THE IMPACT OF PREFERENTIAL TRADE AGREEMENTS ON TRADE IN INDONESIA

Gohar Sedrakyan

The impact of preferential trade agreements on trade in Indonesia
Gohar Sedrakyan
Economics Working Paper 2023–11–C
November 2023

Abstract

We focus on the question whether signing preferential trade agreements was a solution to improve the balance of trade, specifically applied to the case of Indonesia's trade, a member of the Association of Southeast Asian Nations (ASEAN), with forty-two other countries over 1989-2019. The framework of this study uses the gravity model of bilateral trade. The Poisson pseudo-maximum likelihood econometric technique is utilized to run the analysis. This research estimates negative effects of some of the preferential agreements on both the aggregate flows of trade and their disaggregation by nine product groups. The analysis suggests that partial scope agreements, and collaboration with the WTO member countries were beneficial form of integration for Indonesia. The Indonesian exports increased due to the countries with a higher level of internet penetration. The analysis disaggregated by products generates similar results. Pursuit of strategies based on comparative advantage could improve Indonesia's trade balance within the ASEAN-Plus-One and ASEAN free trade area (AFTA) partnerships.

Gohar Sedrakyan
Country and Regional Analysis Division, Office of Economics
U.S. International Trade Commission
Gohar.Sedrakyan@usitc.gov

1. Introduction

The literature on international trade suggests benefits of preferential trade agreements (PTAs) for signatories since they reduce the barriers for market access, allow product variety and lower costs to consumers (Limão, 2016). The motivation for this paper is to answer the question whether signing various types of PTAs was similarly beneficial for the Indonesia's trade balance during the 1989-2019 period. We combine all PTAs signed by Indonesia into four groups and study their impact on the change in trade dynamics of Indonesia and its main partners. This analysis covers forty-two countries, which include the Association of Southeast Asian Nations (ASEAN) and non-ASEAN partners.

The preliminary review of data which covered the trade flows between Indonesia and its partners for 1989-2019, and corresponding review of existing literature motivated this analysis. This review assessed that Indonesia experienced a significant reduction in the balance of trade after signing some of the PTAs (Supriana, 2011; IMF, 2019). In this analysis we determine whether the medium-term shift to trade deficit after signing those agreements was due to an isolated case or, possibly, a systematic problem for Indonesia.

Indonesia is an active participant of global trade. The population of this Southeast Asian country is over 270 million, which makes Indonesia the fourth most populous nation in the world after China, India, and the United States, respectively (WB, 2019). The review of the literature shows that the economic integration efforts of Indonesia and its overall economic development were closely tied. First opportunities for acceleration of economic and cultural integration in the Southeast Asia were put forth by the Bangkok Declaration in August of 1967. The Association of Southeast Asian Nations (ASEAN) was launched by the leaders of five countries, including Indonesia, who signed this declaration in Thailand. For Indonesia, the period of mid-1960s to

1980 was characterized by accelerated growth, e.g., in 1975-1980 it reached 7.5 percent (Thorbecke, 1991; Soesastro and Basri, 2005). This growth was driven by government-led industrialization and oils exports (Akita and Hermawan, 2000). Oil prices reached their peak in 1982. The fall in the world price of oil in mid-1980s affected Indonesia's balance sheet and reduced government revenues. Akita and Hermawan (2000) analyzed 1980-1995 period according to five-year performance plans. They assessed that the economy of Indonesia went through further restructuring which led to economic growth. Thus, the 1983-1995 economic growth was mainly driven by market liberalization and significant increase of household consumption (Thorbecke, 1991; Akita and Hermawan, 2000). The simultaneous shift of export composition to non-oil and gas products and reduction of trade barriers was another major contributor to economic development (Soesastro and Basri, 2005). During the same period, the ASEAN free trade area (AFTA), a trade block of ten nations, became the basis for a more profound step in the regional economic integration launched in January 1992 (Yang and Martinez-Zarzoso, 2014). Indonesia officially joined AFTA in 1993, and its economy benefited from this integration in the short term. The recession hit Indonesia in 1997.

In 1989-1992, Indonesia, in aggregate terms, ran a trade surplus with its future AFTA partners (*Figure 1; Table A1*). Indonesia reported a trade deficit only with Malaysia (1989-1993). During the same period, there were sporadic instances of trade deficit with Myanmar (1989), Vietnam (1990) and Thailand (1991). This positive dynamic in trade continued until 2004. Indonesia reported trade deficit with its AFTA partners, estimated as an aggregate of all trade flows, since 2005 onward. This negative trend in trade with the AFTA partners was reversed only in 2019. According to trade statistics, the trade surplus of 2019 was achieved

mainly due to a significant reduction of imports from Philippines and Singapore, and an increase of exports to Brunei, Cambodia, and Vietnam.

Figure 1. Trade balance of Indonesia and its AFTA partners (in thousand USD)
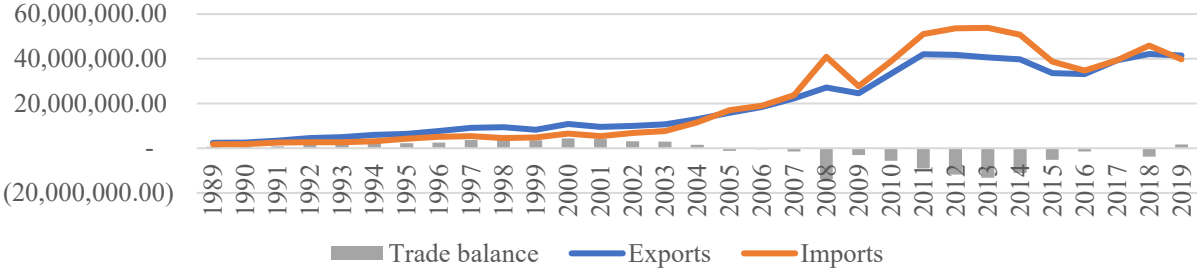
During the period of this analysis, Indonesia, as part of the ASEAN free trade zone, launched FTAs with six countries, such as China, Australia, Japan, etc. (*Table A1*).

Source: World Trade Organization

These are also known as ASEAN-Plus-One trade agreements. The ASEAN-Plus-One agreement with the People's Republic of China entered into force in 2005. In two years, the trade surplus with China reversed and Indonesia reported a growing trade deficit with this country from 2007 onward (Figure 2).

Figure 2. Trade balance of Indonesia and China (in thousand USD)
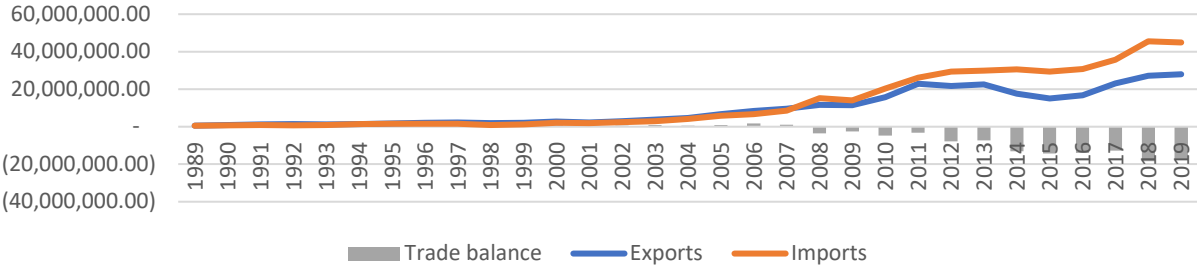
A similar link between signing an FTA and a negative shift in the balance of trade of Indonesia is evaluated in the case of Australia.

Indonesia has been exploring other trade expansion strategies in recent years. Based on the Asia Regional Integration Center, Indonesia is in various stages of implementation of several new FTAs classified as follows: 17 being at the stage of consultation and study, 6 being at the stage of negotiations, and 3 being signed but not yet in effect.

From the technical perspective, a gravity model of trade from 1989 to 2019 is constructed to reveal the changes in trade dynamics between Indonesia and its forty-two partner countries. In terms of the analytical strategy applied to the large datasets associated with international trade, we follow the literature which suggests that the Poisson pseudo-maximum likelihood (PPML) technique is a widely used method (Greaney and Kiyota, 2020; Jagdambe and Kannan, 2020; Halil and Tugce, 2022; Sedrakyan, 2022).

The contribution of this analysis is threefold. First, it adds to the existing literature on international trade in terms of providing evidence that a newly signed PTA may have a potential to reverse the positive balance of trade in the long term. Second, this is a comprehensive analysis of all preferential agreements and their effects on trade balance of Indonesia in the long-term perspective. Third, we test an independent variable- level of internet penetration- which is not typically used in gravity models of trade for controlling the relative cost of trade. This strategy determines that the higher level of internet penetration in a trade partner has a strong positive effect on trade, specifically exports, in Indonesia.

This paper is structures as follows. Section 2 provides a summary of the existing literature. Section 3 provides information about data. Section 4 describes the method and econometric strategy. Section 5 covers results of the analysis. Section 6 discusses possible policy implications and concludes the study.

2. Literature Review

The studies of trade associated with Indonesia can be divided into three large groups. The first group assesses the effects of various determinants on the fluctuations in trade flows between Indonesia and other ASEAN countries (Narjoko and Amri, 2007; Shepherd and Wilson, 2009; Qurbani et al., 2021). Qurbani et al. (2021) considers the leadership role of Indonesia in the ASEAN. This research focuses on the role of "justice" in minerals sector. This study determines that the implementation of legal, economic and tax reforms, possibilities of inclusive redistribution of oil and gas revenues, and recognition of the rights of indigenous communities benefited the minerals sector and economy of Indonesia. Additionally, the upswing of more equitable approach to the listed topics spilled over into other partner countries and expanded their extractive industries. Narjoko and Amri (2007) study the level of industrialization gap in Indonesia and compare it with other ASEAN countries. They determine that the higher gap is partly driven by the limited utilization of terms of trade. They particularly estimate that Indonesia did not take the full advantage of product sharing through trade. Shepherd and Wilson (2009) assess significant difference in the cost of imports and exports in the ASEAN countries. They conclude that the improved transport and IT infrastructures could facilitate more trade. They estimate that modernized port facilities can potentially raise trade in the region by 7.5 percent.

The second school of thought represents extensive literature dedicated to determining the impact of further integration of AFTA countries with third parties. This research focuses on specific effects of the AFTA's further liberalization and corresponding developments experienced in Indonesia (Amiti and Konings, 2007; Supriana, 2011; Ferrianta et al., 2012). Hence, we find research which focuses on the change in dynamics of trade from the

macroeconomic standpoint. Supriana (2011) studies the effects of ASEAN-China Free Trade Area (ACFTA) agreement and estimates significant effects of trade creation for China. It also determines the strong impact on trade diversion and subsequent decline of society's wealth in Indonesia. Amiti and Konings (2007) study two policy changes - a reduction of tariffs on final goods and a contraction of tariffs on intermediate inputs-and their impact on imports. They assess 12 percent gains in productivity if the tariffs are reduced on intermediate inputs by 10 percentage points. This study concludes that reducing the tariffs on imported inputs is more advantageous than lowering output tariffs. Other studies analyze the effects of FTAs on specific sector of the economy (Ferrianta et al., 2012; Niami et al., 2019). Ferrianta et al. (2012) analyze the ASEAN-China Free Trade Area (ACFTA) agreement applied to the maize sector. They estimate a significant decline of this sector in Indonesia and offer two strategies to reverse contraction. First, the contraction in maize sector of Indonesia can be reversed through an increase in sector's productivity by 3.5 percent, acreage allotment by 6.29 percent, and subsidized prices by 4.47 percent. Second, it can be achieved through the ban of the imported equivalents from China. Niami et al. (2019) discusses the ASEAN-Australia FTA specifically in terms of the effects of imported Australian live beef and cattle on changes in the labor force in Indonesia. They conclude that an unprepared entry of Indonesia into this agreement would result in two contradictory outcomes. The first effect is a short-run reduction in the cost of beef in Indonesia, which would have a positive effect on household consumption. The second effect is less desirable for Indonesia. This study estimates that the lower prices would reduce the domestic variety of beef and result in the substitution away from domestic beef towards similar products from Australia. These negative shifts in domestic beef production would result in higher unemployment in Indonesia.

The third group of studies takes a broader look into the topic of PTAs signed by Indonesia. These studies find that often the economic diplomacy was a major factor impacting PTA signing decisions (Soesastro and Basri, 2005; Syarip, 2020). Soesastro and Basri (2005) suggest that Indonesia's PTA related policies are an element of international economic diplomacy. Syarip, 2020 finds that PTAs served to the agenda of foreign policy called the Association of Southeast Asian Nations (ASEAN)-first with the priorities of sustaining the geopolitical influence of ASEAN. This study also finds that pro-ASEAN FTA policies were disproportionately stronger in the stages of negotiations and ratification compared to that of implementation.

The long-term analysis of Indonesia's trade liberalization through signing various trade agreements and its impact on trade balance is limited and has either sector-specific or country-specific focus (Acar et al., 2009; Gumilang et al., 2011; Cali et al., 2019). Cali et al. (2019) study the potential macroeconomic effects of forthcoming European Union Indonesia Comprehensive Economic Partnership Agreement. This research estimates that Indonesia's aggregate output, per capita income at all levels of distribution and exports will rise due to this cooperation. Gumilang et al. (2011) study the effects of Indonesia Japan Trade Agreement and AFTA on the economy and level of pollution in Indonesia. They estimate that none of these agreements would lead to drastic changes in the economy or environmental performance of Indonesia. Acar et al. (2009) focus on the long-term effects of trade liberalization among three countries: Indonesia, Malaysia and Bangladesh. The paper estimates that FTAs signed among these three countries will benefit Malaysia and Indonesia and result in welfare loss in Bangladesh. The recommendation is to consider liberalization through signing PSAs which would allow more gradual adjustment of Bangladesh to stiffer trade competition.

There is a consensus among economists and policymakers that digitalization and internet penetration have positive effects on trade (Monteiro and The, 2017; Visser, 2019; Ferencz et al., 2022; Herman and Oliver, 2023). Herman and Oliver (2023) estimate that higher levels of digitalization lead to an increase in trade for both high- and low-income countries. According to Monteiro and The (2017), 30 percent of all in-force trade agreements had a statement on trade in digital goods and services by 2017. Visser (2019) studies 162 exporters and 175 destination countries and suggests that the rise in the number of internet users by 10 percent leads to 0.2-0.4 percent growth in exports. This study also estimates that the trade in developing countries is more sensitive to the effects of internet. OECD's Services Trade Restrictiveness Index (STRI) and Digital STRI also recognize the importance of digitalization and its effects on trade. Ferencz et al. (2022) use this database and estimate that the regulatory standards of digital economy became more restrictive globally. In turn, this regulatory stringency leads to wide-scale implications on international trade, since it increases trade barriers, impacts final cost of goods and services, and distorts global supply chain.

Despite the abovementioned consensus on the importance of digitalization for trade, the economists do not have an agreement on how to construct or treat the level of digitalization in their research. On the one hand, we find recent studies of international trade where digitalization, in general, is not controlled as a driving factor (Zahonogo, 2016; Beaton et al., 2017; Okoro et al., 2020). On the other hand, the studies, which use the factor of digitalization, vary in the approaches they employ for measuring this variable (Liu and Nath, 2013; Visser, 2019; Herman and Oliver, 2023). Thus, Herman and Oliver (2023) construct a new index of internet use (IU) to estimate the effect of internet connectivity on trade and welfare. In constructing IU index, they consider two important characteristics, such as the number of internet users and the quality of the

internet in terms of bandwidth capacity of trade partners. Visser (2019), uses the number of subscribed broadband users per 100 people of each country in the pair and multiplies them. Liu and Nath (2013), in addition to the mentioned number of broadband users per 100 individuals, use three other alternative methods such as the number of internet hosts per 100 people, value of investments in telecommunications, and quality of the internet bandwidth.

3. Data

3.1. Independent variables

3.1.1. PTA variables

This analysis uses four binary variables to denote various types of preferential trade agreements (PTA). This strategy of grouping trade partners under the four PTA types described below allows us to determine whether each of these agreements resulted in a trade creation, diversion or, possibly, contraction. Thus, the positive coefficients associated with all PTAs would signal trade creation. The combination of negative and positive coefficients associated with PTAs would signal two possible cases. The case of trade contraction, if the negative coefficient associated with a PTA is greater than the positive one. The case of trade diversion, if the positive coefficient of a PTA is greater and, therefore, outweighs the negative one. Finally, the case of trade contraction is assessed if all estimated PTA coefficients are negative.

We compile the list of all forty-two countries included in the analysis and the type of a PTA, or possibly not having one, they use for trade with Indonesia in *Table A1*. The choice of forty countries is determined by the combined level of their economic integration with Indonesia, which represents 95 percent share in the latter's total trade. Despite the limited bilateral trade with Indonesia, two additional countries—Lao People's Democratic Republic and Brunei Darussalam—are also added to the list. This strategy of including two missing members of the

11

AFTA treaty in the list of analyzed countries allows us to test the full effect of this agreement.

Thus, the first variable, PTA_{1t}, controls the intra-ASEAN trade and is equal 1 if both countries in the period t are members of the ASEAN free trade area (AFTA) and 0 otherwise. Ten countries, including Indonesia, comprise the AFTA zone. In 1989-2019, Indonesia, as part of the ASEAN free trade area, launched FTAs with six trade partners. This study follows the literature and uses ASEAN-Plus-One term to refer to those FTAs and denotes them as PTA_{2t}. 1 is assigned if both countries in the period t are members of the ASEAN-Plus-One and 0 otherwise. The third variable, PTA_{3t}, controls for the countries which have Partial Scope Agreement (PSA) with Indonesia. The provisions of partial scope agreements are more limited than those of free trade agreements. The binary variable takes 1 if both Indonesia and given country have a PSA in effect and 0 otherwise. Indonesia and Pakistan have a bilateral PSA in effect since September 2013. Another plurilateral PSA, known as the Global System of Trade Preferences among Developing Countries (GSTP), entered into force in April 1989 and intended to promote trade between developing countries. Over time, some GSTP members, e.g., Vietnam, India, South Korea, Malaysia, proceeded with more comprehensive integration agreements with Indonesia, such as AFTA or ASEAN-Plus-One. Since entering a more comprehensive trade agreement did not discontinue any of the PSA treaties, the corresponding PTA_{3t} variable remained unchanged. Simultaneously, the corresponding PTA variable for AFTA or ASEAN-Plus-One reflects the change in the type of agreement according to the period of occurrence. Table A1 shows the timeframe of each of those treaties entering into force. The fourth variable, PTA_{4t}, controls for the trade partners which do not have any major form of PTA in place. This also includes partial scope agreements (PSAs) due to their limited nature. WTO membership may also have an impact

on trade, a binary variable assigning 1 if both trade partners in the period t belong to it and 0 otherwise is included.

3.1.2. Other independent variables

We construct a gravity model of trade to conduct data analysis. In its general formulation, a gravity model requires to control for importer and exporter-specific determinants, which would reflect the levels of demand for and supply of products available for trade. It also requires the factors, which will control for the ease of access to markets of trade partners. Thus, we start with the basic construct which includes the GDPs of and distance between trade partners. This analysis includes Real GDP in 2015 prices, which is retrieved from the World Development Indicators (WDI) of the World Bank database. The straight-line distance between two countries in kilometers is used and it is calculated based on their center latitudes and longitudes. The size of potential demand is controlled by adding the population of trade partners as another independent determinant. These data are collected from the Population estimates and projections dataset of the World Bank which, in turn, is linked to the UN World Population Prospects annual dataset.

The fluctuations in exchange rates are another characteristic that contributes to the ease of market access and may change the direction of trade flow. This analysis uses the rate of 1 unit of foreign exchange to Indonesian Rupiah (IDR). We do not link the exchange rate to the U.S. Dollar (USD), since the United States and several countries, which pegged their domestic exchange to USD, namely Oman, Saudi Arabia, and United Arab Emirates, are included in this analysis. Our strategy allows us to capture the fluctuations of their domestic currency to IDR.

As stated earlier in the literature review, the economists have not reached a consensus on how to determine the level of digitalization and whether it should be controlled in gravity models of trade. This analysis supports the literature which accepts that the level of internet penetration loosens physical barriers and reduces associated trade costs for buyers and manufacturers located in different countries. For the internet to link parties of transaction, both countries need to have a certain level of digitalization. Here, we create a ratio, $Digital_{it}$, between the share of internet users in total population of a partner country (i) at time (t) and the same determinant calculated for Indonesia (I) at time (t), described in equation [1]:

$$Digital_{it} = \frac{\frac{nu\,mber\;of\;interenet\;users_{it}}{population_{it}}}{\frac{nu\,mber\;of\;interenet\;users_{It}}{population_{It}}}, \quad [1]:$$

This ratio clusters studied countries by the following four groups:

$$Digital_{it} \begin{cases} if \; \geq 1; \; \text{in partner country share of internet users is higher or equal than that in Indonesia} \\ if \in (0;1); \; \text{in partner country share of internet users is lower than that in Indonesia} \\ if = 0 \; and \; for \; t \in [1989-1993]; \; \text{due to no reported internet use in Indonesia} \\ if = 0 \; and \; for \; t \in [1994-2019]; \; \text{due to no reported interenet use in partner country} \end{cases}$$

This analysis includes binary variables which control for several common characteristics in Indonesia and partner country and are believed to facilitate trade, such as language, border (contiguity), and colonial history. More than 700 languages and local dialects are spoken in Indonesia. Current analysis controls for the knowledge of Dutch, English and Malay, as Bahasa Indonesia (Indonesian) is considered a modification of it. The binary variable which controls for common history takes 1 for the countries colonized by Portugal and/or the Netherlands and 0 otherwise. According to the World Population Review, Indonesia is made up of over seventeen thousand islands and it shares land border with only three countries. Of those three Malaysia is the only country included in this analysis. Thus, the binary variable defining contiguity takes 1 in case of Malaysia and 0 otherwise. Finally, the cost of transportation is higher for landlocked and

island countries, and the literature recommends using binary variables to control for those characteristics. Indonesia is an island nation. Similarly, all other countries included in the analysis have a coastline; therefore, we do not control for being a landlocked country. Here, 1 is assigned if both Indonesia and trade partner are island nations and 0 otherwise.

3.2. Dependent variables

The data (including the disaggregation by product types) on bilateral trade flow between Indonesia and its trade partners were obtained from the World Integrated Trade Solution (WITS) of the World Bank. Although, Indonesia trades with over two hundred partners, we chose to include the data on bilateral trade of forty-two countries. The share of forty countries in Indonesia's trade was about 95 percent for the duration of our analysis. We also added the data on two remaining countries of the ASEAN free trade area, Lao People's Democratic Republic and Brunei Darussalam, since this treaty represented one of the focal points in the analysis of PTAs. The description and sources of data are provided in Table 1.

4. Methodology

This analysis uses the Poisson pseudo-maximum likelihood (PPML) econometric technique. This method is described in Santos Silva and Tenreyro (2006). Several features of the PPML method determined the choice of this strategy. First, this method allows us to keep the dependent variable equal 0 as valid cases. This is essential, specifically for the analysis conducted by product groups. Second, this method is consistent in the presence of heteroscedasticity, which is an issue frequently arising in data analysis of international trade with a group of studied countries of different size. Third, this method works efficiently with large datasets that also cover long duration (1989-2019) of the study.

Table 1. Descriptive statistics and data sources

Variables	Description	Mean	Std. Dev.	Min	Max	Source
Imp_{ijt}	Imports to Indonesia (thousand USD)	1,789.97	4,239.04	0	45,537.82	WITS, World Bank
Exp_{ijt}	Exports from Indonesia (thousand USD)	2,146.75	4,204.13	0	33,714.7	WITS, World Bank
GDP_{it}	Real GDP trade partner in 2015 prices (million USD)	1,613,542	3,243,556	0	19,974,530	UNCTAD
GDP_{jt}	Real GDP Indonesia 2015 prices (thousand USD)	554,022	228,839	251,688	1,049,319	UNCTAD
$Dist_{ij}$	Direct distance (km)	7,426	4,381	599	17,730	Google Maps
Pop_{it}	Population size (thousand)	114,864	252,868	252	1,407,745	UNCTAD
Pop_{jt}	Population size Indonesia (thousand)	224,030	27,426	178,209	270,626	UNCTAD
Er_{ijt}	Exchange rate of local currency to IDR (in thousands)	1,172.35	40,059.86	.0002	1,444,127	UNCTAD
$Digit_{ijt}$	Ratio of computer users	30	227	0	4,589	ITU World Telecommunication/ ICT Indicators & WB
$Island_i$	Island country	0.2	0.4	0	1	World Population Review
$Cont_{ij}$	Contiguity-Common border with Indonesia	0.02	.2	0	1	The World Factbook, CIA
$Comlang_i$	Malay, Dutch and English	1.12	0.9	0	2	World Population Review
$Comhist_i$	Common colonizers (Portugal and/or Netherlands)	0.2	0.4	0	1	WorldAtlas.com
Remoteness	Estimate of $\sum_i \frac{dis_{ij}}{GDP_i/GDP_W}$	0.2	0.6	0	4.2	Google Maps/ UNCTAD
PTA_{1t}	AFTA/Both ASEAN	0.2	0.4	0	1	WTO
PTA_{2t}	ASEAN-Plus-One	0.05	0.2	0	1	WTO
PTA_{3t}	PSA/Both in partial scope agreement	0.3	0.5	0	1	WTO
PTA_{4t}	No majorPTA	0.8	0.4	0	1	WTO
WTO_t	Both in WTO	0.8	0.4	0	1	WTO

In addition, we follow the literature on international trade which suggests the necessity of

controlling for the multilateral resistance terms (MRT) (Anderson and van Wincoop, 2003).

Frequently studies use importer and exporter-fixed effects to control for MRTs. In our case, Indonesia is one of the countries in each analyzed country pair. Therefore, controlling a country-fixed effect would produce a constant-dummy for Indonesia and automatically drop it by the statistical software. Therefore, to keep the analysis consistent, instead of creating importer and exporter fixed effects, we use another MRTs controlling technique specified in the literature. It is addressed in Head (2003) which recommends introducing a determinant of remoteness. This variable is estimated according to the equation of remoteness provided as $Rem_i = \sum_i \frac{dis_{ij}}{GDP_i/GDP_W}$.

This equation is interpreted as the country's spatially weighted GDP from its trading partners. From the technical standpoint, the software goes through two-step estimation. First, it calculates the share of GDP of a trade partner in world GDP. Then, this derived value is added as the denominator in the formula of remoteness described earlier. Finally, all macroeconomic control variables are included with a one-year lag which allows to avoid reverse causality.

Another important specification of the Santos Silva and Tenreyro (2006) approach is to model the gravity equation in the level-log format. Current research closely follows the recommended specifications and includes the dependent variable in level - not logarithmic – form. Simultaneously, the independent variables are transformed into natural logarithms. Thus, the model is described by the following equation [2]:

$$Dep_{ijt} = \alpha_0 + \alpha_1 lnGDP_{it-1} + \alpha_2 lnGDP_{jt-1} + \alpha_3 lnDist_{ij} + \alpha_4 lnPop_{it-1} + \alpha_5 lnPop_{jt-1} + \alpha_6 lnExch_{t-1} + \alpha_7 lnDigital_{it-1} + \alpha_7 PTA_{1t} + \alpha_8 PTA_{2t} + \alpha_9 PTA_{3t} + \alpha_{10} PTA_{4t} + \alpha_{11} WTO_{it} + \alpha_{12} Rem_{it-1} + \alpha_{13} A_i + \varepsilon_{it}$$
[2]

where:

Dep_{ijt} - stands for dependent variables - a) volume of exports from Indonesia (j) to partner economy (i) at time (t); b) volume of imports from partner economy (i) to Indonesia (j) at time (t); c) volume of exports of a type of product from Indonesia (j) to partner economy (i) at

time (t); and d) volume of imports of a type of product from partner economy (i) to Indonesia (j) at time (t),

A_i - vector of binary variables, i.e., $Island_i$, $Cont_i$, $Comlang_i$,

ε_{it} - cluster robust error (clustered on country pairs).

To avoid the issue of multicollinearity in the model we conduct variance inflation factor (VIF) test. VIF test is applied to the random effects regression of the model. This strategy allowed to choose an appropriate set of regressors that would not produce multicollinearity in model [2].

Finally, to confirm that the specifications of the model are well-defined, we proceed with postestimation test and use heteroscedasticity-robust RESET test. To accomplish this test, we construct a new regressor $(xb)^2$, where b represents the vector of estimated values. The gravity model is properly defined if the RESET test reports a $p-value > 0$. We report these p-values along with the results of the analysis (last rows of Tables A2 and A3).

5.   Results

The discussion of results is divided into two main sections. First, we cover the assessed effects of PTAs on changes in total exports and imports of Indonesia in 1989-2019. Second, we discuss the outcomes related to a selected list of products for the same timeframe. This strategy allows a more thorough understanding of the impact that PTAs had on trade in each product category. The corresponding results are provided in *Tables A2* and *A3*.

5.1. The effects of PTAs on total exports and imports

To proceed with the interpretation of PPML estimates, we use the approach outlined in Yotov et al. (2016).and Herman (2023). According to these studies, the effect of PPML estimate is computed by using the following equation: % *change in* $X_{ij} = (e^{\overline{\beta}_z * \Delta z} - 1) * 100$, where Δz is

the change in analyzed determinant and $\bar{\beta}_z$ is the estimated coefficient. Applying this approach to our estimates, leads to the following results.

PTAs had a significant impact on ***total exports*** of Indonesia (*Table A2*). According to the analysis, ASEAN free trade area (PTA_{1t}) agreement did not significantly impact the exports from Indonesia. In contrast, ASEAN-Plus-One (PTA_{2t}) agreements significantly and negatively affected the Indonesian exports which, on average, declined by 23.9 percent, estimated as $(e^{(0.273)*1} - 1) * 100$ (since e is about 2.718) and if all other explanatory variables are held constant. Partial scope agreements (PTA_{3t}) were significant and increased exports from Indonesia by 23.4 percent. Not having any major PTA in place (PTA_{4t}) was another significant and negative factor resulting in the reduction in exports from Indonesia by 36.4%.

The impact of PTAs on ***total imports*** received in Indonesia is provided in *Table A3* and is as follows. The AFTA was a significant driver of a large share of imports received in Indonesia. Due to AFTA, the imports received in Indonesia increased by 101 percent or more than doubled, if all other explanatory variables are held constant. Similarly, ASEAN-Plus-One agreements increased imports on average by 42.2 percent. The analysis did not reveal significant effects of PSAs, not having major PTAs and WTO membership on imports received in Indonesian. To summarize the AFTA and ASEAN-Plus-One agreements were the significant factors resulting in the rise of imports received in Indonesia.

Hence, based on these results, two simultaneously occurring effects produced the trade deficit in Indonesia and they can be disaggregated as follows. First, it was due to the contraction of exports as an outcome of ASEAN-Plus-One cooperation and not having major PTAs. Second, it was due to the significant increase in Indonesian imports driven by the AFTA and ASEAN-Plus-One partnerships.

Another important contribution of this analysis, it reaffirms the significance of digitalization for acceleration of trade. This paper estimates that higher levels of digitalization compared to that in Indonesia contributed to a significant rise in Indonesian exports. This shows that the countries with higher levels of digitalization used the opportunity of gained access to Indonesian market to buy more products from this country.

Other factors significantly impacting trade flows of Indonesia included population size and exchange rate. The positive relation between population size and level of trade outflow can be explained by directly linking these factors through the changes in domestic labor market. Here, a rise in labor force competition contributes to lower wages and prices which, in turn, increases exports. The reduction in trade outflow due to an appreciation of domestic currency is explained by the price increase of domestic products relative to foreign ones. The negative relation between GDP of Indonesia and its exports may be driven by number of factors, which are not the focus of this analysis. As an example, they may include domestic laws causing certain constraints for exports and encouragement of consumption behavior with higher propensity to consume domestically manufactured goods and services. [1] The literature supports this finding. Widiatedja (2021) analyzes Indonesia's ban on exports of nickel ore to the European Union. Laksana (2022) studies the effects of export taxes on minerals. They estimate that the export taxes significantly reduced exports of raw materials. The positive relation between remoteness and imports is easier to explain if we recall its definition. This is country's spatially weighted

---

[1] I discussed this negative relation between exports and GDP with David Riker. One approach was to make adjustments to the model, so the outcome would fit the general view in macroeconomics that economic development should also result in an increase in exports. However, we made the decision to avoid individual bias and to allow the data and model speak for themselves. So, this outcome leads to another Indonesia study. This time it should be an analysis of the country's domestic regulations and their impact on trade restrictions. Also, to support this decision, I cited two papers studying the effects of domestic regulations on export contraction in Indonesia.

GDP from its trading partners, which can rise either due to a higher distance or a smaller aggregate output of the importing country in World GDP or combination of movements in both. Our results show that the distance between trade partners has a significant negative effect on imports received in Indonesia. Therefore, the positive effect of remoteness on imports is rather due to more goods and services received from countries with relatively smaller aggregate output as share in World GDP.

5.2. The effects of PTAs on exports and imports of nine product groups

This section discusses the effects of PTAs on trade for selected **product groups.** The *exports by product groups* support our findings estimated for total exports from Indonesia and provide more comprehensive information. Thus, AFTA (PTA_{1t}) had a significant and negative effect on the Indonesian exports of seven product categories: minerals; animals; plastic or rubber; textile and clothing; wood; metals; and vegetables. The ASEAN-Plus-One (PTA_{2t}) agreements negatively impacted the Indonesian exports of the following product groups: minerals; plastic or rubber; textile and clothing; wood; metals; machines and electronics; and vegetables. The analysis also determined some evidence of trade diversion which was the result of both the contraction in exports due to the AFTA and ASEAN-Plus-One agreements and the rise in exports due to PSAs. This trade diversion was limited to the following product groups: minerals; textile and clothing, wood; and vegetables. In all cases of trade diversion, the coefficients suggested that the increased volume of Indonesian exports due to PSA was disproportionally smaller than the decline in exports due to the AFTA and ASEAN-Plus-One agreements. Therefore, the net effect of these agreements was the decline in Indonesian exports of corresponding product groups. The analysis also estimated that not having major PTAs with a

partner country resulted in a significant contraction of Indonesian exports of all product categories.

The effects of WTO membership had a significant positive effect on Indonesian exports. Specifically, this impacted the increase in exports of minerals; plastic or rubber; textiles and clothing; machines and electronics; and vegetables. The exports of these products were negatively affected by the AFTA and ASEAN-Plus-One agreements. However, the volume of this export diversion due to WTO partnerships was lower than the loss of similar exports due to AFTA (PTA_{1t}) and ASEAN-Plus-One (PTA_{2t}) agreements.

The ***imports by product groups*** provide relatively mixed results. Thus, we determine that all types of controlled PTAs had a significant and positive effect on imports of animals product category. ASEAN-Plus-One agreements resulted in a significant increase of imports of metals and machines received in Indonesia. In addition, these agreements led to a significant reduction in imports of fuel; minerals; plastic and rubber; and vegetables. We also find that AFTA had a contractionary effect on imports of similar product groups, except for plastic and rubber, received in Indonesia. PSA significantly impacted the rise in imports of fuel; minerals; wood; metals; and vegetables received in Indonesia. Not having PTAs resulted in the contraction of imports for the following product categories: fuel; minerals; plastic and rubber; textile; wood; machines; and vegetables.

Fuel is the top exported product for Indonesia. Its share in total exports reached 20% in 2019. This analysis did not determine significant effect of AFTA and ASEAN-Plus-One agreements on Indonesian exports of fuel products, such as oil and gas. Thus, Indonesia did not fully utilize the potential of the markets for fuel. There is also a significant negative effect of PSAs on Indonesian exports of fuel products. The literature review supports these findings.

According to Akita and Hermawan (2000) and Soesastro and Basri (2005) Indonesia restructured the composition of its exports and reduced the volume of fuel exports. Our analysis of fuel imports estimates significant contraction of this product category due to the AFTA and ASEAN-Plus-One agreements. One way to explain this effect is to view it as a substitution away from imports towards domestic consumption and this topic requires further studies.

6. Conclusions and policy implications

In this paper we examined the effect of four different PTAs on the balance of trade in Indonesia in 1989-2019. Our analysis did not estimate a significant effect of AFTA agreement on the Indonesian exports sent to these countries. Meantime, the AFTA members utilized the potential of the Indonesian market, where the corresponding imports increased Considering that AFTA did not significantly affect the flow of Indonesian exports, this country may consider developing trade strategies that would make this outcome more positive for its balance of trade. AFTA significantly reduced the Indonesian exports of the following product groups: minerals; animals; plastic and rubber; textile; wood; metals; and vegetables.

The ASEAN-Plus-One agreements most significantly contributed to the trade deficit. Here we observed two simultaneously occurring significant trends: a contraction of Indonesian exports and a much sharper rise in imports from the ASEAN-Plus-One partners.

PSAs and WTO membership positively impacted Indonesia's trade balance. The Indonesian exports significantly increased because of these agreements. Meantime, these agreements did not significantly affect the rise in imports to Indonesian.

Lastly, this analysis estimated that not having major regional trade agreements resulted in a decline in trade balance of Indonesia, due to a significant contraction of exports.

The analysis disaggregated by nine product groups provided observations in line with the discussion on the aggregate exports and imports provided above.

Further studies are needed to determine the drivers of negative relation between the economic growth and exports in Indonesia and whether domestic regulations had any systematic effect on this contraction. Another topic of future studies is to analyze the domestic regulations related to trade of fuel products in Indonesia. Specifically, this study would focus on whether Indonesian regulations restricted trade of fuel products and encouraged domestic consumption from local manufacturers.

Acknowledgements

References

Acar M., Alpay S., Bakimili E., Koc Z.Z. 2009. South — East Asian Integration in the Context of OIC: Implications of Free Trade among Malaysia, Indonesia and Bangladesh. *Journal of Economic Integration.* 24 (1), 1-18.

Akita, T., Hermawan, A. 2000. The Sources of Industrial Growth in Indonesia, 1985–95: An Input-Output Analysis. ASEAN Economic Bulletin, 17(3), 270–284.

Amiti, M., Konings, J. 2007. Trade Liberalization, Intermediate Inputs, and Productivity: Evidence from Indonesia. *American Economic Review*, 97 (5): 1611-1638.

Anderson, J.E., van Wincoop, E. 2003. Gravity with Gravitas: A Solution to the Border Puzzle. American Economic Review. 93 (1), 170-192.

Cali M., Maliszewska M., Olekseyuk Z., Osorio-Rodarte I. 2019. Economic and Distributional Impacts of Free Trade Agreements: The Case of Indonesia. *World Bank Policy Research Working Paper*, No. 9021.

Cui, L., Song, M., Zhu, L. 2019. Economic evaluation of the trilateral FTA among China, Japan, and South Korea with big data analytics. *Computers & Industrial Engineering*. 128, 1040-1051.

Ferencz, J., López-González, J., García, I.O., 2022. Artificial Intelligence and International Trade: Some Preliminary Implications. *OECD Trade Policy Paper*, No.260.

Ferrianta, Y., Hanani, N., Setiawan, B., Muhaimin, W. 2012. Impact of Trade Liberalization Asean-China Free Trade Area (ACFTA) on the Performance of Indonesia Maize Economy. *Journal of Basic and Applied Scientific Research*, 2(7), 6801-6809.

Firmansyah T., Jayadi A. 2019. The effect of government macroeconomic policy on Indonesia's fisheris export to the United States in 1989-2019. *JIET (Journal Ilmu Ekonomi Terapan*.

Greaney, T.M., Kiyota, K. 2020. The gravity model and trade in intermediate inputs. *The World Economy*, 43(8), 2034-2049.

Gumilang H., Mukhopadhyay K., Thomassin P.J. 2011. Economic and environmental impacts of trade liberalization: The case of Indonesia. *Economic Modelling*, 28 (3), 1030-1041.

Head, K. 2003. Gravity for beginners, mimeo, *University of British Columbia*.

Herman P.R., 2023. Gravity Estimation: Best Practices and Useful Approaches. *United States International Trade Commission*. Working paper 2023-10-C.

Herman, P.R., Oliver, S., 2023. Trade, policy, and economic development in the digital economy. *Journal of Development Economics* 164, 103135.

IMF, 2019. 2019 Article IV consultation—press release; staff report; and statement by the

> executive director for Indonesia. *International Monetary Fund*. Washington, DC.

Jagdambe, S. Kannan, E. 2020. Effects of ASEAN-India Free Trade Agreement on agricultural

> trade: The gravity model approach. *World Development Perspectives*, 19.

Kawai, M. 2005. East Asian economic regionalism: progress and challenges. *Journal of Asian*

> *Economics*. 16 (1), 29-55.

Kindleberger C. 1973. The World in Depression. London: Allen Lane.

Laksana M.P.A. 2022. Export Taxes and Trade Pattern: Case from the Indonesian Mineral

> Industry. *Published in Jurnal Perencanaan Pembangunan.*

Limão, N., 2016. Chapter 6 - Preferential Trade Agreements, Editor(s): Bagwell, K., Staiger,

> R.W., Handbook of Commercial Policy, *North-Holland*, 1 (B), 279-367.

Liu, L., Nath, H.K. 2013. Information and communications technology and trade in emerging

> market economies. *Emerging Markets Finance and Trade*, 49 (6), 67-87.

Malloy M. P. 2019. Tariff Act of 1789, Encyclopedia.com

> https://www.encyclopedia.com/history/encyclopedias-almanacs-transcripts-and-
> maps/tariff-act-1789.

Monteiro J.-A., Teh R. 2017. Provisions on Electronic Commerce in Regional Trade

> Agreements. *World Trade Organization,* WTO Staff Working Paper ERSD-2017-11.

Narjoko, D. A., Amri, P. D. 2007. The Developmental Gap between the ASEAN Member

> Countries: The Perspective of Indonesia. *ASEAN Economic Bulletin*, 24(1), 45–71.

Niami, M., Sulistiyono, A., Pujiono, P., Harahap, B. 2019. Proceedings of the 3rd International

> Conference on Globalization of Law and Local Wisdom (ICGLOW 2019). *Advances in*
> *Social Science, Education and Humanities Research. Atlantic Press.*

Okoro, A.S., Ujunwa, A., Umar, F. Ukemenam, A. 2020. Does regional trade promote economic growth? Evidence from Economic Community of West African States (ECOWAS). *Journal of Economics and Development,* 22 (1).

Qurbani, I. D., Heffron, R. J, Rifano, A. T. S. 2021. Justice and critical mineral development in Indonesia and across ASEAN. *The Extractive Industries and Society*, 8 (1), 355-362.

Syarip R., 2020. Defending Foreign Policy at Home: Indonesia and the ASEAN-Based Free Trade Agreements. *Journal of Current Southeast Asian Affairs*. 39 (3), 405-427.

Santos Silva J.M.C., Tenreyro S., 2006. The log of gravity. *The Review of Economics and Statistics*, 88 (4), 641–658.

Sedrakyan, G. 2022. Ukraine War-induced Sanctions against Russia: Consequences on Transition Economies, *Journal of Policy Modeling*, 44(5), 863-885.

Sedrakyan, G. 2022. Free Trade Agreements; Economics or Politics? *Bagwell Center for the Study of Markets and Economic Opportunity*, Kennesaw State University, Commentary < https://ssrn.com/abstract=4207166 >.

Shepherd, B., Wilson, J.S. 2009. Trade facilitation in ASEAN member countries: Measuring progress and assessing priorities. *Journal of Asian Economics*, 20 (4), 367-383.

Soesastro H., M. C. Basri. 2005. The Political Economy of Trade Policy in Indonesia. *ASEAN Economic Bulletin*. 22 (1), 3-18. < https://www.jstor.org/stable/25573840?seq=1 >

Simdi, H., Unal, T. D. 2022. Has South Korea Really Benefited from FTAs? A Gravity Model Estimation. *Korea Observer*, 55(2), 197-221.

Supriana, T. 2011. Indonesian Trade under China Free Trade Area. Economic Journal of Emerging Markets, 3(2), 139–151.

Thorbecke E., 1991. Adjustment, Growth and Income Distribution in Indonesia. *World Development*, 19 (11), 1595-1614.

U.S. Department of State. 1944. Bretton Woods Conference of 1944 (archive), retrieved on 05/18/2022 < [The Bretton Woods Conference, 1944 (state.gov)](state.gov)>

U.S. International Trade Commission. 2022. The Year in Trade 2021: Operation of the Trade Agreements Program 73rd Report, Publication Number: 5349. <https://www.usitc.gov/publications/332/pub5349.pdf>

Visser, R., 2019. The effect of the internet on the margins of trade, *Information Economics and Policy*, 46, 41-54.

WB, 2019. World Development Indicators. *The World Bank Group.* Washington, DC.

Yang, S. and Martínez-Zarzoso I. 2014. A Panel Data Analysis of Trade Creation and Trade Diversion Effects: the Case of ASEAN-China Free Trade Area. *China Economic Review,* 29, 138-151.

Yotov Y.V., Piermartini R., Monteiro J., Larch M., 2016. An Advanced Guide to Trade Policy Analysis: The Structural Gravity Model Online Revised Version. *World Trade Organization*.

Zahonogo, P., 2016. Trade and economic growth in developing countries: Evidence from sub-Saharan Africa, *Journal of African Trade,* 3*(*1–2), 41-56.

Widiatedja IGNP. 2021. Indonesia's Export Ban on Nickel Ore: Does It Violate the World Trade Organization (WTO) Rules? *Journal of World Trade*, 55(4), 667-696.

Appendices

Table A1. Countries included in the analysis and types of their PTAs with Indonesia[2]

ASEAN free trade area (AFTA)		ASEAN-Plus-One		PSA (Partial Scope Agreement)		No major PTAs	No major PTAs
PTA_{1t}	Date of entry into force for both countries**	PTA_{2t}	Date of entry into force for both countries	PTA_{3t}	Date of entry into force for both countries	PTA_{4t}	PTA_{4t}
Brunei Darussalam	01/01/1993	Australia	01/01/2010	Bangladesh	04/19/1989	Belgium	Russia
Cambodia	01/01/1993	China	01/01/2005	Brazil	04/19/1989	Canada	Saudi Arabia
Lao People's Democratic Republic	01/01/1993	India	10/01/2010	Egypt	04/19/1989	France	South Africa
Malaysia	01/01/1993	Japan	12/01/2008	India	04/19/1989	Germany	Spain
Myanmar	01/01/1993	New Zealand	01/01/2010	Malaysia	04/19/1989	Hong Kong (China)**	Switzerland
Philippines	01/01/1993	South Korea	01/01/2010	Mexico	04/19/1989	Italy	Turkey
Singapore	01/01/1993			Myanmar	04/19/1989	Kenya	United Arab Emirates
Thailand	01/01/1993			Nigeria	04/19/1989	Netherlands	United Kingdom
Vietnam	01/01/1993			Pakistan	04/19/1989	Oman	United States
				Philippines	04/19/1989	Poland	
				Singapore	04/19/1989		
				South Korea	04/19/1989		
				Sri Lanka	04/19/1989		
				Tanzania	04/19/1989		
				Thailand	04/19/1989		
				Vietnam	04/19/1989		

Source: World Trade Organization

Note: *If the dates of entry into force differ for goods and services, we focus on goods.

**This ASEAN-Plus-One agreement entered into force for both Indonesia and Hong Kong (China) in 2020, therefore for the purpose of our analysis this is included under the No major PTAs group.

---

[2] To remain precise in the analysis of PTAs, we do not introduce a binary variable that would group the listed countries by their membership to Asia-Pacific Economic Cooperation (APEC) launched in November 1989 and comprised of the 21 countries of Pacific Rim. According to the U.S. ITC's Year in Trade 2021 report "Operating as a cooperative, multilateral forum, APEC achieves its goals by promoting dialogue to reach consensus without binding commitments or treaty obligations." Therefore, there is no corresponding PTA treaty on the WTO website and thus in this research.

Table A2. Results on total exports and exports by product types

Variables	Total exports	Fuel exports	Minerals exports	Animals exports	Plastic/Rubber exports	Textile exports	Wood exports	Metals exports	Machines exports	Vegetables exports
$lnDist_{ij}$	0.510 (1.164)	27.617 (15.829)	-1.447 (.863)	8.324*** (1.138)	-1.014 (1.180)	2.040* (.830)	-1.225 (.898)	9.471*** (1.265)	3.290*** (.957)	-7.220*** (1.631)
$lnGDP_{ij}$	.508 (.717)	1.029* (.509)	-.221*** (.063)	1.729* (.840)	.042 (.045)	.072 (.047)	.239 (.461)	1.310* (.657)	.002 (.081)	.090 (.406)
$lnGDP_{ji}$	-1.844*** (.532)	-4.367*** (.493)	-4.885** (1.667)	.358 (1.298)	-3.448*** (.950)	-2.373** (.847)	-.353 (.717)	-4.696** (1.582)	-4.831*** (.615)	-.398 (.896)
$lnPop_i$	.786 (.856)	3.926* (1.744)	.107 (1.058)	.121 (2.161)	-.049 (.410)	-.429 (.3169)	.7392 (.427)	.002 (.915)	-.536 (.308)	1.706* (.707)
$lnPop_j$	11.225*** (2.750)	17.752*** (2.422)	21.266** (7.563)	-1.099 (6.159)	18.846*** (4.065)	12.512*** (3.009)	4.006 (3.664)	22.065 (6.217)	25.294*** (2.389)	7.655* (3.511)
$lnExch_{ij}$	-.542*** (.132)	-.926*** (.181)	-.701 (.394)	-.199 (.270)	-.753** (.267)	-.547*** (.094)	-.403* (.183)	-.855* (.336)	-.678*** (.134)	-.185 (.106)
$lnDig_{ij}$	.041** (.014)	.040* (.017)	.101** (.039)	.040* (.021)	.072* (.034)	.040* (.0168)	.046** (.017)	.035 (.034)	.163*** (.022)	.084* (.038)
$Island_i$	2.806 (2.524)	46.419* (20.524)	-1.989* (.831)	8.039* (4.073)	1.172 (1.124)	2.111 (1.664)	-.377 (.610)	12.644*** (3.150)	4.252 (2.228)	-3.720* (1.875)
$Cont_i$	2.851 (3.301)	48.353* (19.193)	-4.566 (2.720)	19.428*** (2.740)	-4.911* (2.092)	-.537 (2.851)	-1.361 (2.314)	21.004*** (3.713)	5.467* (2.621)	-11.963*** (3.704)
$Comhist_i$	.743 (1.115)	-30.017 (15.747)	.081 (1.994)	-13.447*** (2.715)	4.616** (1.542)	3.882 (2.348)	.187 (.856)	-10.008*** (2.794)	-1.399 (1.635)	-1.214 (1.420)
$Comlang_i$	.514 (.793)	-4.268*** (1.176)	-1.520** (.548)	.810 (1.644)	-.921 (.542)	-.552 (.613)	.219 (.510)	.727 (1.693)	-.088 (.867)	.444 (1.039)
$Remot_i$	.325 (.859)	.025 (.941)	4.706*** (.594)	-1.563* (.756)	-.308 (.191)	-.750 (.433)	.982 (.964)	.566 (1.479)	.382* (.162)	.155 (.736)
PTA_1	-.186 (.317)	.189 (.663)	-2.957*** (.386)	-.735** (.272)	-2.740*** (.495)	-2.268*** (.552)	-1.576** (.539)	-.791*** (.263)	.225 (.169)	-1.668*** (.455)
PTA_2	-.273** (.103)	-.091 (.128)	-1.940*** (.139)	-.126 (.176)	-1.322*** (.073)	-.773*** (.147)	-1.878*** (.141)	-1.923*** (.188)	-.282*** (.076)	-1.087*** (.070)
PTA_3	.364*** (.129)	-.629* (.253)	2.258* (1.126)	.454 (.514)	.029 (.158)	.557*** (.115)	.207** (.084)	-.691** (.289)	.132 (.239)	.354*** (.082)
PTA_4	-.452*** (.092)	-.531** (.188)	-2.755*** (.159)	.261* (.130)	-2.193*** (.151)	-1.467*** (.139)	-1.861*** (.075)	-2.381*** (.130)	-.573*** (.135)	-1.362*** (.208)
WTO	.198*** (.054)	.1310 (.091)	.875*** (.169)	.119 (.155)	.525*** (.080)	.198* (.100)	.087 (.101)	.280 (.150)	.750*** (.110)	.344* (.145)
$Const$	-119.027*** (25.467)	-216.64*** (30.390)	-175.103** (60.230)	-10.863 (54.761)	-165.572*** (35.531)	-105.364*** (25.100)	-37.077 (30.498)	-218.697*** (56.923)	-231.311*** (21.034)	-76.706** (29.844)
N groups	42	42	42	42	42	42	42	42	42	42
N observations	1,302	1,302	1,302	1,302	1,302	1,302	1,302	1,302	1,302	1,302
Pseudo log-likelihood	-134111431	-72761267	-21807462	-5164958	-15052649	-18336598	-12051128	-23588101	-12365110	-33699171
RESET p-val.	.0057	0.9489	0.263	0.000	0.587	0.210	0.000	0.544	0.014	0.043

*Note: clustered robust standard errors in parenthesis; *, ** and *** indicate significance at $p < 0.05; 01$ and 0.001, respectively.*

Table A3. Results on total imports and imports by product types

Variables	Total imports	Fuel imports	Minerals imports	Animals imports	Plastic/Rubber imports	Textile imports	Wood	Metals imports	Machines imports	Vegetables imports
$lnDist_{ij}$	-1.404* (.717)	3.305 (1.850)	-3.466** (1.276)	-2.507 (1.699)	-5.460*** (1.239)	1.470 (1.400)	-.541 (.983)	.192 (1.075)	-.920 (1.063)	-7.462 (17.084)
$lnGDP_{ij}$	.044 (.166)	1.717* (.709)	-.106*** (.019)	.362 (.638)	-.203*** (.057)	1.263 (.662)	-.008 (.023)	.105 (.524)	.072 (.466)	.007 (.013)
$lnGDP_{ji}$	.515 (.800)	-6.055*** (1.066)	2.860*** (.554)	-2.560 (1.856)	.716 (1.186)	2.586*** (.647)	.836 (.723)	1.569* (.616)	1.045 (1.083)	.864 (.664)
$lnPop_i$	1.732** (.635)	3.126*** (.752)	3.203* (1.304)	-1.907 (1.280)	2.646*** (.808)	-1.834 (1.788)	.655 (.652)	1.134 (.923)	2.966** (1.043)	-1.762 (1.122)
$lnPop_j$	3.486 (3.428)	19.693*** (5.170)	-7.625*** (2.123)	20.061* (8.475)	5.459 (6.190)	-5.756* (2.680)	2.217 (2.920)	-1.057 (2.596)	1.935 (5.320)	3.390 (2.658)
$lnExch_{ij}$	-.334* (.147)	-.652*** (.183)	.025 (.068)	-.829* (.396)	-.442 (.366)	-.107 (.073)	-.125 (.100)	-.103 (.137)	-.630* (.276)	-.189 (.134)
$lnDig_{ij}$	-.002 (.014)	-.105* (.052)	.012 (.032)	.070* (.032)	.013 (.022)	-.001 (.025)	.039** (.015)	-.001 (.022)	.012 (.019)	.009 (.022)
$Island_i$	1.127 (2.213)	12.213* (5.063)	-2.016* (1.029)	1.141 (2.908)	-2.849** (1.141)	-3.183 (2.417)	.824 (.922)	.695 (1.601)	4.699 (2.984)	1.185 (5.312)
$Cont_i$	-1.478 (1.676)	10.507* (4.277)	-6.126** (2.333)	-15.769 (9.299)	-9.629*** (2.571)	-1.876 (7.750)	-3.646 (2.649)	-.253 (2.629)	-.683 (2.971)	-26.136 (40.589)
$Comhist_i$	-.348 (.957)	-5.701** (2.063)	-1.230 (1.180)	9.188 (5.296)	1.721 (1.075)	1.208 (3.342)	.9520 (1.276)	-.695 (1.127)	.825 (1.116)	12.574 (10.392)
$Comlang_i$	.661 (.582)	2.799 (1.456)	2.639 (1.515)	-1.854 (2.253)	1.278 (.880)	-.505 (1.620)	.437 (.790)	.8328 (.906)	2.062 (1.086)	-1.630 (1.057)
$Remot_i$	1.535* (.732)	-4.285* (1.788)	.706 (.530)	-.731 (.423)	2.214** (.805)	.669 (.851)	1.128** (.437)	1.547 (.995)	2.293** (.892)	-.540 (.323)
PTA_1	.702* (.362)	-1.475*** (.393)	-2.167*** (.503)	1.530** (.596)	-.103 (.643)	.733 (.420)	.219 (.602)	.439 (.475)	.158 (.589)	-2.839*** (.314)
PTA_2	.352*** (.068)	-.789*** (.199)	-2.243*** (.112)	.977*** (.109)	-.431*** (.098)	-.257 (.166)	-.088 (.080)	.244** (.083)	.316*** (.084)	-2.430*** (.107)
PTA_3	.241 (.330)	.352* (.169)	1.519*** (.193)	.205 (208)	-1.259*** (.178)	-.593 (.351)	3.091*** (.144)	1.762*** (.174)	-1.177*** (.227)	.760** (.240)
PTA_4	-.065 (.139)	-1.796*** (.147)	-2.712*** (.169)	.607*** (.086)	-.740*** (.182)	-.244 (.265)	-.415* (.199)	-.224 (.234)	-.410* (.177)	-2.803*** (.132)
WTO	.165 (.092)	.259 (.238)	.502* (.244)	.448*** (.136)	-.032 (.155)	.054 (.137)	.151 (.149)	.198 (.139)	.265 (.146)	.442* (.197)
$Const$	-56.549 (29.429)	-203.93*** (41.753)	41.410* (18.070)	-176.023** (67.871)	-75.462 (53.218)	52.429*** (16.795)	-33.869 (25.764)	-9.418 (24.012)	-51.713 (47.511)	-9.844 (37.754)
N groups	42	42	42	42	42	42	42	42	42	42
N observations	1,302	1,302	1,302	1,302	1,302	1,302	1,302	1,302	1,302	1,302
Pseudo log-likelihood	-175512532	-76659811	-4029784	-3718889	-8829344	-12589141	-5338385	-25372341	-51980590	-17518972
RESET p-val.	0.0003	0.5764	0.8262	0.9148	0.0001	0.3708	0.8341	.1678	0.0790	0.0004

Note: clustered robust standard errors in parenthesis; *, ** and *** indicate significance at $p < 0.05; 01$ and 0.001, respectively.

Table A4. Three PTA variables: Results on total exports with and exports by product types[3]

Variables	Total exports	Fuel exports	Minerals exports	Animals exports	Plastic/Rubber exports	Textile exports	Wood exports	Metals exports	Machines exports	Vegetables exports
$lnDist_{ij}$	0.503 (1.164)	27.613 (15.825)	-1.456 (.861)	8.334*** (1.134)	-1.045 (1.186)	2.027* (.831)	-1.236 (.906)	9.448 (1.271)	3.261*** (.957)	-7.224*** (1.641)
$lnGDP_{ij}$	.510 (.716)	1.034* (.507)	-.221*** (.063)	1.727* (.841)	.042 (.046)	.072 (.047)	.242 (.468)	1.308* (.655)	.001 (.079)	.094 (.414)
$lnGDP_{ji}$	-1.852*** (.531)	-4.375*** (.496)	-4.899** (1.666)	.359 (1.298)	-3.466*** (.947)	-2.392** (.846)	-.368 (.721)	-4.706** (1.576)	-4.842*** (.616)	-.402 (.895)
$lnPop_i$	.778 (.852)	3.908* (1.733)	.081 (1.061)	.151 (2.160)	-.065 (.407)	-.435 (.319)	.729 (.420)	.009 (.917)	-.545 (.311)	1.702* (.712)
$lnPop_j$	11.261*** (2.754)	17.785*** (2.445)	21.343** (7.556)	-1.116 (6.151)	18.941*** (4.049)	12.592*** (2.994)	4.065 (3.687)	22.130*** (6.193)	25.360*** (2.408)	7.670* (3.514)
$lnExch_{ij}$	-.543*** (.130)	-.927*** (.182)	-.705 (.393)	-.200 (.270)	-.756** (.268)	-.549*** (.094)	-.405* (.184)	-.856* (.336)	-.679*** (.135)	-.186 (.107)
$lnDig_{ij}$	.042** (.015)	.040* (.017)	.101** (.039)	.040* (.021)	.073* (.035)	.041* (.017)	.047** (.017)	.035 (.034)	.164*** (.022)	.085* (.038)
$Island_i$	2.789 (2.522)	46.325* (20.487)	-1.972* (.819)	8.092* (4.028)	1.205 (1.445)	2.086 (1.658)	-.371 (.609)	12.607*** (3.155)	4.182 (2.236)	-3.719* (1.873)
$Cont_i$	2.842 (3.298)	48.270* (19.181)	-4.598 (2.762)	19.454*** (2.624)	-5.036* (2.102)	-.603 (2.842)	-1.373 (2.342)	20.945*** (3.733)	5.357* (2.643)	-11.967*** (3.732)
$Comhist_i$	.736 (1.111)	-29.963 (15.744)	.144 (2.044)	-13.467*** (2.683)	4.687** (1.537)	3.927 (2.343)	.194 (.855)	-9.964*** (2.813)	-1.337 (1.652)	-1.212 (1.422)
$Comlang_i$	.498 (.786)	-4.259*** (1.172)	-1.539** (.552)	.772 (1.652)	-.943 (.546)	-.569 (.616)	.208 (.504)	.746 (1.705)	-.115 (.876)	.444 (1.038)
$Remot_i$	.323 (.859)	.018 (.940)	4.709*** (.594)	-1.561* (.757)	-.307 (.193)	-.752 (.437)	.982 (.976)	.566 (1.477)	.381* (.160)	.153 (.741)
PTA_1	.264 (.298)	.722 (.568)	-.197 (.395)	-.999*** (.241)	-.550 (.495)	-.802 (.533)	.282 (.538)	-.411 (.226)	.794*** (.198)	-.309 (.448)
PTA_2	.172 (.094)	.437 (.230)	.814*** (.224)	-.378* (.168)	.851*** (.152)	-.664*** (.141)	-.028 (.538)	.446* (.202)	.268 (.143)	.269 (.177)
PTA_3	.364** (.129)	-.628* (.252)	2.211* (1.118)	.477 (.512)	.029 (.158)	.557*** (.115)	.207* (.084)	-.691* (.289)	.132 (.239)	.353*** (.083)
WTO	.198*** (.054)	.131 (.090)	.874*** (.169)	.120 (.155)	.525*** (.081)	.200* (.099)	.088 (.101)	.280 (.150)	.750*** (.110)	.344* (.144)
$Const$	-119.737*** (25.541)	-217.35*** (30.551)	-178.296** (60.110)	-10.665 (54.669)	-168.425*** (35.395)	-107.45*** (24.950)	-39.370 (30.733)	-221.601*** (56.680)	-232.348*** (21.222)	-78.191** (29.755)
N groups	42	42	42	42	42	42	42	42	42	42
N observations	1,302	1,302	1,302	1,302	1,302	1,302	1,302	1,302	1,302	1,302
Pseudo log-likelihood	-134385	-72832522	-21832733	-5170212	-15193955	-18513240	-12202914	-23682039	- 12441423	-33743736
RESET p-val.	.0044	0.946	0.262	0.000	0.487	0.345	0.000	0.529	0.023	0.041

*Note: clustered robust standard errors in parenthesis; *, ** and *** indicate significance at p< 0.05, 0.01, and 0.001, respectively.*

---

[3] PTA_{1t} -AFTA; PTA_{2t} -ASEAN-Plus-One; $PTA_{3t} - PSA$

Table A5.Three PTA variables: Results on total imports and imports by product types[4]

Variables	Total imports	Fuel imports	Minerals imports	Animals imports	Plastic/Rubber imports	Textile imports	Wood	Metals imports	Machines imports	Vegetables imports
$lnDist_{ij}$	-1.406* (.718)	3.305 (1.850)	-3.471** (1.276)	-2.517 (1.704)	-5.488*** (1.237)	1.468 (1.401)	-.555 (.987)	.195 (1.077)	-.941 (1.079)	-7.457 (17.116)
$lnGDP_{ij}$	.044 (.166)	1.719* (.708)	-.106*** (.019)	.364 (.641)	-.203*** (.057)	1.276* (.649)	-.008 (.023)	.106 (.526)	.074 (.480)	.007 (.013)
$lnGDP_{ji}$	.515 (.800)	-6.055*** (1.066)	2.858*** (.554)	-2.563 (1.854)	.702 (1.185)	2.570*** (.635)	.833 (.723)	1.568* (.617)	1.026 (1.085)	.864 (.664)
$lnPop_i$	1.731** (.634)	3.125*** (.752)	3.208* (1.306)	-1.948 (1.277)	2.624*** (.801)	-1.864 (1.737)	.650 (.648)	1.131 (.920)	2.931** (1.046)	-1.759 (1.121)
$lnPop_j$	3.492 (3.426)	19.693*** (5.171)	-7.620*** (2.123)	20.098* (8.463)	5.549 (6.186)	-5.709* (2.649)	2.235 (2.918)	-1.047 (2.599)	2.034 (5.346)	3.390 (2.658)
$lnExch_{ij}$	-.334* (.147)	-.652*** (.183)	.025 (.068)	-.831* (.395)	-.442 (.366)	-.108 (.072)	-.125 (.100)	-.103 (.137)	-.633* (.276)	-.189 (.134)
$lnDig_{ij}$	-.002 (.014)	-.104* (.052)	.012 (.032)	.069* (.032)	.013 (.022)	-.001 (.025)	.039** (.015)	-.001 (.020)	.012 (.019)	.009 (.022)
$Island_i$	1.122 (2.205)	12.209* (5.063)	-2.014* (1.031)	1.194 (2.925)	-2.854** (1.137)	-3.217 (2.286)	.841 (.924)	.688 (1.590)	4.603 (2.986)	1.186 (5.338)
$Cont_i$	-1.481 (1.677)	10.511* (4.277)	-6.137** (2.333)	-15.970 (9.314)	-9.669*** (2.569)	-1.985 (7.613)	-3.682 (2.656)	-.263 (3.023)	-.700 (2.971)	-26.116 (40.674)
$Comhist_i$	-.346 (.956)	-5.703* (2.063)	-1.229 (1.181)	9.320 (5.271)	1.716 (1.075)	1.252 (3.299)	.972 (1.281)	-.689 (1.122)	.817 (1.115)	12.568 (10.424)
$Comlang_i$	.660 (.581)	2.800 (1.457)	2.644 (1.516)	-1.914 (2.270)	1.278 (.880)	-.523 (1.607)	.424 (.788)	.828 (.900)	2.015 (1.070)	-1.630 (1.050)
$Remot_i$	1.535* (.732)	-4.285* (1.788)	.708 (.528)	-.733 (.424)	2.219** (.806)	.660 (.842)	1.132** (.440)	1.546 (.999)	2.295* (.909)	-.539 (.323)
PTA_1	.767** (.294)	-.320 (.387)	.543 (.432)	.933 (.619)	.635 (.580)	.974** (.320)	.632 (.555)	.664 (.381)	.569 (.504)	-.036 (.314)
PTA_2	.414** (.153)	1.005*** (.210)	.465** (.163)	.377** (.150)	.295 (.230)	-.027 (.263)	.313 (.194)	.465** (.269)	.711*** (.207)	.373 (.199)
PTA_3	-.241 (.330)	-352* (.169)	1.518*** (.194)	.210 (.207)	-1.259*** (.178)	-.290 (.345)	3.091*** (.134)	1.762*** (.174)	-1.174*** (.228)	.759** (.240)
WTO	.165 (.092)	.259 (.238)	.502* (.244)	.449*** (.136)	-.031 (.155)	.054 (.137)	.151 (.149)	.198 (.139)	.266 (.147)	.442* (.196)
$Const$	-56.657 (29.387)	-205.73*** (41.817)	38.616* (18.060)	-175.294** (67.823)	-75.801 (53.137)	52.042** (16.874)	-34.392 (25.710)	-9.707 (24.108)	-52.661 (47.778)	-12.687 (37.827)
N groups	42	42	42	42	42	42	42	42	42	42
N observations	1,302	1,302	1,302	1,302	1,302	1,302	1,302	1,302	1,302	1,302
Pseudo log-likelihood	-175519	-76679062	-4034630	-3724377	-8857941	-12603613	-5344877	-25378493	-52070123	-17518972
RESET p-val.	0.0004	0.584	0.839	0.917	0.0001	0.347	0.823	.160	0.055	0.053

*Note: clustered robust standard errors in parenthesis; *, ** and *** indicate significance at $p < 0.05; 01$ and 0.001, respectively.*

[4] PTA_{1t}-AFTA; PTA_{2t}-ASEAN-Plus-One; $PTA_{3t} - PSA$