (days)
China	823	800	21	24
India	1332	1462	17.1	21.1
Indonesia	585	660	17	26
Malaysia	525	560	11	8
Philippines	755	915	15	15
Singapore	460	440	6	4
Thailand	595	760	14	13
Vietnam	610	600	21	21

Source: The Ease of Doing Business Index.

Other factors that may impede trade flows are shown in Table 5.4. Indonesia's customs perform very poorly along with the Philippines. Indonesia's seaport also underperforms, although it is better than the Philippines' and Viet Nam's.

Table 5.4 Selected trade facilitation measures (TFMs) for selected countries, 2016[89]

Selected Countries	Customs Index (1 to 5)	Quality of Seaport Index (1 to 7)	Quality of Air Transport Index (1 to 7)	Shipping (Maritime Transport) Index	Land Transport or Container Transportation (in 20-foot equivalent units)
China	3.32	4.59	4.81	167.48	199,565,501
India	3.17	4.53	4.49	27.19	12,431,700
Indonesia	2.69	3.91	4.52	46.24	12,083,010
Malaysia	3.17	5.44	5.70	106.79	24,570,000
Philippines	2.61	2.92	3.25	17.81	7,421,441
Singapore	4.18	6.66	6.85	122.7	31,688,000
Thailand	3.11	4.18	4.95	44.32	8,239,363
Viet Nam	2.75	3.84	4.06	62.84	8,495,730

Source: The Logistic Performance Index for the customs indicator, the Global Competitiveness Index for the quality of seaport and air transport indicator, and the World Development Indicator for the Liner Shipping Connectivity Index (Shipping) and the container transportation indicator.

By contrast, the quality of Indonesia's air transport performs relatively better. Indonesia's index of air transportation is greater than the Philippines', Viet Nam's and India's. Furthermore, Indonesia's shipping fares better than the Philippines', India's, and Thailand's, but worse than China's and Viet Nam's. This is a challenge for Indonesia to improve its shipping index further given its geographical nature as an archipelago. The inter-island connection as well as the connection between Indonesia's main islands and the international markets through shipping are keys to enhancing Indonesia's trade flows.

Container transportation facilitates shipping between factory, port, and warehouses (Shepherd et al., 2011). Improvements in road infrastructure can lead to effective container transportation. As a result, this can reduce timely delivery and improve cost saving (Brooks, 2016). Table 5.4 also shows that there were more than 12 million 20-foot containers transported in Indonesia in 2016. This capacity is higher than that of the Philippines, Vietnam, and Thailand. However, Malaysia's containers transportation can reach 24 million units, twice Indonesia's capacity. China's capacity is more than ten-fold Indonesia's capacity. This implies that although Indonesia has made significant reforms in its road infrastructure, this remains poor in comparison with China, Singapore, and Malaysia.

[89] The higher indexes, the better of the quality of seaport, air transport, customs, corruption, and shipping. Carrying more 20-foot equivalent units are better for container transportation.

The foregoing discussion leads to the main research questions of this chapter, namely, What are the impediments to Indonesia's trade flows and their relative impacts in terms of at-the border barriers and behind-the-border barriers to trade? To address this research question, a gravity model will serve as the main workhorse. The next section further discusses the specification of the gravity model, the estimation strategy and the data used.

5.3 Model specification, data, and estimation method

This study employs a gravity model to investigate the effect of Indonesia's trade impediments on its trade flows. In the model specification, Indonesia's trade impediments will be represented by at-the-border barriers (ABBs) factors and behind-the-border barriers (BBBs) factors, and both are brought together into a gravity specification. Even though their roles are the same, which is essentially as an impediment to trade, we include them both to determine the relative importance of each type. As noted, this study expects that the effect of BBBs is more substantial in affecting Indonesia's trade flows than (ABBs).

In order to classify trade impediments into ABBs and BBBs, we refer to earlier studies, subject to data availability. All previous studies classify a tariff as an ABB. But they are different in their treatment of NTMs. We combine the suggestions from Henn and McDonald (2011), Damuri (2012), the UNCTAD (2015), and the European Commission (2016) to help determine which types of NTMs fall into ABBs and which to BBBs.

Another factor that we would like to consider is trade facilitation measures (TFMs) – or lack thereof. Following trade facilitation indicators provided by the WTO (2015) and suggestions from previous studies as discussed above, the study takes costs to export/import, time to export/import, customs, seaport, airport, land transport (road), and maritime transport (shipping) into account. But we also need to group them into ABBs and BBBs. Note that what impedes trade is a lack of trade facilitation, not the TFM itself.[90]

Wilson et al. (2003) include poor conditions of seaports and customs as ABBs. Walkenhorst and Yasui (2009) and Wilson (2009) define cost to exports/imports and time to

[90] It is possible that a TFM, just like NTM, serves as a covert protectionism. In this study, however, we assume it away.

exports/imports as border procedures (or ABBs). Iwanow and Kirkpatrick (2007) suggest that land (road) transport factors are significant BBBs TFMs. Sadikov (2007) points out that all impeding domestic infrastructures should be seen as TFMs at BBBs. Following Sadikov, the current study assumes that trade logistics infrastructure such as road, air transport, and maritime transport are parts of the BBBs. Table 5.5 summarises our classification of trade impediments and the associated categories of ABBs and BBBs.

Table 5.5 The category of ABBs and BBBs

Impediment Indicators	Category	Impediment Type	References
Import Tariff	ABB	Tariff Measures	Traditionally treated as the ABBs by trade literature
Trade Quota	ABB	NTMs	Henn and McDonald (2011), Damuri (2012), UNCTAD (2015), and European Commission (2016)
Trade Ban	ABB	NTMs	Henn and McDonald (2011), Damuri (2012), UNCTAD (2015), and European Commission (2016)
Subsidy Measures	BBB	NTMs	Henn and McDonald (2011), Damuri (2012), UNCTAD (2015), and European Commission (2016)
Local Content Measures	BBB	NTMs	Henn and McDonald (2011), Damuri (2012), UNCTAD (2015), and European Commission (2016)
The cost to Export/Import	ABB	Lack of TFMs	Walkenhorst and Yasui (2009) and Wilson (2009)
Time to Export/Import	ABB	Lack of TFMs	Walkenhorst and Yasui (2009) and Wilson (2009)
Seaport	ABB	Lack of TFMs	Wilson et al. (2003)
Customs	ABB	Lack of TFMs	Wilson et al. (2003)
Air Transport	BBB	Lack of TFMs	Sadikov (2007)
Land Transport (Road)	BBB	Lack of TFMs	Iwanow and Kirkpatrick (2007) and Sadikov (2007)
Maritime Transport (Shipping)	BBB	Lack of TFMs	Sadikov (2007)

5.3.1 Model specification

To set up our model specification, we recall an empirical model of gravity equation with the multilateral resistance (MR) factors as shown in equation (4.8) from Chapter 4. We state equation (4.8) as being our equation (5.1) in this chapter and can be expressed as follows:

$$l\,n\,X_{ijt} = k + ln\,Y_{it} + l\,n\,Y_{jt} + (1-\sigma)\rho ln\,D_{ij} + (1-\sigma)l\,n\,b_{ij} + \tau_1 Lang_{ij}$$
$$+\tau_2 Col_{ij} + \tau_3 FTA_{ij} + \beta_{1i}\delta_{1i} + \beta_{2j}\delta_{2j} + \beta_{3ij}\delta_{3ij} + (1-\sigma)\varepsilon_{ijt} \qquad (5.1)$$

where equation (5.1) also denotes the empirical model of gravity equation in panel data setting. In this case, $l\,n\,X_{ijt}$ is the log of time-varying trade flows and becomes our dependent variable. Y_{it} and Y_{jt} are time-varying exporters' GDP and importers' GDP. D_{ij} is distance between the two countries. b_{ij} is a proxy of border barriers. Both D_{ij} and b_{ij} represent bilateral trade cost factors (Anderson and van Wincoop, 2003). Some traditional gravity variables such as common language ($Lang_{ij}$), the common colony (Col_{ij}), and free trade area (FTA_{ij}) variable are also included in equation (5.1). The MR factors are

represented by exporting country FE (δ_{1i}) and importing country FE (δ_{2i}) following Feenstra (2002). The empirical model above also includes bilateral (pair) FE (δ_{3i}) following Baier and Bergstrand (2007).

In order to transform equation (5.1) to be our main estimating equation, we simplify the parameters of interest of equation (5.1) by using different notations as follows:

$$ln X_{ijt} = \alpha_1 + \alpha_2 ln Y_{it} + \alpha_3 ln Y_{jt} + \alpha_4 ln D_{ij} + \alpha_5 ln b_{ij} + \alpha_6 Lang_{ij} + \alpha_7 Col_{ij}$$
$$+\alpha_8 FTA_{ij} + \delta_i + \delta_j + \delta_{ij} + \varepsilon_{ijt} \quad (5.2)$$

To accommodate our gravity equation with trade impediment variables, the augmentation of equation (5.2) is necessary by incorporation of the ABBs variables and the BBBs variables. We also include some time-varying control variables. We treat b_{ij}, $Lang_{ij}$, Col_{ij}, and FTA_{ij} as time-invariant control variables. Time dummies are also used in our model specification. Therefore, the equation (5.2) now becomes:

$$ln X_{ijt} = \alpha_1 + \alpha_2 ln Y_{it} + \alpha_3 ln Y_{jt} + \alpha_4 ln D_{ij} + \beta_k ABB'_{ijt} + \gamma_k BBB'_{ijt}$$
$$+\pi_k Control'_{1ijt} + \tau_k Control'_{2i} + \delta_i + \delta_j + \delta_{ij} + \theta_t + \varepsilon_{ijt} \quad (5.3)$$

Equation (5.3) is now our main model specification where the dependent variable of the log of X_{ijt} is Indonesia's bilateral aggregate trade (export and import) flows from Indonesia to its trading partner, and vice versa in USD at time *t.*

We use the sum of export and import of the Indonesian trade (or bidirectional trade flows) in this study subject to data availability. This approach increases the number of observations and improves point of estimates, as in Benedictis and Taglioni (2011). Benedictis and Taglioni (2011) argue that the main problem of trade data is due to under-reporting, outliers, or missing observations. Thus, the sum of exports and imports can help to reduce this problem. We, however, run some robustness check with the alternative, unidirectional flows, e.g., export flows and import flows as the dependent variable.

Y_{it} and Y_{jt} are the log of exporters' GDP (Indonesia and its trade partners) and the log of importers' GDP (Indonesia and its trade partners) at time *t* in nominal GDP respectively. Feenstra and Ma (2014) suggest that GDP is an important factor in measuring the economic

capacity of a country. $ln\ D_{ij}$ is the log of distance between the two countries' capital city in Kilometers.

ABB'_{ijt} is the vector of ABBs. Recalling Table 5.5, this vector includes Indonesia's and its trade partners' import tariff rates at time *t* in the percentage[91] and the ABBs NTMs such as Indonesia's trade quotas (export and import quotas) and Indonesia's trade bans (export and import bans) at time *t* respectively. This vector also includes the ABBs TFM variables such as the quality of Indonesia's and its trade partners' seaports as well as customs in indexes at time *t*. The log of Indonesia's trade costs, which is the sum of the costs of exports and the costs of imports in USD at time *t* and the log of Indonesia's time to trade (time to export and time to import) in days at time *t*, are also included in this vector.

BBB'_{ijt} is the vector of BBBs. According to Table 5.5, this vector will take the BBBs NTMs and the BBBs TFMs into account. The BBBs NTMs incorporate the variable of subsidy measures and local content measures.[92] In addition, we also include the BBBs TFMs as provided in Table 5.5 such as container transportation that represents Indonesia and its trade partners' container transportation from land to seaports and vice versa, representing the quality of road (or land transport) at time *t* in the log form. The Air transport variable denotes the quality of air transportation at time *t* in index. Maritime transportation (shipping) reflects the quality of maritime transportation at time *t* and is proxied by the Liner Shipping Connectivity Index (LSCI).[93]

$Control'_{1ijt}$ is the vector of time-varying control variables. This vector includes the log of exporters' population (Indonesia and its trade partners) and the log of importers' population (Indonesia and its trade partners) at time *t* to capture endowment effects (Feenstra and Ma

[91] Import tariff rates use the weighted mean applied tariff. Following tradition in the trade literature, the constant of 1 is added to the import tariff rates before taking the logs in order to address some country pairs, in this case between Indonesia and its trade partners or vice versa, have zero or missing tariff rates. The World Integrated Trade Solution defines weighted mean applied tariff or effectively applied weighted average tariff as the average of tariffs weighted by their corresponding trade value or the average of effectively applied rates weighted by the product import shares corresponding to each partner country. Data are classified using the HS 6 or the HS 8 digits. See https://wits.worldbank.org/CountryProfile/Metadata/en/Indicator/Tariff for detail.
[92] These subsidies measures exclude export subsidies under P7 (see the UNCTAD international classification of NTMs, the 2012 version).
[93] UNCTAD (2010) construct five indicators of the maritime transport sector to be an index of LSCI by featuring indicators such as number of ships, container-carrying capacity on ships, maximum vessel size, number of services, and number of companies that deploy container ships in a country's ports.

2014). The current study includes a good governance variable to control irregular payment effects in trade, following Iwanow and Kirkpatrick (2007), Shepherd and Wilson (2009), and the WTO (2015). information and communication technology (ICT) play important roles in streamlining cross-border trade flows (Brooks, 2016). Hence, the model also takes this variable into account to control for the ICT utilization effects. The measure of the ICT variable is based on its percentage investment of Indonesia's total exports and imports in goods at time t.[94]

$Control'_{2i}$ is the vector of time-invariant control variables. The study includes a dummy for preferential trade agreements (PTAs) between exporter and importer countries to capture economic integration effects. More specifically, this variable indicates whether the two countries are members of the same PTAs (either regional trade agreements or bilateral trade agreements or both) during the observations (see the time period of data in data explanation section). In that manner, we assume that PTA membership does not change, or the time variation of the PTAs variable tends to be constant. The dummy is assigned one if both countries belong the same PTA and zero otherwise.

Other dummies are used to accommodate if the trade partners share common land, share an official common language, or have the same colonial ties (the colonial history) – all these are to control for geographical border effects in land, cultural effects, and the colonial history effects respectively. As noted, δ_i and δ_j are exporting country fixed effects and importing country fixed effects respectively. The variable of δ_{ij} is bilateral (pair) fixed effects. θ_t is time dummies to capture the business cycle effects. Finally, α_1 is a constant and ε_{ijt} denotes the variable of error term.

5.3.2 Data explanation

The data structure takes the form of panel data covering 177 of Indonesia's trade partners from 2007 to 2016 (see Appendix 6.1 for the list of countries). The year 2007 is chosen as the initial period simply due to the availability of TFMs and NTMs data, as most TFMs

[94]UNCTAD explains that the ICT to trade covers computers and peripheral equipment, communication equipment, consumer electronic equipment, electronic components, and other information and technology goods or miscellaneous thing.

datasets used by this study start from 2007, while the time series of NTMs, on the other hand, is slightly shorter, starting from 2008 or 2009.

Anderson and van Wincoop (2003) explain that trade volumes in the gravity model with the MR factors can be proxied by trade values. Thus, this study opts trade values to be the dependent variable following Anderson and van Wincoop (2003). The Trade Map datasets from the International Trade Statistic is accessed to obtain Indonesia's bilateral trade data in terms of export plus import. As noted, while the dependent variable of the gravity models used in many previous studies is a measure of unidirectional trade flows rather than total trade flows, i.e. export flows (Poyphonen 1963; Aitken 1973; Anderson 1979; Bergstrand 1985, 1989; Deardorff, 1998) or import flows (Subramanian and Wei 2007; Armstrong 2009), the use of the sum of exports and imports as the dependent variable will help us to increase the number of observations that should lead to an improve in point of estimates as suggested by Benedictis and Taglioni (2011).

The World Integrated Trade Solution (WITS) is the main source for import tariff rates in terms of the weighted mean applied tariff. For the NTMs datasets, the study heavily relies on the Global Trade Alert (GTA). The GTA dataset includes NTMs at country level, both ABBs and BBBs in the form of panel data. The NTMs dataset sourced from the GTA offers several advantages. For example, it provides a panel data structure with detail NTMs types that fits with our estimation strategy. The UNCTAD's Trade Analysis Information System (TRAINS) and the World Integrated Trade Solution (WITS) also provide NTMs information but they are in a cross-sectional setting.

With respect to NTMs variables, this study only takes NTMs series with complete data from 2008 or 2009 to 2016, on trade quotas, trade bans, subsidy measures, and local content measures. In addition, we only consider the most harmful measures, i.e., the 'red' category.

As noted, NTMs are difficult to observe, let alone to measure. Addressing this difficulty, the feasible approach to follow is the direct approach as suggested by Chen and Novy (2012) instead of developing an ad-valorem equivalent (AVE) method.[95] The direct approach

[95] The ad-valorem equivalents (AVEs) method that introduced by Kee et al. (2009) could not be performed in this study since this method only captures the aggregate effects of NTMs on trade flows.

suggests that a possible way to observe and to measure NTMs is by treating these NTMs as a dummy variable. This dummy variable strategy has been supported by a vast number of previous studies such as Bao and Chen (2013), Cadot and Gourdon (2016) and Ing and Cadot (2017).[96] We follow this direct approach by treating all NTMs in this study as a binary variable. As a result of this approach, this study only looks at NTMs at the country level, rather than the product level, since we use the aggregate (total-all products) bilateral trade data between the two countries instead of the disaggregate bilateral trade data in products in the HS digits between the two countries. Another important reason that we use dummy for NTMs is to capture different trade effects associated with these various types of NTMs.

Since we focus on Indonesia's NTMs affecting its export and import goods, it is challenging to set a panel data setting for these NTMs variables due to data availability. We identify that Indonesia's trade quotas and Indonesia's trade bans have sufficient observations to be a panel data structure, while Indonesia's subsidy measures and Indonesia's local content measures need to include several related types of NTMs as a part of subsidy measures and local content measures in aiming of a panel data setting and in increasing the number of observations. Thereby, bailout (capital subsidy or equity participation), state loan, financial grant, in-kind grant, production subsidy, interest payment subsidy, loan guarantee, tax of social insurance relief, consumption subsidy, import incentive, financial assistance in foreign market and state aid are included to be the variable of Indonesia's subsidy measures. In addition, we include local sourcing, local operations, local labour and localisation incentive being part of Indonesia's local content measures variable.

The dummies for Indonesia's trade quotas, Indonesia's trade bans, Indonesia's subsidy measures or Indonesia's local content measures are assigned a value of one if it affects Indonesia's export goods or import goods during the observation at time *t* and zero otherwise.

This study also collects the TFMs variables datasets from several sources. For instance, the Global Competitiveness Index (GCI) compiled by the World Economic Forum (WEF) provides

[96] Those previous studies took a form of dummy for specific trade concerns such as TBT and SPS. They score one if tariff lines are affected by TBT or SPS, and zero otherwise.

indexes dataset of the quality of seaport and air transport starting from 2007.[97] The Logistic Performance Index (LPI) compiled by the World Bank that assesses the quality of customs around the world also started from 2007.[98] The World Bank Doing Business (DB) Index series are used to access Indonesia's trade costs (export and import costs) in USD per container (deflated) and Indonesia's time to trade (time to export and time to import) in number of days from 2007 to 2015.[99] The World Development Indicator (WDI), based on the UNCTAD datasets, is the key source of information on container transportation from land to the seaport and vice versa[100], international shipping networks[101], and the ICT for trade purposes[102] from 2007 to 2016. The WDI also provides the dataset of the exporter's population and the importers' population from 2007-2016. The corruption index is a proxy of good governance variable that collects from the Worldwide Governance Indicators (WGI) by Kaufmann et al. (2010), with a series from 2007 to 2016.[103]

The GDP (in USD) and population datasets are taken from the WDI. The data for distance, common land border, common language and colony (the colonial history) are collected from the CEPII. The Asia Regional Integration Centre (ARIC of the ADB), the WTO, and the Global System of Trade Preferences among Developing Countries (GSTP)-UNCTAD provide the information of Indonesia's PTAs that have been signed and are in effect. Table 5.7 exhibits the summary of the statistic of the observed variables of our gravity model.

[97]The scale of seaport quality and air transport quality index ranges from 1 to 7 in which the higher index, the better the quality. See http://reports.weforum.org/global-competitiveness-index-2017-2018/downloads/ for how to measure the quality of seaport and air transport for detail.

[98] The scale of customs index is 1 to 5, meaning the higher index, the better the quality. Since the data of LPI releases per two years consecutively, therefore the study assumes that index is still valid with the same value until the new LPI index is then unleashed. For example, if Indonesia's customs index had a value of 2.22 in 2010, this index remains so until 2011 before the new LPI index was released in 2012. In this case, this study does not apply extrapolation or interpolation. See https://lpi.worldbank.org/ for how to measure the quality of customs for detail.

[99] See https://www.doingbusiness.org/en/doingbusiness for how to measure trade (export and import) costs and time to trade (export and import) in the number of days for detail.

[100] The more units can be transported (in 20-foot equivalent units), the better road quality. See (https://data.worldbank.org/indicator/IS.SHP.GOOD.TU?view=chart for how to measure the quality of container transportation.

[101] The scale of index is the higher index, the better regarding more connecting to global maritime. See https://data.worldbank.org/indicator/IS.SHP.GCNW.XQ?view=chart for how to measure the quality of the international shipping networks.

[102] The bigger proportion of total trade (total export or total import), the better in terms of the amount of investments in ICT.

[103] The scale of corruption index is -2.5 (weak) to 2.5 (strong), corresponding the higher index, the lower corruption (or the better in terms of good governance). Seehttp://info.worldbank.org/governance/wgi/#home for how to measure the corruption index for detail.

Table 5.7 Summary statistic of the variables observed in the gravity model

Variable	Units	Observations	Mean	St.Dev	Min	Max
Indonesia's aggregate trade flows	Million USD	3479	0.87	3.10	0.0	33.70
Exporters' GDP	Billion USD	3502	400	398	9.84	932
Importers' GDP	Billion USD	3502	579	1,080	0	18,600
Distance	Kilo meters	3502	10,047.52	4,484.92	886.14	19,772.34
Import tariff	%	3132	4.62	5.7	0	150
Indonesia's trade quota	Dummy [0,1]	2623	0.15	0.36	0	1
Indonesia's trade ban	Dummy [0,1]	2620	0.08	0.27	0	1
Indonesia's subsidy measures	Dummy [0,1]	2786	0.13	0.33	0	1
Indonesia's local content measures	Dummy [0,1]	2794	0.07	0.25	0	1
Seaport quality	Index [1,7]	2087	3.8	0.88	1.26	6.83
Custom quality	Index [1,5]	3244	2.65	0.43	1.3	4.21
Indonesia's cost to trade	USD per container	3128	872.3	26.48	585	1397
Indonesia's time to trade	Days	3128	21.88	4.35	17	27
Container transportation	Million unit	2925	8	10	0	200
Air transportation	Index [1,7]	3087	4.45	0.75	1.05	6.92
Maritime transportation	Index	3052	26.28	18.15	0.53	167.48
Exporters' Population	Million	3502	140	109	11.9	261
Importers' population	Million	3502	141	145	10243	1380
Common land border	Dummy [0,1]	3502	0.017	0.13	0	1
Common official language	Dummy [0,1]	3502	0	0	0	0
Colony ties	Dummy [0,1]	3502	0.011	0.11	0	1
Preferential trade agreement (PTA)	Dummy [0,1]	3502	0.29	0.48	0	1
Good governance	Index [-2.5,2.5]	3479	-0.32	0.76	-1.81	2.45
Indonesia's ICT to trade	% of total trade	3479	5.9	1.91	3.37	9.06

Finally, it is important to check the possibility of multicollinearity between the variables used. Based on the coefficients of correlation (see Appendix 5.2, Table 1), we find no indication of multicollinearity between the dependent variable and trade impediment variables, or between trade impediment variables themselves.

5.3.3 Estimation strategy

Addressing the potential problems of estimation

The use of panel data in a gravity estimation gives rise to potential sources of heteroskedasticity and autocorrelation.[104] Heteroskedasticity might exist due to changing variances between cross-sectional units over time. Autocorrelation arises when error terms within units are serially correlated due to time series construct. Failure to control both could lead to biased standard error estimates. As a result, the test statistics become invalid, and the precision of the coefficient of estimates would be diminished. Thus, the standard OLS is no longer valid (Wooldridge, 2013).

[104] A modified Wald test and Wooldridge test are used in this study to check the existence of the biased problem due to panel heteroskedasticity and panel autocorrelation.

When the OLS estimation is adjusted using a robust variance matrix, the coefficient of estimates can yield the correct size (or be unbiased), but the value of coefficients would be insignificant (Bertrand et al., 2004). Hansen (2007) argues that the group level fixed effects might be biased in this case, while Hausman and Kuersteiner (2008) point out that the fixed effect (FE) method including the difference-in-difference (DiD) method remain failed to account for autocorrelation.

Silva and Tenreyro (2006) introduce the Pseudo-Poisson Maximum likelihood (PPML) method to estimate the gravity model with a large number of zero trade flows. This PPML method can also be used to tackle the problem of heteroskedasticity. Their PPML estimator is powerful when the number of zero trade flows of the dependent variable is large as argued by Zarzoso (2013).[105] However, they do not explicitly explain how to handle the problem of autocorrelation in gravity panel data. In addition, the number of zero trade flows in this study is relatively small, accounting for 1.7% of total observations. We decided therefore not to use the PPML estimation.

Our preferred estimation method is feasible generalized least squares (FGLS), in line with Hansen (2007) and Hausman and Kuersteiner (2008). The FGLS estimator assumes that explanatory variables in the right-hand-side of the equation that can influence the disturbances (or the true error variance-covariance matrix) are initially unknown. Therefore, these unknown influencer variables affecting the error terms need to be estimated. Note, however, that in the case of gravity structure, the standard FGLS estimator remains biased if two fundamental problems are not properly addressed, namely multilateral resistances (MR) (Anderson and van Wincoop, 2003), and endogeneity. The latter most likely arises from the PTA and the unobserved time-invariant variables in the right-hand-side of the equation that potentially correlate with the gravity equation's error term due to omitted variables (and selection bias) as discussed by Baier and Bergstrand (2007).

Feenstra (2002) suggests one way to reduce the problem of multilateral resistance is to control exporters' fixed effects as well as importers' fixed effects. On the other hand, Baier and Bergstrand (2007) argue that controlling bilateral fixed effects (i.e., pair fixed effects) is

[105] Zarzoso (2013) suggests that zero trade values reasonably matter for the PPML estimator when their number around 10% to 30% of all observations.

effective to reduce the source of endogeneity bias from the PTA and unobserved time-invariant heterogeneity (for example a distance variable). To capture the business cycle effects of a country, a time fixed effect is included, following Matyas (1997).

One remaining issue in using of the FGLS estimator is related to the length of panel data, as this can determine the level of efficiency of estimates. The length of panel data in this case is measured by the ratio of the number of time series (T) over the number of cross-section (N) or T/N. A seminal paper by Parks (1967) points out that the FGLS estimator will have robust standard errors when T is greater than N. However, recent studies by Reed and Ye (2011) and Moundigbaye et al. (2018) suggest that the FGLS estimator is an efficient estimator in the presence of heteroskedasticity and autocorrelation when T is fixed, and N is large (particularly $T/N<1$ as argued by Reed and Ye (2011) or $T/N\leq1.5$ as argued by Moundigbaye et al. (2018)). In this study, time dimension is 10 and cross dimension is 177, hence T/N is 0.06, hence acceptable in the sense of both Reed and Ye (2011) and Moundigbaye et al. (2018).

Expected signs of the explanatory variables

The literature suggests that the coefficients of the key gravity variables such as the GDP of exporters and importers should be positive, while a distance variable is negative. We expect that the coefficients of ABBs to trade such as tariff measures and NTMs (i.e., trade quotas and trade bans) to be negative. Behind-the-border impediments such as subsidy measures and local content measures should have a negative sign and be significant. On the other hand, improvement in the provision of TFMs should encourage more trade flows. It is expected therefore that the coefficients of both ABB and BBB TFMs will be positive.

The signs of some control variables could not be determined a priori, as they can go either way and the results from earlier studies were mixed. These include exporters' population, importers' population, common land border, common official language, and colonial origin. Other control variables such as the PTA and good governance factor should have positive effect. A positive PTA coefficient is an indication that participation in global integration can help to increase trade flows. Similarly, an improvement in the good governance leading to low costs related to administration aspects of trade, should facilitate more trade flows.

5.4 Empirical results

The modified Wald test for heteroskedasticity and the Wooldridge test for autocorrelation confirm that the main panel data used in this study suffers from the problems of heteroskedasticity and autocorrelation.[106] We opted, therefore, for FGLS. Table 5.8 provides regression results from this estimator (column 3). For the sake of comparison, we also show the results from OLS and fixed effect (columns 1 and 2). The standard OLS in column (1) is biased due to several potential sources such as non-constant disturbances (heteroskedasticity), serial correlation in error terms (autocorrelation), the MR problem, and endogeneity problem. Therefore, using the standard OLS can lead to invalid coefficient of estimates and misleading statistical inferences.

When the study improves the technique by employing an FE method and controlling possible biases, the method is still incapable of explaining the key gravity variables and trade impediment variables. This confirms Hausman and Kuersteiner (2008) that the FE technique does not properly address the autocorrelation problem. In the FE technique, time-invariant factors such as distance, common official language, colony, and PTA are wiped away as they are perfectly collinear with fixed effects factors as seen in column (2).

On the other hand, the results from FGLS are more plausible and robust with lower standard errors. The key gravity variables and some of the trade impediment factors are statistically significant with the expected signs. The results imply that a 10% increase in world exporters' GDP and importers' GDP should raise Indonesia's trade flows by an average of 0.97% and 1.71%, respectively. Even though there are time fixed effects in the main model, the FGLS estimator plays an important role in estimating our time-invariant variables including dummies by giving them a weighted of heteroskedasticity and the AR (1). For instance, the distance factor shows negative effect, as expected.

[106] See Appendix 5.3 for the results.

Table 5.8 The impact of Indonesia's trade impediments on its aggregate trade flows

	(1) OLS	(2) FE	(3) FGLS FE
Gravity variables			
Exporters' GDP (Log)	-0.307	0.183	0.097*
	(0.685)	(0.201)	(0.054)
Importers' GDP (Log)	-0.008	-0.018	0.171***
	(0.089)	(0.163)	(0.048)
Distance (Log)	-0.433***	-	-0.787***
	(0.131)		(0.224)
Trade Impediment Variables			
Import Tariff (Log)	-0.395**	-0.375***	-0.139***
	(0.200)	(0.142)	(0.032)
Indonesia's Trade Quotas	0.175	0.240**	0.110**
	(0.215)	(0.099)	(0.044)
Indonesia's Trade Bans	0.454	0.017	-0.025
	(0.281)	(0.093)	(0.032)
Indonesia's Subsidies Measures	0.508**	-0.033	-0.012
	(0.201)	(0.050)	(0.018)
Indonesia's Local Content Measures	0.045	-0.274***	-0.100***
	(0.291)	(0.100)	(0.031)
Seaport Quality	-0.101	0.454	0.518***
	(0.205)	(0.284)	(0.071)
Customs Quality	0.193	0.039	0.035
	(0.221)	(0.112)	(0.036)
Indonesia's Cost to Trade (Log)	3.098***	-4.496	-1.649
	(0.810)	(5.702)	(1.547)
Indonesia's Time to Trade (Log)	2.323	6.587***	2.869***
	(1.700)	(1.645)	(0.531)
Container Transportation (Log)	1.564***	0.707	0.396***
	(0.121)	(0.432)	(0.122)
Air Transportation	-0.484**	-0.389*	-0.296***
	(0.202)	(0.204)	(0.048)
Maritime Transportation (Shipping)	-0.012*	0.014	0.006**
	(0.007)	(0.010)	(0.003)
Control Variables			
Exporters' Population (Log)	-1.009	13.595***	7.431***
	(1.129)	(4.048)	(1.441)
Importers' Population (Log)	0.471**	4.491*	3.074***
	(0.219)	(2.467)	(0.531)
Common Land Border	-0.597	-	-0.692**
	(0.603)		(0.313)
Common Official Language	-	-	-
Colony Ties	-1.686**	-	2.229***
	(0.703)		(0.791)
Preferential Trade Agreements (PTA)	-0.330**	-	4.277***
	(0.161)		(0.362)
Good Governance	0.747***	0.845**	0.303**
	(0.155)	(0.404)	(0.137)
Indonesia's ICT to Trade	-0.443**	-1.062	-0.736***
	(0.212)	(0.698)	(0.223)
Constant	-8.157	-269.514***	-141.655***
	(11.329)	(75.779)	(23.922)
Observations	1,485	1,485	1,482
R-squared	0.347	0.131	-
Pair FE	No	Yes	Yes
Exporter FE	No	Yes	Yes
Importer FE	No	Yes	Yes
Time FE	No	Yes	Yes

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

The effects of trade impediments: the ABBs

The results of the ABBs to trade are mixed. As expected, the role of import tariffs is significant in reducing Indonesia's trade flows. A 10 % increase in the world import tariff on average decreases Indonesia's trade flows by around 1.4%. However, the coefficient of trade quotas turns out to be against expectations. This might imply that trade quotas in the given period in the net might have actually facilitated trade more than impeded them. This can be related to what is called asymmetric NTMs. Bratt (2015) points out that the effect of NTMs on the international trade flows to some extent is unclear. In some cases, NTMs could expand trade, while others are trade impediments. Bratt further argues that when importing countries impose NTMs on exporting countries, the NTMs effect on exporting countries could be different. Some exporting countries tend to gain more trade, but others do not. This phenomenon is called asymmetric NTMs.

By contrast, the coefficient of Indonesia's trade bans is not significant. To explain why this variable is insignificant, we refer to the GTA database, showing that most of Indonesia's trade bans due to export bans applied to mining products. The possible reason behind this insignificance is that the trend of Indonesia's export bans on unprocessed metals and minerals has recently declined since this policy was effectively withdrawn in 2014.

With respect to the ABBs TFMs, this study finds that the impact of seaport on Indonesia's trade flows is positive and significant. A one-point increase in the quality of the seaport index on the world average promotes Indonesia's trade flows by about 5.2% on average. This implies that improvement in seaport infrastructure is essential to increase Indonesia's trade flows. Another notable finding is that one day saved in time to trade on average raises Indonesia's trade flows by around 2.9%. This finding explains that shorter time to trade (export and import) in Indonesia can help to expand its international trade flows.

Wilson et al. (2003) point out that it is possible that to some extent, customs improvement and import tariff reduction are substitutes. That is, customs improvement may compensate for the lack of improvement in tackling tariff barriers, and vice versa. The result in model (3) confirms Wilson et al.'s findings (2003) that most countries in our sample including Indonesia seem to opt for tariff reduction, as this strategy is more feasible to apply, thanks to the rapid development of economic integration that provides opportunities for tariff

negotiations. On the other hand, improvement in customs requires investment that can be much more costly. In the case of cost to trade, the insignificance coefficient might be caused by the fact that Indonesia's cost to trade has been comparatively low (see Table 5.3), therefore this factor is no longer significant in affecting Indonesia's trade flows.

The effects of trade impediments: the BBBs

As expected, behind-the-border NTMs in the form of local content measures are significant in reducing Indonesia's trade flows by around 10.5%.[107] Note that this effect of the local content measures is greater than that of import tariffs. This evidence is consistent with findings from Kee et al. (2009), Hoekman and Nicita (2012), and UNCTAD (2012), confirming that the impact of NTMs on inhibiting trade is greater than tariff measures. Evidence also shows that the impact of this behind-the-border impediment on Indonesia's aggregate trade flows is more severe than those of at-the-border ones such as trade quotas and trade bans. This finding confirms Henn and McDonald's work (2011), which shows that the BBBs NTMs are found more harmful than the ABBs NTMs. However, the effect of the subsidy measures does not significantly influence Indonesia's trade flows.

The estimation results of the behind-the-border TFMs are more mixed. For instance, the factor of container transportation is significant and positively associated with Indonesia's trade expansion. The improvement of container transportation by 10% of the world average may increase Indonesia's trade flows by around 4%. Maritime transportation is another important infrastructure for trade. Higher connectedness to global shipping can help trade to expand. The result of shipping shows that the improvement of world maritime infrastructure by one index point on the world average increases Indonesia's trade flows by about 0.6%. However, the coefficient for air transportation is not as expected. The possible interpretation could be that most of the world air transportation including in Indonesia is used for passenger purposes rather than airfreight. Therefore, air transportation is unlikely to be used for trade purposes since this mode of transportation is not efficient in costs and fewer goods to carry than shipping.

The estimation results of control variables in the model (3) show that the increasing of the world exporters' and importers' populations on average has a significant impact on

[107] The value of 10.52% is calculated as$(e^{0.10} - 1) * 100$.

expanding Indonesia's trade flows. Evidence in column (3) also shows that Indonesia's trade is negatively associated with the border factor. In contrast, the colony factor promotes Indonesia's trade flows. However, the common official language factor is wiped out due to perfectly collinearity with the fixed effects factors.

A positive coefficient of the PTA variable indicates that Indonesia's trade flows gain a significant benefit from its participation in economic integration. Thus, more PTA means more trade for Indonesia. The result of the good governance factor suggests that Indonesia's trade may increase by an average of 3% when the index of good governance in aggregate improves by one point of the index on the world average. The finding in the column (3) also demonstrates that the use of the ICT for trade purposes remains low in Indonesia. A 10% reduction in investment in the ICT for trade decreases Indonesia's trade flows by around 7.4%.[108]

5.5 Robustness check

To further validate the results above, we run a series of robustness checks. Firstly, we check the consistency of the main panel data, as we are concerned with the loss of observation in the initial dataset, a treatment we had to take in order to conform with the availability of the trade impediment variables. Secondly, we run the alternative estimations whereby the dependent variable is unidirectional trade flow, as opposed to the sum of export and import as used in the estimations above.

Thirdly, we relax the assumption of strict exogeneity of the GDP variable in the main model, and instead assume that GDP is the function of trade, therefore allowing for simultaneity in the model (and, hence, increase realism). We would also observe the persistent trade effects in our model by including the lagged trade variable (assuming that trade in the previous period influences the value of current trade). This step is undertaken to address omitted variable bias due to the exclusion of lagged trade as a regressor in the right-hand-side or equation. We can call this a dynamic endogeneity problem. In this context, the dynamic gravity equation with the two-step system generalised method of moments (GMM)

[108]For benchmarking, Singapore invested 33.6% of the total exports for the ICT for trade purposes in 2016, while Indonesia only invested 3.3% of the total exports in the same year (the WDI database). This data shows that Singapore relies much on its ICT trade-related used to generate more gains from international trade in comparison with Indonesia.

by Blundell and Bond (1998) is used to tackle both the simultaneity problem and the dynamic endogeneity bias.

The last robustness check is to address possible price distortion that might be embedded owing to the use of trade values (in USD) as the dependent variable in the main model. Hence, we use trade volumes instead to check the consistency of the main estimation results.

5.5.1 Checking the consistency of the main panel data estimation

The main panel data in the study suffers from loss of observations (58%) because of missing data corresponding to those observations. Therefore, the robustness check in this case has a function of examining the consistency of the main panel data estimation in Table 5.8. For that, this study exercises three types of panel data to be estimated and check the consistency of the result. First, the main panel data remains employed. Second, since many variables of interest are missing, then the multiple imputation strategy is used in this context. In regard to the last, some alternative proxies of key variables are used to improve the number of samples to be observed in the analysis. These three types of data are regressed by utilizing the main gravity model as equation (5.3) with the feasible generalized least square (FGLS) estimator. Next, each of the time series data types is dropped from 10 years to 6 years to seek the relative consistency of the estimation. Therefore, each type of data has two estimation results.

The main panel data

Given the main panel model (see Appendix 5.4, Table 1 in column 1), the missing data account for around 21% to 25% of Indonesia's NTMs variables and around 11% to 17% for TFMs. The first estimation in the column (1) is the study's preferred model as this can explain a good deal about the key variables in the right-hand side of equation. However, this preferred model only takes 42% of the observed sample in the analysis, meaning there are 58% of observations lost due to missing data.

In order to check the consistency of the preferred model in column (1), the study deploys the second estimation in column (2) in Table 1 (Appendix 5.4). In the second estimation, the study cuts time series of the original panel data from 10 years to 6 years (2010-2015) while

the number of countries is the same. As a result, the number of missing data of Indonesia's NTMs significantly reduce from above 20% to below 10%. This also improves TFMs' observations in column (2). Therefore, the number of observations in the analysis increases from 42% to 63%. At the same time, the number of loss observations declines from 58% to 37%. The second estimations results are virtually the same as the first estimation results, suggesting a consistent result. This consistent evidence demonstrates that the study's key variables are weakly affected by the possibility of having sample selection bias due to sample size (missing data) reduced.

In the second estimation, the study finds that the level of significance of Indonesia's subsidy measures and customs has changed from insignificant to significant. However, the study could not explain further whether this is due to sample selection bias or because Indonesia's subsidy measures and customs' observations simply induce better estimations.

Multiple imputation panel data

Multiple imputation methods have a function to handle the missing data. This technique was first introduced by Rubin (1987). The basic idea of the multiple imputations is the distribution of observed data used to estimate multiple missing values. Markov Chain Monte Carlo is one of the widely used techniques that assumes a joint multivariate normal distribution for all variables in the model. Given the observed data, the Markov Chain Monte Carlo can fill the missing observations. The study uses this technique to improve the study's missing data.

Column (1) in Table 2 (Appendix 5.4) shows that the sample size observed in analysis greatly improves to be 3157 or 89%. Also, this multiple imputation method contributes to reducing the number of missing observations of the study's key variables such as Indonesia's NTMs and TFMs variables to be around 1%. Although this is like a full sample size, the estimation results are poor. Distance factor is positive and not significant, which is unexpected. The PTA variable is also insignificant. This does not fit with the previous findings that suggested that PTA factor should be positive and significant to enhance trade flows. In addition, the results based on the multiple imputation panel data could not explain much about the study's variables of interests such as Indonesia's NTMs and TFMs factors.

The second estimation in column 2 of Table 2 (Appendix 5.4) also shows the same results as the first estimation. The results of the second estimation are also poor, even though the missing observations of all variables in the model smaller than the first estimation as the time series reduce from to 10 years to 6 years. These findings suggest that some of the key gravity variables, NTMs variables, and TFMs variables are inconsistent.

Alternative proxies of the key variables of NTMs and TFMs

Now the study uses alternative proxies of NTMs and TFMs. For instance, the study includes Indonesia's anti-dumping and Indonesia's trade licencing to replace Indonesia's trade quotas and Indonesia's trade bans. The study also replaces some of the TFMs variables that have a similar proxy with the main TFMs variables. For instance, the study uses timeliness instead of Indonesia's time to trade, and shipment over shipping[109]. This replacement of some variables of interests has an aim to improve the number of observed samples in the analysis. As a result, in column (1) in Table 3 (Appendix 5.4), the number of observed samples in the analysis increases from 1482 to 1522.

However, the results show that exporter's GDP as one of the key gravity variables is not significant. The insignificance of exporters' GDP is also found when the study reduces the number of time series from 10 years to 6 years as in column (2) in Table 3 (Appendix 5.4). In addition, some of the control variables such as PTA and variables of interests such as Indonesia's anti-dumping, customs, Indonesia's cost of trade, and shipment demonstrate inconsistency when the number of time series reduces from 10 years to 6 years. This indicates that those variables might suffer from sample selection bias due to the missing data dropped. The evidence of insignificant exporters' GDP in columns (1) and (2), as well as their inconsistent results, suggests that the study is inadequate to interpret the estimation results in Table 3 (Appendix 5.4), neither column (1) nor column (2).

Based on the evidence above, the study argues that the main panel data is still relatively better in estimation results compared to multiple imputation panel data and alternative proxy panel data. The results demonstrate that the level of significance and the signs of the key variables of the main panel data estimation are relatively consistent, which is less

[109] Both timeliness and shipment variables dataset are collected from the Logistic Performance Index compiled by the World Bank.

affected by the possibility of sample selection bias due to the missing data being dropped. The multiple imputation panel data can well handle the missing data, approaching the size of a full sample. However, this yields poor results because the multiple imputation values do not reflect the true values of missing data. Alternative proxies panel data are significant to improve the number of observed samples in the analysis. However, the result is inconsistent for some control variables and the variables of interests. In addition, the exporters' GDP is not significant for both estimations, and not matched with the theoretical framework of the gravity equation. Thus, the interpretation of the results is less clear in this case.

5.5.2 Checking unidirectional trade flows

The second robustness check in this study has a function to check the consistency of the main model results if the study separates the estimation between Indonesia's imports and Indonesia's exports. The gravity model in equation (5.3) is used with the feasible generalized least square (FGLS) estimator. It can be seen from Table 4 (Appendix 5.4) that column (1) and column (2) show the estimation results of when Indonesia's imports and exports respectively are the dependent variable, while column (3) is the result of the main model.

Results in column (1) demonstrate that the primary gravity variables such as exporters' GDP, importers' GDP and distance matter for Indonesia's import, and all signs are as expected. This is consistent with the gravity model and previous empirical studies. However, this finding does not apply to Indonesia's export case in column (2) where the exporter's GDP is not significant even though others such as importers' GDP and distance are significant and have the expected signs. The insignificance of exporters' GDP runs counter to the gravity model.

Column (1), by contrast, shows relatively better estimation. This can also explain many of the trade impediments factors as the variables of interest. Furthermore, the study finds in column (1) that the significant effects of import tariffs and NTMs such as subsidy measures and local content measures can decrease Indonesia's import flows. Furthermore, Indonesia's imports are is positively associated with the improvement of TFMs such as seaport quality, time to import, and container transportation. On the other hand, the high cost of imports has a negative impact on Indonesia's imports. Customs and air

transportation have effects on Indonesia's imports. However, it is unclear how to interpret those factors since their signs are not as expected.

The robustness result in Table 4 (Appendix 5.4) demonstrates that the main model result is more consistent with the case of Indonesia's import than its export case. This evidence accentuates how trade impediment factors play central roles in affecting Indonesia's aggregate imports rather than its aggregate exports. Trade impediments in Indonesia's imports can reduce the exporter firms' profit that causes Indonesia's exports to be less competitive in international markets. The implication is that this can lead to a poor performance in Indonesia's merchandise trade growth.

5.5.3 Addressing simultaneity and omitted variable bias

Baier and Bergstrand (2007) argue that the possibility of having simultaneity bias in a gravity equation is small, since the gravity model accounts for trade in bilateral flows.[110] These flows, in terms of the ratio of export and import values to GDP of the two countries are tiny, relative to the world trade, and hence should not lead to serious simultaneity bias in the gravity context. However, this study relaxes this strict exogeneity assumption in the main model to provide yet another robustness check to the results above. For instance, we allow the dependent variable (Indonesia's trade flows) to be able to influence exporters' GDP and importers' GDP as regressors in the right-hand-side of the equation. In addition, there may still exist unobservable variables that simultaneously influence both Indonesia's trade flows variable as well as exporters' GDP and importers' GDP.

Reed (2015) suggests that the suspected endogenous variables on the right-hand-side of the equation should be replaced by their lagged values to avoid problems associated with simultaneity bias. In addition, we allow current trade to be influenced by the previous trade, thus lagged a trade variable is added as a regressor on the right-hand-side of the equation. This strategy is important if we are to avoid omitted variable bias due to exclusion of the lagged trade. At the same time, this also serves to assess the possibility of that whether Indonesia experiences persistent trade flows effects or not under the dynamic gravity

[110] Baier and Bergstrand (2007) also argue that it would be different if the model takes the form of multilateral trade flows where it can potentially lead to simultaneity bias between trade and GDP as discussed in Frankel and Romer (1999). See Frankel and Romer (1998) for detail.

model. Eichengreen and Irwin (1998) point out that exporting countries usually in practice take a vast amount of sunk costs into account when establishing their distribution networks and services on foreign markets. This leads to a persistent trade effect whereby current trade depends on previous trade transactions. In this case, we expect that the lagged values of trade and the two countries' GDP are relevant for current trade.

To accommodate the concerns above, we adjust the model setting from a static gravity equation to a dynamic one.[111] This is because the static estimators are incapable of handling the possible endogeneity bias mentioned above, as the lagged explanatory variables will correlate to the composite error terms. Numerous studies in the dynamic gravity model have suggested that the one-step or two-step difference GMM estimator introduced by Arellano and Bond (1991) or the one-step or the two-step system GMM estimator developed by Blundell and Bond (1998), is accordingly used in estimating the dynamic gravity model .[112] Blundell and Bond (1998) argue that the two-step difference GMM may suffer from the poor instruments of lagged levels of the dependent variable.[113] To fix this problem, extra moment conditions must be generated in order to produce more valid instrument variables that are strictly exogenous to the error terms and the unobserved time-invariant heterogeneity. They point out that this strategy is necessary in order to yield the most efficient estimates with respect to the dynamic panel model particularly with small (finite) *T* and large (infinity) *N*. Given our data structure, therefore, we follow the two-step system GMM following Blundell and Bond (1998).

The results in Table 5 (Appendix 5.4) show that our dynamic gravity model is correctly specified. In this case, our model passes the two necessary conditions suggested by Arellano and Bond (1991). Firstly, the *p*-value of Hansen *J*-test implies that the *null* hypothesis is accepted, resulting in 116 instruments as a group, that serve as valid instruments for the dynamic gravity model.[114] Secondly, there is no evidence of serial correlation in the second

[111] This study sets equation (5.3) to be the dynamic gravity model as follows: $l\,n\,X_{ijt} = \alpha_1 + \alpha_2 X_{ij,t-1} + \alpha_3 ln\,Y_{it} + \alpha_4 l\,n\,Y_{jt} + \alpha_5 ln\,D_{ij} + \beta_k ABB'_{ijt} + \gamma_k BBB'_{ijt} + \pi_k Control'_{1ijt} + \tau_k Control'_{2ij} + \mu_{ij}$, where μ_{ijt} is the composite error terms that contain the unobserved time-invariant heterogeneity and the random disturbance term. We estimate this dynamic gravity model using a two-step system GMM.

[112] See Egger (2001), Harris and Matyas (2001), Zarzoso et al. (2009) and Olivero and Yotov (2012) for details.

[113] See Blundell and Bond (1998) for review.

[114] The Hansen *J*-test (1982) is performed in the GMM model as a standard diagnostic in any overidentified instrumental variables estimation. If the null hypothesis is accepted, the instrumental variables are considered valid for the dynamic GMM model, as suggested by Arellano and Bond (1991) and Blundell and Bond (1998).

order of the first-differenced errors, reflecting the consistency of our dynamic gravity model.

The lagged value of trade shows a positive and highly significant effect at 1 %. This finding suggests the presence of persistent trade flow effects in Indonesia. On the other hand, the lagged exporters' GDP is negative, whereas the lagged importers' GDP variable and distance factor lose their significance. We suspect that the presence of persistent trade flows is so strong that this alters the sign of the key gravity variables and their level of significance. Eichengreen and Irwin (1998) argue that persistent trade effect can generate a level of trade greater than would be predicted by the economic size and distance of the destination market.

The results of some of the trade impediment variables are consistent with those from the main model, such as import tariff, Indonesia's time to trade and container transportation, but others are not, such as local content measures and shipping. Furthermore, the sign of seaport quality changes to negative, and so does Indonesia's cost to trade. We suspect that these changes are the result of the conversion to the dynamic setting. But we could not explain further why, except to speculate that indeed the simultaneity bias and omitted variable bias might have been negligible, as suggested by Baier and Bergstrand (2007), and forcing the model to be dynamic leads to different results, in that the effects of control variables are confounded by a persistent trade effect.

5.5.4 Addressing price distortion in the use of trade values as the dependent variable

We assume that the value of trade values can be biased owing to price fluctuation (price distortion). Therefore, we replace trade values with trade volumes as our dependent variable in order to check the consistency of the main results. Indonesia's aggregate trade volumes data (in Kilograms) are collected from the WITS database. The main drawback of using Indonesia's aggregate trade volumes is the availability of data is limited from 2010 to 2016, as compared to trade values data that span from 2007 to 2016. As a result, these data substantially suffer from missing observations. This problem amplifies as several small countries that Indonesia trade with, also have missing data issue.

The results of the estimations with this trade volume are poor. For example, exporter's GDP and importers' GDP show negative signs (Table 6 in Appendix 5.4). Furthermore, Indonesia's subsidy measures coefficient turns positive (while insignificant in the main result) and so does the local content measures coefficient (while negative in the main result). These results suggest that using trade volumes carry a significant problem of missing observation that in turns heavily distorts the estimation.

5.6 Conclusion and implications

This study has shown that that the use of the FGLS estimator fits with this study's gravity model with panel data. The FGLS estimator properly addresses the problems of heteroskedasticity and autocorrelation. When it includes FE, it can also reduce the issue of multilateral resistance and the endogeneity biases, producing unbiased results and the most efficient estimator (or BLUE). More importantly, the FGLS also can explain more fully the effect of the key gravity variables and this study's variables of interest (in this case the trade impediment factors) on Indonesia's trade flows than other specifications as shown in Table 5.8.

When the study exercises three types of data structures to check the consistency of the main model estimation, the robustness check results show that the use of the main panel data is consistent compared to the multiple imputation panel data and the alternative proxies panel data. The changes in the dependent variable from the sum of Indonesia's imports and exports to unidirectional trade (import or export flows) in the second robustness check gives evidence that the impact of trade impediment factors on Indonesia's aggregate import flows is almost similar to the main model results. This indicates that Indonesia's aggregate import flow is more sensitive to trade impediment factors than its exports. Our third robustness check shows that a persistent trade effect is present in the case of Indonesia.

Reductions in import tariff, improvements in seaport, and reductions in time to trade increase Indonesia's trade flows.[115] BBBs to trade such as local content requirements, poor

[115] The criteria to choose the ABB to trade factors and the BBBs to trade factors in this study is based on the expected sign of the coefficient, the level of significance, and the magnitude of the coefficient.

container transportation (land transportation) and maritime transportation (shipping) also play important roles in increasing Indonesia's trade flows. The result shows that the effect of local content measures is greater than that of import tariffs, while a number of previous studies also confirmed this finding as discussed in previous sections. It can be inferred that the main problem in Indonesia's aggregate trade flows increasingly emerges from the behind-the-border NTMs. On the other hand, in terms of trade facilitation, the at-the-border measures are more important than the behind-the-border measures.

In lieu with the hypotheses therefore we confirm that the BBBs NTMs are more harmful to Indonesia's trade flows than tariff measures and the ABBs NTMs. Reform of the ABBs trade facilitation gives a more positive effect than reform of the BBBs trade facilitation.

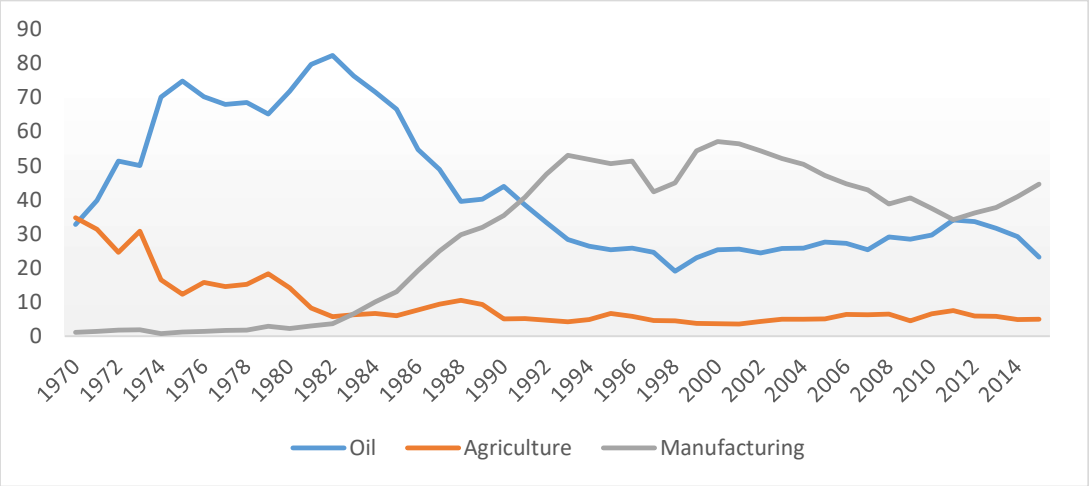
The implications of the research findings are that while tariffs have gone down, impediments to trade come mostly from NTMs and the lack of trade facilitations. Given resource constraints (budgets, human resources, and technology), policy should focus on reducing the NTMs behind-the-border (such as local content requirements), while improving trade facilitation at-the-border (such as better customs services).

One caveat to note is that the use of Indonesia's aggregate trade data in our study could not explain fully the effect of trade impediments on sectoral level and products level. Therefore, it is suggested to use Indonesia's disaggregate trade data in order to investigate more trade impediment effects on its sectoral level and products level.

Chapter 6: Export restrictions in Indonesia's manufacturing exports

6.1 Introduction

Indonesia's manufacturing sectors have rapidly developed since the oil boom era ended in the mid-1980s. Major reforms were undertaken to improve the role of Indonesia's manufacturing sectors in the mid-1980s. The increasing trend of Indonesia's manufacturing exports mainly started in 1982 where its exports performance surpassed that of the agriculture sector in 1984 and the oil sector in 1991 (Figure 6.1).



Source: World Development Indicator database.

Figure 6.1. The share of oil, agriculture, and manufacturing exports to total Indonesia's merchandise exports (in percentage) during 1970-2015

From the early 1990s to the mid-1990s, Indonesia significantly opened its economy to the regional and the global economies. The open policy initially began with the implementation of unilateral liberalization mainly in the mid-1980s after the oil boom ended. For further trade expansion and to obtain more benefits from economic integration, Indonesia was actively involved in Initiating regional economic integration in 1992 through AFTA and actively participated in APEC in 1994 (Pangestu et al., 2015). Indonesia's economy became more binding with the global economy when Indonesia established its membership of the WTO in 1995. The large-scale reforms in trade policy and engagement with economic integration helped Indonesia to bring down its tariffs (import tariffs) mostly for all products

from 14% and 15% in 1995 to around 6% and 8% in 2016 both for the effectively applied tariffs (on average) and the most-favoured-nation (MFN) tariffs (on average) respectively.[116] Currently, Indonesia's preferential tariffs are almost zero for all tariff lines. This is mostly due to the common effective preferential tariff (CEPT) of the ASEAN Free Trade Area (AFTA).

The discussion above suggests that the contribution of Indonesia's manufacturing exports to the nation's economy played an important role in expanding Indonesia's merchandise exports during the mid-1980s and the mid-1990s. A rapid increase in manufacturing exports boosted Indonesia's economic growth to around 8 % over the same period (Kuncoro, 2018).

However, after the Asian financial crisis in 1997/1998, the performance of Indonesia's manufacturing exports started to decline. Table 6.1 shows that the the share of Indonesia's manufacturing exports to total merchandise exports has been lower compared to those of ASEAN neighbours in the last two decades. For example, during the Susilo Bambang Yudhoyono government (2006-2010 and 2011-2015), Indonesia's manufacturing exports were 41% and 39% on average, respectively. This percentage is the lowest among selected ASEAN members such as Malaysia, Philippines, Singapore and Thailand over the same period. It is even lower than Vietnam, a late-arriving member of ASEAN.

Table 6.1 The share of manufacturing exports to total merchandise exports for selected ASEAN countries, 1995-2018

Country	Manufactures exports (% of merchandise exports) on average			
	1995-2000	2001-2005	2006-2010	2011-2015
Indonesia	50	52	41	39
Malaysia	78	77	67	63
Philippines	81	90	80	77
Singapore	85	71	68	71
Thailand	73	76	75	75
Vietnam	44	50	57	71

Source: Author's calculation based on the World Development Indicator database.

We argue that one of the main factors that caused Indonesia's manufacturing exports to significantly decrease after the AFC is the proliferation of non-tariff measures (NTMs), particularly export restrictions. In response to the AFC, the government undertook major liberalisation. But it was short-lived, as protectionism started to make a comeback in early

[116] Author calculation based on the WITS database. For detail, it can be seen in Figure 5.2 in Chapter 5.

2000s. The use of NTMs continued as the global financial crisis (GFC) hit in 2008 and the second commodity boom ended in 2012 (Basri and Patunru, 2012; Pengestu, et al., 2015; Patunru and Rahardja, 2015; Kuncoro, 2018). In most cases, the main rationale from policy makers is to prioritise domestic need for raw materials and intermediate goods. By doing this the government encourages exports of manufacturing goods with higher domestic value added only. As other studies argue, however, such policy might backfire as it runs counter to the objectives of increasing employment and export earnings (see, for example, Athukorala and Patunru (2019)).

Our objective therefore is to show how export measures that are applied in Indonesia's manufacturing sector hamper its export performance. In this study we focus on different types of export restrictions, namely export prohibitions, export licensing requirements, export taxes, and export quotas. These measures are selected due to data availability and also because these are the most common measures taken by the government. We have a secondary objective related to the way we estimate our model. That is, we are interested to compare different estimators in relation to addressing the problem of zero-value of trade flows—a common problem in gravity-based trade estimation.

Most previous studies on trade protection using the GTA database only investigated the effect of trade protection in terms of import measures (NTMs) on trade flows (see, for example, Kinzius, Sandkamp, and Yalcin 2019), but to the best of our knowledge, none discussed the effect of trade protection in terms of export measures (NTMs) on trade flows, especially for Indonesia's case. Thus, our objective is to examine the extent to which export measures (NTMs) adversely affect Indonesia's trade flows, especially Indonesia's exports in manufacturing sectors.

This study shows that export measures in the manufacturing sector have a negative effect on Indonesia's manufacturing exports. That is, imposing export restriction in the objective to encourage exports of higher value-added goods negates the objective of increasing the total export earnings. The policy implication of this is that trade policy should focus on reducing export NTMs.

The rest of this chapter is organized as follows. Section 6.2 discusses Indonesia's NTMs in manufacturing exports; section 6.3 sets out the model specification and the estimation method; section 6.4 explains the data used in the study; section 6.5 discusses the empirical results; section 6.6 lays out a series of robustness check; and section 6.7 concludes and provides implications for the research findings.

6.2 Indonesia's NTMs in manufacturing exports

Table 6.2 provides the statistical description of the number of countries, export products and export values in Indonesia's manufacturing sectors that were subject to these export measures (in percentage). The main source of information regarding these measures is the Global Trade Alert (GTA) database. The database defines 'red measures' as the NTMs that almost certainly discriminate against foreign commercial interests, 'amber measures' as the NTMs are likely involved in discrimination against foreign commercial interests, and 'green measures' as the NTMs that liberalise on a non-discriminatory (that is most-favoured-nation) basis; or improves the transparency of a relevant policy (Evenett and Fritz, 2018). In this study, we only use the 'red measures' as we focus on the most harmful export measures.

Table 6.2 shows a significant presence of export NTMs in Indonesia's manufacturing sectors during 2013-2014. This is a period where export taxes were introduced. The measure was imposed mostly in the metals sector. Export taxes were withdrawn in 2015 and replaced by export quotas. Table 6.2 confirms that Indonesia has become more protective in trade policies as the commodity boom ended in 2012.

Tabel 6.2 Number of countries, export products (HS6), and export values affected by Indonesia's exports 'red' measures in manufacturing sectors, 2012-2015

Year	Export Measures	Number of countries affected	Number of products affected	Number of export values affected
2012	Export prohibitions, export licensing requirements, export taxes	17%	13%	5%
2013	Export taxes	100%	100%	100%
2014	Export taxes	100%	100%	100%
2015	Export quotas	100%	100%	100%

Source: Authors' calculation based on the Global Trade Alert database.

6.3 Model specification and estimation method

We use the basic gravity equation (Silva and Tenreyro, 2006) as a baseline to construct the main model specification. The basic gravity equation is expressed as follows:

$$X_{ij} = \alpha_0 Y_i^{\alpha_1} Y_j^{\alpha_2} D_{ij}^{\alpha_3} \varepsilon_{ij} \quad (6.1)$$

where X_{ij} is trade flow from country *i* to country *j*. X_{ij} is proportional to the product of the two countries' GDPs (Y_i, Y_j) and inversely proportional to their distance (D_{ij}). The term of ε_{ij} denotes estimation error. Equation (6.1) is commonly expressed in log-linear form and the estimation of the parameters of interest is done by the ordinary least squares (OLS) as follows:

$$lnX_{ij} = ln\alpha_0 + \alpha_1 lnY_i + \alpha_2 lnY_j + \alpha_3 lnD_{ij} + ln\varepsilon_{ij} \quad (6.2)$$

However, Silva and Tenreyro (2006) demonstrate that if the variance of error terms (ε_{ij}) in equation (6.2) depends on Y_i, Y_j, or D_{ij}, then the expected value of $ln\ \varepsilon_{ij}$ also depends on the Y_i, Y_j, or D_{ij}, leading to inconsistent estimates of the elasticities of interest. In other words, the error factor in the log-linear specification as equation (6.2) is heteroskedastic. This violates the assumption of $ln\ \varepsilon_{ij}$ is statistically independent of Y_i, Y_j, or D_{ij}.

As discussed in Chapter 4, the basic gravity equation only assumes that the value of bilateral trade flows is strictly positive (Silva and Tenreyro, 2006; Head and Mayer, 2014; Martin and Pham, 2015). The problem arises when the dataset of bilateral trade flows shows a great portion of zero trade flows. This occurs mostly due to the use of disaggregated trade data or bilateral trade data at the products level (Head and Mayer, 2014). The presence of zero trade flows, on the other hand, might provide important information. Therefore, estimating trade flows could be problematic when taking logs to remove zero observations, leading to bias (Silva and Tenreyro, 2006; Head and Mayer, 2014; Martin and Pham, 2015).

Zero trade flows are frequent in disaggregated trade datasets for several reasons. First, some pairs of countries in the sample never do trade in certain commodities in a given of time (Silva and Tenreyro, 2006; Helpman et al., 2008). Second, some missing trade flows may be wrongly recorded as zero (Silva and Tenreyro, 2006; Head and Mayer, 2014). Third, the value of trade is registered as zero if the bilateral trade values never reach a particular threshold, for example, USD 500 (Silva and Tenreyro, 2006; Baltagi et al., 2014).

A vast number of studies have developed strategies to deal with the frequent zero trade flows in the gravity model.[117] Eichengreen and Irwin (1995) develop the $ln(1 + X_{ij})$ to be the dependent variable in the gravity model in order to keep zero observations. However, Silva and Tenreyro (2006) argue that the $ln(1 + X_{ij})$ strategy could lead to bias. Martin and Pham (2015) confirm Silva and Tenreryro's argument that this practice of $ln(1 + X_{ij})$ might yield bias in the estimation if the procedure of estimation in the gravity model is not changed.

Eaton and Tamura (1994) use $ln(a + X_{ij})$ as the dependent variable in the gravity model and this is known as the Eaton-Tamura (ET) Tobit estimator. In the ET Tobit estimator, the variable of a is a parameter to be estimated. However, the coefficient of estimate a (or $\hat{a}$) in the ET Tobit method could be problematic due to a lack of interpretation and it is difficult to implement (Head and Mayer, 2014). Using Monte Carlo simulation, previous studies demonstrated that the ET Tobit results performed poorly in the presence of zero trade flows (Silva and Tenreyro, 2006). Head and Mayer (2014) apply the same technique as Silva and Tenreyro (2006) and find that the ET Tobit is biased under two assumptions, that is the log-normal errors and a constant variance-to-mean ratio (or in the presence of the heteroskedasticity assumption).

Eaton and Khartoum (2001) introduce the Eaton-Khartoum (EK) Tobit estimator to fix the problem of the ET Tobit Estimator. In the EK Tobit estimator, a minimum level of trade values now applies to the dependent variable of (X_{ij}). It is set by the value of a. When trade values (X_{ij}) fall below the value of a, X_{ij} will therefore be observed as zero ($X_{ij} = 0$). But otherwise, when $X_{ij} > a$, X_{ij} will therefore be observed as $X_{ij} = X_{ij}^{*}$ or $\ln\,(X_{ij}^{min})$ for zeros. However, Head and Mayer (2014) found that the EK-Tobit is consistent in the presence of zero trade flows under the assumption of log-normality but inconsistent under the assumption of a constant variance-to-mean ratio.

Helpman et al. (2008) develop a Heckman-based approach to account for zero trade flows. In this method, two-step estimations are used. First, to estimate the probability of country *i* and contry *j* having positive trade flows, the Probit estimator is used. Second, selection

[117] We have discussed this in Chapter 4. We note it again here for relevance.

correction resulting from the first-step estimation is included in the gravity equation to estimate the positive trade flow obersevations.[118] However, Head and Mayer (2014) argue that Helpman et al.'s (2008) model is designed to estimate the intensive margin effects rather than to deal with zero trade flows.

The Pseudo-Poisson Maximum Likelihood (PPML) estimator advanced by Silva and Tenreyro (2006) is another method to estimate a frequent of zero trade flows. In the PPML, zero trade flows as the dependent variable in the gravity model are in levels rather than in logs to account for information provided by zero trade flows. Silva and Tenreyro (2006) also argue that the PPML method produces consistent estimates in the presence of heteroskedasticity.

Some studies have confirmed that the PPML method is the most adequate estimator for dealing with frequent zero trade flows and for reducing bias from the heteroskedasticity problem. For instance, based on Monte Carlo evidence, Silva and Tenreyro (2006) suggest that when the dependent variable applies in levels ($X_{ij} \geq 0$), the results show better than those of the standard Non-Linier Square (NLS), the Gamma Pseudo-Maximum-Likelihood (GPML), the truncated OLS, the ET-Tobit estimator ($ln(a + X_{ij})$), and the OLS with $ln(1 + X_{ij})$. Silva and Tenreyro (2006) also demonstrate that the performance of the PPML estimator is relatively robust under the different patterns of heteroskedasticity.[119] The biased of the PPML estimator is relatively small. This method is consistent as it can also deal with the measurement errors in the dependent variable due to rounding errors. In addition, Silva and Tenreyro (2011) show that the PPML results are relatively consistent when the sample size increases from 1,000 to 10,000 observations in response to heteroskedasticity. They also found that the PPML results are still consistent when the number of zero trade flows is high, between 62% and 83% of total samples. The results of other estimators, by contrast, show inconsistency as the number of observations increases and the number of zero trade flows is high.

Martines-Zarzoso's (2013) Monte Carlo simulation results confirmed Silva and Tenreyro's (2006, 2011) arguments that the PPML results are less affected by heteroskedasticity using the same cases of heteroskedasticity as Silva and Tenreyro applied in their study. In the

[118] See Helpman et al. (2008) for detail.
[119] See Chapter 4 for reviews.

presence of zero trade flows even in large percentages (40% and 60%), Martines-Zarzoso found that the PPML shows consistent results. Also, the PPML estimation results remain consistent when this method applies to a cross-sectional data and a panel data structure.

Head and Mayer (2014) also use the Monte Carlo study to investigate the consistency of the PPML estimator in the gravity equation. The Monte Carlo simulation applies to six estimation methods: the LSDV on $ln(X_{ij})$, the ET-Tobit estimator that $ln(a + X_{ij})$, the EK-Tobit estimator $\ln(X_{ij}^{min})$ for 0s, the PPML model, the GPML model, and the Multinomial-PML. Evidence has shown that the PPML (or the Multinomial-PML) results are consistent in the presence of heteroskedasticity (or under a constant variance-to-mean ratio assumption), while others are biased. They also confirm Silva and Tenreyro's (2011) finding that the coefficient of estimates approaches to the true value when sample size increases.

A number of recent studies such as those conducted by Anderson et al. (2015) and Kinzius et al. (2019) also used the PPML estimator in their main gravity estimation method in order to estimate trade flows with frequent zero values and with heteroskedasticity in panel data. This indicates that the PPML method has become a new workhorse in the gravity literature as predicted by Silva and Tenreyro (2006).

This study therefore prefers the PPML method to estimate the main gravity specification. Equation (6.2) is modified to accommodate the PPML formation as follows:

$$X_{ij} = \exp(ln\alpha_0 + \alpha_1 lnY_i + \alpha_2 lnY_j + \alpha_3 lnD_{ij}) \quad (6.3)$$

Silva and Tenreyro (2006) argue that the transformation of this non-stochastic form into a stochastic form is needed in order to obtain a constant elasticity model. To devise why this transformation is important, we need to simplify equation (6.3) and then to be specified as follows:

$$X_{ij} = exp(\alpha_0 + \alpha_k W'_{ij}) + \varepsilon_{ij} \quad (6.4)$$

where X_{ij} in levels ($X_{ij} \geq 0$); W'_{ij} is a vector of exporters' GDP (Y_i), importers' GDP (Y_j), and distance given the two countries (D_{ij}); and ε_{ij} is the error term. The PPML model allows the dependent variable (consider *x*) connecting with independent variables (consider *y*) under a constant elasticity model framework resulting in $x_i = exp(y_i\beta)$. The functional form of $x_i = exp(y_i\beta)$ reflects that the conditional expectation of x_i given y, or can be

represented as $E[x_i|y]$. Following this strategy, this study assumes that equation (6.4) has a constant elasticity model if $E(X_{ij}|W'_{ij})$. Silva and Tenreyro (2006) also suggest that the importance of the conditional variance of the PPML model to possess a proportional relationship to its conditional means. When this assumption applies to equation (6.4), it would yield a consistent estimate once $V(X_{ij}|W'_{ij}) \propto E(X_{ij}|W'_{ij}) = exp(\alpha_k W'_{ij})$.

The assumptions explained above are important for estimating a vector of W'_{ij} in equation (6.4) by solving the first-order conditions as suggested by Silva and Tenreyro (2006) as follows: $\sum_{i=1}^{n}\sum_{j=1}^{n}[X_{ij} - exp(\alpha_1 W'_{ij})]W'_{ij} = 0$, corresponding in instances where each observation has the same information on the parameter of interests. Although $E(X_{ij}|W'_{ij})$ is found not proportional to $V(X_{ij}|W'_{ij})$, the estimation results of equation (6.4) remain robust as heteroskedasticity increases with its conditional means. The PPML model also assumes that count data[120] that are usually used in this model are not required to be Poisson at all due to the asssumption of a constant elasticty model as discussed above.

Martines-Zarzoso (2013) and Baltagi et al. (2014) point out that the PPML model can also be applied to a panel data structure, so that equation (6.4) with panel data can be expressed as follows:

$$X_{ijt} = exp(\alpha_0 + \alpha_k W'_{ijt} + \delta'_{ij}) + \varepsilon_{ijt} \quad (6.5)$$

where X_{ijt} is nominal trade values in levels ($X_{ijkt} \geq 0$) from country *i* to country *j* at time *t*. W'_{ijt} denotes the vector of explanatory variables at time *t* such as exporting GDP (Y_{it}), importing GDP (Y_{jt}), and bilateral distance (D_{ij}).

However, equation (6.5) is still a basic gravity specification with panel data in the form of the PPML. Therefore, this study innovates equation (6.5), particularly the vector of W'_{ijt} by adding time-varying export measures (NTMs). These time-varying export measures become our key variables. In the vector of dummy variables (δ'_{ij}), this study includes time-variant gravity-type variables (common land border and colony ties) and dummies FTA (ASEAN and APEC).

[120] The observations can take only non-negative integer values such as 0, 1, 2, 3, …,n.

We assume that equation (6.5) will possess a strong robustness property once $E(X_{ijkt}|W'_{ijt}, \delta_{ij}) = exp(\delta_{ij})e^{\alpha_1 W'_{ijt}}$ following Baltagi et al. (2014). In that sense, equation (6.5) is consistent under the conditional means assumption. Lastly, we add time-varying control variables namely the Logistic Performance Index (LPI), and fixed effect factors such as sector two-digit effects and time fixed effects into equation (6.5). We then augment equation (6.5) to be our main model specification and is expressed as follows:

$$X_{ijkt} = exp[\alpha_1 lnGDP_{it} + \alpha_2 lnGDP_{jt} + \alpha_3 lnD_{ij} + \alpha_4 ex\_pr_{ijkt} + \alpha_5 ex\_tax_{ijkt} + \alpha_6 ex\_lc\_rq_{ijkt} + \alpha_7 ex\_quo_{ijkt} + \delta_1 border_{ij} + \delta_2 colony_{ij} + \delta_3 ASEAN_{ij} + \delta_4 APEC_{ij} + \gamma_1 LPI_{it} + \gamma_2 LPI_{jt} + \vartheta_k + \theta_t]\varepsilon_{ijkt} \quad (6.6)$$

where X_{ijkt} is Indonesia's exports *i* to country *j* in USD at product level *k* and at time *t*. In this study, the existence of zero trade flows in manufacturing exports in our dependent variable dataset is assumed due to the absence of trade in manufacturing exports from Indonesia to its trade partners. GDP_{it} and GDP_{jt} denote Indonesia's GDP and importers' GDP in USD at time *t* in log-form. D_{ij} is the log of the distance between the two countries' capital city in kilometers.

ex_pr_{ijkt} is Indonesia's export prohibitions applied to Indonesia's manufacturing products *k*, a destination to specific importing country *j* at time *t*. $ex\_lc\_rq_{ijkt}$ is Indonesia's export licencing requirements applied to Indonesia's manufacturing products *k*, a destination to specific importing country *j* at time *t*. ex_tax_{ijkt} is Indonesia's export taxes applied to Indonesia's manufacturing products *k*, a destination to specific importing country *j* at time *t*. ex_quo_{ijkt} is Indonesia's export quotas applied to Indonesia's manufacturing products *k*, a destination to specific importing country *j* at time *t*.

The value of ex_pr_{ijkt}, $ex\_lc\_rq_{ijkt}$, ex_tax_{ijkt}, and ex_quo_{ijkt} would be one if a product *k* is affected by Indonesia's export prohibitions, Indonesia's export licencing requirements, Indonesia's export taxes or Indonesia's export quotas, and zero otherwise. As noted, these export measures become our key variables. The coefficient of estimates of these key variables would be important to reveal the level of Indonesia's trade protection on its manufacturing exports. Our strategy to estimate these particular types of export measures as mentioned above basically follows Cadot and Gourdon (2016) and Kinzius et al. (2019). In

that manner, we can capture different trade effects come up from these various types of export measures.

$border_{ij}$ and $colony_{ij}$ are common land border and common colony between the two countries respectively. The value of either variable is one if the two countries share the same border or the same colony ties, respectively, and zero otherwise. $ASEAN_{ij}$ and $APEC_{ij}$ are the ASEAN dummy and the APEC dummy, respectively. If the two countries are members of ASEAN or of APEC, the value of the dummy would be one, and zero otherwise. The FTA variables of $ASEAN_{ij}$ and $APEC_{ij}$ have a function to capture regional integration effects on Indonesia's manufacturing exports. We also control for the two countries' trade facilitation factors, particularly the logistics infrastructure, at time *t* by using the Logistic Performance Index (LPI_{it} and LPI_{jt}).

We cluster our variance using the HS-6 products *k*. Time-invariant variables in our model may correlate with the error terms. This might pose an endogeneity problem. Therefore, sector two-digit fixed effects (ϑ_k) are included in the model to reduce the endogeneity bias, while time fixed effects (θ_t) are necessary to capture business cycle effects. ε_{ijkt} denotes the error terms.

This study expects that the sign of the key variables such as export prohibitions, export quotas, export licencing requirements and export taxes to be negative. Gravity variables such as GDP_{it} and GDP_{jt} should have a positive sign, while distance is expected to be negative. We also expect that Indonesia's integration into ASEAN and APEC would help to boost Indonesia's manufacturing exports. Thus, both variables should have positive signs. Positive signs are also expected from explanatory variables such as a common border, common colony tie, and LPI for both countries.

6.4 Data explanation

Our dataset covers 103 countries during 2012-2015 with an unbalanced panel structure.[121] As noted in the previous chapter (see Table 5.1), the number of Indonesia's NTMs and the number of trade partners countries affected by Indonesia's NTMs are higher particularly

[121] See Appendix 6.1 for the list of countries

during 2012-2015. Thus, this study opts for NTMs samples over this period. Based on the GTA database and as noted in Section 6.2, this study selects the four types of Indonesia's export measures that have been majorly applied by the Indonesian government to its export products in manufacturing sectors. This is also subject to data availability. These export measures are export prohibitions, export taxes, export licencing requirements and export quotas. Due to data availability, we only use Indonesia's export measures applied to its export products in manufacturing sectors. We could not find detailed information relating to export measures imposed by importing countries against Indonesia's export goods.

Indonesia's merchandise export data in the products level used as the dependent variable originates from the World Integrated Trade Solution (WITS) compiled by the World Bank. As noted, this study focuses on Indonesia's export products in the manufacturing sector. For that, Harmonized Commodity Description and Coding Systems (HS) 2012 classification by the UN Comtrade is applied to define our manufacturing sector. Around 60% of our data contain zero trade flows.

In order to take the appropriate HS codes, this study follows Ing and Cadot (2017) and Niu et al. (2018). We divide the manufacturing sector into 12 groups according to the HS-2 code (see Table 6.3). We further disaggregate these HS-2 codes into their HS-6 codes. We identify 348 from 404 of the total manufacturing products in our data, or 86% of Indonesia's export products at HS-6 digit in manufacturing exports that have been subjected to Indonesia's export measures during 2012-2015.

The GTA database is an important source for Indonesia's export NTMs dataset from 2012 to 2015. To classify the types of Indonesia's export NTMs, we use Chapter P based on the UNCTAD International Classification of Non-Tariff Measures, the 2012 version (the GTA also follows this UNCTAD classification). Chapter P describes the different types of non-tariff export-related measures such as export prohibitions (P11), export quotas (P12), licencing or permit requirements to export (P13), and export taxes and charges (P5). As noted, we emphasize to applying the red measures category only. The definition of red measures and other measures according to the GTA has been explained in Section 6.2.

Table 6.3 Manufacturing sectors based on the HS-2 codes, 2012-2017

No	Manufacturing sectors	HS-2 code	Product sectors
1	Chemical	28-34	Inorganic chemical (28); organic chemical (29); pharmaceutical products (30); fertilisers (31); tanning or dyeing extracts (32); essential oils and resinoids, parfumery cosmetics (33); soap (34)
2	Plastics and rubber	39-40	Plastic and articles (39); rubber and articles (40)
3	Leather	42	Articles of leather (42)
4	Wood	44	Wood and articles of wood (44)
5	Paper	47-48	Pulp of wood (47); paper and paperboard (48)
6	Textiles	52; 54-55; 60-63	Cotton (52); man-made textiles (54); man-made fibres (55); Knitted or crocheted fabrics (60); apparel and clothing accessories, knitted (61); apparel and clothing accessories, not knitted (62); Other made-up textile articles; sets; worn clothing and worn textile articles (63)
7	Footwear	64	Footwear and articles (64)
8	Stone, cement, and glass	69-70	Ceramic products (69); glass and glassware (70)
9	Precious stones and metals	71	Precious stones and metals, pearl, coin (71)
10	Base metals	72-76; 80	Iron and steel (72); iron and steel articles (73); copper and articles (74); nickel and articles (75); aluminium and articles (76); tin and articles (80)
11	Machinery and electrical equipment	84-85	Machinery (84); electrical machinery (85)
12	Motor vehicles and transport equipment	87	Vehicles (87)

Source: World Customs Organization

The NTMs dataset sourced from the GTA offers several advantages. For example, it provides a panel data structure with detail export measures types that fits with our estimation strategy. The UNCTAD's Trade Analysis Information System (TRAINS) and the World Integrated Trade Solution (WITS) also provide NTMs information but they are in a cross-sectional setting. From this perspective, the GTA Database is the best for our study purpose. The Logistic Performance Index (LPI) is included to represent the quality of infrastructure. The scale of LPI is 1 to 5, with 5 is the best the quality of logistic infrastructure, and 1 the worst. In this study, we assume that the LPI variable also reflects the quality of trade facilitation in both countries. The variable GDP in USD is taken from the World Development Indicator (WDI). The data of distance, common land border and colony are collected from the CEPII database. The ASEAN and the APEC provide information about member countries of each FTA, including Indonesia. Table 6.4 displays a summary of the statistic of the observed variables of our PPML model.

Table 6.4 Summary statistic of the variables observed

Variable	Units	Obs	Mean	Std. Dev.	Min	Max
Indonesia's export values	Billion USD	7992	0,086	0,007	0	0,172
Indonesia's GDP	Billion USD	7992	890	4.60	861	9,178
Importers' GDP	Billion USD	7992	9,052	3,500	4.000	18,100
Distance	Kilo meters	7992	8,907	4,433	1,012	19,370
Common land border	Dummy [0,1]	7992	0.035	0.184	0	1
Colony tie	Dummy [0,1]	7992	0.026	0.159	0	1
Indonesia's export prohibitions	Dummy [0,1]	7992	0.001	0.035	0	1
Indonesia's export quotas	Dummy [0,1]	7992	0.005	0.073	0	1
Indonesia's licensing requirements to export	Dummy [0,1]	7992	0.005	0.068	0	1
Indonesia's export taxes	Dummy [0,1]	7992	0.010	0.101	0	1
ASEAN member	Dummy [0,1]	7992	0.139	0.346	0	1
APEC member	Dummy [0,1]	7938	0.399	0.490	0	1
Indonesia's LPI	Index [1,5]	7992	2.95	0.01	2.94	3.09
Importers' LPI	Index [1,5]	7853	3.56	0.41	2.04	4.13

6.5 Empirical results

We estimate the main model, along with two alternatives for comparison. Table 6.5 displays the results. In the standard OLS (column 1), observations with zero trade flows are dropped. These observations are back in the second OLS (column 2) but with $ln(1 + X_{ij})$ transformation on the zero trade flows, following Eichengreen and Irwin (1995). Column (3) is our main estimation results in which the model in column (3) has been estimated by using the PPML technique. The estimation results of the standard OLS (column 1) are poor. For example, the key variables of Indonesia's export NTMs such as export prohibitions and export taxes are positive, against the expectation. We suspect that this is due to sample selection bias that comes mainly from dropping the zero-value observations. This confirms Silva and Trenreyro's (2006) and Head and Mayer's (2014) finding that a large number of undefined zero logarithms induce bias in the OLS estimation.

When the zero trade flows are added back but with additional value of 1 on the observation, the estimation also yields biased coefficients (column 2). This confirms Martin and Pham's (2015) argument that when $ln(1 + X_{ij})$ transformation is applied to the gravity model in order to account for zero trade flows, it yields biased results.

Table 6.5 The impact of Indonesia's export NTMs on its manufacturing export performance

	(1)	(2)	(3)
Estimation method	OLS	OLS	PPML
Dependent variable	ln Indonesia's exports	ln (1+Indonesia's exports)	Indonesia's exports (levels)
Indonesia's export NTMs			
Indonesia's export prohibitions	4.121***	-0.480	-0.008
	(1.373)	(1.207)	(0.674)
Indonesia's export licensing requirements	1.687	-1.059	-0.240***
	(1.308)	(0.765)	(0.020)
Indonesia's export taxes	3.216***	-6.340***	-1.535***
	(0.840)	(1.453)	(0.340)
Indonesia's export quotas	1.113	-56.972***	-0.401**
	(1.543)	(9.605)	(0.167)
Gravity and control variables			
Log of Indonesia's GDP	-	-1,471.543***	0.171***
		(239.278)	(0.015)
Log of importers' GDP	-0.240	0.479**	0.160***
	(0.388)	(0.194)	(0.012)
Log of distance	-1.060	-1.991***	-0.302***
	(0.940)	(0.701)	(0.030)
Colony ties	2.902***	2.536***	0.216***
	(0.893)	(0.409)	(0.075)
Common land border	-4.450***	-3.234***	-0.094*
	(1.181)	(0.680)	(0.055)
ASEAN	-0.411	0.723	0.193***
	(2.660)	(1.469)	(0.055)
APEC	0.560	0.631	0.127***
	(1.382)	(0.616)	(0.032)
Indonesia's LPI	-0.200	-266.626***	-
	(6.782)	(43.472)	
Importers' LPI	-1.226	0.313	0.098***
	(1.170)	(0.622)	(0.035)
Observations	3,173	7,799	7,799
Time FE	No	No	Yes
Sector 2-digit FE	No	No	Yes
Importer FE	No	No	No
Exporter FE	No	No	No

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

To overcome the problem arising from the OLS estimation, we turn to the PPML method (column 3). The results from the PPML model in column (3), by contrast, are more plausible and robust with lower standard errors than those reported in columns (1) and (2). Most of the key variables of Indonesia's export NTMs such as export licensing requirements, export taxes and export quotas, and all gravity variables are significant with the expected signs. Export licensing requirements were mattered in reducing Indonesia's manufacturing exports by about 21%.[122] While export taxes and export quotas were significant in dropping Indonesia's manufacturing exports by around 78% and 33% respectively.

[122] Because Indonesia's export NTMs are dummies, so then the value of each significant variable is calculated as follows. For example, the value of 21 % of export licensing requirements is calculated as $(e^{-0.24} - 1) * 100$. This calculation also applies to export taxes and export quotas.

On the other hand, the variable of export prohibitions was not significant in affecting Indonesia's manufacturing exports. To explain why this variable is insignificant, we refer to the GTA database, showing that most of Indonesia's export prohibitions applied to unprocessed (base) metals. The possible reason behind this insignificance is that the trend of Indonesia's export prohibitions on unprocessed (base) metals has recently declined since this policy was effectively withdrawn in 2014. The evidence of the insignificance of export prohibitions also confirms the previous chapter results in Chapter 5 that the role of Indonesia's trade prohibitions/or bans (export and import bans) is essentially less important for affecting Indonesia's trade flows.

The main results in column 3 also show that the signs of gravity variables such as Indonesia's GDP, importers' GDP, and distance are as expected. Most of the control variables such as colony ties and economic integration with ASEAN and APEC have a positive impact on Indonesia's export products in manufacturing sectors. In addition, the quality of importers' logistic infrastructure (represented by the LPI) plays an important role in promoting Indonesia's export products in the manufacturing sectors. However, Indonesia's own logistics performance index has dropped from the estimation. This could be due to very low variation, as Indonesia is the only exporter country in the sample, and this low variation have been fully absorbed by the time fixed effects and/or the sector 2-digit effects.

Although the role of export measures on manufacturing exports is still under-researched, our main results essentially confirm the arguments and analysis that Indonesia's export taxes and export prohibitions not only negatively affect its trade flows in natural resources sectors such as the crude palm oil and cooking oil sector (Basri and Patunru, 2012), or the logging and rattan sector (Pangestu et al., 2015), but also negatively affect Indonesia's export products in the manufacturing sectors. This study has also shown that Indonesia's export licensing requirements play a key role in the reduction of Indonesia's manufacturing exports.

It is important to note that relative high protection subject to Indonesia's manufacturing exports leads to the price of manufacturing products being significantly increased. When

this occurs, it could lower the competitiveness level of Indonesia's manufacturing products in export markets. As a result, this may significantly decrease the value of Indonesia's manufacturing exports. When the number of export measures proliferate, these export NTMs could potentially reduce incentives for manufacturing firms to exports (Kuncoro, 2018). Thus, local manufacturing firms prefer to distribute their products to domestic market.

6.6 Robustness check

We run a series of robustness checks. First, we use product fixed effects rather than two-sector digit fixed effects. This strategy is commonly practiced when the gravity model applies to disaggregated trade data (products level trade data). In the estimation strategy, product fixed effects can be used to absorb many more confounding factors emerging from product-invariant heterogeneity rather than two-sector digit fixed effects as suggested by Kinzius et al. (2019). As noted earlier, we assume that the absence of trade in exports values from Indonesia to its trade partners induces a major number of zero trade values in our dependent variable dataset. In this second robustness check, we run the alternative estimations whereby zero trade values are replaced by missing trade values (or no trade values in exports have been recorded) in order to check the consistency of the main model results. In other words, we change all zero trade values in exports in the main dataset with missing trade values in exports.

In the third robustness check, we include the multilateral resistances (MR) factors following Anderson and van Wincoop (2003). Anderson and van Wincoop (2003) define the MR factor as the third country (rest of the world) factor that may affect trade flows between a given two countries (the average trade costs factors). Anderson and van Wincoop (2003) argue that the omission of the MR factors in the gravity model would lead to bias. Hence, we take the MR factors into account and capture these factors by using importer fixed effects and exporter fixed effects following Feenstra (2002). For the first-three robustness checks, the study still uses the PPML estimation method. Fourth, we use a Poisson technique to estimate the model. As suggested by Baum (2010), the dependent variable in the Poisson model is suitable for a non-negative count variable including zero values. The results for the first robustness check are given in Table 6.6, column 1. The coefficients of export licensing

requirements, export taxes, and export quotas are consistent with our main results but with a larger magnitude of the coefficients.

Table 6.6 The robustness check results

Estimation method	(1) PPML	(2) PPML	(3) PPML with MR	(4) Poisson
Dependent variable (Indonesian exports)	Zero trade values (levels)	Missing trade values (levels)	Zero trade values (levels)	Zero trade values (levels)
Indonesia's export NTMs				
Indonesia's export prohibitions	0.584***	-0.120***	-0.069	-0.319
	(0.045)	(0.018)	(0.735)	(0.342)
Indonesia's export licensing requirements	-0.791***	-0.017	-0.190***	0.050
	(0.064)	(0.221)	(0.041)	(0.111)
Indonesia's export taxes	-2.436***	-	-1.465***	-0.343***
	(0.042)		(0.390)	(0.111)
Indonesia's export quotas	-2.554***	-	-0.326*	-0.099
	(0.220)		(0.175)	(0.110)
Gravity and control variables				
Log of Indonesia's GDP	0.230***	0.246***	-0.162	0.100***
	(0.017)	(0.015)	(0.310)	(0.013)
Log of importers' GDP	0.187***	0.025**	0.253	0.246***
	(0.012)	(0.010)	(0.310)	(0.010)
Log of distance	-0.328***	-0.036	0.533	-0.438***
	(0.029)	(0.025)	(0.381)	(0.028)
Colony ties	0.210***	-0.032	-0.430	0.439***
	(0.074)	(0.069)	(1.662)	(0.070)
Common land border	-0.087	-0.035	1.151**	-0.108
	(0.054)	(0.051)	(0.498)	(0.068)
ASEAN	0.192***	0.056	0.292	0.062
	(0.055)	(0.049)	(0.690)	(0.058)
APEC	0.116***	0.013	-0.043	0.031
	(0.032)	(0.029)	(0.078)	(0.030)
Indonesia's LPI	-	-	-	0.710***
				(0.057)
Importers' LPI	0.096***	-0.027	-0.036	-0.326***
	(0.034)	(0.033)	(0.483)	(0.030)
Observations	7,799	3,117	7,799	7,799
Time FE	Yes	Yes	Yes	No
Importer FE	No	No	Yes	No
Exporter FE	No	No	Yes	No
Sector 2-digit FE	No	Yes	Yes	No
Product FE	Yes	No	No	No

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

This indicates that controlling product fixed effects can help to absorb better product-invariant heterogeneity than that of only controlling two-sector digit fixed effects as shown in our main model estimation. However, the strategy of using product fixed effects turns export prohibitions positive. This counterintuitive result undermines the whole estimation. We thus prefer our previous, main results.

The results based on the missing trade values in column (2) cannot explain much of any significance regarding the study's variables of interests such as Indonesia's export NTMs. These variables of interets show inconsitency when missing trade values are employed in

our main model. In addition to the distance factor as well as most of the control variables, these variables show as insignificant. This indicates that those variables might suffer from sample selection bias due to the missing trade values dropped in the estimation.

When we take the MR factors into account and treat our dependent variable in levels, the signs of Indonesia's export licensing requirements, export taxes and export quotas are negative, as expected (column 3). The variable of export prohibitions, by contrast, is not significant. Although the PPML estimation yields consistent estimates, taking the MR factor into account to estimate the main model comes at a risk. For example, our gravity variables and most of the control variables lose their significance, suggesting a deviation from the fundamental assumptions of the gravity model. We suspect that the presence of the MR factors is so strong that this leads to different results of gravity variables and some of control variables, in that the effects of these variables could be confounded by the MR factor effects.

In the fourth robustness check, we estimate our main model with the Poisson estimator where time trends (time fixed effects) and sector two-digit products fixed effects are not accounted for. The results associated with the Poisson estimator in column (4) suggest that the variables of interests of Indonesia's export NTMs, particularly for Indonesia's export licensing requirements and export quotas, are not important. On the other hand, the variable of Indonesia's export taxes is significant but its effect is descending due to the lower magnitude of coefficient than that of Indonesia' export taxes result in the main model. This evidence suggests that the exclusion of the unobservable time and sector two-digit products-specific factors leads to inconsistent parameter estimates of the variables of interests in the model in column (4).

We can infer that our main model results are relatively robust in comparison with other specifications as shown in Table 6.6. The main results have been shown to be weakly affected by either the inclusion of product fixed effects or the use of missing trade values data, while the results of the PPML with the MR factors show poorly estimation in terms of the key gravity variables and some control variables. In addition, the Poisson results fail to explain the effects of Indonesia's export NTMs on Indonesia's manufacturing exports as these are better explained by the main results.

6.7 Conclusion and implication

In this chapter, we have estimated a gravity model for disaggregated trade data of Indonesia's manufacturing exports. Our preferred estimator, the PPML can help overcome the problem that usually emerges from using a dataset with a significant number of zero trade observations. The estimation strategy that treats the dependent variable as levels rather than as logarithms plays an essential role in reducing the effect of sample selection bias. The PPML estimator gives consistent estimates as expected. A series of robustness checks confirms this finding.

The results show that the imposition of Indonesia's export measures to its export goods in manufacturing sectors has a negative impact on its manufacturing exports, especially during 2012-2015. The main problem of Indonesia's manufacturing exports increasingly emerges from its export taxes, export quotas and export licencing requirements. Higher Indonesian trade protection in regards to export taxes, export quotas and export licencing requirements lead to lower Indonesian manufacturing exports for all products on average by 78%, 33%, and 21% respectively. The implication of this study is that reforms in Indonesia's export measures, particularly reforms in export taxes, export quotas and export licencing requirements, are necessary in order to promote Indonesia's manufacturing exports.

The caveat to note is that we only focus on the impact of Indonesia's export NTMs on its export products in manufacturing sectors, while the impact of Indonesia's import NTMs applied to its import products in manufacturing sectors would be interesting in the future research. For further study, the combination of these two analyses can enrich analysis of Indonesia's trade protection in manufacturing sectors and can also give a new insight.

Chapter 7: FDI determinants in Indonesia

7.1 Introduction

The flow of foreign direct investment (FDI) in Indonesia has been dynamic due to changes in policy regimes and implementations. During the Soekarno era (later known also as the Old Order era), particularly in the mid-1950s to the mid-1960, the economic nationalist sentiment against foreign companies, particularly those from western countries, significantly increased. The Old Order regime forced these foreign companies to transfer their ownership to the government. The Soekarno administration used the nationalization scheme in the case of the Dutch company in 1957-1959, and implemented a hostile takeover of various British and American corporations between 1963 and 1965.[123] As Lindblad (2015) noted, the Old Order regime was the least attractive era for foreign investment to come to Indonesia.

Soeharto took the presidency from Soekarno in 1966. Soeharto named his regime 'the New Order.' The government introduced Foreign Investment Law No. 1/1967, which would play a critical role in liberalizing the investment regime in Indonesia. Above all, the law has a strategic function to facilitate foreign investors to come with minimal conditions attached (Hill, 1984). The New Order government also restored Indonesia's relationship with the United States and several European countries by signing the Investment Guarantee Agreements and Treaties. Rehabilitation was also made with several international institutions: the IMF, the World Bank, and the United Nations. These improved the investment climate in Indonesia, resulting in a vast amount of FDI inflows to Indonesia. The total number of FDIs approved significantly increased from USD 125 million in 1967 to USD 522 million in 1982 (BKPM; Hill, 1984), and this FDI mostly went to the natural resources sector rather than the manufacturing sector (Hill, 1984; Lindblad, 2015).[124]

However, there were critiques from Indonesian students in the early 1974 of the Soeharto government. One of them was that Soeharto gave privilege more to foreign investors, while

[123] Redfern (2010) points out that at least 90 foreign companies were taken over by the Old Order government during 1963-1965.

[124] However, Lindbald (2015) cited Hill (1984) that a realization of rates of the approved FDI was essentially below 40%.

putting aside Indonesian (native) entrepreneurs being involved in Indonesia's investment. This caused discontent among the public, especially students. A large number of students' demonstration that turned into a political event (known as 'the Malari') in 15 January 1974 caused political chaos in Indonesia. This political event occurred in conjuction with a state visit by Japanese prime minister Kakuei Tanaka.

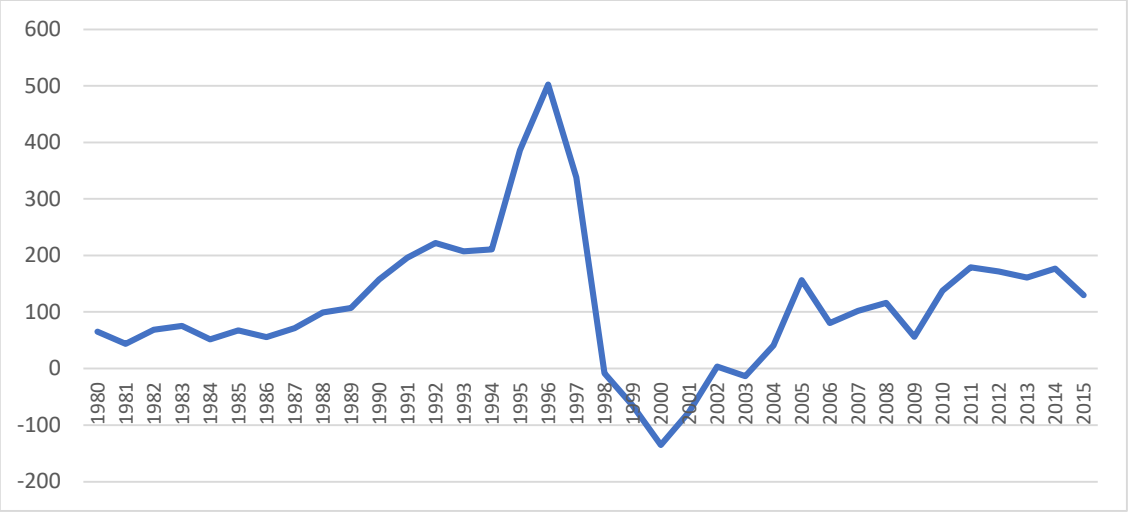
In response, the government had to roll back investment liberalisation. In what followed, FDI policies in Indonesia became more restrictive. Amongst everything, these restrictive policies included requirements that new FDI coming to Indonesia engage in a joint venture with local companies (51% of FDI shares must be owned by Indonesia's company within ten years). Government also closed a more list of business sectors to FDI. Tax incentives were reduced and foreign worker restrictions were enforced (Hill, 1984). However, the number of total FDIs approved according to BKPM continued to increase in the short run, especially in 1974 (USD 1,417 million) and in 1975 (USD 1,757 million) because of some bulky investments on liquefied natural gas (LNG) projects, nickel mines, aluminium smelters, and steel plants (Lindbald, 2015). The total FDIs approved rose again in the late 1970s mainly due to a surge in US oil investments (Hill, 1984).

When the oil boom ended in 1983, there was an urgent agenda to relax FDI restrictions in Indonesia. The Soeharto government thus unleashed deregulation investment packages in 1985/1986 that brought back FDI to a more liberal regime (Hill,1984). For instance, in 1986, some important deregulations were made, i.e., foreign companies could be licenced for an additional 30 years subject to certain conditions, and all sectors opened to foreign companies with the condition that at least 85% of their production must be exported.[125] Since then, Indonesia has shifted its economic strategy from oil exporting country to non-oil exporting country. The manufacturing sector became the leading sector for Indonesia, replacing the role of the oil sector. A significant number of FDI flows into Indonesia's manufacturing sectors (particularly the labour-intensive manufacturing sectors) essentially accelerated Indonesia's economic growth at around 8% during the mid-1980s to the mid-1990s.

[125] See Hill (1984) for other deregulations.

Several studies have discussed the importance of FDI for Indonesia's economy. For instance, along with trade, FDI helps Indonesia to create more jobs, increase income and living standards, improve technology and wages, and reduce poverty (Nabende et al., 2001, Lipsey and Sjöholm 2011; Lindbald 2015). Other studies also show that FDI has expanded Indonesia's productivity in manufacturing sectors (Sjöholm, 1997), developed Indonesia's industrialisation since the mid-1980s and integrated Indonesia's economy with the global economy (Elias and Noone, 2011).

Figure 7.1 shows that Indonesia's FDI inflows significantly increased from around 75 billion USD in 1983 to around 500 billion USD in 1996 at real prices. However, as the Asian financial crisis hit in 1997, Indonesia's FDI inflows experienced a free-fall. The number of FDI inflows to Indonesia dropped to minus 8 billion USD in 1998 and kept falling to minus 135 billion USD in 2000, before this started to recover. The commodities boom starting in 2004 attracted a vast amount of FDI inflows into Indonesia's natural-resource and commodity sectors. This helped Indonesia to get its FDI inflows back into positive territory in 2004, and this has continued until recently.

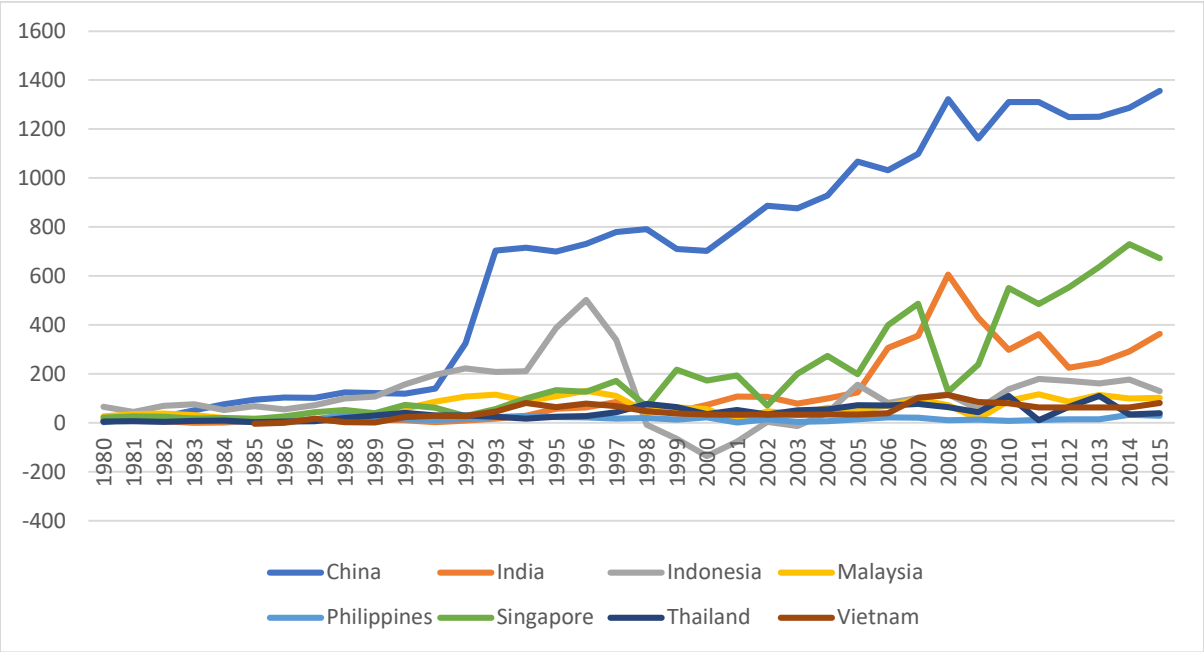


Note: Author's calculation based on FDI inflows at current prices (UNCTADStat) divided (adjusted) by the GDP deflator (WDI).

Figure 7.1 Indonesia FDI inflows at real prices in billion USD, 1980-2015

Between 2010 and 2015, Indonesia was the second largest FDI recipient in Southeast Asia after Singapore (Figure 7.2). Nevertheless, Lipsey and Sjöholm (2011) argue that the amount of Indonesia's FDI inflows is still below its potential, given the country's economic size. China and India, on the other hand, are known as being among the most attractive FDI locations in

the world. China received FDI inflows more than ten times (FDI at real prices) those of Indonesia in 2015, while India enjoyed three times (FDI at real prices) Indonesia's FDI inflows over the same year. Lipsey and Sjöholm (2011) point out that a relatively poor business environment and inefficient institutions seem to be the reason behind the low FDI inflows into Indonesia.



Note: Author's calculation based on FDI inflows at current prices (UNCTADStat) divided by the GDP deflator (WDI).

Figure 7.2 FDI inflows for selected countries at real prices in billion USD, 1980-2015

Most previous studies on FDI only investigated what determines global or regional FDI flows. Very few of the earlier studies discussed FDI determinants in the case of Indonesia, the exceptions including Lipsey and Sjöholm (2011). This latter analysis is mostly based on reviewing the earlier studies, in a way that their empirical analysis is not explicitly supported by a theoretical framework. This motivates us to employ a theoretical model that can provide a means to understand better what factors affect the flow of FDI to Indonesia. Our results essentially confirm Lipsey and Sjöholm's key arguments and analysis, in addition to some new insights.

We use a knowledge-and-physical-capital (KPC) model of FDI following Bergstrand and Egger (2007, 2013), which is built on the earlier model of Knowledge-Capital (KC) (Carr et al. 2001; Markusen and Maskus, 2001). These models are derived from the gravity model. The fundamental gravity variables such as economic mass factor (GDP) and distance are still

included, since their roles remain important in explaining bilateral FDI flows, as they do to trade flows. The advantage of using the KPC model is that we can observe the determinants of horizontal FDI and vertical FDI.

The main difference between horizontal and vertical FDI lies in the motivation by which the investment is directed. Shatz and Venables (2013) point out that horizontal FDI is driven by market access motivation, that is, multinational firms duplicate their production plants in different locations in order to better serve local markets. On the other hand, vertical FDI is driven by resource access motivation, that is, investing in order to access lower-cost inputs so as to maximise profits. In practice, a firm undertaking vertical FDI typically fragments its production into different places that offer a lower combination of cost inputs. In this regard, therefore, vertical FDI plays an important role in shaping global production networks (GPNs).[126]

The vertical FDI theory was first introduced by Helpman (1984). In vertical FDI, multinational firms seek relative factor endowments between countries that provide the cheapest inputs in the production process (resource-seeking). Because of this motivation, multinational firms prefer to fragment their tasks (slices) of the production process in several different locations. Brainard (1993b) calls such a framework to analyse vertical FDI as factor-proportion theory. In this theory, multinational firm headquarters (the parent) are located in one market with relatively more capital-intensive factors, and production facilities are located in another market (the host) with a relatively labour-abundant economy. Baltagi et al. (2007) and Egger (2008) show that trade and vertical FDI are complementary. Furthermore, trade in vertical FDI is associated with the trade of intermediate goods within firms. In sum, vertical FDI is an important instrument for countries to participate more fully in GPNs.

On the other hand, Markusen (1984) introduces the horizontal FDI theory where multinational firms produce the same product in multiple plants in multiple countries to serve local markets by using local production (production from start to finish in one country). In another model, horizontal FDI is defined as a proximity-concentration theory

[126] Athukorala (2018) defines GPNs as the dispersion of separate stages (tasks) of an integrated production process across national boundaries.

(Brainard, 1993a). Brainard points out that a proximity-concentration theory as the decision of multinational firms to invest is determined by the trade-off between proximity to a market (a plant set-up in the host country) and concentration production facilities at the firm-level (multinational firms engage with exports). This theory implies that horizontal FDI might seek to save on trade costs by serving locally instead of trading. In this context, FDI and trade in horizontal type are substitutes (Egger and Pfaffermayr, 2004), but result in high fixed investment costs to build multiple plants in several host countries. However, this practice continues due to the objective of expanding markets (market access motivation) and controlling a majority of firm ownership in the host country.

It is important to investigate the determinants of both types of FDI in Indonesia. On the one hand, Indonesia is a country with one of the largest populations in the world. This attracts multinational firms to come and to tap this huge market through horizontal FDI. On the other hand, Indonesia has started to participate in GPNs mainly since the mid-1980s (Athukolara, 2018). GPNs are a vehicle for Indonesia to integrate more fully its economy into global economy. In these contexts, vertical FDI can help Indonesia to engage more with GPNs. Therefore, in this study, we examine the characteristics of FDI flows in Indonesia. Is it mostly horizontal or vertical type? Understanding this difference is important to provide input to policy makers for their effort to encourage firms whether to expand market access or to participate in GPNs.

Regardless of the motivating factors behind the FDI inflows, however, all FDIs are likely to be a function of institutional factors in the host country (Blonigen, 2005; Fan et al., 2008; Lipsey and Sjöholm, 2011). These factors mainly include investment risks, corruption, bureaucracy quality (Blonigen, 2005; Wagle, 2010; Lipsey and Sjöholm, 2011), law and order and government stability (Daude and Stein 2007; Fan et al., 2008). By contrast, weak institutions contribute to discouraging FDI (Fan et al., 2008), leading to very few capital flows from rich to developing countries (Alfaro et al., 2005) and increasing the cost of doing business (Blonigen, 2005). Therefore, in this study, we specifically examine the effect of institutional determinants on Indonesia's FDI flows.

Evidence shows that both types of horizontal FDI and vertical FDI exist in the bilateral aggregate data of Indonesian FDI flows, but horizontal bilateral FDI flows are more

pronounced than vertical bilateral FDI flows. Furthermore, a specific institutional determinant such as corruption has a major effect on Indonesia's bilateral FDI flows. For policy implications, the type of horizontal FDI flows remains important to keep Indonesia's economy open to foreign firms that prefer to access Indonesia's large markets with majority shares. However, a policy that further supports vertical FDI can help Indonesia to deepen its involvement in GPNs. In this case, vertical FDI is complementary with trade: where vertical FDI increases so does trade, particularly trade in intermediate goods. In addition, vertical FDI is needed for open more jobs in Indonesia. With respect to institutional measures, an improvement in good governance (that is, low level of corruption) in Indonesia can raise Indonesia's bilateral FDI flows performance.

The rest of this paper is organised as follows. Section 7.2 discusses the types of FDI in Indonesia. Section 7.3 examines some of institutional determinants of FDI. Section 7.4 sets out the model specification, data explanation, and estimation strategy. Section 7.5 discusses the empirical results. Section 7.6 lays out a series of robustness check, and section 7.7 concludes and draws the implication of research finding.

7.2 Types of the recent of FDI flows in Indonesia

Table 7.1 shows the FDI inflows into Indonesia's manufacturing sector during 2010-2012. The most recent FDI inflows into Indonesia went to capital-intensive sectors (metal, machinery and electronic industry, and motor vehicles and other transport equipment industry) and not so much to labour-intensive sectors (textile, leather goods and footwear).[127] There was a major transition of FDI inflows into Indonesia's manufacturing sectors, from labour-intensive sectors to capital-intensive sectors (Aswicahyono et al., 2011). Aswicahyono et al. (2011) point out that this major transition occurred due to the Asian financial crisis in 1997/1998 after which the labour-intensive sectors have been slowing down. Capital-intensive sectors, by contrast, such as electronics and transportation grew strongly after crisis 1997. This might have been caused by the fact that the level of real wages in Indonesia's labour-intensive sectors relatively increased overtime (Manning, 1998),

[127] We category these sub-sectors of manufacturing such as labour-intensive sectors, resource-intensive sectors and capital-intensive sectors based on the factor intensity following Tadjoeddin et al. (2016).

reducing the level of the competitiveness of Indonesia's labour inputs in these sectors (Aswicahyono and Hill, 2015).

Table 7.1 The realization of Indonesia's FDI inflows into manufacturing sectors in million USD

Year	2010		2011		2012	
	value	% of total	value	% of total	value	% of total
Food Industry	1025.74	30.74%	1104.64	16.27%	1782.95	15.1%
Textile Industry	154.79	4.64%	497.26	7.32%	473.12	4.0%
Leather Goods & Footwear Industry	130.38	3.91%	255	3.76%	158.89	1.3%
Wood Industry	43.05	1.29%	51.14	0.75%	76.30	0.6%
Paper and Printing Industry	46.41	1.39%	257.53	3.79%	1306.61	11.1%
Chemical and Pharmaceutical Industry	793.36	23.77%	1467.40	21.61%	2769.80	23.5%
Rubber and Plastic Industry	104.30	3.13%	369.96	5.45%	660.30	5.6%
Non-Metallic Mineral Industry	28.39	0.85%	137.15	2.02%	145.76	1.2%
Metal, Machinery & Electronic Industry	589.51	17.66%	1772.78	26.11%	2452.62	20.8%
Medical Preci. & Optical Instru, Watches & Clock Industry	0	0.00%	41.92	0.62%	3.40	0.0%
Motor Vehicles & Other Transport Equip. Industry	393.77	11.80%	770.13	11.34%	1840.05	15.6%
Other Industry	27.56	0.83%	64.74	0.95%	100.20	0.9%
Total	**3337.30**	**100%**	**6789.65**	**100%**	**11769.95**	**100%**

Source: Indonesia Investment Coordinating Board (BKPM)

In the recent literature, there has been a discussion regarding the presence of vertical FDI being strongly associated with manufacturing sub-sectors such as machinery, electronic, motor vehicles and other transport equipment. Pangestu et al. (2015) point out that FDI and trade in machinery and transport equipment could be used as a broad measure of a country's participation level in GPNs. Athukorala (2018) suggests that improved FDI and trade in passenger vehicles (automobiles) and parts and components can help Indonesia to participate more in GPNs. Given Indonesia's recent FDI data in manufacturing sectors, as shown in Table 7.1, vertical FDI rather than horizontal FDI, appears to be dominant. However, rather than connecting its vertical type of FDI to GPNs, the production of these sub-manufacturing sectors in Indonesia mainly serves the domestic market, especially the motor vehicles (automotive) industry (Aswicahyono and Hill, 2015).

7.3 Why is the quality of institutions important for Indonesia's FDI flows?

There are several reasons why the quality of institutions is important for Indonesia's FDI flows. According to the literature, poor institutions is one of the major problems for foreign

firms to invest in Indonesia. For instance, poor institutions in Indonesia is mainly due to a relative high of corruption and investment risks (Lipsey and Sjöholm, 2011). In addition, Von Luebke (2009) points out that inefficient bureaucracy is also an important factor besides corruption that likely deters FDI activity in Indonesia.

The World Economic Forum (2017) in its survey confirms both studies above that the most problematic factors for doing business (i.e., investing) in Indonesia are still corruption and poor bureaucracy. Moreover, Pardede and Zahro (2017) and Prospera (2019) suggest that poor bureaucracy is a result of a lack of coordination among ministries and agencies in the central government, and between the central and regional governments.

However, in rare cases, FDI is only weakly affected by institutional deficiency such as corruption. Fan et al. (2008) confirm this argument in the case of FDI inflows into China. Lipsey and Sjöholm (2011) argue that the relationship between corruption and FDI might seem paradoxical. Large FDI inflows and a relatively high corruption occur at the same time in many East Asian countries, including Indonesia. One possible explanation could be that foreign investors trade-off the cost of corruption with cheap labour and easy access to markets in many East Asian countries. Given the importance of foreign investment for Indonesia's economy, it is worthwhile to investigate what institutional factors really affect Indonesia's FDI flows.

Table 7.2 shows that the quality of Indonesia's institutions seems to have decreased according to the International Country Risk Guide (ICRG) index.[128] The level of Indonesia's government stability is the lowest among the selected Asian countries during 2012-2016. Investing in Indonesia also becomes riskier in 2012-2016 than in 2007-2011, even though this is better than China. In addition, the corruption level tends to be higher in 2012-2016 than that of 2007-2011. However, the level of Indonesia's corruption in 2012-2016 is relatively low in comparison with other selected Asian countries except for Singapore. Law and order enforcement in Indonesia became weak in 2012-2016 compared to 2007-2011. Compared to other selected countries, law and order performance in Indonesia is the worst

[128] As suggested by Daude and Stein (2007), the ICRG index is widely used by the most empirical works of FDI flows to measure the institutional variables besides the Worldwide Governance Indicators (the WGI index) that developed by Kaufmann et al. (2010)).

after the Philippines and Thailand. However, there is no significant progress found in Indonesia's bureaucracy quality.

Table 7.2 The institutional qualities for selected countries, 2007-2011 and 2012-2016 on average

Countries	5 years average, 2007-2011					5 years average, 2012-2016				
	Govt. Stab	Inv.Risks	Corrupt	Law and Order	Bureaucracy quality	Govt. Stab	Inv.Risk	Corrupt	Law and Order	Bureaucracy quality
China	10.2	6.8	2.2	4.2	2.0	8.5	6.6	2.0	3.5	2.0
India	7.3	8.5	2.4	4.0	3.0	7.1	7.9	2.5	4.2	3.0
Indonesia	7.8	8.7	3.3	3.0	2.0	6.0	7.7	3.0	2.8	2.0
Malaysia	7.2	9.4	2.6	4.0	3.0	6.7	8.9	2.5	4.0	3.0
Philippines	6.1	9.0	2.0	2.5	3.0	7.6	8.7	2.4	2.5	3.0
Singapore	10.9	12.0	4.5	5.0	4.0	9.3	11.9	4.5	5.0	4.0
Thailand	6.8	7.5	1.8	2.5	2.0	6.9	8.0	2.0	2.5	2.0
Vietnam	10.1	8.1	3.0	4.0	2.0	7.4	7.4	2.5	4.0	2.0

Source: The International Country Risk Guide.
Note: Govt. Stab is the government stability, Inv.Risks is the investment risks, and Corrupt is corruption. The higher the index, the better.

7.4 Model specification, data, and estimation strategy

The knowledge-capital model

The theory of FDI is developed by bringing the two types of FDI (i.e., horizontal and vertical FDI) into one model, namely the knowledge-capital (KC) model. The KC model is a model with two homogeneous goods, two countries, and two homogeneous factor endowments: unskilled labour and skilled labour. The recent literature of the KC model produced by Carr et al. (2001) and Markusen and Maskus (2001) explains that the KC model uses three principal assumptions. First, knowledge-based (intangible) assets (e.g., skilled engineers) may be fragmented along the production process. In other words, they can be used in foreign production facilities at low cost in a host country but are internationally immobile from one location to another location. Second, a skilled labour factor is important to generate knowledge-intensive activities (e.g., research and development) and transform the output of the knowledge-intensive activities into a final product. Third, knowledge-based services (e.g., management and technology) from the parent firms can be jointly used by multiple foreign production facilities in the host country. The KC model of the multinational firms tells us that the first-two assumptions create a vertical motive of FDI where R&D locates in a skilled-labour abundant country and production in an unskilled-labour abundant country. The third assumption explains the motive of horizontal FDI that replicates the same products and services in different locations.

The knowledge-and-physical-capital model

Bergstrand and Egger (2007, 2013) extend this KC model. They suggest that the KC model should include a third factor (i.e., the physical-capital endowment)[129] and a third country factor in this case represents the rest of the world. For this reason, they introduce the knowledge-and-physical-capital (KPC) model as an extension of the KC model. Bergstrand and Egger (2013) argue that the rationale behind the inclusion of the physical-capital factor is that multinational firms tend to be very physical-capital intensive (as well as skilled-labour intensive), particularly when they set up horizontal FDI (multiple plants in different locations). In addition, the multinational firms tend to be headquartered in relatively physical-capital abundant countries (as well as skilled-labour abundant countries) (Bergstrand and Egger, 2013). The third country factor to reflect in the presence of the rest of the world helps to explain that bilateral FDI empirically tends to be maximised when parent country's GDP is greater than host country's GDP (Bergstrand and Egger, 2007). Another argument for why the third country effect is important, is made by Baltagi et al. (2007). They explain that third country effects need to be accounted for since the average country pair is relatively small as compared to the rest of the world. Baltagi et al. (2007) argue more in regard to technical aspects in that the omission of the third country effects may lead to biased parameter estimates of the determinants of bilateral FDI.

Bergstrand and Egger (2007) assume that factor endowments such as unskilled labour (*U*) and skilled labour (*H*) are internationally immobile. Physical-capital endowment (*K*) is assumed to be internationally mobile in the sense that multinational firms will choose the optimal allocation of using a physical-capital endowment between parent and host country to maximise their profits. The KPC model is a model with two sectors, i.e., the homogeneous sector (which is perfectly competitive) and the differentiated sector (which is monopolistic competition). The three countries involved in the KPC framework are the parent country, the host country and the third country represents the rest of the world (ROW).

7.4.1 Model specification

In the construction of the model specification, we recall our empirical model from Chapter 4. We use the same empirical models as shown in Chapter 4 following Bergstrand and Egger

[129]Bergstrand and Egger (2007) explain that equipment is an example of physical-capital endowment.

(2007, 2013).[130] Then, this study augments these models by including some additional proper variables in order to specify the main model. In Bergstrand's and Egger's (2007) KPC model, the gravity approach assumes to have N countries (>2), one final differentiated good, and no trade costs; labour and/or capital is internationally immobile; trade or investment is flows from country *i* to country *j* in year *t* ($Flow_{ijt}$).

This model is then expressed as the product of the GDPs of the two countries, relative to the world GDP as follows:

$$Flow_{ijt} = GDP_{it} * GDP_{jt}/GDP_t^W \quad (7.1)$$

where GDP^W is the world GDP. Equation (7.1) is the standard frictionless gravity equation. In the gravity equation that uses bilateral flows as the mass, the first term on the right-hand-side is replaced by the squared bilateral GDP multiplied by a proxy for similarity. The latter is measured by the product of the relative GDP of each country ($s_{it}s_{jt}$), where $s_i = GDP_i/(GDP_i + GDP_j)$ and $s_j = GDP_j/(GDP_i + GDP_j)$. Similarity here refers to similar income per capita (Helpman 1987). Therefore, equation (7.1) becomes:

$$Flow_{ijt} = \frac{GDP_{it}GDP_{jt}}{GDP_t^W} = \left(GDP_{it} + GDP_{jt}\right)^2 (s_{it}s_{jt})/GDP_t^W \quad (7.2)$$

When both s_{it} and s_{jt} are 0.5, countries *i* and *j* are similar in income per capita, and ($s_{it}s_{jt}$) is at the maximum. Equation (7.2) can be expressed in a log-linear form as follows:

$$lnFlow_{ijt} = -lnGDP^W + 2\ln\left(GDP_i + lnGDP_j\right) + \ln\left(s_i s_j\right) \quad (7.3)$$

Equation (7.3) can be seen as the basic gravity equation without trade and/or investment friction because the factor of distance that represents trade/or investment barriers and the variables of other types of trade/or investment impediments are not yet included. With respect to GDP^W, Bergstrand and Egger (2013) explain that GDP^W variation is almost zero in a large number of cross-section data, and does not need to be included in equation. They also explain that in a panel data setting, changes in GDP^W are simply accounted for using time dummies. The value of two is a constant in equation (7.3), and so can be dropped in estimation. To create the baseline for the KPC model of FDI, Bergstrand and Egger (2007,

[130] Particularly the equation (4.16), the equation (4.17), the equation (4.18), and the equation (4.19). See Chapter 4 for reviews.

2013) include time-invariant bilateral distance and three relative factor endowments in equation (7.3). Therefore, the equation (7.3) becomes:

$$lnFDI_{ijt} = \ln(SumGDP_{ijt}) + \ln(Similarity_{ijt}) + lnDistance_{ij} + u_{ijt} + h_{ijt} + k_{ijt} + \varepsilon_{ijt} \quad (7.4)$$

where FDI_{ijt} is the bilateral FDI flows from parent country (*i)* to host country (*j)* at time *t*; $SumGDP_{ijt}$ is the total GDP between the two countries; $Distance_{ij}$ is bilateral distance between the two countries; u_{ijt} is the ratio of parent country's unskilled labour endowment to host country's; h_{ijt} is the ratio of parent country's skilled labour endowment to host country's; k_{ijt} is the ratio of parent country's physical-capital endowment to host country's; and ε_{ijt} is the error term.

In this settings, Bergstand and Egger (2013) argue that the variables of relative factor endowments as described above (u_{ij}, h_{ij} and k_{ij}) are important for examining the types of FDI. They point out that the amount of horizontal FDI based in the parent country (*i*) with plants in the host country (*j*) would be maximized when the parent country (*i*) is a physical-capital abundant country. This is due to the multi-plant structures of horizontal FDI, where headquarters are set up by using intensive physical-capital (skilled-labour). On the other hand, since the headquarters of vertical FDI are set up by using skilled-labour services and plants are set up by using physical-capital services, the amount of vertical FDI based in the parent country (*i*) with a plant in a host country (*j*) would be pronounced when parent country (*i*) is abundant in skilled-labour and physical-capital endowments relative to host country (*j*), assuming unskilled labour is constant at the mean.

Bergstrand and Egger (2007, 2013) also suggest that the baseline of the KPC model can be augmented by incorporating other appropriate variables such as the typical gravity equation variables such as a bilateral dummy (contiguity, language, and colony), and investment costs in the host country and trade costs in the parent and host countries following the KC model.

In our model specification, the augmented KPC model includes time-invariant contiguity or a common land border dummy and the same colony dummy. We take institutional measures of FDI into account to capture investment cost variables. In addition, this study also assumes

that the specific variable of trade cost is not necessarily required since the variable of distance can be a general proxy of trade costs in our KPC specification. We also include macroeconomic factors, policy factors and infrastructure factors as our control variables.

Thus, we can express our KPC model specification as follows:

$$lnFDI_{ijt} = \alpha_1 + \alpha_2 lnSumGDP_{ijt} + \alpha_3 lnSimilarity_{ijt} + \alpha_4 lnDistance_{ij} + \alpha_5 u_{ijt} + \alpha_6 h_{ijt} + \alpha_7 k_{ijt} + \alpha_8 Border_{ij} + \alpha_9 Colony_{ij} + \beta_k Control'_{jt} + \gamma_k Institution'_{jt} + \theta_t + \varepsilon_{ijt} \quad (7.5)$$

where the dependent variable of the log of FDI_{ijt} is Indonesia's bilateral FDI flows (inflows and outflows) from the parent country to Indonesia (as a host country) and from Indonesia (as a parent country) to the host country at current prices in USD at time *t*. The log of $SumGDP_{ijt}$ denotes the sum of Indonesia's GDP and its partners' GDP at current prices in USD at time *t,* corresponding to economic size (absolute factor endowments). As noted, similarity is $Similarity_{ijt} = \left[\frac{GDP_i}{(GDP_i+GDP_j)}\right] x \left[\frac{GDP_j}{(GDP_i+GDP_j)}\right]$ following Bergstrand and Egger (2007, 2013).

The variables $SumGDP_{ij}$ and $Similarity_{ijt}$ capture the presence of horizontal FDI. When the two markets in both countries grow larger ($SumGDP_{ijt}$) and their incomes per capita become more similar ($Similarity_{ijt}$), this should raise horizontal FDI (Baltagi et al., 2008). Another reason is that it is very costly to set up horizontal FDI in the form of a single plant in the parent country and duplicate this plant in several host countries to produce the same product. Therefore, this requires a similar factor endowment of both countries where they should have abundance in skilled labour endowment and physical-capital endowment (Baltagi et al., 2007; Bergstrand and Egger, 2013).

The variables of u_{ijt}, h_{ijt} and k_{ijt} are the unskilled labour ratio, the skilled labour ratio and the physical capital ratio respectively between Indonesia and its partners FDI at time *t*. As noted, those three factors account for relative factor endowment. We follow Baltagi et al. (2007), Egger (2008), and Bergstrand and Egger (2007, 2013) to express the variables of u_{ijt}, h_{ijt} and k_{ijt} in ratio forms: the parent-to-host unskilled labour endowment ratio ($u_{ijt} =$

$\frac{u_{it}}{u_{jt}}$); the parent-to-host skilled labour endowment ratio ($h_{ijt} = \frac{h_{it}}{h_{jt}}$); and the parent-to-host physical capital endowment ratio ($k_{ijt} = \frac{k_{it}}{k_{jt}}$). In practice, u_{ijt} is constructed from the ratio of school enrolment (primary and secondary) education parent to host country. h_{ijt} and k_{ijt} are developed from the ratio of tertiary (higher) education parent to host country and the ratio of gross fixed capital formation (constant 2010 USD) parent to the host country respectively.

Bergstrand and Egger (2013) argue that the types of FDI in the theoretical hypothesis in the KPC model could be driven by the relationship between the variable of skilled labour endowment ratio and physical-capital endowment ratio (assuming the unskilled labour ratio to be constant).[131] When the ratio of skilled labour endowment in parent-to-host country continues to rise (>0.5) and the ratio of physical capital tends to fall (closer to 0.5), this suggests that skilled labour becomes abundant in parent country (*i*) relative to its physical capital. Given this circumstance, multinational firms from parent country (*i*) tend to seek cost-minimizing production in a host country (*j*). In other words, this condition rises further the vertical type of FDI rather than the horizontal type of FDI. Now assuming that the ratio of skilled-labour endowment is constant, the ratio of unskilled labour endowment parent to host country is at 0.5 and the ratio of physical-capital is at 1.0, then these ratios suggest that parent country (*i*) is very physical-capital abundant. In this case, horizontal FDI might rise further than vertical FDI.

In terms of the predicted signs of relative factor endowment, Bergstrand and Egger (2013) argue that when the coefficient of estimate u_{ijt} has a negative sign (holding h_{ijt} constant), this suggests the existence of vertical FDI. When the unskilled labour endowment ratio (u_{ijt}) variable sign is negative, it implies that the comparative advantage of a host country is increased through its abundance in unskilled labour endowment. Therefore, this situation drives multinational firms in the parent country to exploit vertical FDI (Egger, 2008; Bergstrand and Egger, 2013). By contrast, when the coefficient of estimate h_{ijt} has a positive sign (holding u_{ijt} constant), the presence of horizontal FDI is indicated.

[131] Bergstrand and Egger (2013) explain that these relationships among relative factor endowment variables by using the Edgeworth box technique. See Bergstrand and Egger (2013) for details.

The log of $Distance_{ij}$ is distance between the two countries' capital city in kilometers. $Institutional_{jt}$ is the vector of institutional variables in the host country. As mentioned above, this vector includes the variable of government stability, investment risks[132], good governance, law and order and bureaucracy in the index at time t.

We control for time-invariant variables such as border and colony. $Control'_{jt}$ is the vector of time-varying control variables such as economic factors, policy related to FDI flows factors, and public infrastructure factors in the host country at time t. We assume that all variables potentially encourage Indonesia's FDI flows. The economic factors will include the variable of GDP growth, education, and urban population. The level of education can capture the level of productivity (Lipsey and Sjöholm, 2011). Fan et al. (2008) suggest that urban population is a proper control variable to capture labour availability, particularly in developing countries. In this context, labour availability will help multinational firms in conducting the process of production.

Policies related to FDI include fiscal policy factors such as corporate tax rates. Blonigen (2005) suggests that high corporate taxes discourage FDI. The open policy factor incorporates trade openness.[133] High trade openness reflects the low level of trade barriers mainly in terms of tariffs. Other policies related to FDI flows as control variables in the main model are anti-monopoly policies and property rights protections. Anti-monopoly policies reduce market entry barriers for foreign firms, while property rights protection policies offer a guarantee to secure foreign firms' intellectual property from piracy. To control for public infrastructure factors, we incorporate utility infrastructure, in this case, access to electricity. Morisset and Nesso (2002) emphasize how utility infrastructure, particularly in the host economies, plays an important role in supporting foreign firms to build their plants. They suggest that access to electricity is more important than other utility infrastructure such as telecommunication and water resources. As suggested by Bergstrand and Egger (2007), the

[132] Originally, this should be termed as the investment profile in the ICRG index. However, this study prefers to refer the investment profile as the investment risks, since by definition, investment profile is an assessment of factors affecting the risk to investment that are not covered by other political, economic, and financial risk component. Its subcomponents are contract viability/expropriation, profits repatriation, and payment delays.
[133] Trade openness in this case is that the ratio of total merchandise trade (exports and imports) to GDP.

role of time effects (θ_t) is important in controlling the third country effects. α_1 and ε_{ijt} are the constant terms and the error terms respectively.

7.4.2 Data explanation

The study employs Indonesia's aggregate bilateral FDI flows (which include FDI inflows and FDI outflows) to be a dataset of the dependent variable following previous studies as those conducted by Braconier et al. (2005), Bergstrand and Egger (2007, 2013), and Baltagi et al. (2008), where these previous studies used the aggregate FDI flows dataset in their dependent variable. The aggregate bilateral FDI flows (which include FDI inflows and FDI outflows) datasets for a specific country such as Indonesia are difficult to find except from the UNCTADStat database. Nevertheless, the UNCTADStat database is not regularly updated. Thus, the data of bilateral FDI flows (inflows and outflows) at the current prices between Indonesia and its partner countries are limited from 2004 to 2012. Hence, the data from the UNCTADStat is the best data source to serve our KPC model estimation.[134] These datasets cover 42 countries that are Indonesia's FDI partners (inflows and outflows) from 2004 to 2012.[135] In addition, this study cannot employ the data relating to Indonesia's bilateral FDI per sectors (i.e., the agriculture and manufacturing sectors) to be a dataset of the dependent variable in this study's KPC model, since these types of dataset, especially for Indonesian FDI flows case, are almost impossible to find. To support our argument, this study has checked on several sources, i.e., the Bank of Indonesia (BI) database, the Indonesian Investment Coordinating Board (BKPM) database, and the UNCTADStat database, but none of these types of data are available.

The World Development Indicator (WDI) compiled by the World Bank makes available the datasets of GDP, GDP growth, trade openness, urban population, education and access to electricity. The WDI also provides the datasets of education (primary and secondary), tertiary (higher) education data, and gross fixed capital formation (constant 2010 USD). These datasets are used to construct the variable of unskilled labour endowment ratio (u_{ijt}), skilled labour endowment ratio (h_{ijt}), and physical capital endowment ratio (k_{ijt})

[134] The study also uses the OECD bilateral FDI database, the APEC bilateral FDI database, and the ASEAN bilateral FDI database to verify and to complete our UNCTADStat dataset of Indonesia's bilateral FDI flows.
[135] See Appendix 7.1 for the list of country of the KPC model. According to the UNCTADStat database, the data of Indonesia's aggregate FDI flows covers around 20% of the world economies where there are 206 countries listed in the UNCTADStat database during 2004-2012.

respectively. The study also takes three indicators of indexes from the Global Competitiveness Index (GCI) developed by the World Economic Forum into account. First, the percentage of the corporate tax rate is retrieved from the GCI database. The study combines these corporate tax rates datasets from the GCI with tax rates dataset from the WDI database. The indexes of antimonopoly policy and property rights protections are also collected from the GCI.[136]

The International Country Risk Guide (ICRG) provides the datasets of government stability, investment risks, corruption (as a proxy of good governance), law and order, and bureaucracy quality. The government stability and the investment risks indexes have a maximum score of 12 points (very low risk) and a minimum score of 0 points (very high risk). Law and order index and corruption index have a maximum score of 6 points (very low risk) and minimum score of 0 points (very high risk). While the bureaucracy quality has a maximum score of 4 points (very low risk) and a minimum score of 0 points (very high risk). Therefore, these imply that the higher score of the indexes, the better.[137] The data on distance, common land border and colony come from the CEPII database.

It is important to check the possibility of multicollinearity due to correlation among the variables observed. The first is coefficient of correlation, while the second is the variance inflation factor (VIF). According to the coefficients of correlation, there is no perfect collinearity in which the value is 1 nor severe multicollinearity in which the value is above 0.9 (see Table 1 in Appendix 7.4). In addition, the VIF results show that all variables observed are lower than the cut-off point at 10 or VIF < 10 (see Table 2 in Appendix 7.4).[138] Wooldridge (2013) also suggests that the multiple linear regression assumptions allow the independent variables to be correlated each other as long they are not perfectly correlated. While Williams (2015) argues that even severe multicollinearity (as long as it is not perfect) does not violate the OLS assumptions and the estimation results remain unbiased. Table 7.3 displays the summary statistics of the observed variables of our KPC model.

[136] The scale of antimonopoly and property rights indexes is from 1 to 7, which is the higher the index, the less monopoly of the market structure, and the higher property protection respectively.
[137] All datasets above are available at https://epub.prsgroup.com/products/icrg-historical-data. We also provide the list of the variable definitions in Appendix 7.3.
[138]The variance inflation factor (VIF) quantifies the severity of multicollinearity in an OLS analysis. The VIF provides an index that measures how much the variance (the square of the estimate's standard deviation) of an estimated regression coefficient is increased because of collinearity. See Torres-Reyna (2007) for a commonly given rule of thumb of VIF.

Table 7.3 Summary statistics of the variables observed in the KPC model

Variable	Units	Obs	Mean	Std.Dev	Min	Max
Indonesia's FDI flows at the current prices	Million USD	723	156.21	661.23	0	8514.13
Sum GDP	Trillion USD	756	1.73	2.45	0.28	17.1
Similarity	Ratio	756	0.17	0.07	0.017	0.25
Distance	Kilo meters	756	9145.91	4414.65	886.14	19276.41
Skilled ratio	Ratio	678	1.38	1.35	0	5.73
Unskilled ratio	Ratio	673	1.31	2.04	-0.05	27.88
Physical capital ratio	Ratio	756	3.81	9.14	0.01	89.14
Government stability	Index [0,12]	756	7.75	1.29	4.04	11.5
Investment risk	Index [0,12]	756	9.19	1.82	5.08	12
Good governance	Index [0,6]	756	3.04	1.17	1	6
Law and order	Index [0,6]	756	3.76	1.14	1.04	6
Bureaucracy	Index [0,4]	756	2.55	0.81	1	4
Border	Dummy [0, 1]	756	0.02	1.52	0	1
Colony	Dummy [0, 1]	756	0.02	1.52	0	1
GDP growth	%	756	4.51	2.97	-14.72	15.24
Education	School enrolment (% gross)	699	0.99	0.02	0.85	1.09
Trade openness	Total trade (import plus export) to GDP in %	756	66.8	51.42	18.46	398.43
Urban Population	% of total population	756	54.89	18.69	8.79	100
Corporate tax rates	%	746	42.42	12.78	16.8	116.8
Utility infrastructure (electricity access)	% of population	756	94.35	7.31	40.6	100
Anti-monopoly policy	Index [1,7]	756	4.75	0.634	2.82	6.12
Property right enforcement	Index [1,7]	750	5.72	1.68	1.94	9.61

7.4.3 Estimation strategy

To estimate the first model (equation 7.5), this study uses random effects (RE) and fixed effects (FE). Since our panel data suffer from heteroskedasticity and autocorrelation (see Point A in Appendix 7.4), clustering by host country when estimating standard errors would help to reduce this bias.[139] In that manner, a consistent estimate can be accordingly aimed for. Another estimator such as the feasible generalised least square (FGLS) is employed to properly address the problem of heteroskedasticity and autocorrelation, by giving a weighted heteroskedasticity and autocorrelation or AR (1) to the observed variables in the main model. This technique is substantially undertaken in order to obtain a consistent and efficient estimate. This study expects that the FGLS estimator would have better estimation than the RE and the FE models. To overcome omission bias due to in the presence of a third country factor that represents the rest of the world, this study uses time fixed effects to control the third country factor in panel data setting as suggested by Bergstrand and Egger (2013). The use of panel data also helps to reduce omitted variables bias due to country-specific heterogeneity effects following Baltagi (2005).

[139] See Torres-Reyna (2007) for detail.

The subset of Indonesia's bilateral FDI flows dataset as the dependent variable comes with zero and negative FDI flows. However, this study only uses a positive value of Indonesia's bilateral FDI flows following Wagle (2010).[140] We treat negative FDI flows by giving them absolute values. However, our FDI data still contains zero (and missing) observations. To keep zero (and missing) observations, we add a constant, following Yeyati et al. (2007).[141] Therefore, our dependent variable becomes $ln(1 + absolute\ FDI_{ijt})$. Although the results of this strategy have shown to be inconsistent in the gravity model for trade (see Chapter 6), the earlier empirical works of the gravity model for FDI revealed the opposite where the results were relatively consistent (Yeyati et al., 2007; Daude and Stein, 2007; Guerin and Manzocchi, 2009).

As mentioned above, we expect that the variables of $SumGDP_{ijt}$ and $Similarity_{ijt}$ are positive and significant following Bergstrand and Egger (2007, 2013) and Baltagi et al. (2008), suggesting the presence of horizontal FDI. The role of distance is essentially unclear as to whether it captures trade costs or investment costs (Carr et al., 2001). The distance result is somehow problematic in terms of the analysis. However, in order to have a proper interpretation, we expect a negative sign for $Distance_{ij}$ following the basic theory of gravity model, that is, distance is an inversely related to with trade/or FDI. We expect that the variable of u_{ijt} is negative (Bergstrand and Egger 2013), suggesting the presence of vertical FDI. Both h_{ijt} and k_{ijt} are expected to have positive signs (Bergstrand and Egger, 2013), suggesting the existence of a horizontal type of FDI.

Since the unit of measurements of our institutional variables is in the index where the higher, the better, therefore all institutional variables such as government stability, investment risks, good governance, law and order and bureaucracy quality should be positive and significant. However, we predict that the sign of border (similar border) and colony (same colony) are positive. We also expect that some of the control variables such as GDP growth, education, urban population, trade openness, and public infrastructure have a positive sign. The corporate tax rate should be negative. As the unit measurements of anti-

[140]As suggested by Wagle (2010), this study uses the negative values of FDI in the dependent variable for robustness check.

[141] Yeyati et al. (2007) explain that adding 1 is equivalent to adding one dollar to FDI flows.

monopoly policy and property rights protection reflect the higher the index, the better it is, we expect that both are positive.

7.5 Empirical results

As noted, Equation (7.5) is estimated using the RE, the FE, and the FGLS models. We estimate the KPC model with different strategies for comparative purposes. We do not provide the pooled OLS results since the Breusch and Pagan test suggests that the RE model is preferred to pooled OLS.[142] In most cases, the FE model is preferred to the RE model if unobserved heterogeneity assumingly has a systematic correlation with any of the explanatory variables. However, the Hausman test in this study indicates that the RE model is preferred to the FE model.[143]

The use of the panel data in our main estimation may induce the potential sources of heteroskedasticity and autocorrelation.[144] Heteroskedasticity might exist due to changing variances between cross-sectional units over time. Autocorrelation arises when error terms within units are serially correlated due to a time series construct. Failure to control both could lead to biased standard error estimates. As a result, the test statistics become invalid, and the precision of the coefficient of estimates would be diminished. Thus, the standard OLS is no longer valid (Wooldridge, 2013) and the FE model to some extent is still inappropriate to counter the problem of autocorrelation (Hansen, 2007 and Hausman and Kuersteiner, 2008).[145] Furthermore, these latter studies suggested the FGLS method to be applied in fixing the problem of heteroskedasticity and autocorrelation by giving a weighted heteroskedasticity and autocorrelation or AR (1) to the observed variables in the main model. For these reasons, we choose the FGLS model to be our preferred model. When we estimate Equation (7.5) with the FGLS model, we find that the FGLS model performs superior to the RE model.[146] Some of the key variables and the control variables are

[142] The OLS estimation results in biased and inconsistent if cross-sectional data is pooled across time given the existence of unobserved effects (Wooldridge, 2013). See Point B in Appendix 7.5 for the Breusch and Pagan test result.
[143] See Point C in Appendix 7.5 for the Hausman test result.
[144] See Point A in Appendix 7.5 for panel heteroskedasticity and autocorrelation tests.
[145] See Hansen (2007) and Hausman and Kuersteiner (2008) for details.
[146] Egger (2008) points out that when a distance variable is correlated with time-invariant unobserved factors (in our case such as border and colony) and other determinants, the use of the RE estimator yields biased. See Egger (2008) for detail.

explained better by the FGLS results. We should also note that the strategy to weight variables observed in Equation (7.5) with heteroskedasticity factors and autocorrelation factors or the AR (1) as applied in the FGLS model could generate efficiency in estimation results. This implies that the FGLS results have lower standard errors than those of the RE model and the FE Model. Table 7.4 compares the results from these three strategies.

The result in columns (3) of Table 7.4 reveals that our key variables such as gravity variables and knowledge-and-physical-capital variables have the expected signs and are statistically significant. The positive signs of economic mass (the sum of GDP) and similar in incomes per capita tend to encourage the type of horizontal FDI in Indonesia's bilateral aggregate FDI flows. Skilled ratio and physical ratio also appear to play a large role in affecting Indonesia's bilateral FDI flows in terms of the horizontal FDI. Our result also suggests that the unskilled ratio's sign is as expected, and its level of significance is supportive of vertical activity in Indonesia's bilateral FDI flows, as expected also. These results are consistent with Bergstrand and Egger (2013) findings.

Some evidence from control variables such as GDP growth, education, trade openness, access to electricity (utility infrastructure), border effects, and colony have a positive impact on Indonesia's bilateral FDI flows. These results imply that these conventional FDI determinants remain significant in explaining Indonesia's bilateral FDI flows. We also find that the anti-monopoly policy factor is significant in influencing Indonesia's bilateral FDI flows.

Table 7.4 FDI determinants in Indonesia's bilateral aggregate FDI flows

Dep.Var: Log of Indonesia's bilateral FDI flows (inflows and outflows)	FE	RE	FGLS
Regressors	(1)	(2)	(3)
Gravity variables			
Log of sum GDP	-1.110**	1.259***	1.874***
	(0.540)	(0.317)	(0.134)
Log of similarity	-0.270	0.822**	0.516***
	(0.577)	(0.336)	(0.127)
Log of distance	-	-0.827***	-0.743***
		(0.301)	(0.127)
Knowledge-and-physical-capital variables			
Skilled ratio	0.191***	0.144***	0.176***
	(0.025)	(0.050)	(0.064)
Unskilled ratio	-0.017	-0.055**	-0.056**
	(0.019)	(0.024)	(0.026)
Physical capital ratio	0.030	0.031*	0.027**
	(0.026)	(0.017)	(0.013)
Institutional determinants			
Government stability	-0.075	-0.069	-0.013
	(0.074)	(0.060)	(0.037)
Investment risk	-0.121	-0.222**	-0.170***
	(0.096)	(0.087)	(0.048)
Good governance	0.157	0.317***	0.312***
	(0.135)	(0.096)	(0.084)
Law and order	0.534	0.378*	0.125
	(0.393)	(0.224)	(0.115)
Bureaucracy Quality	0.528	-0.885**	-0.658***
	(0.776)	(0.404)	(0.181)
Control Variables			
GDP growth	0.034	0.037	0.029**
	(0.024)	(0.024)	(0.014)
Education	8.686*	10.299**	8.627***
	(4.929)	(4.050)	(2.901)
Log of trade openness	-0.191	0.240	1.092***
	(0.650)	(0.312)	(0.240)
Urban	-0.057	-0.011	0.006
	(0.121)	(0.011)	(0.006)
Corporate tax rates	0.010	-0.003	-0.005
	(0.020)	(0.011)	(0.005)
Log of utility infrastructure (Access to electricity)	0.030**	0.015	0.028***
	(0.015)	(0.013)	(0.009)
Anti-monopoly policy	-0.267	-0.242	0.426***
	(0.217)	(0.202)	(0.121)
Property right protection	0.038	0.015	-0.211***
	(0.085)	(0.073)	(0.054)
Border	-	2.600***	3.299***
		(0.861)	(0.583)
Colony	-	2.253***	2.646***
		(0.753)	(0.811)
Constant	21.817	-32.714***	-57.240***
	(18.023)	(7.332)	(5.206)
Year effects	Yes	Yes	Yes
Observations	609	609	607
R-squared	0.196	-	-

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

With respect to institutional measures, Indonesia's bilateral FDI flows is only sensitive to good governance. The good governance sign is positive and significant, as expected. A one-grade increase in the good governance index (or in the higher index) on average raises Indonesia's bilateral FDI by around 37%.[147] This finding confirms the results of previous studies as conducted by von-Luebke (2009) and Lipsey and Sjöholm (2011) and the World Economic Forum's (2017) survey, in which the low level of good governance or corruption discourages Indonesia's FDI flows. Nevertheless, the results of investment risks and bureaucracy quality are not as expected. This could be due to the coefficients of both estimations containing the effects of both FDI inflows and FDI outflows. That is, we could not explain whether the outflow effect dominates the inflow effect, or vice versa.

In order to understand this aspect better, we conduct a simple regression with longer observation of cross-sectional countries and time. In this regard, we regress the following equation:

$$lnFDI_{ijt} = \alpha_1 + \gamma_k Institution'_{jt} + \delta_1 Indonesia + \vartheta_k (Indonesia * Institution'_{jt}) + \beta_k Control'_{jt} + \theta_t + \varepsilon_{ijt} \quad (7.6)$$

Since we only focus on the examination of institutional measures by using an additional equation (7.6), the dependent variable dataset is now varied from Indonesia's bilateral aggregate FDI flows to Indonesia's net inflows (FDI inflows minus FDI outflows). This strategy is necessary since we would like to provide an alternative analysis in regards of the institutional determinants of Indonesia's FDI flows.

$Institution'_{jt}$ is the same as in the KPC model where we include government stability, investment risks, good governance, law and order and bureaucracy quality in index at time t. $\delta_1 Indonesia$ is a country dummy variable of Indonesia, coded one if Indonesia as a dummy country, and zero otherwise. The variables in $Indonesia * Institutional'_{jt}$ are the interaction terms between the variable of Indonesia in dummy and institutional measures as noted above. These interaction variables allow the slopes to differ such that the coefficients tell us how much higher (or lower) the slope for Indonesia is.

[147] The value of 37 % is calculated as $exp(0.312 - 1)$ following Wei (2000). The value of 0.312 is the coefficient of estimate of the good governance variable (column 3).

$Control'_{jt}$ is the vector of time-varying control variables such as economic factors, policy related to FDI flows factors, and public infrastructure factor in the host countries at time t. Some control variables and their explanations are similar to the main model such as GDP growth, education, and urban population. Since the dataset of the dependent variable now uses Indonesia's FDI net inflows, we add additional control variables in equation (7.6) by including GDP per capita, inflation, real interest rate, and population. GDP per capita captures the level of income in the host country. The level of inflation is considered a proxy of macroeconomic stability. Real interest rates represent the cost of capital in the host country. Population captures the market size in the host country. We also keep utility (public) infrastructure, but we replace the access to the electricity variable with a mobile phones factor. θ_t is time fixed effect. α_1 and ε_{ijt} are the constant and error terms respectively.

On the other hand, the application of an additional estimation as specified above leads to change in the panel data structure. Our panel data now covers more countries (125 countries) with longer observations than the main model, from 1984 to 2016.[148] Then, we test for multicollinearity of the panel data[149] and find no serious multicollinearity among the variables observed (see Table 2 and Table 4 in Appendix 7.4).[150] Again, we apply the FGLS estimator (the same as the main model) for efficiency purpose.[151]

Table 7.5 shows that the signs of investment risks, good governance, and bureaucracy quality practically flip. When we use FDI net inflow as our dependent variable in our additional estimation, the signs of these two variables turn out to be expected, i.e., better investment risks and better bureaucracy are associated with higher net inflow to Indonesia. That might indicate that in the case of investment risks and the bureaucracy quality in the main model results, the outflow effect outweighs the inflow effect; that is, when investment risks and the bureaucracy quality of other countries are relatively better (or even equal) to

[148] See Appendix 7.1 for the list of country of estimating equation (7.6). See Appendix 7.2 for data sources and Table 1 in Appendix 7.2 for the summary statistic of the variables observed of estimating equation (7.6).
[149] To reduce the multicollinearity effects, we subtract each institutional variable with their means or use a centering technique. We then interact them with Indonesian dummy following Allison (2012).
[150] After subtracting all interaction variables with their means, we then test multicollinearity by using two technique (i.e., coefficient of correlation and the variance inflation factor or VIF). According to the coefficient of correlation result, no any perfect collinearity (the value is 1) and severe multicollinearity (we assume the value is around 0.9) are found. The VIF results of variables observed show below 10, accordingly complied with the cut-off point of the VIF in which the value of VIF should be below 10.
[151] See Appendix 7.2 for the estimation strategy of estimating equation (7.6).

Indonesia's, the FDI flows more outwardly than inwardly (hence the negative signs of these two variables in the main estimation). This finding is consistent with Lipsey and Sjöholm (2011) that investment climate (risk) is an important factor in driving FDI flows in Indonesia. Our evidence also confirms the argument of von Luebke (2009), Pardede and Zahro (2017), and Prospera (2019) that improvement in Indonesia's bureaucracy can help Indonesia to enhance its FDI flows.

Table 7.5 FDI determinants in Indonesia's FDI net inflows

Dep. Var: log of FDI net flows	
Regressors	FGLS
Institutional variables (Indonesia)	
dIndonesia*Government stability	-0.143
	(0.116)
dIndonesia*Investment risk	0.350**
	(0.140)
dIndonesia*Good governance	-0.430*
	(0.254)
dIndonesia*Law and order	0.392
	(0.297)
dIndonesia*Bureaucracy	0.797**
	(0.363)
Year effects	Yes
Observations	1,161
R-squared	-

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
Note: For the complete estimation result, see Table 2 in Appendix 7.2.

Another key issue to be concerned with is that the good governance factor now has a significant negative sign of coefficient. This result implies that the low level of good governance (or the high level of corruption) encourages more FDI net inflows into Indonesia. This finding essentially confirms Lipsey and Sjöholm's (2011) argument that corruption in most East Asian countries including Indonesia seems paradoxical where a vast amount of FDI flows and relatively high corruption occur at the same time due to cheap labour inputs and to access to large markets. Kuncoro (2004) argues that corruption in Indonesia could induce more costs of doing business but these costs are essentially predicted and calculated by firms and treat them as part of transaction costs. In such cases, corruption has a role in increasing economic growth (Huntington, 1968 and Mauro, 1995), and at the same time also in increasing the amount of investment (Mauro, 1995). In sum, it is possible that Indonesia might the experience circumstance in the literature known as the efficient grease hypothesis (Huntington, 1968 and Kaufmann and Wei, 1999) in which corruption as 'grease money' may help firms to reduce burdens associated with government regulations and time delays to get permits.

7.6 Robustness check

For the robustness check, we apply three different strategies. Firstly, we account for negative values of Indonesia bilateral FDI flows. Yeyati et al. (2007) suggest that negative FDI flows may also convey important information for the issue under consideration. Secondly, to test for sensitivity of the findings, alternative variables have been experimented with, including using the world governance indicator (WGI) index instead of the ICRG index as the institutional measures of FDI. Thirdly, we assume that the FDI flows dynamically. This is due to the FDI flows being significantly associated with multi-year investment projects (Hayakawa et al., 2013). Therefore, the amount of FDI might vary from year to year. Given this assumption, the dynamic estimation such as the system generalised method of moments (GMM) by Blundell and Bond (1998) might be more appropriate than the static model.

7.6.1 Accounting for negative FDI flows

Since we have estimated the KPC model by using the absolute value (or the positive value) of Indonesia bilateral FDI flows, for the robustness check now, we account for all of them (including the negative values) to check the consistency of our main results. As discussed above, adding one (or a constant) to FDI flows is widely used in the FDI literature in order to keep zero (and missing) observations.[152] In that manner, they are easily taking logs. Yeyati et al. (2007) point out that when the values of FDI flows are large, $ln(1 + FDI_{ijt}) \approx \ln FDI_{ij}$, and in this case, the regression coefficient can still be interpreted as elasticities. However, for the small values of FDI flows, this transformation can be translated as semi-elasticity.[153] However, this could be problematic when the negative values of FDI flow are taking logs. In overcoming this, Yeyati et al. (2007) develops a new equation of retaining all values of FDI flows as follows:

$$LnFDI_{ijt} = sign\left(FDI_{ijt}\right) * \log\left(1 + \left|FDI_{ijt}\right|\right) \quad (7.7)$$

This transformation as equation (7.7) defines zero (and missing) observations and negative FDI flows, which behave like $\log\left(FDI_{ijt}\right)$ for $FDI_{ijt} \gg 0$ and like $-\log\left(-FDI_{ijt}\right)$ for

[152] Yeyati et al. (2007) explain that adding one is equivalent to adding one dollar to FDI flows.
[153] See Yeyati et al. (2007) for details.

$FDI_{ijt} \ll 0$. Thus, we follow equation (7.7) to account for all values in our FDI datasets.[154] In addition, we still use the FGLS model for the estimation method.

The results of the robustness check (see Table 1 in Appendix 7.6) shows that our key knowledge-and-physical-capital variables have lost their significance. This is different from the previous literature, particularly Bergstrand and Egger (2013), where these variables should have expected signs and be significant. In that sense, our robustness estimation might become inconsistent, leading to bias.[155]

7.6.2 Using an alternative proxy of institutional variables

In the second robustness check, our concern is only to change institutional variables of FDI in our main model by using the WGI index, while others remain the same. This is important to ensure the consistency of our main results in terms of institutional determinants of FDI. Some of the WGI indexes offer almost similar proxies for the ICRG index, except for the investment risks. As our observed samples of the robustness check the source from the WGI index, we then take political stability, good governance, the rule of law, and government effectiveness into account. These variables replace institutional variables in the ICRG index such as government stability, good governance, law and order, and bureaucracy quality respectively.[156] For estimation, we keep the FGLS model to use. The positive FDI values of the dependent variable are still employed, which is the same as done for the main model's estimation strategy. The results show that the use of different institutional variables with different units of measurement (in indexes) leads to the low level of efficiency (higher standard error) of estimation (see Table 2 in Appendix 7.6). As a result, this reduces the magnitude of the gravity variables, the knowledge-and-physical-capital variables, and some

[154] Previous studies that also using Yeyati et al.'s (2007) technique as equation (7.7) are Daude and Stein (2007) and Guerin and Manzocchi (2009).

[155] Wagle (2010) also accounts for negative values of FDI in his robustness check. The results show that the magnitude of key variables of the main model is significantly decreased, especially for the key gravity variables (See Wagle, 2010 for details). However, we could not whether to confirm or to compare our robustness result with Wagle's as we use a different model and estimator (Wagle uses the Probit estimator in his robustness check).

[156] See Kaufmann et al. (2010) for the definition of political stability, corruption, rule of law, and government effectiveness. The scale of for all indicators in the WGI index is ranging from approximately -2.5 (weak) to 2.5 (strong).

control variables. A low level of efficiency in robustness estimation also leads to none of the institutional variables being significant.

7.6.3 Dynamic estimation

A key aspect of the dynamic panel data model is the existence of the lagged dependent variable in the right-hand side (RHS) of equation. This reflects how the value of the dependent variable in the previous year is a predictor for the current value of dependent variable. However, this technique comes at the cost of endogeneity where the lagged the dependent variable in the RHS of equation correlates with the unobserved time-invariant heterogeneity (or panel level effects) in the composite error terms. For this reason, the use of static estimators such as the OLS model might be biased, while the FE model would yield the Nickell bias (1981).[157] To fix this problem, instrumental variables are required. The system GMM model following Blundell and Bond (1998) will create a set of moment conditions that provide potential valid instruments. At the next stage, these valid instruments play a crucial role in producing a consistent estimate.

Table 3 (Appendix 7.6) shows that our dynamic robustness estimation is correctly specified. In this case, our robustness model passes the two necessary conditions as suggested by Arellano and Bond (1991). Firstly, the *p-value* of Hansen *J*-test implies that the *null* hypothesis is accepted, resulting in 41 instruments as a group that serve as valid instruments for our dynamic model. Secondly, there is no evidence of serial correlation in the second order of the first-differenced errors, reflecting the consistency of our robustness estimation model. The lagged value of Indonesia's bilateral FDI flows shows a positive and highly significant effect at 1 %. However, we find that most of the key variables and control variables lose their significance. Although the coefficient of estimates is consistent based on

[157]The basic dynamic specification takes the following form: $y_{it} = \alpha y_{i,t-1} + \beta x'_{it} + \mu_{it}$ for *i* = 1,...,N and *t* = 3,…,T, contains the composite error terms, that is $\mu_{it} = \eta_i + \upsilon_{it}$, where μ_{it} is the composite error term; η_i denotes the unobserved time-invariant heterogeneity (or panel level effects); and υ_{it} the random disturbance term. In this case, both η_i and υ_{it} are assumed to be independent of each other and among themselves. If this basis dynamic specification is estimated using the OLS, the endogeneity bias comes up through $E(y_{i,t-1} \mid \eta_i) \neq 0$. On the other hand, the Nickell bias (1981) points out that when the FE model is employed to estimate the dynamic panel data with the small *T* (time series) and tends to be fixed; and large *N* (individuals) and tends to be infinity-explanatory variables in the RHS of the equation cannot be distributed independently of the error terms. Therefore, the FE technique fails to account for the endogeneity problem in the dynamic panel model even after transformation. See Nickell (1981) for details.

the Hansen *J*-test and the serial correlation test, this study suspects that these alterations are the results of the conversion to the dynamic setting.

7.7 Conclusion and policy implication

This chapter has used econometric analysis to probe the determinants of FDI flows in Indonesia. The estimation is based on the KPC model, where the relative bilateral market sizes and the relative bilateral factor endowments play a central role in revealing proper FDI determinants of Indonesia's FDI flows. The role of the FGLS estimator is central in our main model estimation. This model can yield a consistent result as well as be efficient in estimation compared to other estimators as discussed above. A series of robustness checks suggests that our main results are consistent.

The results show that the type of vertical FDI co-exists with the type of horizontal FDI in Indonesia's bilateral aggregate FDI flows. However, horizontal FDI activity appears to be dominant. This can be explained by the significance effects with the positive signs of the market sizes (the total GDP of both countries and similarity in incomes per capita) and the relative factor endowments (the skilled ratio and the physical-capital ratio), while vertical FDI type in Indonesia's bilateral FDI could be only explained by one variable, that is, the significant effect of the unskilled ratio variable with a negative sign of coefficient.

We confirm that institutional factors play an important role in affecting Indonesia's FDI flows. Evidence implies that Indonesia's bilateral FDI flows are sensitive to the level of good governance. We note that our KPC model is robust but some key institutional variables such as investment risks and bureaucracy quality fail to achieve expected signs, although they are significant. In order to understand this aspect better, we estimate a simple additional regression with a different structure to the data. Both factors have a positive impact on Indonesia's positive net inflows, as expected. However, the factor of good governance turns out to be negative and significant. This finding suggests that Indonesia might experience an efficient grease hypothesis in which corruption as 'grease money' may help firms to avoid the red tape of bureaucracy. Another important finding is that the performance of Indonesia's bilateral FDI flows essentially predictable. A higher FDI level in Indonesia is concordant with FDI determinants in terms of macroeconomic factors, open policy factors, and utility infrastructure factors.

Policy implications can be drawn based on our evidence as follows. First, the domination of horizontal FDI in Indonesia's bilateral aggregate FDI flows might indicate that Indonesia still is not involved much in GPNs. However, the type of horizontal FDI remains important in keeping Indonesia's economy opening to foreign firms that prefer to access Indonesia's large markets with majority ownerships. But If the country wishes to take advantage of GPNs, it needs to encourage more vertical FDI. Vertical FDI and trade are complimentary, so then an increase in vertical FDI increases trade, particularly trade in intermediate goods. In addition, vertical FDI is crucially needed by Indonesia for employment purposes. Deepening the engagement with GPNs is a key factor for Indonesia's integration into the regional and the global economies. Second, strengthening Indonesia's institutions can help to raise Indonesia's bilateral aggregate FDI flows. Third, lowering risks in investment and having better quality in bureaucracy help to increase Indonesia's net FDI inflows. Fourth, Indonesia should maintain its macroeconomic factors, expand its open policy strategy, and improve its utility infrastructure, as their role remains important in increasing FDI activity in Indonesia.

Our caveat is that the panel data we use in the KPC model has limited observations in terms of time (2004-2012). In future research, the use of updated and longer observations (if available) is strongly suggested in order to get a better estimation. In addition to this study caveat, we do not include an analysis of the export platform FDI. Thus, it is suggested to incorporate the examination of Indonesia's export platform FDI in future research in order to get a better analysis.

Chapter 8: Conclusion

8.1 Summary

Indonesia has been gradually integrating itself with the global economy over the last three decades. In the early years of opening up its economy, Indonesia undertook unilateral liberalisation in the 1960s. In this period, most reforms were conducted voluntarily in the attempt to open the economy to the world and thus gain the benefits of more integration. As a result, some structural changes in the economy took place.

The unilateral reforms not only helped Indonesia out of crisis when the oil boom ended in 1982/1983 and when the Asian financial crisis hit the country in 1997/1998, but these reforms also improved Indonesia's economy in general. Indonesia's integration into the global economies further enlarged as the nation actively participated in establishing the AFTA in 1992 and in founding the APEC in 1994. In addition, Indonesia also embraced multilateral integration by joining the GATT in 1950 and has had automatic membership of the WTO since its establishment in 1995. Engaging with various economic integration schemes can help Indonesia to realize its comparative advantage, to take advantage of its specializations, and to reform its economy. Economic integration can also reduce Indonesia's trade costs, as it has a significant role in bringing down Indonesia's tariffs.

While Indonesia's tariffs have declined, its non-tariff measures (NTMs) have significantly increased (see Chapters 1, 2, 5 and 6). As a result, the overall level of trade protection in Indonesia has risen. When the global commodity boom ended in 2012, the number of NTMs in Indonesia was pronounced, especially during 2012-2015 (Chapter 5). This study also recognizes the importance of trade facilitation for promoting global trade flows (see Chapters 2, 3 and 5). The lack of trade facilitation such as a lack of infrastructure, poor institutions, and bad regulations can lead to higher trade costs. In the case of Indonesia, the quality of its trade facilitations has been seemingly low. The increasing number of NTMs and the low level of trade facilitation in Indonesia contribute to driving down Indonesia's trade flows, and at the same time, constrain Indonesia's further integration into the regional and the global economies.

Economic integration should not only expand Indonesia's trade flows but it also plays a significant role in transforming investment regime in Indonesia to be more open (see Chapters 1, 2 and 7). The contribution of FDI to Indonesia's economy is large. FDI brings more jobs to the country, improves the technology of production, increases labour wages and labour productivity in manufacturing sectors, and expands Indonesia's trade flows especially through regional and global production networks. FDI is also the engine of Indonesia's economic growth since FDI can help Indonesia in aiming a higher level of development.

There are two types of FDI, namely horizontal FDI and vertical FDI (Chapters 3 and 7). Each type has different motivations and characteristics. Horizontal FDI is motivated by a market-seeking objective and is typically characterized by capital-intensive investments. On the other hand, vertical FDI seeks low cost inputs in production. This latter type of FDI helped spark global production networks (GPN)s where foreign firms can fragment their part of production to different countries. Even though Indonesia is one of the largest emerging economies in the world and the largest country in the Southeast Asia, its FDI flows appear to underperform given its economic size and resources (Chapter 7).

This study addresses three main questions. The first, What are the impediments to Indonesia's trade flows? These impediments can be encountered and experienced either at-the-border or behind-the-border. Therefore, the first research question is being framed to address impediments at the Indonesian border (at-the-border barriers) and behind the Indonesian border (behind-the-border barriers). The second research question is, Does trade protection applied to Indonesia's manufacturing products have an impact on its export performance in manufacturing sectors? The third research question is, What factors determine foreign direct investment (FDI) flows in Indonesia?

The gravity model has been a workhorse model in this study and it has been largely employed to answer the main questions. The conceptual framework of the trade model and the FDI model has also been developed from the gravity equation (Chapter 3). The theoretical foundations of the gravity equation in the trade literature (since Tinbergen firstly introduced this equation in 1962) were finally established when Anderson and van Wincoop (2003, 2004) elaborated the multilateral resistance (MR) factors into the gravity model. The

MR factors are trade between the two countries (or bilateral trade flows) that depend on the third country factor (in this case is the rest of the world). The Gravity equation can also be applied to the FDI analysis. The knowledge-capital (KC) model and the knowledge-physical-capital (KPC) model are essentially the FDI models derived from the gravity equation.

Chapter 4 extended the gravity models for trade and FDI in the case of Indonesia based on the conceptual framework of the gravity model in Chapter 3. In this chapter, several proper estimation methods were used and played a significant role in overcoming bias associated with endogeneity problem. For instance, The MR factors are explicitly included in the empirical trade model and accompanied by bilateral pair fixed effects (to reduce self-selection or omitted variables bias due to the inclusion of the FTA variable in the RHS of equation). The inclusion of these factors was shown to be important in explaining trade impediment effects on Indonesia's aggregate trade flows (Chapter 5). The potential problem of bias was also found in our empirical trade model due to the use of the panel data structure. This was done by the careful choice of estimator namely, the feasible generalized least squares (FGLS). The FGLS method properly accounts for heteroskedasticity and autocorrelation within a panel, resulting in the lowest standard errors compared to the OLS and the FE model (Chapter 5). The FGLS estimation results in Chapter 5 were also found significantly to explain the effect of the key gravity variables and the study's variables of interest (in this case the trade impediment factors) on Indonesia's aggregate trade flows.

Our empirical trade model also deals with the frequent zero trade flows due to the use of disaggregated trade data in panel (Chapter 4 and 6). The Pseudo-Poisson Maximum Likelihood (PPML) method was used as this estimator treats zero trade flows of the dependent variable in the gravity model in levels rather than in logs. This method is also consistent in the presence of heteroskedasticity. We have estimated a gravity model for disaggregated trade data of Indonesia's manufacturing exports in Chapter 6. The result has shown that the PPML method played an essential role in reducing the effect of sample selection bias and the method produced consistent estimates as expected.

The gravity equation can also be modified in modelling the FDI flows. One of these approaches is the Knowledge-Physical-Capital (KPC) model introduced by Bergstrand and

Egger (2007, 2013). The KPC model has vigorous, theoretical underpinnings, derived from the theory of the firm (Chapter 4). The role of the FGLS estimator is central in estimating our KPC model in Chapter 7. The FGLS estimator produced a consistent result as well as an efficient result compared to other estimators such as the FE and the RE estimators.

Chapter 5 answered the first research question. The FGLS method estimated the main gravity model with the MR factors. The results showed that a combination of trade impediments such as trade protection (import tariffs and NTMs) and TFMs significantly affect Indonesia's aggregate trade flows. Furthermore, reductions in import tariffs, improvement in seaports, and reduction in time to trade at-the-border barriers increase Indonesia's aggregate trade flows, while behind-the-border barriers to trade such as local content requirements, poor container transport (land transport) and maritime transport (shipping) also play an important role in affecting Indonesia's aggregate trade flows.

The study also found that the effect of local content measures is greater than import tariffs. This result implies that the main problem of Indonesia's aggregate trade flows increasingly emerges from behind-the-border NTMs. In addition, evidence showed that an improvement in trade facilitation at-the-border is more important than an improvement in trade facilitation behind-the-border. We can thus conclude that behind-the-border barrier NTMs are more harmful to Indonesia's trade flows than tariff measures and the at-the-border barrier NTMs, while reforms of the at-the-border barrier trade facilitation give more positive effects than reforms of the behind-the-border barrier trade facilitation.

The second research question was addressed in Chapter 6. The use of disaggregated panel data of Indonesia's manufacturing export flows at the HS-6 digits from 2012 to 2015 involved a significant portion of zero trade flows. Hence, the PPML method is needed to estimate the gravity model. The results showed that the PPML method played an important role in overcoming bias associated with the frequent number of zero trade flows. Treating the dependent variable as levels instead of logarithms could indeed reduce sample selection bias. The finding shows that the imposition of Indonesia's NTM policies to its manufacturing products is negatively associated with its manufacturing exports. Indonesia's export measures applied to its export products in manufacturing sectors such as export taxes, export quotas, and export licencing requirements were dominant over this period and were

significantly lowering Indonesia's manufacturing exports on average by 78%, 33%, and 21% respectively.

We revealed the answer to the third research question in Chapter 7. The determinants of FDI flows in Indonesia were examined using a model of FDI derived from the gravity equation, namely the Knowledge-Physical-Capital (KPC) model. To support the KPC model, a panel data structure in the form of Indonesia's bilateral aggregate FDI flows (both FDI inflows and FDI outflows) has been employed. Institutional factors are also included in the KPC model to assess how institutional factors in Indonesia influence Indonesia's FDI flows. Our KPC model also accounts for the third country effect that represents the rest of the world and was shown to be important in explaining Indonesia's FDI flows. The main results suggest that market sizes and relative factor endowments appear to be strong determinants of Indonesia's aggregate FDI flows, especially for its horizontal type relative to its vertical type. With respect to institutional measures, Indonesia's bilateral FDI flows are negatively influenced by the low level of good governance. In addition to the conventional determinants of FDI, the results have shown that macroeconomic factors, open policy factors, and utility infrastructure factors were positively associated with Indonesia's bilateral FDI flows.

This study makes a significant contribution in understanding the progress of Indonesia's integration into the regional and the global economies based on the examination of trade protection, the quality of trade facilitation, and the types of FDI flows in Indonesia. The results have revealed that the level of Indonesia's trade protection is still relatively high due to the significant number of NTMs, while at the same time, the quality of its trade facilitation is relatively low. Both problems may constrain Indonesia in integrating its economy to the regional and the global economies. In addition, it seems that horizontal FDI in Indonesia is more pronounced than vertical FDI. The implication of this is that Indonesia's participation in the global production networks is not significant.

8.2 Policy implications

Indonesia has liberalized its economy since the late of 1960s. Although the implementation of liberalization in Indonesia was not consistent, and occasionally shifted to a more protective policy, Indonesia still has made significant reforms (see Chapters 1, 2 and 7). For

example, tariffs on trade have been reduced and restrictions on investment have been eased. In addition, being involved in the various platforms of economic integration (AFTA, APEC, WTO, bilateral free trade and unilateral integration) played a key role in facilitating the continuous reforms of Indonesia's trade and FDI. Thus, these reforms positively affected the performance of Indonesia's trade and FDI over the last four decades. These reforms have also elevated Indonesia's economy to the next stage, that is it has integrated further into the regional and the global economies.

While tariffs have been lower, NTMs in Indonesia have become higher, and at the same time, some of Indonesia's trade facilitation is still lacking (Chapter 5). Thus, policies especially those towards a reduction in NTMs as well as an improvement in trade facilitations are crucial for Indonesia's trade expansion. The policy should focus on reducing NTMs behind-the-border (such as local content requirements) and improving trade facilitations at-the-border (such as better customs services).

Evidence of Indonesia's export NTMs affecting its manufacturing exports was found in Chapter 6. Policy implications of this finding are that reforms in export measures are urgently required because these reforms can increase Indonesia's manufacturing exports. But reforms in Indonesia's export NTMs would be significant in fostering its manufacturing exports if these are accompanied by policies that can strongly push Indonesia to further engage with GPNs. The role of GPNs is important for Indonesia in increasing its trade in intermediate goods, especially intermediate goods in manufacturing sectors.

When horizontal FDI appears more dominant than vertical FDI, there are some implications for Indonesia's economy (Chapter 7). First, Indonesia is still not involved much in GPNs. Second, as consequence of the first, foreign firms investing in Indonesia were mainly attracted by accessing Indonesia's large market. At the same time, Indonesia's firms investing abroad were motivated by access the new foreign markets. Third, if the country wishes to take advantage of GPNs and deepening its integration into the regional and the global economies, Indonesia needs to encourage more vertical FDI. With regards to institutional determinants, improving Indonesia's institutions especially towards good governance can help to increase Indonesian bilateral FDI flows. Finally, lowering risks in

investment and improving the quality of bureaucracy help to increase Indonesia's net FDI inflows.

8.3 Limitations of the study and future research

The analysis based on the estimation of Indonesia's aggregate trade flows in this study (Chapter 5) could not significantly explain the effect of trade impediments at the sectoral level and products level. For future research, it is strongly suggested to use the disaggregation of Indonesia's trade data in order to have an in-depth investigation on the effects of impediments to Indonesia's trade flows on the sectoral level and products level. The analysis in Chapter 6 only focuses on the impact of Indonesia's export NTMs on its manufacturing export goods. Accounting for the effects of Indonesia's import NTMs on its manufacturing imports in future research would be interesting. This further study could improve the analysis of Indonesia's trade impediments. Limitations of the analysis in Chapter 7 are that the panel data used in the KPC model has limited observations in terms of time (2004-2012). We also do not include an analysis of the export platform FDI. The use of updated observations (if available) and providing the examination of Indonesia's export platform FDI in further study would be of interest.

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Appendix 5.1. List of Indonesia's Trade Partners

1	Afghanistan	45	Denmark	89	Latvia	133	Russian
2	Albania	46	Djibouti	90	Lebanon	134	Rwanda
3	Algeria	47	Dominican Republic	91	Lesotho	135	Samoa
4	Andorra	48	Ecuador	92	Liberia	136	Sao Tome and Principe
5	Angola	49	Egypt	93	Lithuania	137	Saudi Arabia
6	Antigua and Barbuda	50	El Salvador	94	Luxembourg	138	Senegal
7	Argentina	51	Equatorial Guinea	95	Macao, China	139	Serbia
8	Armenia	52	Estonia	96	Macedonia	140	Seychelles
9	Australia	53	Ethiopia	97	Madagascar	141	Sierra Leone
10	Austria	54	Fiji	98	Malawi	142	Singapore
11	Azerbaijan	55	Finland	99	Malaysia	143	Slovakia
12	Bahamas	56	France	100	Maldives	144	Slovenia
13	Bahrain	57	Gabon	101	Mali	145	Solomon Islands
14	Bangladesh	58	Gambia	102	Malta	146	South Africa
15	Barbados	59	Georgia	103	Marshall Islands	147	Spain
16	Belarus	60	Germany	104	Mauritania	148	Sri Lanka
17	Belgium	61	Ghana	105	Mauritius	149	Sudan
18	Belize	62	Greece	106	Mexico	150	Suriname
19	Benin	63	Grenada	107	Micronesia	151	Swaziland
20	Bhutan	64	Guatemala	108	Moldova	152	Sweden
21	Bolivia	65	Guinea	109	Mongolia	153	Switzerland
22	Bosnia and Herzegovina	66	Guinea-Bissau	110	Montenegro	154	Taiwan
23	Botswana	67	Guyana	111	Morocco	155	Tajikistan
24	Brazil	68	Haiti	112	Mozambique	156	Tanzania
25	Brunei	69	Honduras	113	Myanmar	157	Thailand
26	Bulgaria	70	Hong Kong, China	114	Namibia	158	Timor-Leste
27	Burkina Faso	71	Hungary	115	Nepal	159	Togo
28	Burundi	72	Iceland	116	Netherlands	160	Tonga
29	Cambodia	73	India	117	New Zealand	161	Trinidad and Tobago
30	Cameroon	74	Iran	118	Nicaragua	162	Tunisia
31	Canada	75	Iraq	119	Nigeria	163	Turkey
32	The Central African Republic	76	Ireland	120	Norway	164	Turkmenistan
33	Chad	77	Israel	121	Oman	165	Tuvalu
34	Chile	78	Italy	122	Pakistan	166	UEA
35	China	79	Jamaica	123	Palau	167	Uganda
36	Colombia	80	Japan	124	Panama	168	Ukraine
37	Comoros	81	Jordan	125	Paraguay	169	United Kingdom
38	Congo, Rep	82	Kazakhstan	126	Peru	170	Uruguay
39	Costa Rica	83	Kenya	127	Philippines	171	USA
40	Côte d'Ivoire	84	Kiribati	128	PNG	172	Uzbekistan
41	Croatia	85	Korea	129	Poland	173	Vanuatu
42	Cuba	86	Kuwait	130	Portugal	174	Viet Nam
43	Cyprus	87	Kyrgyzstan	131	Qatar	175	Yemen
44	Czech Republic	88	Lao	132	Romania	176	Zambia
177	Zimbabwe						

Appendix 5.2. Coefficient of correlation

Table 1. The coefficient of correlation between the dependent variable and trade impediment variables and among trade impediment variables

	Trade	Tariff	Trade quota	Trade ban	Subsidies	Local content	Seaport	Customs	Cost of trade	Time to trade	Container Trans.	Air Trans.	Shipping
Trade	1.00												
Tariff	-0.03	1.00											
Trade quota	0.16	-0.06	1.00										
Trade ban	0.27	-0.00	0.39	1.00									
Subsidies	0.32	0.04	0.34	0.29	1.00								
Local content	0.29	0.05	0.04	0.18	0.35	1.00							
Seaport	0.23	0.05	-0.06	0.17	0.20	0.35	1.00						
Customs	0.06	-0.20	0.42	0.15	0.28	-0.01	-0.02	1.00					
Cost of trade	0.00	-0.01	-0.07	-0.10	-0.06	0.02	-0.12	-0.18	1.00				
Time to trade	0.10	0.02	-0.21	0.16	0.12	0.33	0.49	-0.09	0.14	1.00			
Container Trans.	0.33	-0.00	0.25	0.12	0.22	0.13	-0.09	0.05	-0.09	-0.65	1.00		
Air Trans.	0.24	0.04	-0.00	0.10	0.21	0.33	0.80	-0.06	0.14	0.25	0.17	1.00	
Shipping	0.44	0.06	0.09	0.31	0.41	0.48	0.47	0.00	-0.05	0.14	0.52	0.49	1.00

Appendix 5.3. Heteroskedasticity and autocorrelation test results

Panel heteroskedasticity

The study initially assumes that the error variances are the same for all variables (i) under the null hypothesis in which $\sigma_i^2 = \sigma^2 \forall_i = 1, \dots, N$. A modified Wald test is deployed to test this assumption, following Baum (2001). Baum has developed `xttest3` command in Stata to run the modified Wald test. Thus, the study applies `xttest3` command to detect the presence of panel heteroskedasticity in study's panel data. But prior to run `xttest3` command, the fixed effects estimator must be progressed. Rejecting the null hypothesis for any level of confidence (1%, 5%, and 10%) leads to the conclusion that the panel data suffers from heteroskedasticity. The Stata output of a modified Wald test as below:

```
Modified Wald test for groupwise heteroskedasticity

in fixed effect regression model
H0: sigma(i)^2 = sigma^2 for all i
chi2 (264)=  6.7e+05
Prob>chi2 =  0.0000
```

The Stata output of the modified Wald test shows that the the null hypothesis is rejected at any level of confidence, validating the presence of heteroskedasticity in the study's panel data.

Panel autocorrelation

Wooldridge (2002) derived a theoretical framework on how to test autocorrelation in panel data models.[158] By Drukker (2003), the Wooldridge test in serial correlation is translated into the Stata command `xtserial`. The study then performs this `xtserial` command to run the Wooldridge test for panel autocorrelation. The null hypothesis is accepted if there is no serial correlation in error terms within units of the first order. In other words, the assumption of $E(\varepsilon_{i,t}\, \varepsilon_{j,s}) = 0$ for all s ≠ t is satsified. However, the assumption of no serial correlation in error terms within units must be tested. The Stata output presents that the

[158] See Wooldridge (2002) in Chapter 10, subsection 10.6.3 for review his autocorrelation test.

$\rho\ value = 0.0019$ rejects the null hypothesis at any level of confidence (1%, 5%, and 10%), indicating there is autocorrelation of the first order in the study's panel data.

```
Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,     255) =      9.898
           Prob > F =      0.0019
```

Appendix 5.4 Robustness check results

Table 1 The main model estimation and % missing variables

Variables	(1)					(2)				
	Missing	Total	% Missing	α'	S.E	Missing	Total	% Missing	α'	S.E
The Dependent Variable (Xijt)	**61**	**3540**	**1.72%**	**-**	**-**	**26**	**2124**	**1.22%**	**-**	**-**
Gravity Variables										
Exporters' GDP (Log)	38	3540	1.07%	0.097*	0.054	17	2124	0.80%	0.160**	0.063
Importers' GDP ((Log)	38	3540	1.07%	0.171***	0.048	17	2124	0.80%	0.149***	0.05
Distance (Log)	38	3540	1.07%	-0.787***	0.224	17	2124	0.80%	-0.765***	0.223
Trade Impediment Variables										
Import Tariff (Log)	408	3540	11.53%	-0.139***	0.032	237	2124	11.16%	-0.163***	0.034
Indonesia's Trade Quotas	917	3540	25.90%	0.110**	0.044	32	2124	1.51%	0.144***	0.039
Indonesia's Trade Bans	920	3540	25.99%	-0.025	0.032	34	2124	1.60%	-0.044	0.032
Indonesia's Subsidy Measures	754	3540	21.30%	-0.012	0.018	202	2124	9.51%	-0.034*	0.018
Indonesia's Local Content Measures	746	3540	21.07%	-0.100***	0.031	26	2124	1.22%	-0.130***	0.031
Seaport Quality	453	3540	12.80%	0.518***	0.071	243	2124	11.44%	0.512***	0.07
Customs Quality	296	3540	8.36%	0.035	0.036	170	2124	8.00%	0.073**	0.034
Indonesia's Costs to Trade (Log)	412	3540	11.64%	-1.649	1.547	26	2124	1.22%	-1.460	1.551
Indonesia's Time to Trade (Log)	412	3540	11.64%	2.869***	0.531	26	2124	1.22%	2.970***	0.535
Container Transportation (Log)	615	3540	17.37%	0.396***	0.122	348	2124	16.38%	0.422***	0.121
Air Transportation	453	3540	12.80%	-0.296***	0.048	244	2124	11.49%	-0.284***	0.049
Shipping	488	3540	13.79%	0.006**	0.003	282	2124	13.28%	0.006**	0.003
Control Variables										
Exporters' Population (Log)	38	3540	1.07%	7.431***	1.441	17	2124	0.80%	7.009***	1.434
Importers' Population (Log)	38	3540	1.07%	3.074***	0.531	17	2124	0.80%	2.314***	0.571
Common Land Border	38	3540	1.07%	-0.692**	0.313	17	2124	0.80%	-0.715**	0.311
Common Official Language	38	3540	1.07%	-	-	17	2124	0.80%	-	-
Common Colony	38	3540	1.07%	2.229***	0.791	17	2124	0.80%	2.138***	0.783
Preferential Trade Agreement	38	3540	1.07%	4.277***	0.362	17	2124	0.80%	4.213***	0.355
Good governance	61	3540	1.72%	0.303**	0.137	26	2124	1.22%	0.297**	0.135
Indonesia's ICT to Trade	61	3540	1.72%	-0.736***	0.223	26	2124	1.22%	-0.748***	0.226
Constant				-141.655***	23.922				-132.145***	23.937
N Countries				**177**					**177**	
T Time series (year)				**10"**					**6"**	
Samples observed in number				**1,482**					**1342**	
Loss of observation in %				**58**					**37**	
Samples observed in %				**42**					**63**	

'The Feasible Generalized Least Squares (FGLS) estimator with Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

"10 time series is from 2007-2016 and 6 time series is from 2010-2015

Table 2 Main model estimation with multiple imputed values method and % missing variables

Variables	(1)					(2)				
	Missing	**Total**	**% Missing**	**α'**	**S.E**	**Missing**	**Total**	**% Missing**	**α'**	**S.E**
The Dependent Variable (Xijt)	**61**	**3540**	**1.72%**	**-**	**-**	**26**	**2124**	**1.22%**	**-**	**-**
Gravity Variables										
Exporters' GDP (Log)	38	3540	1.07%	0.170***	0.050	17	2124	0.80%	0.043	0.058
Importers' GDP (Log)	38	3540	1.07%	0.176***	0.041	17	2124	0.80%	0.097*	0.053
Distance (Log)	38	3540	1.07%	0.032	0.586	17	2124	0.80%	-2.452***	0.673
Trade Impediment Variables										
Import Tariff (Log)	408	3540	11.53%	-0.132***	0.027	237	2124	11.16%	-0.189***	0.030
Indonesia's Trade Quotas	38	3540	1.07%	0.017	0.023	17	2124	0.80%	0.087**	0.035
Indonesia's Trade Bans	38	3540	1.07%	-0.003	0.026	17	2124	0.80%	-0.035	0.027
Indonesia's Subsidy Measures	38	3540	1.07%	0.006	0.018	17	2124	0.80%	0.001	0.018
Indonesia's Local Content Measures	38	3540	1.07%	-0.048*	0.024	17	2124	0.80%	-0.094***	0.028
Seaport Quality	37	3540	1.05%	0.137***	0.037	16	2124	0.75%	0.473***	0.053
Customs Quality	0	3540	0.00%	-0.036	0.026	0	2124	0.00%	0.012	0.023
Indonesia's Costs to Trade (Log)	38	3540	1.07%	-0.063	0.062	17	2124	0.80%	1.820***	0.693
Indonesia's Time to Trade (Log)	38	3540	1.07%	0.025	0.152	17	2124	0.80%	0.083	0.212
Container Transportation (Log)	28	3540	0.79%	0.052**	0.026	13	2124	0.61%	0.029	0.036
Air Transportation	38	3540	1.07%	-0.070*	0.037	17	2124	0.80%	-0.162***	0.041
Maritime Transportation (Shipping)	38	3540	1.07%	0.002	0.002	17	2124	0.80%	0.005**	0.002
Control Variables										
Exporters' Population (Log)	38	3540	1.07%	-0.115***	0.038	17	2124	0.80%	-0.160***	0.057
Importers' Population (Log)	38	3540	1.07%	1.648***	0.407	17	2124	0.80%	2.185***	0.560
Common Land Border	38	3540	1.07%	6.862***	0.532	17	2124	0.80%	-0.227	0.533
Common Official Language	38	3540	1.07%	-	-	17	2124	0.80%	-	
Common Colony	38	3540	1.07%	-3.687***	0.576	17	2124	0.80%	-5.931***	0.632
Preferential Trade Agreement (PTA)	38	3540	1.07%	-0.007	0.067	17	2124	0.80%	0.053	0.107
Good governance	38	3540	1.07%	0.111	0.076	17	2124	0.80%	0.069	0.102
Indonesia's ICT to Trade	38	3540	1.07%	0.087***	0.013	17	2124	0.80%	-0.203***	0.06
Constant				-18.284***	6.179				0.000	0.000
N Countries				**177**					**177**	
T Time Series (year)				**10"**					**6"**	
Samples observed in number				**3,157**					**1921**	
Samples observed in %				**89**					**90**	
Loss of observation in %				**11**					**10**	

'The Feasible Generalized Least Squares (FGLS) estimator with Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

"10 time series is from 2007-2016 and 6 time series is from 2010-2015

Table 3 The main model estimation with some alternative proxy variables and % missing variables

Variables	(1)					(2)				
	Missing	**Total**	**% Missing**	**α'**	**S.E**	**Missing**	**Total**	**% Missing**	**α''**	**S.E**
Dependent Variable (Xijt)	**61**	**3540**	**1.72%**	**-**	**-**	**26**	**2124**	**1.22%**	**-**	**-**
Gravity Variables										
Exporters' GDP (Log)	38	3540	1.07%	0.017	0.056	17	2124	0.80%	0.010	0.055
Importers' GDP (Log)	38	3540	1.07%	0.128***	0.046	17	2124	0.80%	0.122**	0.052
Distance (Log)	38	3540	1.07%	-6.863***	1.394	17	2124	0.80%	-1.268***	0.171
Trade Impediment Variables										
Import Tariff (Log)	408	3540	11.53%	-0.081***	0.028	237	2124	11.16%	-0.088***	0.029
Indonesia's Anti-Dumping	38	3540	1.07%	0.039	0.024	17	2124	0.80%	0.107***	0.028
Indonesia's Trade Licensing	38	3540	1.07%	-0.097**	0.041	17	2124	0.80%	-0.177***	0.049
Indonesia's Subsidy Measures	38	3540	1.07%	-0.002	0.017	17	2124	0.80%	-0.006	0.016
Indonesia's Local Content Measures	38	3540	1.07%	-0.101***	0.027	17	2124	0.80%	-0.114***	0.028
Seaport Quality	37	3540	1.05%	0.209***	0.052	16	2124	0.75%	0.256***	0.055
Customs Quality	0	3540	0.00%	0.039	0.038	0	2124	0.00%	0.076*	0.04
Indonesia's Costs of Trade (Log)	38	3540	1.07%	-2.917***	0.72	17	2124	0.80%	-1.948	1.267
Timeliness	38	3540	1.07%	-0.021	0.067	17	2124	0.80%	0.041	0.071
Container Transportation (Log)	28	3540	0.79%	0.401***	0.073	13	2124	0.61%	0.308***	0.096
Air Transportation	38	3540	1.07%	-0.168***	0.043	17	2124	0.80%	-0.186***	0.042
Shipment	38	3540	1.07%	-0.060	0.059	17	2124	0.80%	-0.189***	0.058
Control Variables										
Exporters' Population (Log)	38	3540	1.07%	2.945***	0.773	17	2124	0.80%	1.800**	0.912
Importers' Population (Log)	38	3540	1.07%	3.292***	0.559	17	2124	0.80%	2.554***	0.636
Common Land Border	38	3540	1.07%	-5.605***	1.397	17	2124	0.80%	-0.407*	0.222
Common Official Language	38	3540	1.07%	-		17	2124	0.80%	-	
Common Colony	38	3540	1.07%	6.413***	0.584	17	2124	0.80%	4.234***	0.584
Preferential Trade Agreement	38	3540	1.07%	-0.718	1.346	17	2124	0.80%	4.705***	0.276
Good governance	38	3540	1.07%	0.272***	0.1	17	2124	0.80%	0.286***	0.105
Indonesia's ICT to Trade	38	3540	1.07%	0.270***	0.07	17	2124	0.80%	0.241*	0.138
Constant				0.000	0				-29.036**	14.025
N Countries				**177**					**177**	
T Time Series (year)				**10''**					**6''**	
Samples observed in number				**1,522**					**1,298**	
Samples observed in %				**43%**					**61%**	
Loss of observation in %				**57%**					**39%**	

'The Feasible Generalized Least Squares (FGLS) estimator with Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

'10 time series is from 2007-2016 and 6 time series is from 2010-2015

Table 4 The impact of Indonesia's trade impediments on its import, export, and trade (import and export) performance.

Dependent Variable	IM	EX	Trade (IM+EX)
Independent Variables	(1)	(2)	(3)
Gravity Variables			
Exporters' GDP (log)	1.218***	0.059	0.097*
	(0.271)	(0.055)	(0.054)
Importers' GDP (log)	0.324**	0.231***	0.171***
	(0.150)	(0.045)	(0.048)
Distance (log)	-1.024***	-7.239***	-0.787***
	(0.273)	(1.039)	(0.224)
Trade Impediment Variables			
Import Tariff (log)	-0.841***	0.009	-0.139***
	(0.094)	(0.026)	(0.032)
Indonesia's IM/EX Quotas	0.085	0.204***	0.110**
	(0.067)	(0.078)	(0.044)
Indonesia's IM/EX Bans	-0.076	-0.025	-0.025
	(0.060)	(0.031)	(0.032)
Indonesia's Subsidy Measures on IM/EX	-0.120**	0.025*	-0.012
	(0.049)	(0.015)	(0.018)
Indonesia's Local Content Measures on IM/EX	-0.227***	-0.045	-0.100***
	(0.050)	(0.031)	(0.031)
Seaport Quality	0.315***	0.091	0.518***
	(0.080)	(0.104)	(0.071)
Customs Quality	-0.476***	0.010	0.035
	(0.165)	(0.034)	(0.036)
Indonesia's Cost to IM/EX (log)	-0.851***	0.051	-1.649
	(0.258)	(0.516)	(1.547)
Indonesia's Time to IM/EX (log)	1.330***	4.810**	2.869***
	(0.298)	(2.382)	(0.531)
Container Transportation (log)	0.410***	3.476***	0.396***
	(0.114)	(1.048)	(0.122)
Air Transportation	-0.165*	-0.243***	-0.296***
	(0.089)	(0.065)	(0.048)
Maritime Transportation (Shipping)	0.006	-	0.006**
	(0.004)		(0.003)
Control Variables			
Exporters' Population (log)	-1.325***	-19.492***	7.431***
	(0.432)	(2.477)	(1.441)
Importers' Population (log)	-	3.004***	3.074***
		(0.515)	(0.531)
Common Land Border	-0.681	-0.012	-0.692**
	(0.455)	(0.750)	(0.313)
Common Official Language	-	-	-
Colony Ties	3.112***	0.000	2.229***
	(0.872)	(0.000)	(0.791)
Preferential Trade Agreements (PTA)	3.985***	0.765***	4.277***
	(0.415)	(0.289)	(0.362)
Good governance	0.276*	-	0.303**
	(0.150)		(0.137)
Indonesia's ICT to IM/EX	-	-	-0.736***
			(0.223)
Constant	0.000	351.608***	-141.655***
	(0.000)	(43.083)	(23.922)
Observations	605	877	1,482
Pair FE	Yes	Yes	Yes
Exporter FE	Yes	Yes	Yes
Importer FE	Yes	Yes	Yes
Time FE	Yes	Yes	Yes

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 5 The dynamic gravity estimation result

VARIABLES	(1) 2 Step Sys GMM
Gravity variables	
Log Indonesia' Trade Flows (t-1)	0.617***
	(0.018)
Log Exporters' GDP (t-1)	-0.400**
	(0.172)
Log Importers' GDP (t-1)	0.010
	(0.047)
Log Distance	-0.090
	(0.073)
Trade Impediment Variables	
Log Import Tariff	-0.248***
	(0.043)
Indonesia's Trade Quotas	0.069
	(0.084)
Indonesia's Trade Bans	0.223***
	(0.075)
Indonesia's Subsidies Measures	-0.002
	(0.032)
Indonesia's Local Content Measures	-0.040
	(0.062)
Seaport Quality	-0.234***
	(0.056)
Customs Quality	0.131
	(0.095)
Log Indonesia's Cost to Trade	-4.031**
	(1.725)
Log Indonesia's Time to Trade	2.109***
	(0.512)
Log Container Transportation (Road)	0.592***
	(0.050)
Air Transportation	-0.146***
	(0.051)
Maritime Transportation (Shipping)	-0.002
	(0.002)
Control Variables	
Log Exporters' Population	1.015*
	(0.527)
Log Importers' Population	0.150
	(0.131)
Common Land Border	-0.284
	(0.394)
Common Official Language	0.000
	(0.000)
Colony Ties	-0.763***
	(0.172)
Preferential Trade Agreements (PTA)	-0.141
	(0.106)
Good governance	0.397***
	(0.058)
Indonesia's ICT to Trade	0.296
	(0.265)
Year effect	Yes
Observations	1,482
Number of Groups	264
Number of Instruments	116
Hansen J-test (p-value)	0.274
AR (1) test (p-value)	0.001
AR (2) test (p-value)	0.273

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 6 Trade volumes estimation result

Dependent Variable	Trade Volume
Independent Variables	FGLS FE (1)
Gravity variables	
Exporters' GDP (Log)	-0.370***
	(0.072)
Importers' GDP (Log)	-0.110*
	(0.061)
Distance	-9.004***
	(0.994)
Trade Impediment Variables	
Import Tariff	-0.007
	(0.034)
Indonesia's Trade Quotas	-0.126**
	(0.063)
Indonesia's Trade Bans	-0.021
	(0.039)
Indonesia's Subsidies Measures	0.055**
	(0.025)
Indonesia's Local Content Measures	0.078*
	(0.046)
Seaport Quality	0.107
	(0.102)
Customs Quality	0.084*
	(0.044)
Indonesia's Cost to Trade (Log)	0.729
	(2.350)
Indonesia's Time to Trade (Log)	0.101
	(0.937)
Container Transportation (Road)	0.209**
	(0.089)
Air Transportation	0.193**
	(0.077)
Maritime Transportation (Shipping)	-0.008
	(0.006)
Control Variables	
Exporters' Population (Log)	5.843**
	(2.538)
Importers' Population (Log)	9.384***
	(0.772)
Common Land Border	1.452*
	(0.843)
Common Official Language	-
Colony Ties	13.426***
	(0.512)
Preferential Trade Agreements (PTA)	1.673***
	(0.246)
Good Governance	0.398*
	(0.214)
Indonesia's ICT to Trade	-0.443
	(0.366)
Constant	-63.618
	(42.440)
Observations	1,126
Pair FE	Yes
Exporter FE	Yes
Importer FE	Yes
Time FE	Yes

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Appendix 6.1. List of Indonesia's export destination countries in manufacturing sectors

1	Argentina	31	Greece	61	Nepal	91	Thailand
2	Australia	32	Guatemala	62	Netherlands	92	Trinidad & Tobago
3	Austria	33	Honduras	63	New Zealand	93	Tunisia
4	Bahrain	34	Hong Kong	64	Nigeria	94	Turkey
5	Bangladesh	35	Hungary	65	Norway	95	Uganda
6	Belarus	36	Iceland	66	Oman	96	Ukraine
7	Belgium	37	India	67	Pakistan	97	United Arab Emirates
8	Bosnia & Herzegovina	38	Iran	68	Panama	98	United Kingdom
9	Botswana	39	Ireland	69	Papua New Guinea	99	United States of America
10	Brazil	40	Israel	70	Paraguay	100	Uruguay
11	Brunei Darussalam	41	Italy	71	Peru	101	Uzbekistan
12	Bulgaria	42	Jamaica	72	Philippines	102	Vietnam
13	Cambodia	43	Japan	73	Poland	103	Yemen
14	Canada	44	Jordan	74	Portugal		
15	Chile	45	Kazakhstan	75	Qatar		
16	China	46	Kenya	76	Romania		
17	Colombia	47	Korea	77	Russia		
18	Costa Rica	48	Kuwait	78	Saudi Arabia		
19	Croatia	49	Kyrgyzstan	79	Senegal		
20	Cyprus	50	Lao	80	Serbia		
21	Czechia	51	Latvia	81	Singapore		
22	Denmark	52	Lithuania	82	Slovakia		
23	Dominican Republic	53	Luxembourg	83	Slovenia		
24	Ecuador	54	Macedonia	84	South Africa		
25	Egypt	55	Malaysia	85	Spain		
26	El Salvador	56	Malta	86	Sri Lanka		
27	Estonia	57	Mexico	87	Swaziland		
28	Finland	58	Morocco	88	Sweden		
29	France	59	Myanmar	89	Switzerland		
30	Germany	60	Namibia	90	Tanzania		

Appendix 7.1. List of countries

(i) Knowledge-and-physical-capital model

1	Argentina	12	Estonia	23	Luxembourg	34	South Africa
2	Australia	13	Finland	24	Malaysia	35	Spain
3	Austria	14	France	25	Mexico	36	Sweden
4	Bangladesh	15	Germany	26	Morocco	37	Thailand
5	Belgium	16	Hong Kong, China	27	Netherlands	38	Tunisia
6	Brunei Darussalam	17	Hungary	28	New Zealand	39	Turkey
7	Bulgaria	18	India	29	Philippines	40	United Kingdom
8	Canada	19	Ireland	30	Poland	41	United States
9	China	20	Italy	31	Romania	42	Viet Nam
10	Czech Republic	21	Japan	32	Singapore		
11	Denmark	22	Korea, Republic of	33	Slovakia		

(ii) Additional regression

1	Albania	11	Bolivia	21	Colombia	31	Egypt
2	Algeria	12	Botswana	22	Congo	32	El Salvador
3	Angola	13	Brazil	23	Congo, DR	33	Ethiopia
4	Argentina	14	Brunei	24	Costa Rica	34	Finland
5	Australia	15	Bulgaria	25	Cote d'Ivoire	35	France
6	Austria	16	Burkina Faso	26	Cyprus	36	Gabon
7	Bahamas	17	Cameroon	27	Czech Republic	37	Gambia
8	Bahrain	18	Canada	28	Denmark	38	Germany
9	Bangladesh	19	Chile	29	Dominican Republic	39	Ghana
10	Belgium	20	China	30	Ecuador	40	Greece

41	Guatemala	51	Indonesia	61	Kuwait	71	Mexico
42	Guinea	52	Iran	62	Lebanon	72	Mongolia
43	Guinea-Bissau	53	Iraq	63	Liberia	73	Morocco
44	Guyana	54	Ireland	64	Libya	74	Mozambique
45	Haiti	55	Israel	65	Luxembourg	75	Myanmar
46	Honduras	56	Italy	66	Madagascar	76	Namibia
47	Hong Kong	57	Jamaica	67	Malawi	77	Netherlands
48	Hungary	58	Japan	68	Malaysia	78	New Zealand
49	Iceland	59	Jordan	69	Mali	79	Nicaragua
50	India	60	Kenya	70	Malta	80	Niger

81	Nigeria	91	Portugal	101	South Africa	111	Thailand
82	Norway	92	Qatar	102	South Korea	112	Togo
83	Oman	93	Romania	103	Spain	113	Trinidad & Tobago
84	Pakistan	94	Russia	104	Sri Lanka	114	Tunisia
85	Panama	95	Saudi Arabia	105	Sudan	115	Turkey
86	Papua New Guinea	96	Senegal	106	Suriname	116	UAE
87	Paraguay	97	Serbia	107	Sweden	117	Uganda
88	Peru	98	Sierra Leone	108	Switzerland	118	United Kingdom
89	Philippines	99	Singapore	109	Syria	119	United States
90	Poland	100	Somalia	110	Tanzania	120	Uruguay

121	Venezuela
122	Vietnam
123	Yemen
124	Zambia
125	Zimbabwe

Appendix 7.2. Additional regression's data, estimation strategy, and the complete results

Data explanation of the additional regression

The datasets of the world FDI net inflows in the equation (6.6) are retrieved from the WDI. Some data sources in the panel data model are the same as the KPC model. For instance, the datasets of institutional variables such as government stability, investment risks, corruption (as aproxy of good governance), law and order, and the bureaucracy quality are from the ICRG database. Other similar data sources with the KPC model are some of the control variables i.e., the GDP growth, the trade openness, the urban population and education that collect from the WDI. The WDI also provides the data of GDP per capita, inflation in terms of the consumer price index (CPI), real interest rates, population, and mobile cellular subscription.

Table 1 Summary statistic of the variables observed in the additional regression

Variable	Units	Obs.	Mean	St. Dev	Min	Max
FDI net flows (Absolute)	Billion USD	3399	6.10	19	0.0004	232
Government stability	Index [0,12]	4088	7.53	2.1	0.67	12
Investment risk	Index [0,12]	4088	7.36	2.51	0	12
Good governance	Index [0,6]	4088	2.99	1.36	0	6
Law and order	Index [0,6]	4088	3.62	1.48	0	6
Bureaucracy	Index [0,4]	4088	2.16	1.18	0	4
d_Indonesia	Dummy [0, 1]	4125	0.008	0.089	0	1
dIndonesia*Government stability		4088	-0.0024	0.12	-2.65	3.21
dIndonesia*Investment risk		4088	-0.004	0.14	-3.36	1.76
dIndonesia*Good governance		4088	-0.008	0.14	-2.99	0.84
dIndonesia*Law and order		4088	-0.007	0.11	-2.12	1.13
dIndonesia*Bureucracy		4088	-0.004	0.09	-2.17	0.83
GDP per capita	USD	3978	10533.29	15842.98	65.01142	119225.4
GDP growth	%	3958	4.51	2.97	-14.72	15.24
Education	School enrolment (% gross)	2703	71.63	23.59	-4.21	100
Trade openness	Total trade to GDP in %	3939	62.94	48.43	4.91	986.65
Urban Population	% of total population	4125	54.51	24.22	7.12	100
Real interest rates	%	2562	7.051	25.94	-97.61	789.79
Utility infrastructure (mobile cellular)	Mobile cellular subscriptions (per 100 people)	4049	38.34	49.45	0	240.79
Population	Million people	4116	46.20	149	0.22	1,380
Inflation	CPI	3487	70.63	60.78	2.04e-11	2740

Estimation strategy

For the dependent variable, we use the same technique as the KPC model. We use the positive FDI net inflows by treating negative FDI net inflows as absolute values. We also account for zero (and missing observations) of FDI net inflows by adding a constant. In this

case, $ln(1 + absolute\ FDI_{ijt})$ is appropriate to be our dependent variable of the additional regression.

As mentioned above, we have a focus of analysis on institutional variables. We allow the Indonesia's dummy to interact with the institutional policy variables. The inclusion of these interaction terms helps us to understand better whether institutional variables will have different impacts on Indonesia's FDI flows or not. We expect that those interaction variables have positive signs and significant. We also expect that some of the control variables are positive and significant e.g., GDP per capita, GDP growth, education, trade openness, population, urban population, and public infrastructure. Those control variables can help to encourage FDI net inflows, while other control variables such as inflation and real interest rate should have a negative sign and significant. They can reduce foreign firms' profit when their rates become higher.

For estimation, we use the FGLS model. As noted earlier, in the FGLS model, heteroscedasticity and autocorrelation can be reduced by weighting the observed variables in the model with the heteroscedasticity factors and the autocorrelation or AR (1) factors. In that manner, the FGLS estimation is not only aiming a consistent estimate but also resulting in an efficient estimate. Thus, in the additional regression estimation, the FGLS is our choice estimator.

The complete estimation results of the additional regression

Table 2 FDI determinants in Indonesia FDI net flows

Dep. Var: log of FDI net flows	FGLS
Regressors	(1)
Institutional variables (World)	
Government stability	0.000
	(0.021)
Investment risk	0.066***
	(0.023)
Good governance	0.044
	(0.047)
Law and order	-0.014
	(0.037)
Bureaucracy	-0.046
	(0.060)
Institutional variables (Indonesia)	
dIndonesia*Government stability	-0.143
	(0.116)
dIndonesia*Investment risk	0.350**
	(0.140)
dIndonesia*Good governance	-0.430*
	(0.254)
dIndonesia*Law and order	0.392
	(0.297)
dIndonesia*Bureaucracy	0.797**
	(0.363)
Control variables	
Log of GDP per capita	0.777***
	(0.066)
GDP growth	0.014**
	(0.007)
Log of inflation	-0.164**
	(0.081)
Log of trade openness	0.446***
	(0.081)
Education	0.005*
	(0.003)
Log of population	0.889***
	(0.026)
Real interest rates	-0.000
	(0.002)
Urban Population	0.004*
	(0.002)
Utility infrastructure (log of mobile cell)	0.107***
	(0.037)
dIndonesia	-0.331
	(0.274)
dIndonesia*Utility infrastructure	-0.127
	(0.085)
Constant	-3.107**
	(1.261)
Year effects	Yes
Observations	1,161
R-squared	-

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Appendix 7.3. List of institutional definitions of the ICRG Index

(Source: https://www.prsgroup.com/wp-content/uploads/2012/11/icrgmethodology.pdf, accessed on December 2018)

- *Government Stability* – 12 Points This is an assessment both of the government's ability to carry out its declared program(s), and its ability to stay in office. The risk rating assigned is the sum of three subcomponents, each with a maximum score of four points and a minimum score of 0 points. A score of 4 points equates to Very Low Risk and a score of 0 points to Very High Risk. The subcomponents are: Government Unity, Legislative Strength, Popular Support.

- *Investment Profile* – 12 Points This is an assessment of factors affecting the risk to investment that are not covered by other political, economic and financial risk components. The risk rating assigned is the sum of three subcomponents, each with a maximum score of four points and a minimum score of 0 points. A score of 4 points equates to Very Low Risk and a score of 0 points to Very High Risk. The subcomponents are: Contract Viability/Expropriation, Profits Repatriation, and Payment Delays.

- *Corruption* – 6 Points This is an assessment of corruption within the political system. Such corruption is a threat to foreign investment for several reasons: it distorts the economic and financial environment; it reduces the efficiency of government and business by enabling people to assume positions of power through patronage rather than ability; and, last but not least, introduces an inherent instability into the political process. The most common form of corruption met directly by business is financial corruption in the form of demands for special payments and bribes connected with import and export licenses, exchange controls, tax assessments, police protection, or loans. Such corruption can make it difficult to conduct business effectively, and in some cases may force the withdrawal or withholding of an investment. Although our measure takes such corruption into account, it is more concerned with actual or potential corruption in the form of excessive patronage, nepotism, job reservations, favour-for-favours, secret party funding, and suspiciously close ties between politics and business. In our view these insidious sorts of corruption are potentially of much greater risk to foreign business in

that they can lead to popular discontent, unrealistic and inefficient controls on the state economy, and encourage the development of the black market. The greatest risk in such corruption is that at some time it will become so overweening, or some major scandal will be suddenly revealed, as to provoke a popular backlash, resulting in a fall or overthrow of the government, a major reorganizing or restructuring of the country's political institutions, or, at worst, a breakdown in law and order, rendering the country ungovernable.

- *Law and Order* – 6 Points Law and Order form a single component, but its two elements are assessed separately, with each element being scored from zero to three points. To assess the "Law" element, the strength and impartiality of the legal system are considered, while the Order element is an assessment of popular observance of the law. Thus, a country can enjoy a high rating – 3 – in terms of its judicial system, but a low rating – 1 – if it suffers from a very high crime rate if the law is routinely ignored without effective sanction (for example, widespread illegal strikes).

- *Bureaucracy Quality* – 4 Points The institutional strength and quality of the bureaucracy is another shock absorber that tends to minimize revisions of policy when governments change. Therefore, high points are given to countries where the bureaucracy has the strength and expertise to govern without drastic changes in policy or interruptions in government services. In these low-risk countries, the bureaucracy tends to be somewhat autonomous from political pressure and to have an established mechanism for recruitment and training. Countries that lack the cushioning effect of a strong bureaucracy receive low points because a change in government tends to be traumatic in terms of policy formulation and day-to-day administrative functions.

Appendix 7.4. Multicollinearity

Table 1 The coefficient of correlation between the dependent variable and explanatory variables (the KPC model variables)

	lnFDI	lnSGDP	lnSim	lnDist	Border	Colony	Skilled	Unskilled	Capital	GDPG	Educ	lnTradeOp	Urban	AccElectric	Govt.Stab	Inv.Risk	Corrupt	Law-Order	Bureaucracy	Tax	Anti-Monop	Property
lnFDI	1.000																					
lnSGDP	0.474	1.000																				
lnSim	0.023	-0.111	1.000																			
lnDist	-0.237	0.127	0.065	1.000																		
Border	0.192	-0.069	0.062	-0.370	1.000																	
Colony	0.177	0.036	0.134	0.086	-0.024	1.000																
Skilled	0.108	-0.071	0.128	0.128	-0.125	0.035	1.000															
Unskilled	-0.241	-0.022	0.078	0.059	-0.078	0.009	-0.311	1.000														
Capital	0.122	0.188	-0.545	0.040	-0.051	-0.051	-0.128	0.003	1.000													
GDPG	0.164	-0.059	-0.011	-0.147	0.045	-0.073	0.280	-0.294	-0.144	1.000												
Educ	0.108	0.174	0.088	-0.026	-0.007	-0.032	-0.131	0.124	-0.098	-0.088	1.000											
lnTradeOp	-0.117	-0.318	-0.035	0.053	-0.045	0.159	-0.247	0.219	0.306	-0.242	0.022	1.000										
Urban	-0.161	0.048	-0.020	0.126	-0.042	-0.234	-0.277	0.311	0.071	-0.331	0.211	0,079	1.000									
Acc.Electric	-0.067	0.147	-0.029	0.176	-0.049	0.056	-0.372	0.350	0.083	-0.394	0.333	0.283	0.406	1.000								
Govt.Stab	-0.082	-0.062	-0.110	0.061	-0.025	-0.034	-0.086	0.058	0.186	0.004	-0.078	0.053	-0.017	0.121	1.000							
Inv.Risk	-0.188	0.036	0.006	0.141	-0.057	0.088	-0.329	0.361	0.067	-0.403	0.092	0.321	0.312	0.483	0.238	1.000						
Corrupt	0.025	0.210	0.088	0.121	-0.027	0.147	-0.204	0.300	-0.065	-0.304	0.258	0.033	0.306	0.474	0.218	0.640	1.000					
Law-Order	-0.192	0.053	0.032	0.194	-0.071	0.151	-0.403	0.492	0.095	-0.458	0.024	0.349	0.335	0.470	0.299	0.673	0.596	1.000				
Bureaucracy	-0.193	0.080	0.108	0.148	-0.068	0.144	-0.398	0.464	0.048	-0.499	0.299	0.317	0.369	0.400	0.155	0.651	0.552	0.795	1.000			
Tax	-0.181	0.066	0.073	0.141	-0.053	-0.039	-0.282	0.168	-0.050	-0.100	0.146	0.018	0.306	0.121	0.206	0.109	0.027	0.206	0.295	1.000		
Anti-Monop	0.059	-0.038	0.050	-0.004	0.015	0.181	0.096	0.105	-0.101	-0.082	-0.150	0.013	-0.153	-0.166	0.062	0.162	0.212	0.337	0.289	-0.266	1.000	
Property	-0.118	0.156	0.027	0.119	-0.062	0.134	-0.378	0.395	0.009	-0.396	0.225	0.286	0.303	0.501	0.269	0.649	0.653	0.835	0.751	0.168	0.328	1.000

Table 2 The coefficient of correlation between the dependent variable and explanatory variables (the additional regression)

	lnFDI	lnGDPC	lnGDPG	IndoDum	lnInfla	lnOpen	Educ	lnPop	Urban	Govt.Stab	Inv.Risk	Corrupt	LawOrder	Bureau	lnMobile	Interest	Inter_1	Inter_2	Inter_3	Inter_4	Inter_5	Inter_6
lnFDI	1.00																					
lnGDPC	0.44	1.00																				
lnGDPG	0.02	-0.30	1.00																			
IndoDummy	0.04	-0.14	0.05	1.00																		
lnInflation	0.21	0.25	-0.07	-0.12	1.00																	
lnOpenness	-0.07	0.12	0.05	-0.05	0.05	1.00																
Education	-0.45	-0.75	0.26	0.11	-0.25	-0.06	1.00															
lnPop	0.52	-0.28	0.15	0.23	-0.00	-0.40	0.03	1.00														
Urban	0.14	0.58	-0.22	-0.13	0.28	0.02	0.16	-0.32	1.00													
Govt.Stab	-0.07	-0.05	0.09	-0.08	0.05	0.06	0.37	-0.14	0.01	1.00												
Inv.Risk	0.21	0.50	-0.09	-0.11	0.31	0.28	0.42	-0.27	0.27	0.11	1.00											
Corrupt	0.19	0.56	-0.17	-0.12	-0.11	-0.03	-0.40	-0.19	0.38	-0.02	0.11	1.00										
LawOrder	0.24	0.57	-0.11	-0.12	-0.03	0.08	-0.55	-0.16	0.33	0.12	0.21	0.68	1.00									
Bureaucracy	0.38	0.73	-0.22	-0.11	0.05	-0.02	-0.41	-0.07	0.35	-0.03	0.34	0.67	0.63	1.00								
lnMobile	0.30	0.42	-0.11	-0.13	0.68	0.26	0.07	-0.14	0.27	0.10	0.54	-0.14	-0.00	0.12	1.00							
Interest	-0.13	-0.11	-0.03	-0.02	-0.03	-0.21	-0.02	-0.05	0.02	-0.06	-0.07	-0.05	-0.17	-0.11	-0.05	1.000						
Inter_1	-0.13	0.02	-0.04	-0.19	0.04	0.03	-0.05	-0.04	0.03	0.14	0.00	0.03	0.03	0.08	0.06	0.640	1.00					
Inter_2	0.04	0.08	0.06	-0.27	0.10	-0.00	-0.05	-0.02	0.06	0.00	0.14	0.12	0.06	0.02	0.12	0.673	-0.08	1.00				
Inter_3	0.03	0.13	-0.03	-0.62	0.16	0.02	-0.09	-0.13	0.11	0.05	0.13	0.19	0.13	0.11	0.18	0.651	0.18	0.65	1.00			
Inter_4	0.00	0.11	0.00	-0.69	0.07	0.03	-0.08	-0.16	0.09	0.07	0.11	0.15	0.15	0.09	0.08	0.109	0.22	0.43	0.80	1.00		
Inter_5	0.02	0.09	-0.05	-0.48	0.18	0.04	-0.08	-0.10	0.09	0.09	0.05	0.12	0.08	0.16	0.19	0.162	0.53	0.08	0.65	0.49	1.00	
Inter_6	0.04	0.11	-0.03	-0.38	0.24	0.02	-0.08	-0.08	0.10	0.05	0.08	0.12	0.04	0.11	0.27	0.649	0.21	0.44	0.62	0.25	0.72	1.00

Note: Interaction_1, Interaction_2, Interaction_3, Interaction_4, Interaction_5, and Interaction_6 are interaction variables of a country dummy Indonesia and government stability, investment risks, good governance, law and order, and the bureaucracy quality respectively.

Table 3 The The variance inflation factor (VIF) of the KPC model variables

Variable	VIF
Law and order	6.56
Bureaucracy	4.81
Property	4.81
Investment risk	2.64
Electricity	2.27
Capital ratio	2.14
ln trade openness	2.01
Anti-monopoly	1.84
Education	1.78
Urban	1.69
Tax	1.65
ln SGDP	1.63
Skilled ratio	1.47
ln similarity	1.62
GDP growth	1.54
Unskilled ratio	1.47
Government stability	1.44
ln distance	1.36
Colony	1.25
Border	1.21
Mean VIF	**2.29**

Table 4 The The variance inflation factor (VIF) of the additional regression

Variable	VIF
Interaction_3	9.08
Interaction_5	7.63
Interaction_4	5.78
ln GDP per capita	5.50
Interaction_6	5.32
Interaction_2	3.98
Bureaucracy	3.43
ln mobile cellular	3.41
Corruption	3.05
Education	2.82
Law and order	2.38
Indonesia_dummy	2.30
ln inflation	2.08
Investment risk	2.05
Urban population	1.79
ln population	1.77
Interaction_1	1.66
ln openness	1.50
Government stability	1.34
GDP growth	1.16
Real interest rate	1.12
Mean VIF	**3.29**

Note: Interaction_1, Interaction_2, Interaction_3, Interaction_4, Interaction_5, and Interaction_6 are interaction variables of a country dummy Indonesia and government stability, investment risks, good governance, law and order, and the bureaucracy quality respectively.

Appendix 7.5. Panel data test results

(A) Panel heteroskedasticity test and panel autocorrelation test

Panel heteroskedasticity

The study initially assumes that the error variances are the same for all variables (i) under the null hypothesis in which $\sigma_i^2 = \sigma^2 \forall_i = 1, \dots, N$. A modified Wald test is deployed to test this assumption, following Baum (2001). Baum has developed `xttest3` command in Stata to run the modified Wald test. Thus, the study applies `xttest3` command to detect the presence of panel heteroskedasticity in study's panel data. But prior to run `xttest3` command, the fixed effects estimator must be progressed. Rejecting the null hypothesis for any level of confidence (1%, 5%, and 10%) leads to the conclusion that the panel data suffers from heteroskedasticity. The Stata output of a modified Wald test as below:

-Knowledge-and-physical-capital model

```
Modified Wald test for groupwise heteroscedasticity in fixed effect regression
model
H0: sigma(i)^2 = sigma^2 for all i
chi2 (76)     =   13133.93
Prob>chi2     =     0.0000
```

-Additional regression

```
Modified Wald test for groupwise heteroscedasticity in fixed effect
regression model
H0: sigma(i)^2 = sigma^2 for all i
chi2 (93)    =   11032.68
Prob>chi2    =   0.0000
```

The Stata output of the modified Wald test for the KPC model (`Prob>chi2 = 0.0000)` and the additional regression (`Prob>chi2 = 0.0000)` shows that the null hypothesis is rejected at any level of confidence, validating the presence of heteroskedasticity in the panel data.

Panel autocorrelation

Wooldridge (2002) derived a theoretical framework on how to test autocorrelation in panel data models.[159] By Drukker (2003), the Wooldridge test in serial correlation is translated into the Stata command `xtserial`. The study then performs this `xtserial` command to

[159] See Wooldridge (2002) in Chapter 10, subsection 10.6.3 for review his autocorrelation test.

run the Wooldridge test for panel autocorrelation. The null hypothesis is accepted if there is no serial correlation in error terms within units of the first order. In other words, the assumption of $E(\varepsilon_{i,t}\ \varepsilon_{j,s}) = 0$ for all s ≠ t is satsified. However, the assumption of no serial correlation in error terms within units must be tested. The Stata output of Wooldridge test as follows:

-Knowledge-and-physical-capital model

```
Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,      70) =      4.671
           Prob > F =      0.0341
```

-Additional regression

```
Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,      82) =     10.480
           Prob > F =      0.0017
```

The Stata output presents that the $\rho\ value = 0.0341$ of the KPC model and the $\rho\ value = 0.0017$ of the additional regression reject the null hypothesis at any level of confidence (1%, 5%, and 10%), indicating there is autocorrelation of both panel data.

(B) Breusch and Pagan lagrangian multiplier test for the KPC model

The Breusch-Pagan Lagrange multiplier (LM) test is used to help us to decide between a random effect regression and a simple OLS regression. The null hypothesis in the LM test is that variances across entities is zero. In other words, there is no significant difference across units, that is, no panel effect evidence.[160]

```
Breusch and Pagan Lagrangian multiplier test for random effects
lnFDI_ijt[pair_id,t] = Xb + u[pair_id] + e[pair_id,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+-----------------------------
                lnFDI_ijt |   5.636785       2.374192
                        e |   .8397174        .916361
                        u |   2.416515       1.554514

        Test:   Var(u) = 0
                             chibar2(01) =   922.47
                          Prob > chibar2 =   0.0000
```

[160] See Torress-Reyna (2007) for detail.

The Stata output of Breusch and Pagan Lagrangian multiplier test for the KPC model (`Prob>chibar2 = 0.0000`) suggests that the null hypothesis is rejected at any level of confidence and conclude that random effects is appropriate instead of the OLS regression due to the existence of significance differences across countries.

(C) Hausman test for the KPC model

Hausman test is a technique to decide the preferred model between the RE model and the FE model.[161] The null hypothesis is the error terms are not correlated with the explanatory variables.

```
             ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |       fe           re         Difference          S.E.
-------------+----------------------------------------------------------------
       lnSGDP|    .3175705     .8365492       -.5189787        .2504571
 lnsimilarity|    .5573544     .6813025       -.1239482         .232194
Skilled Ratio|    .1718118     .1464594        .0253524        .0592266
    Unskilled|   -.0133998    -.0593428         .045943         .022353
 CapitalRatio|    .0299566     .0269198        .0030368        .0106845
         GDPG|    .0202266     .0368098       -.0165832        .0064737
    Education|    7.631295     7.015274        .6160211        1.704296
  lnTradeOpen|     .102923     -.026246         .129169        .3798795
        Urban|   -.0369896    -.0120143       -.0249753         .067158
  Electricity|    .0281537      .006645        .0215087        .0116177
GovtStability|     -.05497    -.0302434       -.0247266        .0267019
     Inv.Risk|   -.1460157    -.1215382       -.0244775        .0291483
      Corrupt|     .252802        .1914        .0614021        .0681296
    Law-order|    .6215201     .4165733        .2049468        .1834747
  Bureaucracy|    .0068205    -.9599754         .966796        2.012604
     Tax rate|    .0110875     .0057766        .0053108        .0108251
Anti-Monopoly|   -.2884982      .015325       -.3038232        .1236113
     Property|     .050222     .0152215        .0350004        .0242953
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                 chi2(18) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       28.26
                Prob>chi2 =      0.0583
                (V_b-V_B is not positive definite)
```

Hausman test result suggests that the KPC model should choose the RE model instead of the FE model as the null hypothesis is accepted. It is because the KPC model $\rho\ value = 0.0583$ is greater than 0.005.

[161] See Greene (2008) for review.

Appendix 7.6. Robustness check results

Table 1 FDI determinants in Indonesia bilateral FDI flows (robustness check with all values)

Dep.Var: log of Indonesia bilateral FDI flows (inflows and outflows)	FGLS	FGLS
Regressors	(1)	(2)
Gravity variables		
Log of sum GDP	1.874***	1.412***
	(0.134)	(0.152)
Log of similarity	0.516***	0.365***
	(0.127)	(0.138)
Log of distance	-0.743***	-0.777***
	(0.127)	(0.144)
Knowledge-physical-capital variables		
Skilled ratio	0.176***	0.093
	(0.064)	(0.073)
Unskilled ratio	-0.056**	-0.019
	(0.026)	(0.030)
Physical capital ratio	0.027**	0.014
	(0.013)	(0.010)
Institutional determinants		
Government stability	-0.013	0.025
	(0.037)	(0.047)
Investment risk	-0.170***	-0.187***
	(0.048)	(0.059)
Good governance	0.312***	0.430***
	(0.084)	(0.102)
Law and order	0.125	0.061
	(0.115)	(0.123)
Bureaucracy	-0.658***	-0.739***
	(0.181)	(0.188)
Control Variables		
GDP growth	0.029**	0.032*
	(0.014)	(0.018)
Education	8.627***	7.856***
	(2.901)	(2.915)
Log of trade openness	1.092***	0.851***
	(0.240)	(0.258)
Urban population	0.006	0.007
	(0.006)	(0.005)
Corporate tax rates	-0.005	-0.011*
	(0.005)	(0.006)
Log of utility infrastructure (Access to electricity)	0.028***	-0.007
	(0.009)	(0.012)
Anti-monopoly policy	0.426***	-0.044
	(0.121)	(0.146)
Property right protection	-0.211***	-0.128**
	(0.054)	(0.065)
Border	3.299***	-0.086
	(0.583)	(2.887)
Colony	2.646***	1.710
	(0.811)	(1.772)
Constant	-57.240***	-37.805***
	(5.206)	(5.729)
Year effects	Yes	Yes
Observations	607	607

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Note: Column (1) uses the positive Indonesia bilateral FDI flows , Column (2) uses all values of Indonesia bilateral FDI flows.

Table 2 FDI determinants in Indonesia bilateral FDI flows (the WGI index)

Dep.Var: log of Indonesia's bilateral FDI flows (inflows and outflows)	FGLS	FGLS
Regressors	(1)	(2)
Gravity variables		
Log of sum GDP	1.874***	1.763***
	(0.134)	(0.157)
Log of similarity	0.516***	0.486***
	(0.127)	(0.134)
Log of distance	-0.743***	-0.692***
	(0.127)	(0.142)
Knowledge-physical-capital variables		
Skilled ratio	0.176***	0.178***
	(0.064)	(0.066)
Unskilled ratio	-0.056**	-0.051*
	(0.026)	(0.026)
Physical capital ratio	0.027**	0.025*
	(0.013)	(0.015)
Institutional determinants		
Government stability	-0.013	-
	(0.037)	
Investment risk	-0.170***	-0.049
	(0.048)	(0.051)
Good governance	0.312***	-0.008
	(0.084)	(0.206)
Law and order	0.125	-
	(0.115)	
Bureaucracy	-0.658***	-
	(0.181)	
political stability	-	-0.085
		(0.167)
Rule of law	-	-0.316
		(0.305)
Government effectiveness	-	0.055
		(0.343)
Control Variables		
GDP growth	0.029**	0.037***
	(0.014)	(0.014)
Education	8.627***	5.517*
	(2.901)	(2.972)
Log of trade openness	1.092***	0.925***
	(0.240)	(0.282)
Urban population	0.006	0.008
	(0.006)	(0.007)
Corporate tax rates	-0.005	-0.007
	(0.005)	(0.006)
Log of utility infrastructure (access to electricity)	0.028***	0.036**
	(0.009)	(0.014)
Anti-monopoly policy	0.426***	0.378**
	(0.121)	(0.156)
Property right protection	-0.211***	-0.122*
	(0.054)	(0.073)
Border	3.299***	3.460***
	(0.583)	(0.719)
Colony	2.646***	2.827***
	(0.811)	(0.920)
Constant	-57.240***	-53.750***
	(5.206)	(6.141)
Year effects	Yes	Yes
Observations	607	607

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
Note: Column (1) is the main results, column (2) is the robustness results.

Table 3 FDI determinants in Indonesia bilateral FDI flows (the dynamic GMM)

Dep.Var: log of Indonesia's bilateral FDI flows (inflows and outflows)	2-Step Sys GMM
Regressors	(1)
Log of Indonesia bilateral FDI flows, lagged one	0.887***
	(0.089)
Gravity variables	
Log of sum GDP	0.183
	(0.155)
Log of similarity	0.328**
	(0.136)
Log of distance	-0.582*
	(0.298)
Knowledge-physical-capital variables	
Skilled ratio	-0.071
	(0.069)
Unskilled ratio	-0.078**
	(0.037)
Physical capital ratio	0.009
	(0.009)
Institutional determinants	
Government stability	0.046
	(0.069)
Investment risk	-0.104
	(0.071)
Good governance	0.143
	(0.105)
Law and order	-0.033
	(0.082)
Bureaucracy	-0.039
	(0.131)
Control Variables	
GDP growth	0.007
	(0.028)
Education	0.451
	(1.666)
Log of trade openness	0.125
	(0.126)
Urban population	-0.000
	(0.003)
Corporate tax rates	0.000
	(0.004)
Log of utility infrastructure (access to electricity)	0.028***
	(0.008)
Anti-monopoly policy	0.272*
	(0.142)
Property right protection	-0.080
	(0.068)
Border	-5.761
	(3.869)
Colony	-0.433*
	(0.250)
Year effects	Yes
Observations	532
Number of Groups	76
Number of Instruments	41
Hansen J-test (p-value)	0.392
AR (1) test (p-value)	0.000
AR (2) test (p-value)	0.114

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1