Journal of Economic Integration
Vol. 38, No. 2, June 2023, 247-277
https://doi.org/10.11130/jei.2023.38.2.247

pISSN: 1225-651X eISSN: 1976-5525

Trade Impediments in Indonesia

Barli Suryanta[1+] and Arianto Arif Patunru[2]

[1]*School of Business and Management, Bandung Institute of Technology (ITB), Indonesia*
[2]*Arndt-Corden Department of Economics, Australian National University, Australia*

Abstract This study investigates the effect of various types of trade impediments on Indonesia's trade flows. We categorize tariff measures, non-tariff measures (NTMs), and the lack of trade facilitation measures into at-the-border and behind-the-border barriers. A gravity model is applied to a panel dataset covering 177 of Indonesia's trade partners from 2007 to 2016. This study shows that Indonesia's trade protection remains high, particularly due to the increasing use of NTMs. Furthermore, the lack of trade facilitation also contributes to increasing trade costs, particularly those associated with trade logistics and administration. We also demonstrate why feasible generalized least square is preferable to ordinary least squares and pseudo-Poisson maximum likelihood when estimating a gravity model using panel data that are auto-correlated and contain a large number of zero observations.

Keywords: Indonesian economy, non-tariff measures, trade facilitation, gravity model

JEL Classifications: F13, F14, F15

Received 7 March 2022, Revised 26 March 2023, Accepted 11 April 2023

I. Introduction

International trade brings several benefits to the Indonesian economy, as it assists the country utilize its comparative advantage, increase its specialization, and maximize the roles of its labor force for manufacturing production. To exploit the benefits of international trade, Indonesia actively pursues economic integration to boost trade. However, Indonesia's involvement in trade remains relatively modest. For instance, Indonesia's merchandise trade-to-GDP ratio was 30% in 2016 (Figure 1). This percentage is the lowest among its main ASEAN neighbors, including Singapore, Vietnam, Malaysia, Thailand, and the Philippines, which had merchandise trade-to-GDP ratios of 203%, 171%, 121%, 99%, and 48%, respectively. This relative position of Indonesia has remained relatively unchanged at least since 1995.

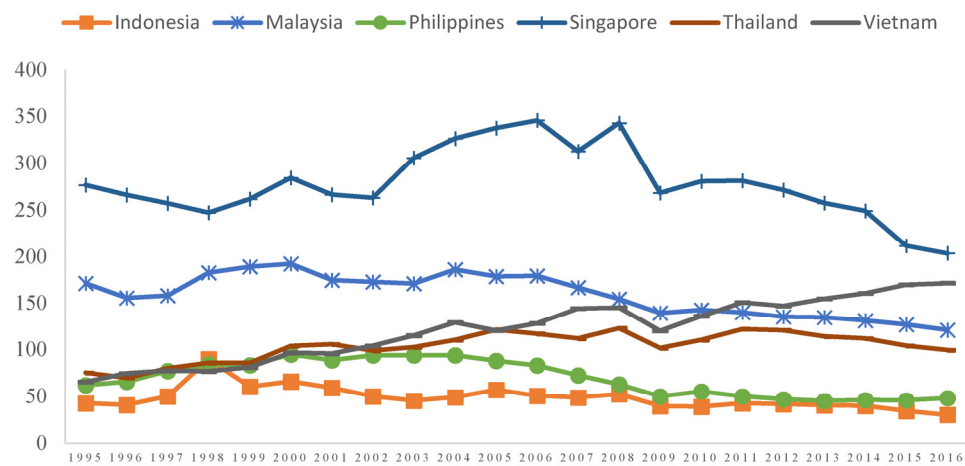
Together with the proliferation of preferential trade agreements (PTAs) and unilateral

+Corresponding Author: Barli Suryanta
Visiting Lecturer, Business Risk and Finance Department, School of Business and Management, Bandung Institute of Technology (ITB), SBM ITB Main Campus, Bandung 40132, Indonesia. E-mail: barli.suryanta@sbm-itb.ac.id
Co-Author: Arianto A. Patunru
Fellow, Arndt-Corden Department of Economics, Crawford School of Public Policy College of Asia & the Pacific, Canberra, ACT 2601, Australia. E-mail: arianto.patunru@anu.edu.au

liberalization, the World Trade Organization (WTO) has succeeded greatly in decreasing tariff barriers across nations. However, although tariff barriers have decreased, the implementation of trade protection measures, such as non-tariff measures (NTMs), has increased dramatically. The role of these NTMs as a factor impeding international trade flows is rapidly emerging.

The United Nations Conference on Trade and Development (UNCTAD, 2009) defines NTMs as "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. 16). This definition suggests that NTM is a neutral concept that a country can use to protect consumer health, the environment, and national security. However, in practice, NTMs frequently impede trade or promote trade while distorting the international market. When countries issue NTMs for protectionist (discriminatory) purposes, they transform into non-tariff barriers (NTBs) (United Nations Economic and Social Commission for Asia and the Pacific [UNESCAP], 2019; Ahamat and Manaf, 2018). 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 to refer to measures that may hinder trade through their application (UNESCAP, 2019).

Figure 1. Merchandise trade (total exports and imports in goods) to GDP, Indonesia and its main ASEAN partners, 1995-2016



(Source) World Development Indicator database.

Apart from tariffs and NTMs, other trade barriers exist, such as poor logistics and connectivity and inadequate export/import clearance management and systems. In this regard, policymakers worldwide have introduced several "trade facility measures" (TFMs) to help in dealing with such impediments. The WTO defines trade facilitation as simplifying, modernizing, and harmonizing export and import processes.[1] This definition suggests that trade facilitation is an effort to

lower trade costs, which benefits cross-border trade flows. In practise, effective trade facilitation is analogous to reducing the trade distance between countries.[2)]

However, trade facilitation typically requires costly investments. For instance, establishing new infrastructure in trade customs, such as information and communication technology (ICT) equipment, necessitates technology, new regulations, and institutional improvement. Due to these costly requirements, many financially constrained developing countries would underinvest in trade facilitation. Other factors, including a lack of political will from member countries (WTO, 2015) and slow implementation (Moise, 2013), also contribute to the lack of trade facilitation. The UNCTAD emphasizes that such a lack can prolong the existence of obstacles to global trade flow, such that long waiting times at borders, inappropriate fees, cumbersome formalities, and inadequate or ambiguous rules and regulations can all become significant trade impediments.[3)]

Some developing countries and all least-developed countries would find it challenging to reform their trade facilitation under the WTO's trade facilitation agreement (TFA) if large investment projects were required. However, the WTO (2015) also argues that a satisfactory rate of TFA implementation will depend on the political will of member countries, particularly the developing and least-developed members. Thus, TFA implementation in the short-run is extremely difficult.

In sum, failure to reduce tariffs or eliminate NTMs and provide adequate TFMs could significantly increase trade costs. These impediments can be encountered and experienced either at the border or behind the border. For this study, we classify impediments accordingly as either at-the-border barriers (ABBs) or behind-the-border barriers (BBBs). The preceding discussion leads to the primary research questions of this study: What are the impediments to Indonesia's trade flows and their relative impacts in terms of ABBs and BBBs to trade? We justify this research question by discussing Indonesia's trade barriers in the following section (section II).

This study would contribute to the literature in two ways. First, we cover three aspects of trade impediments, namely, tariffs, NTMs, and a lack of trade facilitation, in a single model and classify them as ABBs and BBBs to investigate their effect on Indonesia's aggregate trade flows. To the best of our knowledge, existing studies mainly focus on tariffs or NTMs. However, none discuss the effects of trade impediments in terms of ABBs and BBBs, particularly in the case of Indonesia. This distinction facilitates policymaking. Second, the contribution to trade literature, particularly in the case of Indonesia, consists of the present study's model development and specifications.

This study shows that Indonesia's trade flows are sensitive to trade impediments, such as tariffs

1) See https://www.wto.org/english/tratop_e/tradfa_e/tradfa_e.htm for detail of The WTO's Trade Facilitation Agreement (TFA).

2) Lee and Park (2007) define a lack of reform in trade facilitation as an institutional distance in trade.

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

and NTMs and the lack of TFMs. Moreover, behind-the-border NTMs are more detrimental to Indonesia's trade flows than tariffs and NTMs at the border. Regarding trade facilitation, providing TFMs at the border turns out to be more effective than providing them behind the border.

The remainder of the paper is structured as follows. Section II summarizes Indonesia's trade impediments; Section III outlines model specification, data explanation, and estimation strategy; Section IV discusses empirical results and their policy implications; Section V lays out a series of robustness checks; and Section VI concludes and provides implications of the research findings.

II. Indonesia's Trade Impediments

A. Tariff measures

Indonesia's import tariffs have substantially decreased in terms of both effectively applied tariffs (or known as AHS)[4] and most-favored-nation tariffs (MFNs) for all products. The applied tariff in terms of simple average fell from 14% in 1995 to approximately 6% in 2016, whereas the MFN tariff followed a similar pattern, falling from 15% to 8% over the same period.[5] The pattern also shows a general decline in preferential tariffs. For example, nearly all tariff lines have been reduced to zero under the common effective preferential tariff scheme of ASEAN economic integration.

B. Non-tariff measures

Table 1 summarizes the recent NTMs 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 (Evenett and Fritz, 2016). As shown, Indonesia's red (harmful) measures have significantly increased after the global financial crisis in 2008.[6] In the second term of Susilo Bambang Yudhoyono's presidency (2009-2014), he significantly imposed more harmful NTMs, from 3 measures in 2008 to 13 measures in 2009.

---

4) The World Integrated Trade Solution (WITS) uses the concept of effectively applied tariff, which is 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.

5) Author's calculations based on the World Development Indicator database.

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

Table 1. *The Number of Red (Harmful) Measures in Indonesia's NTMs and Number of Affected Countries by Indonesia's Harmful NTMs*

Number of Red MeasuresYear	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

Notes. The number of measures in non-tariff are only for trade in goods. This study excludes foreign direct investment measures and migration measures.
(Source) Author's calculation based on the Global Trade Alert database.

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. In 2012, 17 red measures were implemented in Indonesia, and 153 partner countries were affected. These harmful NTMs are predominantly applied to Indonesia's commodity and natural resource industries (e.g., minerals, palm oil, wood, and agriculture) and labour-intensive industries (e.g., textiles, footwear, and leather). Table 1 shows that President Joko Widodo (Jokowi), who assumed office in 2014, also increased trade protection in terms of NTMs. In 2015, Indonesia's trade protection increased to 15 red measures, impacting 127 countries. These red measures are mostly associated with natural resources and commodity industries, including forestry, tin, sugar, and fishing. Automotive and construction industries, which rely heavily on labour forces, were also affected.

The effect of NTMs on international trade flows is evident. Several previous studies have examined how NTMs can impede trade flows. For instance, NTMs can decrease imports and increase domestic prices (Ferrantino, 2005). According to Heal and Palmioli (2015), NTMs can reduce the level of competition, economies of scale, and participation in GPNs. Moreover, NTMs can increase trade costs and restrict trade expansion. Additionally, NTMs can reduce exporter profits, resulting in slower trade growth (Evenett and Fritz, 2016). Other studies have found that the effects of NTMs on trade are higher than the effects of trade tariffs (Kee et al., 2009; Hoekman and Nicita, 2011).

The World Bank (2016) has reported the impact of NTMs on Indonesia. In 2015, the prices of milled rice, sugar, meat, and fruit increased by more than 20% in comparison with the 2008 prices. In contrast, the prices of processed foods, beverages, and tobacco were 13.7% higher in 2015 than they were in 2008. This indicates that NTMs play a substantial role in increasing Indonesia's domestic prices of several major products.

C. Lack of trade facilitation measures (TFMs)

This study utilizes the WTO's criteria of trade facilitation indicators. 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 can therefore serve as indicators of trade facilitation. Based on earlier empirical studies, we also include other trade facilitation indicators, such as seaports, airports, land transport (road), and maritime transport (shipping).[7)]

Several previous studies have demonstrated that improving a seaport's quality positively impacts its trade volume (Blonigen and Wilson, 2008; Havemen et al., 2009; Feenstra and Ma, 2014). Furthermore, trade increases by 0.7%-8% on average when improving 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).

According to Jacoby and Hodge (2008), the improvement in transportation infrastructure could help firms reduce their operating costs, resulting in efficiencies in sourcing costs, fleets, warehousing, inventory, and transit time visibility. Shepherd et al. (2011) demonstrated that the Asia-Pacific Economic Cooperation (APEC) members gain an average of 4% more export trade due to reforms in transportation infrastructure, or between 2% and 6% for each APEC member. Shepherd and Wilson (2009) have also provided evidence of the effects of TFMs on Indonesia's trade flows. An improvement to Indonesia's seaports increases the country's imports and exports by 17.5% and 13.3%, respectively.

Table 2 shows that Indonesia's export and import costs were relatively low in 2015. In particular, Indonesia's costs are lower than India's and China's, comparable with Malaysia's, but higher than Singapore's. All of this suggests that Indonesia has implemented substantial reforms to reduce its export and import costs. Table 2 also shows the number of days required for export and import clearance. An improvement in time to trade by reduced number of days could prevent additional delays and costs, thus increasing trade. Indonesia's export and import times are relatively competitive compared with those of China, India, and Vietnam. However, their speeds are slower than Singapore, Malaysia, and even the Philippines. This suggests that Indonesia should make greater efforts to improve its time to trade to compete with its neighbors.

Table 3 outlines additional factors that may impede trade flows. Along with the Philippines, Indonesia's customs performance is abysmal. However, its seaport performs better than those of the Philippines and Vietnam.

---

7) 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. Shepherd and Wilson (2009) and Brooks (2016) have suggested air transport factor. Meanwhile, 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.

Table 2. *Cost to Trade and Time to Trade for Selected Countries, 2015*

	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.

Table 3. *Selected Trade Facilitation Measures (TFMs) for Selected Countries, 2016*

	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

Notes. The greater the index, the higher the quality of the seaport, air transport, customs, corruption, and shipping. Transporting more 20-ft equivalent units is preferable for container transportation.

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

In contrast, Indonesia's air transport quality is relatively superior. Indonesia has a higher air transport index than the Philippines, Vietnam, and India. Furthermore, Indonesia's shipping performs better than that of the Philippines, India, and Thailand, but worse than that of China and Vietnam. Given Indonesia's geographical nature as an archipelago, improving its shipping index further will be a challenge. The inter-island connection and the maritime connection between Indonesia's major islands and international markets are essential for boosting Indonesia's trade flows.

Container transportation facilitates shipping between factory, port, and warehouses (Shepherd et al., 2011). Infrastructure enhancements can facilitate efficient container transportation. Consequently, this can reduce timely delivery and improve cost saving (Brooks, 2016). Additionally, Table 4 shows that Indonesia transported over 12 million 20-ft containers in 2016. This capacity exceeds the Philippines, Vietnam, and Thailand. However, Malaysia's container transportation capacity

can reach 24 million units, which is twice that of Indonesia. Meanwhile, China's capacity is more than ten times that of Indonesia. This implies that although Indonesia has made significant reforms in its road infrastructure, it still lags behind China, Singapore, and Malaysia.

III. Methodology and Data

This study employs a gravity model to investigate the effect of Indonesia's trade barriers on its trade flows. In the model specification, Indonesia's trade impediments will be represented by ABBs and BBBs, which are combined into a gravity specification. Even though their roles are identical, which impedes trade, we include them both to determine the relative importance of each type. As noted, this study anticipates that the impact of BBBs on Indonesia's trade flows is more significant than that of ABBs.

In order to classify trade impediments as ABBs or BBBs, we refer to previous studies, if data are available. All prior studies have categorized a tariff as an ABB. However, their treatment of NTMs differs. We use a combination of the suggestions from Henn and McDonald (2011), Damuri (2012), the UNCTAD (2015), and the European Commission (2016) to determine which types of NTMs belong to ABBs and which to BBBs.

Additionally, we would like to consider trade facilitation measures (TFMs)-or lack thereof. Following trade facilitation indicators provided by the WTO (2015) and suggestions from previous studies discussed earlier, the present study considers costs to export/import, time to export/import, customs, seaport, airport, land transport (road), and maritime transport (shipping). However, we must also divide them into ABBs and BBBs. Note that what impedes trade is a deficiency in trade facilitation, not the TFM itself.[8)]

Wilson et al. (2003) included poor seaport and customs conditions as ABBs. Meanwhile, Walkenhorst and Yasui (2009) and Wilson (2009) defined cost to exports/imports and time to exports/imports as border procedures (or ABBs). Iwanow and Kirkpatrick (2007) suggested that land (road) transport factors are crucial BBBs TFMs. Moreover, Sadikov (2007) noted that all domestic infrastructures that impede BBBs should be viewed as TFMs. Following Sadikov (2007), the present study assumes that trade logistics infrastructure, such as road, air transport, and maritime transport, are components of BBBs. Table 4 summarizes our classification of trade barriers and the corresponding ABB and BBB categories.

8) A TFM, just like NTM, can serve as a covert protectionism. In this study, however, we assume it away.

Table 4. *The ABB and BBB Categories*

	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)

A. Model specification

In the construction of the primary model, we first established an empirical model of the gravity equation with the multilateral resistance (MR) factors in a panel data setting as follows:

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

where $\ln X_{ijt}$ is the log of time-varying trade flows, Y_{it} and Y_{jt} are time-varying exporters' GDP and importers' GDP and 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 (1). According to Feenstra (2002), the MR factors are represented by exporting country fixed effect (FE) (δ_{1i}) and importing country FE (δ_{2i}). The preceding empirical model also includes bilateral (pair) FE (δ_{3ij}) following Baier and Bergstrand (2007).

To transform equation (1) into our primary estimation equation, we simplify the parameters of interest by using the following different notations:

$$\ln X_{ijt} = \alpha_1 + \alpha_2 \ln Y_{it} + \alpha_3 \ln Y_{jt} + \alpha_4 \ln D_{ij} + \alpha_5 \ln b_{ij} + \alpha_6 Lang_{ij} + \alpha_7 Col_{ij} + \alpha_8 FTA_{ij} + \delta_i + \delta_j + \delta_{ij} + \epsilon_{ijt} \quad (2)$$

Equation (2) must be expanded to include the ABBs variables and the BBBs variables to accommodate our gravity equation with trade impediment variables. We also include time-varying control variables. We treat b_{ij}, $Lang_{ij}$, Col_{ij}, and FTA_{ij} as time-invariant control variables. In addition, time dummies are utilized in our model specification. Therefore, equation (2) now becomes:

$$\ln X_{ijt} = \alpha_1 + \alpha_2 \ln Y_{it} + \alpha_3 \ln Y_{jt} + \alpha_4 \ln D_{ij} + \beta_k ABB'_{ijt} + \gamma_k BBB'_{ijt} + \pi_k Control'_{1ijt} + \tau_k Control'_{2ij} + \delta_i + \delta_j + \delta_{ij} + \theta_t + \epsilon_{ijt} \quad (3)$$

Equation (3) now becomes 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, depending on data availability. This approach increases the number of observations and improves point of estimates, as suggested by Benedictis and Taglioni (2011), who contend that the main problem of trade data is underreporting, outliers, or missing observations, and that the sum of exports and imports can help to mitigate this issue. However, we also conduct a robustness test with alternative, unidirectional flows, such as export 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. According to Feenstra and Ma (2014), the GDP is a significant indicator of a country's economic capacity. $\ln D_{ij}$ is the logarithm of the distance between the two capital cities in kilometers.

ABB'_{ijt} is the vector for ABBs. Recalling Table 4, this vector includes Indonesia's and its trade partners' import tariff rates at time *t* in percentages,[9] and 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 contains TFM variables, such as the quality of Indonesia's and

9) Import tariff rates use the weighted mean applied tariff. Following tradition in the trade literature, we added the constant of 1 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, that have zero or missing tariff rates. The WITS 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.

its trading partners' seaports and customs in indexes at time *t*. This vector also includes the *log* of Indonesia's trade costs, which are the sum of export and import costs 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*.

BBB'_{ijt} is the vector of BBBs. Table 4 shows that this vector consists of subsidy and local content measures.[10] In addition, we include 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 represents the quality of air transportation at time *t* in index. Meanwhile, maritime transportation (shipping) reflects the quality of maritime transportation at time *t* and is proxied by the Liner Shipping Connectivity Index.[11]

$Control'_{1ijt}$ is the vector of time-varying control variables. This vector captures endowment effects by including the log of exporters' population (Indonesia and its trade partners) and the log of importers' population (Indonesia and its trade partners) at time *t* (Feenstra and Ma 2014). Following Iwanow and Kirkpatrick (2007), Shepherd and Wilson (2009), and the WTO (2015), the current study includes a variable on good governance to control irregular payment effects in trade. ICT plays an important role in streamlining cross-border trade flows (Brooks, 2016); therefore, this variable is also included in the model to control for the ICT utilization effects. The measure of the ICT variable is based on the variable's proportional investment in of Indonesia's total exports and imports of goods at time *t*.[12]

$Control'_{2ij}$ is the vector of time-invariant control variables. The study includes a dummy for 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 (regional trade agreements, bilateral trade agreements, or both) during the observations (see the period of data in data explanation section). Thus, we assume that PTA membership is constant or that the time variation of the PTAs variable tends to be constant. The dummy is assigned a value of 1 if both countries belong to the same PTA, and 0 otherwise.

Other dummies are used to indicate whether the trade partners share common land, an official common language, or the same colonial ties (the colonial history)-these are used to control for geographical border effects in land, cultural, and colonial history effects, respectively. As noted, δ_i and δ_j are exporting and importing country's FEs, respectively. The variable of δ_{ij} is bilateral (pair) FEs. 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.

---

10) These subsidies measures exclude export subsidies under P7 (See the UNCTAD international classification of NTMs, the 2012 version).

11) UNCTAD (2010) construct five indicators of the maritime transport sector to be an index of Liner Shipping Connectivity Index 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.

12) 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.

B. Data explanation

The data structure is a panel covering 177 of Indonesia's trade partners between 2007 and 2016 (See Table A1 in Appendix) for the list of countries. The year 2007 is chosen as the initial period because TFMs and NTMs data are readily available.

Anderson and van Wincoop (2003) explained that trade volumes in the gravity model with the MR factors can be proxied by trade values. Thus, we utilize trade values as the dependent variable, following Anderson and van Wincoop (2003). Access is made to the Trade Map datasets from the International Trade Statistics in order to obtain bilateral trade data on Indonesia's exports and imports. Notably, the dependent variable of the gravity models utilized in many previous studies is a measure of unidirectional trade flows rather than total trade flows, that is, export flows (Poyphonen 1963; Aitken 1973; Anderson 1979; Bergstrand 1985, 1989; Deardorff, 1998) or import flows (Subramanian and Wei 2007; Armstrong, 2009). However, using the sum of exports and imports as the dependent variable will allow us to increase the number of observations that should result in point estimates as suggested by Benedictis and Taglioni (2011).

In terms of weighted mean applied tariffs, the World Integrated Trade Solution (WITS) is the primary source for import tariff rates. The study heavily relies on the GTA for NTMs datasets. The GTA dataset contains country-level NTMs in the form of panel data for both ABBs and BBBs. The NTMs dataset derived from the GTA offers several advantages. For example, it provides a panel data structure with detail NTMs types compatible with our estimation strategy. Meanwhile, the UNCTAD's Trade Analysis Information System and the WITS also provide information on NTMs in a cross-sectional format. Regarding NTMs variables, this study only considers trade quotas, trade bans, subsidy measures, and local content measures NTMs series with complete data from 2007 to 2016. In addition, we only consider "red" measures, which are the most harmful.

As noted, NTMs are difficult to observe, let alone quantify. In lieu of developing an ad-valorem equivalent (AVE) method, the direct approach suggested by Chen and Novy (2012) is the most practical way to address this issue.[13] The direct approach suggests that one method for observing and measuring NTMs is to observe them as dummy variables. Numerous previous studies, such as Bao and Chen (2013), Cadot and Gourdon (2016), and Ing and Cadot (2017), support the use of dummy variables.[14] We follow this direct approach by treating all NTMs as binary variables in this study. Hence, we only examine NTMs at the country level, as opposed to the product level, because we use the aggregate (total-all products) bilateral trade data between the two countries rather than disaggregate bilateral trade data in products using Harmonized System (HS) digits between the two countries. Another important reason for using dummy

13) The *ad-valorem equivalents* method introduced by Kee et al. (2009) could not be performed in this study because this method only captures the aggregate effects of NTMs on trade flows.

14) Those previous studies took a form of dummy for specific trade concerns, such as TBT and SPS. They score 1 if tariff lines are affected by TBT or SPS, and 0 otherwise.

for NTMs is to capture different trade effects associated with the various NTM types.

We focus on Indonesia's NTMs affecting its export and import of goods; hence, configuring a panel data setting for these NTMs variables is challenging because of the lack of data. We determine that Indonesia's trade quotas and trade bans have sufficient observations to be a panel data structure. In contrast, Indonesia's subsidy and local content measures must include several related NTMs as a part of subsidy and local content measures to achieve a panel data structure and increase the number of observations. Thus, Indonesia's subsidy measures include bailout (capital subsidies 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. In addition, we include local sourcing, local operations, local labor, and localization incentive as local content measurement variables for Indonesia.

The dummies for Indonesia's trade quotas, trade bans, subsidy measures, and local content measures are assigned a value of 1 if they affect Indonesia's export or import goods during the observation at time t, and 0 otherwise.

This study also compiles TFMs variables datasets from multiple sources. For instance, the Global Competitiveness Index compiled by the World Economic Forum provides indexes datasets of seaport and air transport quality beginning in 2007.[15] The World Bank began compiling the Logistic Performance Index in 2007 to evaluate the quality of customs worldwide.[16] Specifically, the World Bank Doing Business Index series is utilized to obtain 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.[17] Based on the UNCTAD datasets, the World Development Indicator (WDI) is the primary source of information on container transportation from land to seaport and vice versa,[18] international shipping networks,[19] and ICT for trade purposes[20] from 2007 to 2016. In addition, the WDI provides the exporter population

15) 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 the steps of measuring the quality of seaport and air transport for detail.

16) The scale of customs index is 1 to 5, meaning the higher index, the better the quality. Because the data of Logistic Performance Index (LPI) releases per two years consecutively, 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.

17) See https://www.doingbusiness.org/en/doingbusiness for measuring the trade (export and import) costs and time to trade (export and import) in the number of days for detail.

18) 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.

19) 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.

20) The larger the proportion of total trade (total export or total import), the better it is in terms of the amount

and importer population from 2007 to 2016. The corruption index is a proxy of good governance derived from the Worldwide Governance Indicators by Kaufmann et al. (2010), with a series from 2007 to 2016.[21)]

The WDI provides the population and GDP (in USD) datasets. Meanwhile, the CEPII collects data for distance, common land border, common language, and colony (colonial history). The Asia Regional Integration Centre of the Asian Development Bank (ADB), the WTO, and the Global System of Trade Preferences among Developing Countries-UNCTAD provide information on signed and active PTAs for Indonesia. Table 5 exhibits the summary statistics of the observed variables of our gravity model.

Table 5. *Summary Statistic of the Variables Observed in the Gravity Model*

	UnitsVariable	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 metres	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	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

(Source) Author's calculations.

of investments in ICT.

21) 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). See http://info.worldbank.org/governance/wgi/#home for how to measure the corruption index for detail.

It is important to examine the possibility of multicollinearity between the employed variables. Based on the correlation coefficients (See Table A2 in Appendix), we find no indication of multicollinearity between the dependent variable and trade impediment variables, or between trade impediment variables themselves.

C. Estimation strategy

Using panel data in a gravity estimation can give rise to potential sources of heteroskedasticity and autocorrelation. Heteroskedasticity may exist due to changing cross-sectional unit variances over time. Meanwhile, autocorrelation arises when error terms within units are serially correlated due to time series construct. Failure to control both could result in skewed estimates of standard error. As a result, the test statistics would become invalid, and the precision of the estimation coefficient would decrease. Therefore, the conventional ordinary least square (OLS) is no longer valid (Wooldridge, 2013).

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 coefficients' values are insignificant (Bertrand et al., 2004). Hansen (2007) argued that the group level FEs may be biassed in this instance, whereas Hausman and Kuersteiner (2008) noted that the FE method and the difference-in-difference method continue to fail to account for autocorrelation.

Silva and Tenreyro (2006) introduced the pseudo-Poisson maximum likelihood (PPML) method for estimating the gravity model with a substantial number of zero trade flows. This PPML technique may also be used to tackle the problem of heteroskedasticity. According to Zarzoso (2013), their PPML estimator is powerful when the number of zero trade flows in the dependent variable is high.[22] However, they did not explain explicitly how to address the autocorrelation problem in gravity panel data. In addition, the number of zero trade flows is relatively low in this study, accounting for only 1.7% of total observations. Therefore, we decided not to utilize 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 the variables on the right-hand side of the equation that influence disturbances (or the true error variance-covariance matrix) are initially unknown. Therefore, these unknown influencer variables affecting the error terms must be estimated. Note, however, that in the case of gravity structures, the standard FGLS estimator remains biassed if two fundamental problems, namely, MR (Anderson and van Wincoop, 2003) and endogeneity, are not appropriately addressed. As discussed by Baier and Bergstrand (2007), the latter most likely results from the PTA and the unobserved

22) Zarzoso (2013) suggested that zero trade values reasonably matter for the PPML estimator when their number is approximately 10%-30% of all observations.

time-invariant variables on the right-hand side of the equation, which may correlate with the gravity equation's error term due to omitted variables (and selection bias).

Controlling exporters' FEs and importers' FEs, according to Feenstra (2002), is one way to reduce the problem of MR. Meanwhile, Baier and Bergstrand (2007) contend that controlling bilateral FEs (i.e. pair FEs) effectively reduces the source of endogeneity bias from the PTA and unobserved time-invariant heterogeneity (e.g. a distance variable). Following Matyas (1997), we included a time FE to capture the business cycle effects of a country.

One remaining issue in using of the FGLS estimator is related to the length of panel data, as it affects the estimation accuracy. In this instance, the length of panel data is measured by the ratio of the number of time series (T) to the number of cross-sections (N), or T/N. Parks (1967) specified 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) suggested 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 $T/N \leq 1.5$, as argued by Moundigbaye et al. (2018)). In this study, the time dimension is 10 and cross dimension is 177, so the T/N is 0.06, which is acceptable according to Reed and Ye (2011) and Moundigbaye et al. (2018).

The literature suggests that the coefficients of the key gravity variables, such as the GDP of exporters and importers, is positive, whereas 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), will be negative. Meanwhile, BBBs, including subsidy measures and local content measures, should have a negative sign and be significant. However, enhancing the provision of TFMs should increase trade flows. Therefore, both the ABB and BBB TFM coefficients are expected to be positive.

The signs of some control variables could not be determined beforehand because they can take either direction, and the results of previous studies were contradictory. These include exporters' population, importers' population, a shared land border, common official language, and colonial ancestry. Other control variables, including the PTA and the factor of good governance, should have a positive effect. A positive PTA coefficient indicates that participation in global integration can help increase trade flows. Similarly, an improvement in good governance that reduces the administrative costs associated with trade should facilitate more trade flows.

IV. Empirical Results

The modified Wald test for heteroskedasticity ($\rho(0.0000)\langle 0.01$)) and the Wooldridge test for autocorrelation ($\rho(0.0019)\langle 0.01$)) confirm that the main panel data used in this study suffers

from the problems of heteroskedasticity and autocorrelation.

Therefore, we opted for FGLS. Table 6 displays regression results derived from this estimator (column 3). For the sake of comparison, we also show the OLS and FE results (columns 1 and 2). As previously discussed, the standard OLS in column (1) is biased due to a number of potential sources, including non-constant disturbances (heteroskedasticity), serial correlation in error terms (autocorrelation), the MR problem, and the endogeneity problem. Therefore, using the standard OLS can result in invalid coefficient of estimates and misleading statistical inferences.

When the technique is improved by employing an FE method and controlling for possible biases, the method is still incapable of explaining the key gravity and trade impediment variables. This confirms Hausman and Kuersteiner's (2008) assertion that the FE method does not adequately address the autocorrelation problem. In the FE method, time-invariant factors, such as distance, common official language, colony, and PTA, are eliminated because they are perfectly collinear with FE factors, as shown in column (2).

In contrast, FGLS results are more plausible and robust, with smaller standard errors. The key gravity variables and certain trade impediment factors are statistically significant with the expected signs. The results indicate that a 10% increase in the GDP of global exporters and importers should raise Indonesia's trade flows by 0.97% and 1.71%, respectively. Even though the main model has time FEs, the FGLS estimator plays an important role in estimating our time-invariant variables, including dummies, by assigning them a weighted value of heteroskedasticity and the AR (1). As expected, the distance factor shows a negative effect.

A. The effects of trade impediments: the ABBs

The results of trading ABBs are mixed. As expected, import tariffs play a significant role in reducing Indonesia's trade flows. A 10% increase in the global import tariff decreases Indonesia's trade flows by approximately 1.4% on average. Contrary to expectations, the coefficient of trade quotas turns out to be negative. This suggests that trade quotas during the specified time period actually facilitated trade rather than hindering it. This is associated with the so-called "asymmetric NTMs." According to Bratt (2015), the effect of NTMs on international trade flows is indeterminate. In some cases, NTMs could facilitate trade expansion, whereas in others, they are trade barriers. Bratt (2017) further argued that when importing countries impose NTMs on exporting countries, the NTMs may have a different effect on exporting countries. Some exporting countries tend to increase their trade, whereas 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, which reveals that most of Indonesia's export bans were imposed on mining products. Because this policy was effectively rescinded

in 2014, the trend of Indonesia's export bans on unprocessed metals and minerals has declined, which may explain this insignificance.

Regarding at-the-border TFMs, this study finds that seaports have a positive and significant impact on Indonesia's trade flows. A one-point increase in the quality of the seaport index relative to the global average increases Indonesia's trade flows by an average of 5.2%. This implies that improvements to Indonesia's seaport infrastructure are necessary to increase trade flows. Another noteworthy finding is that, on average, saving one trading day increases Indonesia's trade flows by 2.9%. This demonstrates that a shorter time to trade (export and import) in Indonesia can contribute to the expansion of its international trade flows.

Table 6. *The Impact of Indonesia's Trade Impediments on Its Aggregate Trade Flows*

	(1)	(2)	(3)
	OLS	FE	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)

Table 6. *Continued*

	(1)	(2)	(3)
	OLS	FE	FGLS FE
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	-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

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

Wilson et al. (2003) noted that, to some extent, customs improvement and import tariff reduction can be substitutes. Thus, improvements in customs may compensate for deficiencies in reducing tariff barriers, and vice versa. Model (3) confirms the findings of Wilson et al. (2003); that is, most countries in our sample, including Indonesia, appear to opt for tariff reduction, as this strategy is more feasible to implement due to the rapid development of economic integration, which allows for tariff negotiations. Conversely, improvement in customs requires investment that can be considerably more expensive. In the case of trade costs, the insignificance coefficient might be due to the fact that Indonesia's trade costs have been relatively low (Table 2); therefore, this factor is no longer significant in affecting Indonesia's trade flows.

B. The effects of trade impediments: the BBBs

As expected, behind-the-border NTMs in the form of local content measures reduce Indonesia's trade flows by approximately 10.5%.[23] Note that the local content measures have a greater

effect than import tariffs. This evidence is consistent with the findings of Kee et al. (2009), Hoekman and Nicita (2011), and UNCTAD (2012), confirming that NTMs have a greater impact on inhibiting trade 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 that of at-the-border impediments, such as trade quotas and trade bans. This finding validates Henn and McDonald's (2011) conclusion that the BBBs' NTMs are more harmful than the ABBs' NTMs. However, the effect of the subsidy measures on Indonesia's trade flows is insignificant.

The estimation results of the behind-the-border TFMs are more inconsistent. For example, container transportation has a significant and positive relationship with Indonesia's trade expansion. The improvement of container transportation by 10% of the global average may increase Indonesia's trade flows by approximately 4%. Meanwhile, maritime transportation is another important infrastructure for trade. Higher connectedness to global shipping can facilitate the expansion of trade. The result of shipping shows that a one-index-point improvement in global maritime infrastructure increases Indonesia's trade flows by approximately 0.6%. However, the expected coefficient for air transportation is not as expected. The possible interpretation could be that most of the world's air transportation, including in Indonesia, is used for passenger purposes instead of air cargo. Therefore, air transportation is unlikely to be utilized for commercial purposes, as it is not cost-effective and carries fewer goods than shipping.

Column (3) also shows that Indonesia's participation in economic integration has a significant positive impact on its trade flows. Thus, increasing the number of PTAs will increase Indonesia's trade. The result of the good governance factor suggests that Indonesia's trade may increase by an average of 3% when the global average index of good governance in aggregate improves by one point.

V. Robustness Checks

A. 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, our initial robustness test involves employing a multiple imputation strategy to solve this issue. The main gravity model as equation (1) is still used with the FGLS estimator.

Multiple imputation method was first introduced by Rubin (1987). The basic idea is to estimate multiple missing values based on the distribution of observed data. Meanwhile, Markov

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

Chain Monte Carlo is one of the most prevalent techniques that assume a joint multivariate normal distribution for all model variables. Given the observed data, the Markov Chain Monte Carlo can fill in missing observations. The study uses the multiple imputation technique to fill in the missing data.

Column (1) of Table A3 in Appendix shows that the observed sample size improves dramatically to 3,157, or 89%. This method of multiple imputation also contributes to reducing the number of missing observations of the study's key variables such as Indonesia's NTMs and TFMs variables, to approximately 1%. Although this is comparable with a full sample size, the estimation results are inadequate. Unexpectedly, the distance factor is positive but not statistically significant. The PTA variable is also insignificant. This contradicts previous findings suggesting that the PTA factor should be positive and significant to enhance trade flows. In addition, the results based on the multiple imputation panel data could not adequately explain the study's variables of interest, such as Indonesia's NTMs and TFMs. We conclude that our initial main panel data are superior to a larger panel with imputed values.

B. Checking unidirectional trade flows

The second robustness check involves separating the imports and exports estimates for Indonesia. Using the gravity model in equation (1), we applied the FGLS estimator. Columns (1) and (2) of Table A4 in Appendix show the estimation results when Indonesia's imports and exports are respectively used as the dependent variable.

The results in column (1) indicate that the primary gravity variables, such as exporters' GDP, importers' GDP, and distance, are significant for Indonesia's import, and all indications are as expected. This is consistent with the gravity model and prior empirical research. However, this finding does not apply to Indonesia's export case in column (2), where the exporter's GDP is not significant despite the significance and expected signs of other variables, such as importers' GDP and distance. The insignificance of exporters' GDP runs counter to the gravity model.

By contrast, column (1) shows a relatively superior estimation. This can also explain why numerous trade impediment variables are of interest. Furthermore, column (1) shows that import tariffs and NTMs, such as subsidy measures and local content measures, can decrease Indonesia's import volumes. In addition, Indonesian imports are positively correlated with the improvement of TFMs, such as seaport quality, import time, and container transportation. Meanwhile, the high cost of imports harms Indonesia's imports. Customs and air transportation have effects on Indonesia's imports. However, how to interpret these factors is unclear, as their signs deviate from what would be expected.

The robustness result in Table A4 in Appendix demonstrates that the main model result is more consistent with Indonesia's import case than the export case. This evidence accentuates

how trade impediment factors affect Indonesia's aggregate imports more than exports. Trade barriers in Indonesia's imports can reduce the exporter firms' profits, thereby reducing the competitiveness of Indonesia's exports on international markets. The implication is that this may harm the growth of Indonesia's merchandise trade, as the manufacturing sector continues to rely heavily on imported content.

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

We assume that trade values are susceptible to bias due to price fluctuations (price distortion). Therefore, we replace trade values with trade volumes as our dependent variable to check the consistency of the main results. The WITS database contains the aggregate trade volume data (in kilograms) for Indonesia. However, the main drawback of using Indonesia's aggregate trade volumes is the limited availability of data from 2010 to 2016, in contrast to trade value data that spans from 2007 to 2016. As a result, these data substantially suffer from missing observations. This problem is exacerbated by the fact that a number of small countries with which Indonesia trades also have missing data issues.

The estimation results for this trade volume are poor. For instance, the exporter and importer's GDP both show negative trends Table A5 in Appendix. Furthermore, Indonesia's subsidy measures coefficient becomes positive (but insignificant in the main result) and the local content measures coefficient also becomes positive (but negative in the main result). These results suggest that the use of trade volumes is accompanied by a significant problem of missing observations, which leads to a substantial estimation bias.

VI. Conclusion and Implications

Reductions in import tariffs, improvements to seaports, and a shorter time to trade all contribute to an increase in Indonesia's trade flows. BBBs to trade such as local content requirements, poor 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, a finding that has been confirmed by a number of previous studies, as discussed in earlier sections. It can be inferred that behind-the-border NTMs increasingly pose the greatest threat to Indonesia's aggregate trade flows. Meanwhile, regarding trade facilitation, measures at the border are more important than those behind the border.

Therefore, we confirm that the BBBs NTMs are more detrimental to Indonesia's trade flows than tariff measures and the ABBs NTMs. Reform of the ABBs trade facilitation has a greater

positive effect than reform of the BBBs trade facilitation.

Our research findings imply that although tariffs have decreased, NTMs and the lack of trade facilitation pose the greatest barriers to trade. Given resource constraints (e.g. budgets, human resources, and technology), policy should focus on reducing the NTMs behind the border (e.g. local content requirements) while enhancing trade facilitation at the border (e.g. better customs services).

This study has also demonstrated that the FGLS estimator is compatible with the gravity model with panel data used in this study. The FGLS estimator addresses the problems of heteroskedasticity and autocorrelation appropriately. When FE is incorporated, the issue of MR and endogeneity biases can be reduced, resulting in unbiased results and the most efficient estimator. The study demonstrates that the FGLS can explain 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 better than other specifications. A series of robustness checks validates the consistency of the primary results.

Our caveat is that the panel data used in the primary model has limited time observations (2007-2016). In future research, the use of updated and longer observations, if available, is suggested.

References

Ahamat, H., & Manaf, N.H.A. (2018). Regulatory convergence against non-tariff barriers in ASEAN and the effectiveness of the ASEAN trade. *ASEAN Journal of Legal Studies, 1*, 1-12.

Aitken, N.D. (1973). The effect of the EEC and EFTA on European trade: A temporal cross section analysis. *American Economic Review, 63*(5), 881-892.

Anderson, J.E. (1979). A theoretical foundation for the gravity equation. *American Economic Review, 69*, 106-116.

Anderson, J.E., & van Wincoop, E. (2003). Gravity with gravitas: A solution to the border puzzle. *American Economic Review, 93*(1), 170-192.

Anderson, J.E., & van Wincoop, E. (2004). Trade costs. *Journal of Economic Literature, 42*, 691-751.

Armstrong, S.P. (2009). *The Japan-China economic relationship: Distance, institutions and politics* (Ph.D's thesis). Australian National University, Canberra, Australia.

Baier, S.L., & Bergstrand, J.H. (2007). Do free trade agreements actually increase members' international trade? *Journal of International Economics, 71*, 72-95.

Baldwin, R., & Taglioni, D. (2006). *Gravity for dummies and dummies for gravity equations* (NBER Working Paper Series No. 12516). NBER.

Bao, X., & Chen, W.C. (2013). The impact of technical barriers to trade on different component of international trade. *Review of Development Economics, 17*, 447-460.

Basu, S.R. (2012, April). Non-tariff measures: currently available evidence and future research agenda. *Paper presented at the Research Workshop on Emerging Trade Issues in Asia and the Pacific: Meeting Contemporary Policy Challenges*, Nakorn Pathom, Thailand.

Benedictis, L.D., & Taglioni, D. (2011). The gravity model in international trade. In L.D. Benedictis & D. Taglioni (Eds.), *The trade impact of EU preferential policies.* Springer.

Bergstrand, J.H. (1985). The gravity equation in international trade: Some microeconomics foundations and empirical evidence. *The Review of Economics and Statistics, 67*, 474-481.

Bergstrand, J.H. (1989). The generalized gravity equation, monopolistic competition, and the factor-proportions theory. *The Review of Economics and Statistics, 71*, 143-153.

Bertrand, M., Duflo, E., & Mullainathan, S. (2004). How much should we trust differences in-differences estimates? *Quarterly Journal of Economics, 119*, 249-275.

Blonigen, B.A., & Wilson, W.W. (2008). Port efficiency and trade flows. *Review of International Economics, 16*, 21-36.

Bratt, M. (2017). Estimating the bilateral impact of nontariff measures on trade. *Review of International Economics, 25*, 1105-1129.

Brooks, D.H., & Stone, S.F. (2010). Infrastructure and trade facilitation in Asian APEC. *Asian Development Review, 27*, 135-159.

Brooks, D.H. (2016). Connectivity in East Asia. *Asian Economic Policy Review, 11*, 176-194.

Cadot, O., & Gourdon, J. (2016). Non-tariff measures, preferential trade agreements, and prices: New evidence. *Review World Economics, 152*, 227-249.

Chen N., & Novy, D. (2012). On the measurement of trade costs: Direct vs. indirect approaches to quantifying standards and technical regulations. *World Trade Review, 11*, 401-414.

Damuri, Y.R. (2012). *21st Century regionalism and production sharing practice* (Centre for Trade and Economic Integration Working Papers). Geneve: The Graduate Institute,

Deardorff, A.V. (1998). Determinants of bilateral trade: Does gravity work in neoclassical world? In J.A. Frankel (Eds.), *The regionalisation of the world economy.* Chicago, USA: University of Chicago Press for the NBER.

Djankov, S., Freund, C., & Pham, C.S. (2006). *Trading on time* (The World Bank Policy Research Working Paper Series 3909). The World Bank.

European Commission. (2016). *Analysis of new potentially trade restrictive measures in the period 1 July 2014-31 December 2015.* Brussels, Belgium: European Commission.

Evenett, S.J., & Fritz, J. (2016). *The 19th Global Trade alert reports: global trade plateaus.* St. Gallen, Switzerland: Global Trade Alert, CEPR.

Feenstra, R.C. (2002). Border effects and the gravity equation: Consistent methods for estimation. *Scottish Journal of Political Economy, 49*, 491-506.

Feenstra, R.C., & Ma, H. (2014). Trade facilitation and the extensive margin of exports. *The Japanese Economic Review, 65*, 158-177.

Ferrantino, M.J. (2006). *Quantifying the trade and economic effects of non-tariff measures* (OECD Trade Policy Papers No. 28). OECD.

Hansen, C.B. (2007). Generalized least squares inference in panel and multilevel models with serial

correlation and fixed effects. *Journal of Econometrics, 140*, 670-694.

Hausman, J., & Kuersteiner, G. (2008). Difference in difference meets generalized least squares: Higher order properties of hypotheses tests. *Journal of Econometrics, 144*, 371-391.

Haveman, J., Ardelean, A., & Thornberg, C. (2009). Infrastructure's role in lowering Asia's trade costs: building for trade. In D.H. Brooks & D. Hummels (Eds.), *Trade infrastructure and trade costs: A study of selected Asian ports.* Asian Development Bank Institute, UK and USA: Edward Elgar Publishing.

Head, K. (2003). *Gravity for beginners.* University of British Columbia, Canada: Mimeo.

Heal, A., & Palmioli, G. (2015). *Trade and non-tariff measures: Impacts in the Asia-Pacific region.* Bangkok, Thailand: UNESCAP.

Henn, C., & McDonald, B. (2011). *Protectionist responses to the crisis: Damage observed in product-level trade* (IMF Working Paper). IMF.

Hoekman, B., & Nicita, A. (2011). Trade policy, trade costs, and developing country trade. *World Development, 39*, 2069-2079.

Ing, L.Y., & Cadot, O. (2017). *Ad valorem equivalents of non-tariff measures in ASEAN* (ERIA Discussion Paper Series No. ERIA-DP-2017-09). ERIA.

International Trade Centre & European Commission. (2016). *Navigating non-tariff measures: insights from a business survey in the European Union.* Geneva, Switzerland: ITC and EU.

Ismail, N.W., & Mahyideen, J.M. (2015). *The impact of infrastructure on trade and economic growth in selected economies in Asia* (ADBI Working Paper 553). ADBI.

Iwanow, T., & Kirkpatrick, C. (2007). Trade facilitation, regulation quality, and export performance. *Journal of International Development, 19*, 735-753.

Jacoby, D., & Hodge, D. (2008). Infrastruture investment: The supply chain connection. *CSSMP's Supply Chain Quarterly, Q4*.

Kaufmann, D., Kraay, A., & Mastruzzi, M. (2010). *The worldwide governance indicators: Methodology and analytical issues* (The World Bank Policy Research Working Paper No. 5430). The World Bank.

Kee, H. L., Nicita, A., & Olarreaga, M. (2009). Estimating trade restrictiveness indices. *The Economic Journal, 119*, 172-199.

Lee, H., & Park, I. (2007). In search of optimised regional trade agreements and applications for East Asia. *The World Economy, 30*(5), 783-806.

Mantobaye, M., Rea, W.S., & Reed, W.R. (2018). Which panel data estimator should I use?: A corrigendum and extension. *Economics: The Open-Access, Open-Assessment E- Journal, 12*, 1-31.

Matyas, L. (1991). Proper econometric specification of the gravity model. *The World Economy, 20*, 363-368.

Moise, E. (2013). *The costs and challenges of implementing trade facilitation measures* (OECD Trade Policy Papers No. 157). OECD.

Parks, R.W. (1967). Efficient estimation of a system of regression equations when disturbances are both serially and contemporaneously correlated. *Journal of the American Statistical Association, 62*, 500-509.

Perez, P.A., & Wilson, J.S. (2012). Export performance and trade facilitation reform: Hard and soft infrastructure. *World Development, 40*, 1295-1307.

Persson, M. (2012). From trade preferences to trade facilitation: Taking stock of the issues. *Economics:*

The Open-Access, Open-Assessment E-Journal, Kiel Institute for the World Economy (IfW), Kiel, 6, 1-33,

Poyphonen, P. (1963). A tentative model for the volume of trade between countries. *Weltwirtschaftliches Archiv, Bd., 90*, 93-100.

Reed, W.R., & Ye, H. (2011). Which panel data estimator should I use? *Applied Economics, 43*, 985-1000.

Rubin. (1987). *Multiple imputation for nonresponse in surveys*. New York, USA: J. Wiley and Sons.

Sadikov, A. (2007). *Border and behind-the-border trade barriers and country exports* (IMF Working Paper Series No. WP/07/292). IMF.

Shepherd, B., & Wilson, J.S. (2009). Trade facilitation in ASEAN member countries: Measuring progress and assessing priorities. *Journal of Asian Economics, 20*, 367-383.

Shepherd, B., Serafica, R.B., Bayhaqi, A., & Jing, H. (2011). The trade impact of enhanced multimodal connectivity in the Asia Pacific region. *Journal of Economic Integration, 26*, 624-650.

Silva, J. M. S., & Tenreyro, S. (2006). The log of gravity. *The Review of Economics and Statistics, 88*, 641-658.

Subramanian, A., & Wei, S.J. (2007). The WTO promotes trade, strongly but unevenly. *Journal of International Economics, 72*, 151-175.

UNCTAD. (2009). *Non-tariff measures: evidence from selected developing countries and future research agenda-developing countries in international trade studies.* Geneva, Switzerland: United Nation Publication.

UNCTAD. (2010). *Review of maritime transport.* Geneva, Switzerland: United Nation Publication.

UNCTAD. (2015). *International classification of non-tariff measures: 2012 version.* New York and Geneva: United Nation Publication.

UNESCAP. (2017). *Asia-Pacific trade and investment report 2017: Channeling trade and investment into sustainable development.* Bangkok, Thailand: United Nations publication.

UNESCAP. (2019). *Asia-Pacific trade and investment report 2019: Navigating non-tariff measures towards sustainable development.* Bangkok, Thailand: United Nations publication.

Walkenhorst, P., & Yasui, P. (2009). Quantitative assessment of the benefits of trade facilitation. In Moise E (Eds.), *Overcoming border bottlenecks: The costs and benefits of trade facilitation.* Paris, France: OECD Publishing.

Wilson, J.S., Mann, C.L., & Otsuki, T. (2003). Trade facilitation and economic development: A new approach to quantifying the impact. *The World Bank Economic Review, 17*, 367-389.

Wooldridge, J.M. (2013). *Introductory econometrics: A modern approach* (5th ed.). Mason, USA: South-Western Cengage Learning.

World Bank. (2016). *Indonesia economic quarterly: Resilience through reforms.* Jakarta, Indonesia: World Bank.

World Trade Organization. (2015). *Speeding up trade: benefits and challenges of implementing the WTO Trade Facilitation Agreement*. Geneva, Switzerland: The World Trade Report.

Zaki, C. (2015). How does trade facilitation affect international trade? *European Journal of Development Research, 27*, 156-185.

Zarzoso, I.M. (2013). The log of gravity revisited. *Applied Economics, 45*, 311-327.

Appendix

Table A1. *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						

Table A2. *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

Table A3. *Main Model Estimation with Multiple Imputed Values Method and % Missing Variables*

	(1)				
	Missing	Total	% Missing	α'	S.E
Dependent Variable (Xijt)	61	3540	1.72%	-	-
Gravity Variables					
Exporters' GDP (Log)	38	3540	1.07%	0.170***	0.050
Importers' GDP (Log)	38	3540	1.07%	0.176***	0.041
Distance (Log)	38	3540	1.07%	0.032	0.586
Trade Impediment Variables					
Import Tariff (Log)	408	3540	11.53%	-0.132***	0.027
Indonesia's Trade Quotas	38	3540	1.07%	0.017	0.023
Indonesia's Trade Bans	38	3540	1.07%	-0.003	0.026
Indonesia's Subsidy Measures	38	3540	1.07%	0.006	0.018
Indonesia's Local Content Measures	38	3540	1.07%	-0.048*	0.024
Seaport Quality	37	3540	1.05%	0.137***	0.037
Customs Quality	0	3540	0.00%	-0.036	0.026
Indonesia's Costs to Trade (Log)	38	3540	1.07%	-0.063	0.062
Indonesia's Time to Trade (Log)	38	3540	1.07%	0.025	0.152
Container Transportation (Log)	28	3540	0.79%	0.052**	0.026
Air Transportation	38	3540	1.07%	-0.070*	0.037
Maritime Transportation (Shipping)	38	3540	1.07%	0.002	0.002
Control Variables					
Exporters' Population (Log)	38	3540	1.07%	-0.115***	0.038
Importers' Population (Log)	38	3540	1.07%	1.648***	0.407
Common Land Border	38	3540	1.07%	6.862***	0.532
Common Official Language	38	3540	1.07%	-	-
Common Colony	38	3540	1.07%	-3.687***	0.576

Table A3. *Continued*

	(1)				
	Missing	Total	% Missing	α'	S.E
Control Variables					
Preferential Trade Agreement (PTA)	38	3540	1.07%	-0.007	0.067
Good governance	38	3540	1.07%	0.111	0.076
Indonesia's ICT to Trade	38	3540	1.07%	0.087***	0.013
Constant				-18.284***	6.179
N Countries				177	
T Time Series (year)				10"	
Samples observed in number				3,157	
Samples observed in %				89	
Loss of observation in %				11	

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

Table A4. *The Impact of Indonesia's Trade Impediments on its Import and Export Performance*

Dependent Variable	IM	EX
Independent Variables	(1)	(2)
Gravity Variables		
Exporters' GDP (log)	1.218***	0.059
	(0.271)	(0.055)
Importers' GDP (log)	0.324**	0.231***
	(0.150)	(0.045)
Distance (log)	-1.024***	-7.239***
	(0.273)	(1.039)
Trade Impediment Variables		
Import Tariff (log)	-0.841***	0.009
	(0.094)	(0.026)
Indonesia's IM/EX Quotas	0.085	0.204***
	(0.067)	(0.078)
Indonesia's IM/EX Bans	-0.076	-0.025
	(0.060)	(0.031)
Indonesia's Subsidy Measures on IM/EX	-0.120**	0.025*
	(0.049)	(0.015)
Indonesia's Local Content Measures on IM/EX	-0.227***	-0.045
	(0.050)	(0.031)
Seaport Quality	0.315***	0.091
	(0.080)	(0.104)
Customs Quality	-0.476***	0.010
	(0.165)	(0.034)
Indonesia's Cost to IM/EX (log)	-0.851***	0.051
	(0.258)	(0.516)
Indonesia's Time to IM/EX (log)	1.330***	4.810**
	(0.298)	(2.382)

Table A4. *Continued*

Dependent Variable	IM	EX
Independent Variables	(1)	(2)
Container Transportation (log)	0.410***	3.476***
	(0.114)	(1.048)
Air Transportation	-0.165*	-0.243***
	(0.089)	(0.065)
Maritime Transportation (Shipping)	0.006	-
	(0.004)	
Control Variables		
Exporters' Population (log)	-1.325***	-19.492***
	(0.432)	(2.477)
Importers' Population (log)	-	3.004***
		(0.515)
Common Land Border	-0.681	-0.012
	(0.455)	(0.750)
Common Official Language	-	-
Colony Ties	3.112***	0.000
	(0.872)	(0.000)
Preferential Trade Agreements (PTA)	3.985***	0.765***
	(0.415)	(0.289)
Good governance	0.276*	-
	(0.150)	
Indonesia's ICT to IM/EX	-	-
Constant	0.000	351.608***
	(0.000)	(43.083)
Observations	605	877
Pair FE	Yes	Yes
Exporter FE	Yes	Yes
Importer FE	Yes	Yes
Time FE	Yes	Yes

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

Table A5. *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)

Table A5. *Continued*

Dependent Variable	Trade Volume
Independent Variables	FGLS FE
	(1)
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

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