MASTER THESIS

Tariff Liberalization and the Intensive and Extensive Margins of Trade: The Case for the ASEAN Free Trade Agreement

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Ilona van Schaik[1]

MSc International Economics

Erasmus School of Economics

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Supervisor: Professor Dr. L. Pozzi

Second reader: Professor Dr. J.M.A. Viaene

[1] Email: ilonavanschaik.ivs@gmail.com. Student number: 450154

Abstract

This paper is the first in its attempt to analyse the effect of tariff liberalization on the intensive- and extensive margins of trade for the ASEAN Free Trade Agreement (AFTA). The extensive margin is examined by investigating to what extent preferential tariff changes between 1996 and 2008 contribute to the probability of importing a new HS 6-digit product category. For the intensive margin, the paper analyses to what extent these tariff changes impact the import value of already imported product categories. To alleviate the endogeneity problem encountered when analysing tariff changes in relation to import status and import value, the paper estimates the relationship using an instrumental variable approach. As such, implemented preferential tariffs are instrumented with the scheduled preferential tariffs, which member countries negotiated on before the agreement went into force in 1993. This paper finds robust evidence that tariff reductions significantly increase both the intensive- and extensive margins of trade. In addition, the paper finds that for the extensive margin this effect is smaller when the elasticity of substitution between varieties is high. For the intensive margin, the reverse is found, as a higher elasticity of substitution between varieties leads to a larger effect.

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I. Introduction

On January 28, 1992 a new trade bloc was born when six Asian countries signed the ASEAN Free Trade Agreement (AFTA). Through the elimination of intra-bloc tariff and non-tariff barriers, the ultimate goal of the agreement was to increase the bloc's competitive position in the world market. Along with AFTA, many other trade agreements have been formed in recent years, for which the establishment of the World Trade Organisation (WTO) in 1995 has played an important role. It thus comes with no surprise that a profound effort has been made to analyse the welfare implications of this endeavour to free trade.

At the forefront of such studies lies a range of influential theoretical contributions, pioneered by Krugman (1980) and Melitz (2003). Whereas traditional trade models explained that inter-industry trade is due to cross-country differences in technologies (Ricardo) and factor endowments (Heckser-Ohlin), new trade models explain the prevalence of intra-industry trade. Following this work, a combination of firm heterogeneity, fixed exporting costs and consumers' love-of-variety preferences generate gains from trade that go beyond the traditional trade models. One such gain from trade, which is analysed in this paper, is an increase in product variety. Not only does trade liberalisation increase the value of import of existing trade relationships, it also enables the establishment of new trade relationships, supplying the consumer with a greater spectrum of goods to choose from (Melitz, 2003). This theoretical insight gave rise to the literature that examines the so-called intensive- and extensive margins of trade. Whilst the intensive margin refers to the average trade value per distinct product, the extensive margin captures the number of distinct products traded.

This study aims to analyse the effect of tariff liberalisation on the intensive- and extensive margins of trade for the ASEAN Free Trade Agreement, which is not yet observed in the literature. This question is important for multiple reasons. Firstly, from a societal point of view it is essential to understand to what extent, if at all, consumers experience this increase in product variety due to trade liberalizing measures. An increase in product variety satisfies a wider range of consumer tastes and is therefore a potential gain from trade worth to study.

Secondly, from an academic point of view it is vital to distinguish between these two trade margins, as it explicitly allows for the inclusion of information on non-traded products. As noted by Helpman, Melitz and Rubinstein (2008), earlier studies

that exclude this information substantially produce biased estimates due to selection bias. In fact, a high tariff by itself could be the reason why a certain good is not traded in the first place. Hence, information on zero trade flows should be included when one wishes to accurately analyse the gains from trade.

Using disaggregated product level data at the Harmonized Systems (HS) 6-digit level for the initial six AFTA members, this study analysis the extensive margin of trade by investigating to what extent preferential tariff changes between 1996 and 2008 contribute to the probability that a product category is imported in 2008. To identify the intensive margin, this paper analyse to what extent these tariff changes impact the import value of already existing trade relationships. AFTA is particularly useful for analysing this question as member countries beforehand settled on a preferential tariff reduction schedule, where preferential tariff rates were to be reduced up to 0 percent by 2008. In later years, members have made some amendments to this schedule, which implies that the actually implemented tariffs are not necessarily equal to the scheduled tariffs. This feature is used as an identification strategy, whereby implemented preferential tariffs are instrumented with the scheduled preferential tariffs, as a means to alleviate the reverse causality issue between import status and tariffs. This paper aims to be the first to employ this identification strategy in a study of trade margins, which is an important contribution of this paper.

Using the aforementioned methodology, this paper presents robust evidence that tariff reductions significantly impact both the intensive- and extensive margins of trade. The paper primarily observes that endogeneity of tariffs indeed forms a problem, which should be accounted for. For the extensive margin, the 2SLS estimation results show that a 1% reduction in the preferential tariff rate increases on average the probability of import of a product category by 0.116 percentage points, ceteris paribus. When making a distinction between differentiated- and homogeneous goods, this effect is larger for the former as compared to the latter. The intensive margin results show that a 1% decrease in the preferential tariff rate on average increases the value of imports by 0.17%, ceteris paribus. In this case the effect is larger for homogeneous goods as compared to differentiated goods.

The remainder of the paper is structured as follows. Section II provides the theoretical background on which the empirics are developed. Section III reviews the existing empirical literature on trade margins, while section IV discusses the data.

Section V lays-out the empirical methodology after which results are reported in section VI. Robustness measures are conducted in section VII followed by a discussion in section VIII and concluding remarks in section IX.

II. Trade Liberalization and Product Variety

The relationship between trade margins and trade liberalization is a widely discussed topic among academic literature. This section deliberates the most important of these models and their main predictions.

Krugman's (1980) "new" trade theory was the first model to explain trade patterns under the basis of product variety. This theory was put in favour as traditional trade models of Ricardo and Heckser-Ohlin failed to explain the highly existent intra-industry trade patterns. These models were built on the notion of comparative advantage and did not explain why countries import and export similar products at the same time. The essential assumption in Krugman's (1980) model is that consumers have love-of-variety (LOV) preferences, which allows firms to produce highly differentiated products. Consequently, when countries open up to trade, there will be a wider range of goods available to the consumer. Hence, even in the presence of trade barriers (e.g. tariffs, transport costs), there will be gains from trade.

A limitation of the Krugman (1980) model is that all firms are assumed to be exporters and each firm produces only one product variety. This implies that changes in trade patterns, which result from reductions in trade barriers, solely occur at the intensive margin, while no changes take place at the extensive margin. However, many empirical studies after Krugman (1980) showed that in reality very few firms export, and that the characteristics of these exporting firms significantly differ from non-exporting firms.[2]

To explain these stylized facts, Melitz (2003) extends the Krugman (1980) model, and developed the "new new" trade theory. The two crucial extensions of Melitz (2003) are the inclusion of heterogeneity in firms' productivity levels and the presence of fixed exporting costs. These two assumptions combined imply that a fall in trade costs leads to an adjustment of trade at both the intensive- and extensive margin. Due to this heterogeneity in productivity, firms differ in terms of their marginal costs, as the latter are a decreasing function of the firms' productivity level. After firms observe their level of productivity, they decide whether to enter the

[2] See: Bernard & Jensen (1995, 1999), Clerides, Lach, & Tybout (1998), Aw, Chung, & Roberts (1998).

domestic market and subsequently whether to export, taking into account the fixed entry- and export costs and the variable production- and trade costs. This generates two cut-off productivity levels: the level of productivity at which firms enter the domestic market and the level of productivity at which firms enter the export market.

When trade costs decrease, the export cut-off productivity level decreases as, independent of the productivity level, it becomes more profitable for a firm to export its products. This enables new firms to start exporting and generates a change in trade at the extensive margin.[3] Existing exporting firms also increase their exports and generate a change in trade at the intensive margin. These dynamic changes generate an increase in labour demand by the more productive firms, which increases the real wage and subsequently generates higher costs. Consequently, for the least productive non-exporting firms it becomes unprofitable to stay in the market and they are forced to exit.[4] After Melitz's (2003) various extensions have been developed. For example, Bernard, Redding and Schott (2011) incorporate the fact that firms produce multiple products and export to multiple destinations. They show that trade liberalization can lead firms to produce new products for new export markets.[5]

Related to the margins of trade, Chaney's (2008) model explicitly introduces the extensive margin of trade in a model with many asymmetric countries and asymmetric trade barriers. The main finding of Chaney's (2008) contribution is that there is an opposite effect of the elasticity of substitution between varieties on each margin. More specifically, the intensive margin becomes more sensitive in response to a higher elasticity of substitution, while the extensive margin becomes less sensitive. His model is similar to Melitz (2003) to the extent that a decrease in trade barriers lowers the export cut-off productivity level, allowing new firms to enter the export market. However, what Chaney (2008) incorporates is that when the elasticity of substitution between varieties is high, meaning that goods are less differentiated, firms enjoy less market power. The less productive firms that enter the export market can therefore capture only a small market share. Consequently, the effect of the decrease in trade barriers on aggregate trade is small. On the other hand, when the elasticity of substitution between varieties is low, goods are highly differentiated and firms are less confined by competition. When new firms enter the export market in

[3] It is assumed that each firm produces one variety and thus as new heterogeneous firms enter the export market, additional product varieties are available to the consumer.
[4] This generates an additional gain from trade: increased industry productivity.
[5] Examples of other extensions include: Bernard, Jensen, Redding and Scott (2007) who incorporate a second factor of production; Melitz and Ottaviano (2008) who introduce endogenous mark-ups.

response to the lower trade barriers, they thus capture a larger market share, which generates a larger impact on aggregate trade.

For the intensive margin the effect is reversed. Goods that are highly differentiated have relatively inelastic demand in response to changes in trade costs. This means that the impact of trade barriers on the intensive margin of trade is small, when the elasticity of substitution between varieties is low. At the same time, when goods are more homogeneous, trade barriers have a large impact on the intensive margin of trade. Thus, when the elasticity of substitution increases, the effect of trade barriers on the extensive margin dampens, while the effect of trade barriers on the intensive margin magnifies. In equilibrium, Chaney (2008) shows that the dampening effect of the extensive margin dominates the magnifying effect from the intensive margin.

III. Empirical Studies on the Margins of Trade

In the early stages of the new trade literature, many empirical studies have focused on the estimation of a gravity model to explain bilateral trade flows.[6] A major shortcoming of such studies is that their samples only include non-zero trade flows. Estimations based on such samples have a high potential of being biased due to selection bias (Helpman, Melitz & Rubinstein, 2008). In fact, the presence of a high tariff could explain why a certain good is not traded in the first place.

Recognizing this concern demanded the need for research that investigates the effect of trade liberalization on the intensive and extensive margins of trade. Within this literature, various methods have been used to define and estimate these trade margins. This section reviews this diverse literature, with focus on two prominent methodologies: the dummy variable measure and the Hummels and Klenow (2005) measure. [7]

Dummy Variable Measure

The dummy variable measure defines an increase in the extensive margin as an increase in the probability that a specific product category is traded between two countries. This involves the use of a dummy dependent variable, which equals 1 if the product category was imported and 0 otherwise. The dummy variable approach offers

[6] See for example, Mátyás (1997); Martínez-Zarzoso and Nowak-Lehmann (2003)
[7] These methodologies apply to the use of product-level data instead of firm-level data as employed in for instance Bernard, Jensen, Redding and Schott (2009).

a particularly effective methodology for analysing the effect of tariff reductions.[8] Studies that adopt this approach usually select two years that are sufficiently far apart. However, when it comes to the chosen estimation model, there are noticeable differences between studies.

For example, Moncarz (2010) performs an analysis on Argentina, and examines how tariff reductions through the implementation of MERCOSUR affected the extensive margin of trade. He estimates a Probit model with fixed effects and finds that tariff reductions between 1992 and 2007 led to an increase in the probability of a good being imported in 2007. Debaere and Mostashari (2010) also estimate a Probit model with fixed effects but instead perform the analysis on the United States. Their results show that tariff reductions occurring between 1989 and 1999 had a significant but quantitatively modest impact on the extensive margin. In fact, they find that country and industry specific factors are much more important for determining the extensive margin. This result could be due to the relatively low degree of tariff reductions that occurred within this period.

Hejazi, Grant and Peterson (2017) also analyse the United States import market but find contrasting results compared to Debaere et al. (2010). They develop a multinomial logit model for the agri-food sector and consider four trade margins: no-trade margin, disappearing margin, intensive margin and extensive margin. Analysing tariff changes between 1996 and 2006, the paper finds the effect on newly traded products (i.e. extensive margin) to be twice as large, compared to the intensive margin and the disappearing margin.

Diverging from the above studies, Disdier, Fontagné and Mimouni (2015) estimate a linear probability model with fixed effects for a group of emerging countries. They consider three separate margins: the extensive margin of exit, the extensive margin of entry and the intensive margin. Analysing the years 1996 and 2006, they find that tariff reductions had the largest effect on the intensive margin, and only a limited impact on the import of new varieties. Disdier et al. (2015) additionally distinguish between differentiated and homogeneous goods, and confirm the predictions of Chaney's (2008) model as discussed above.

Hummels and Klenow (2005) measure

An alternative methodology that has received considerable attention in the trade margins literature is developed by Hummels and Klenow (2005). Following this

[8] Instead of an explanatory dummy variable that equals 1 when a trade agreement was in place and 0 otherwise.

methodology, the extensive margin is estimated as a weighted count of the number of distinct product categories imported from a trading partner relative to a reference country (usually total world trade). The intensive margin is defined as the nominal imports from the trading partner relative to the nominal imports from the world, for those product categories in which there is positive trade with the trading country.[9]

Feenstra and Kee (2007) use this methodology to show how Mexico's export variety per industry has changed since it joined the NAFTA in 1994, which substantially lowered tariffs to the US and Canadian markets. Controlling for China's export variety and China's import tariffs to control for the negative market competition effect, the results show that the US tariff reductions positively affected the extensive margin. A disadvantage of using this methodology in analysing tariff liberalization is that it requires the use of average tariff levels for an entire industry or country, which disguises important product heterogeneity. Instead, the dummy variable methodology allows for analysing tariff changes at the product level and specifically incorporates the tariff rate for product categories with zero trade values.

Due to this reason, the Hummels and Klenow (2005) methodology has mainly been applied in gravity equation estimates where the explanatory trade policy variable is adopted as a dummy variable, indicating whether a specific trade agreement was in force or not. For example, Foster, Poschl and Stehrer (2011) analyse a large number of Economic Integration Agreements (EIAs) and estimate a gravity equation including an EIA dummy variable as the explanatory trade policy variable. The paper only finds evidence for the extensive margin. Baier, Bergstrand and Feng (2014) also analyse a large number of EIAs but instead use panel-techniques to alleviate endogeneity problems usually encountered in traditional gravity equations. The paper finds that deeper EIAs have a larger impact on both trade margins.

A disadvantage of the above studies is that the EIA dummy variable does not provide a direct measure of reductions in variable trade costs. The extent to which the intensive- and extensive margins are affected by the implementation of a trade agreement potentially depends on the degree to which trade barriers are actually reduced. Hence, by using a direct measure of reductions in variable trade costs (e.g.

[9] On a more technical explanation, the extensive margin equals $\frac{\sum_{p \in P_{ijt}} X^p_{Wjt}}{\sum_{p \in P_{Wjt}} X^p_{Wjt}}$ where X^p_{Wjt} is the value of country j's imports from the world in product p in year t, P_{Wjt} is the set of all products exported by the world to j in year t and P_{ijt} is the subset of all products in which country i has positive exports to country j. The intensive margin equals $\frac{\sum_{p \in P_{ijt}} X^p_{ijt}}{\sum_{p \in P_{ijt}} X^p_{Wjt}}$ where X^p_{ijt} is the value of country j's imports from country i in product p in year t.

tariffs, transport costs, or non-tariff barriers) the predictions of the new trade theory literature can be studies more accurately.

Persson (2008) recognizes this limitation and instead uses a trade facilitation measure as a proxy for export transaction costs.[10] However, instead of using a weighted count of the number of distinct product categories imported from a trading partner, she uses a simple count measure.[11] She estimates a Poisson model for exports from 130 developing countries to the EU and concludes that a decline in trade costs increases the number of exporting products. In addition, the study finds evidence for the Chaney (2008) model that for differentiated goods the extensive margin is more negatively affected by export transaction costs compared to the intensive margin.

Limitations of the Existing Literature

Based on the existing literature, no robust conclusions can be drawn for the effect of tariff- or trade liberalization on the intensive- and extensive margins of trade. While some studies show that the intensive margin is far more important for explaining the growth in trade, others conclude that it is an increase in product variety that can explain the largest bulk of trade growth. In addition, in many cases, studies that specifically focus on tariff liberalization usually focus on the perspective of one trade liberalizing country, which could make results sensitive to the specific characteristics of this country. This study thereby contributes by analysing multiple countries and their reciprocal import growth, using the ASEAN Free Trade Agreement (AFTA) as an exogenous policy event. In addition, by adopting an instrumental variable technique this paper addresses the endogeneity issue usually encountered when analysing tariffs and trade flows, which is absent in earlier studies on trade margins.

The next section describes the specific data that is used for the analysis and gives more details about why AFTA provides an interesting trade policy event.

IV. Data

This study is based on a comprehensive dataset for the years 1996 and 2008 including information on import flows and preferential tariffs, both implemented and scheduled. This information has been collected for the six initial AFTA members,

[10] This trade facilitation measure is the number of days needed to export or import a standardized good.
[11] As the name suggests, the simple count measure, simply counts the amount of disaggregated product categories that are traded between two countries.

which includes the countries Brunei, Indonesia, Malaysia, Philippines, Singapore and Thailand. The agreement went into force on January 1993, with the goal to boost the countries' competitive position in the world market. To attain this goal, the bloc negotiated in 1992 on a so-called Common Effective Preferential Tariff (CEPT) schedule. This meant that for over 90 per cent of all product categories, preferential tariffs were to be reduced up to 0 per cent. Initially the tariff reduction scheme was to be implemented until 2008, but was later postponed to 2010. In subsequent years, four new members were added to the trade bloc, namely Vietnam (in 1995), Laos and Myanmar (in 1997) and Cambodia (in 1999).[12]

For the analysis this paper focuses on import flows and preferential tariff changes following the dummy variable approach. The choice for the beginning year, 1996, is due to data availability. This is the first year since the agreement went into force for which data on preferential tariffs is available. The choice for the final year, 2008, is based on the initial end date of the tariff reduction schedule. After 2008, preferential tariff rates were scheduled to stay constant, as they were either equal or close to 0 per cent. Using this final year, the study analyses the impact of the total reduction in tariffs generated by the tariff liberalization period.

Import Variety

Data on import flows is extracted through the World Integrated Trade Solution (WITS) portal, which is developed by the World Bank. To obtain a complete dataset including all six countries, this paper combines import data from three sources: the UN COMTRADE database, the United Nations Conference on Trade and Development Trade Analysis Information System (UNCTAD TRAINS) database and the World Trade Organization Integrated Database (WTO IDB). Import data is collected at the HS 6-digit level, which is the most detailed product-level data available for the countries under study. In case the three databases report a different import value, the average value is taken. However, in all cases, the correlation of the import values between the three databases is either equal or close to one.[13]

Since the adoption of the HS classification in 1988, there have been four versions implemented due to revision of the product categories.[14] This can create a difficulty when analysing the extensive margin of trade as it can falsely identify newly traded product categories. For example, a new product category could be added simply by

[12] These countries are not included in the analysis, due to the absence of data on scheduled preferential tariffs.
[13] See Appendix A.
[14] The HS classification has been revised in four years: 1992, 1996, 2001 and 2007.

splitting up an existing product category in two. To resolve this problem, this paper only considers those product categories that are consistently classified in both the HS1996 version and the HS2007 version. This results in 4,154 potentially imported product categories for each country-pair.[15] A remark that needs to be noted, as stressed by Hummels et al. (2005) is that estimations of the extensive margin may be sensitive to the level of product aggregation. The higher the level of disaggregation, the more precise the measure of product variety will be. However, the more disaggregated the data becomes, the more severe the problem of product category revision becomes. This favours the use of HS 6-digit product level data.

Table 1 reports the number of distinct product categories imported, the total import value and the average import value per product category for 1996 and 2008. These numbers are based on how much a county imports from all five other member-countries combined.[16] Comparing columns (b) and (e) shows that for all countries the total value of imports increased considerably between 1996 and 2008. For Indonesia, Malaysia, Singapore, and Thailand this import growth is due to both an increase in the number of distinct product categories imported (columns (a) and (d)) and from an increase in the average import value per product category (columns (c) and (f)). For Brunei and Philippines, the number of distinct product categories decreased, while the average value per product category increased.

TABLE 1 Number of Product Categories and Value Imported in 1996 and 2008

	1996			**2008**		
Country	HS-6 Product Categories **(a)**	Total Value [a] **(b)**	Average Value [b] **(c)**	HS-6 Product Categories **(d)**	Total Value [a] **(e)**	Average Value [b] **(f)**
Brunei	9,128	838	91.77	8,246	1,142	138.49
Indonesia	7,102	6,302	887.38	11,870	53,814	4,533.61
Malaysia	8,178	13,904	1,700.17	9,325	38,565	4,135.65
Philippine	8,762	5,140	586.65	8,745	14,333	1,639.00
Singapore	8,823	28,017	3,175.50	10,876	79,079	7,270.98
Thailand	4,481	6,741	1,504.35	8,945	25,000	2,794.86

Source: own based on UN COMTRADE, UNCTAD TRAINS and WTO IDB
Note: calculations are based on how much a country imports from al five other countries combined.
[a] *total import value in millions of USD* [b] *average import value in thousands of USD*

[15] With 30 country-pairs this comes down to a total of 124,620 observations.
[16] In the empirical analysis, bilateral import flows are used instead. Descriptive statistics based on bilateral import flows are reported in Appendix B.

To distinguish between the extensive- and intensive margins of trade, product categories are assigned into three groups: newly traded categories, disappearing categories and continuously traded categories. The first two groups determine changes in the extensive margin while the latter determines changes in the intensive margin. These groups are defined as follows:

New: product category k, imported from country j, is considered new if imports in 2008 were positive and imports were zero in 1996;

Disappearing: product category k, imported from country j, is considered disappearing if imports in 2008 were zero and imports were positive in 1996;

Continuous: product category, k imported from country j, is considered continuous if imports in both 2008 and 1996 were positive.

Table 2 decomposes the total import growth between 1996 and 2008 into the extensive- and intensive margin contribution, following the above definition. Taking the net effect of the extensive margin, it shows that for all countries, the intensive margin contributes for a larger part in import growth compared to the extensive margin. However, the contribution of new categories still explains a significant amount in total import growth.

TABLE 2 Decomposition of Import Growth in the Extensive- and Intensive Margin

		Extensive Margin		**Intensive Margin**
	Total Change Imports	Contribution of New Categories	Contribution of Disappearing Categories	Contribution of Continuous Categories
Country	**(a)**	**(b)**	**(d)**	**(c)**
Brunei	36%	40.69%	-41.42%	100.73%
Indonesia	754%	41.02%	-2.79%	61.77%
Malaysia	177%	39.50%	-4.61%	65.10%
Philippines	179%	28.04%	-3.96%	75.92%
Singapore	182%	52.40%	-7.98%	55.58%
Thailand	271%	51.48%	-2.73%	51.48 %

Source: own based on UN COMTRADE, UNCTAD TRAINS and WTO IDB
Note: calculations are based on how much a country imports from all five other countries combined where the change in total imports (column (a)) is the percentage change between 1996 and 2008.

Preferential tariffs

To understand whether preferential tariff reductions explain these changes in the extensive- and intensive margin, the dataset includes information on two types of preferential tariffs: implemented and scheduled. The implemented preferential tariffs are those actually levied by the AFTA members, while the scheduled preferential tariffs are the tariffs that the initial six AFTA members planned to implement after negotiations were concluded in 1992. Both tariffs are obtained from the ASEAN Secretariat.[17] Implemented preferential tariffs are complemented by the data from UNCTAD TRAINS and WTO IDB to obtain a complete dataset.

Table 3 reports for both the implemented and scheduled tariffs, the average percentage point change between 2008 and 1996, distinguishing between the three product category groups as defined above.

TABLE 3 Change in Product Categories and Tariffs between 1996 - 2008

	New Categories		**Continuous Categories**		**Disappearing Categories**	
		Average Tariff Change		Average Tariff Change		Average Tariff Change
	#	*I / S*	#	*I / S*	#	*I / S*
Country	**(a)**	**(b)**	**(c)**	**(d)**	**(e)**	**(f)**
Brunei	1,924	-2.58 / -1.67	6,322	-2.68 / -1.67	2,806	-2.47 / -0.99
Indonesia	5,573	-13.04 / -8.52	6,297	-5.80 / -9.53	805	-8.22 / -9.55
Malaysia	3,123	-7.41 / -3.19	6,202	-10.64 / -3.36	1,976	-9.29 / -2.85
Philippines	2,400	-12.67 / -7.06	6,345	-13.69 / -6.94	2,417	-12.42 / -6.63
Singapore	4,229	0.00 / 0.00	6,647	-0.06 / 0.00	2,176	0.00 / 0.00
Thailand	5,159	-0.59 / -1	3,786	-0.64 / -1.00	695	-0.77 / -0.86

Source: own based on UN COMTRADE, UNCTAD TRAINS, WTO IDB and the ASEAN Secretariat
Note: columns (a), (c) and (e) report the number of categories that belong to the defined product groups based on how much a country imported from all five other countries in 1996 and 2008. Columns (b), (d) and (f) report changes in average tariffs as the percentage point change between 2008 and 1996, where "I" stands for implemented preferential tariffs, and "S" stands for scheduled preferential tariffs.

To a large extent members have stuck to their negotiated agreement in 1992, which makes AFTA a useful trade policy change for analysing this question. However, some amendments to the preferential scheme have taken place in later years, which can be seen by comparing the two preferential tariff rates in Table 3. The speed and degree of intra-bloc tariff reductions varies considerably across

[17] I would like to thank Emanuel Ornelas for his kind assistance in obtaining the data.

product categories and across member countries, which generates substantial variation in the dataset.

V. Empirical Methodology

With the implementation of AFTA, preferential tariffs were determined at the HS 6-digit level. It is therefore important to take into account that the effect of tariff reductions on import trade margins is also likely to vary across product categories. To exploit this product-level variation, this paper adopts the dummy variable approach. This methodology allows for analysing tariff changes at the product level, instead of average tariff levels required by the Hummels and Klenow (2005) methodology or the simple count measure that masks important product heterogeneity. The subsequent section firstly discusses the empirical specification for the extensive margin, followed by the specification for the intensive margin and lastly discusses the identification strategy.

Extensive Margin Specification

For the extensive margin, the empirical model investigates to what extent tariff changes contribute to the probability that a product category, k, is imported from a specific trading partner, j, in 2008.

The problem under study can be specified as follows:

(1) $$y_{ijk} = \begin{cases} 1 & if\ y^*_{ijk} > 0 \\ 0 & otherwise \end{cases},$$

(2) $$y^*_{ijk} = \beta_0 + \beta_1 \Delta\ln(1+\tau_{ijk}) + \beta_2 status96_{ijk} + \beta_3 \Delta\ln(1+\tau_{ijk}) * status96_{ijk} + \gamma_{ij} + \eta_{ik} + \varepsilon_{ijk}$$

where y^*_{ijk} is a latent variable whose value determines whether or not a good will be imported in 2008 and takes the value of 1 if country i imports product category k from trading partner j in 2008; $\Delta\ln(1+\tau_{ijk})$ is the change in the natural log of the tariff rate imposed by country i on good k imported from country j, between 2008 and 1996; $status96_{ijk}$ is a dummy variable that takes the value of 1 if country i imported good k from trading partner j in 1996; the interaction term between $status96_{ijk}$ and $\Delta\ln(1+\tau_{ijk})$ captures whether tariff reductions have a different effect depending on the import status of a product category in 1996. γ_{ij} represents country-pair fixed effects, while η_{ik} represents importer-product fixed effects.

Based on the theoretical models discussed above, the expected sign of β_1 is to be negative, since a tariff reduction between 1996 and 2008 yields a negative tariff change. Hence, the more negative this tariff change, the larger the probability that the product category is imported. New trade theories, such as Melitz (2003) emphasize the importance of sunk fixed costs associated with establishing a new trade relationship. The inclusion of the initial import status controls for this, as current import status, due to the associated fixed costs, likely depends on initial import status. Hence, the expected sign of β_2 is to be positive. The interaction term captures whether tariff changes have a different effect on product categories that were already traded in 1996 compared to non-traded product categories in 1996. The expected sign of β_3 is to be positive. When a trade relationship has already been established in 1996, the tariff reduction itself is expected to have a smaller effect on the probability that the product category is traded in 2008. The country-pair- and importer-product fixed effects account for unobserved heterogeneity. Following Disdier et al. (2015) such country-pair fixed effects control for long-run bilateral trade growth shocks, since we look at first-differences. In addition, country-pair fixed effects account for selection of country pairs into trade agreements (Baier & Bergstrand, 2007). Importer-product fixed effects account for growth shocks generated at the demand-side of products that can have an effect on the changes in tariffs.

Choosing the Correct Estimation Method

To obtain unbiased and consistent estimates of equation (2), the appropriate estimation method has to be chosen. As the specification deals with probability estimates, it is logical to use an index model such as the probit or logit model. By definition these models are non-linear, which imposes two important advantages relative to the linear probability model (LPM). First, these models recognize that partial effects of changes in an explanatory variable are not necessarily constant, which is a plausible property in most situations. A second advantage is that estimated predicted probabilities are bounded to lie inside the [0,1] interval, which is ignored in the LPM (Wooldridge, 2010).

An issue, however, with non-linear regressions is that the inclusion of fixed effects can be problematic. It has been widely noted that the maximum likelihood estimator (MLE) used to estimate these index models produces large finite sample bias when T is very small in the presence of fixed effects (Greene, 2002). This allows for the so-called incidental parameter bias, although no consensus exists on the size of

the bias. While Heckman (1981) argues that the bias is not substantial for group sizes of at least eight observations, Greene (2002) warns this bias to be more substantial.

Recognizing the limitations of non-linear models, the LPM has been applied extensively in existing literature due to its superior ability to deal with unobserved heterogeneity, specifically while using instrumental variables, and because results have a more intuitive interpretation (Wooldridge, 2010). In addition, Horrace and Oaxaca (2006) argue that as long as the predicted probabilities do not extensively lie outside the [0,1] interval, the LPM is largely unbiased and consistent. Woolridge (2010) even argues that for estimating partial effects of the explanatory variables, it is not crucial for all predicted probabilities to lie inside the [0,1] interval. Given these advantages, equation (2) will be estimated by OLS.

Intensive Margin Specification

To identify the effect of tariff liberalization on the intensive margin of trade this paper focuses on the import value of continuously traded product categories. To study this aspect, the following equation is estimated using ordinary least squares (OLS):

$$\Delta\ln(y_{ijk}) = \delta_0 + \delta_1\Delta\ln(1+\tau_{ijk}) + \gamma_{ij} + \eta_{jk} + u_{ijk} \quad (3)$$

where $\Delta\ln(y_{ijk})$ is the change in the logarithm of the value of imports of good k that country i imports from country j. Similar to equation (2), γ_{ij} represents country-pair fixed effects, while η_{ik} represents importer-product fixed effects. This approach allows for studying the deepening of already existing trade relationships. The coefficient of δ_1 is expected to be negative, since the more negative the tariff change, the larger the change in import value.

Identification Strategy

A potential concern regarding the above specifications is the possibility of endogenous tariffs. It is therefore essential to rule out reverse causality in the sense that changes in import status and trade values do not induce changes in tariffs. Likewise, changes in omitted variables could in fact explain import changes through its effects on changes in tariffs. For example, a high degree of import penetration could instigate industries to lobby for greater protection through higher tariffs. This could lead to an upward bias of β_1 in the above equation.

To a great extent, this problem is rectified by the use of AFTA as an exogenous policy change. However, the various amendments that have been made to the tariff reduction schedule in later years needs to be taken into consideration, as this can

question the true exogeneity of the implemented tariffs. To deal with this problem, this paper instruments the change in the implemented tariffs by the change in the scheduled tariffs, and estimates the above equations using 2SLS. The scheduled tariff serves as a valid instrument for the implemented tariffs as the scheduled tariffs were pre-determined in 1992 and therefore do not suffer from endogeneity. In addition, the implemented and scheduled tariffs are highly correlated, which satisfies the second condition for a valid instrument.

Although the above-mentioned points largely exclude the possibility of reverse causality for tariff changes that occur after the implementation of AFTA, this is not automatically the case for pre-AFTA tariff levels. For these tariff levels, certain product or industry characteristics are more likely to have an influence. However, since the specification includes importer-product fixed-effects, these factors are accounted for.

A Further Note on the Dummy Variable Measure

As described above, the paper adopts the dummy variable methodology where focus is placed on comparing two years that are sufficiently far apart, instead of analysing the entire range of years in between. There are two reasons that can explain this specific choice. First of all, it is important to control for the initial import status of the product categories. Hence, in an analysis that incorporates a range of years this would imply the inclusion of a lagged dependent variable as an explanatory variable. However, in a specification with first differences this creates a problem, as the import status in year t-1 would be both part of the dependent variable and the explanatory variable, thus necessarily correlated with the error term (Bustos, 2011). As a way to deal with this problem, this study follows the literature and focuses on comparing two years only.

The second reason is related to the definition of a product category. Since the establishment of a new trade relationship does not happen over night, this method provides a way to analyse the effect of the entire tariff liberalization period on import status, allowing for a sufficient amount of time between the two years that are studied.

VI. Results

Table 4 reports the estimation results of equation (2) and (3) by OLS and 2SLS. Focussing on column (c), which includes country-pair- and importer-product fixed

effects for OLS estimation of the extensive margin, the coefficient for β_1 reports the expected negative sign and is statistically significant at the 1% level.[18] Column (d) shows that the magnitude of the estimated β_1 significantly increases when implemented tariffs are instrumented with scheduled tariffs. The estimated coefficient by 2SLS implies that a 1% reduction in the preferential tariff rate on average increases the probability of import of a product category by 0.116 percentage points, holding all other factors constant. To give more intuition behind this result; the overall average percentage reduction in preferential tariffs between 1996 and 2008 was equal to 67% (from 9 percentage points to 3 percentage points). Hence, on average this has increased the probability of import of a product category by 7.77 percentage points. This coefficient is more than three times as large as estimated by OLS, which shows that endogenous tariffs substantially biases the coefficient estimates upwards.[19]

Column (g) shows the OLS estimation of the intensive margin, whilst column (h) shows the corresponding 2SLS estimation.[20] In both cases the estimation of δ_1 shows the expected negative sign and is statistically significant at the 1% level. Focusing on column (h), a 1% decrease in the preferential tariff rate on average increases the value of imports by 0.17%, holding all other factors constant. Hence, when taking the average percentage reduction in preferential tariffs equal to 67%, this has caused an increase in the value of imports by 11.32%. Remarkably, the 2SLS estimation substantially reduces the magnitude of the coefficient when compared with the OLS estimation.

For the extensive margin, column (d) additionally shows that product categories that were imported in 1996 have on average a 51.8 percentage point higher probability of being imported in 2008, than product categories that were not imported in 1996. When looking at the interaction term between the change in tariffs and import status in 1996, the term shows that for products that were already imported in 1996, the magnitude of the tariff reduction on the probability that a product is imported in 2008 is lower. More precisely, for product categories that were traded in 1996, a 1% reduction in the preferential tariff rate increases the probability of being

[18] Since the LPM by definition suffers from heteroskedasticity, all regression results are reported with robust standard errors, clustered at the country-pair product level.
[19] Appendix C.1 reports the corresponding Durbin & Wu-Hausman endogeneity test and shows that Δ ln tariff is indeed endogenous in both the extensive margin regression and the intensive margin regression. Appendix C.2 reports the quality test for using the scheduled tariffs as an instrument for implemented tariffs, and shows that for both the extensive margin regression and the intensive margin regression the instrument is very strong.
[20] Both the Breush-Pagan test and the White test indicate that heteroskedasticity is an issue. Therefore, all regression results are reported with robust standard errors, clustered at the country-pair product level.

imported in 2008 by 0.107 percentage points. Hence, the importance of fixed sunk costs implemented when establishing a new trade relationship is shown, confirming new trade theories (Melitz, 2003). For non-traded product categories in 1996, the tariff reduction is likely to have a larger impact on the probability of being imported in 2008, due to the fixed costs that have to be overcome. The lower the marginal costs, the lower the export cut-off productivity level and the higher the probability that this initially non-traded product category will be imported. For already traded product categories, the tariff reduction itself has a smaller impact as the trade relationship has already been established.

TABLE 4 Baseline regression results 1996 - 2008

	Extensive margin				**Intensive margin**			
	Dependent variable: y^*_{ijk}				Dependent variable: $\Delta\ln(y_{ijk})$			
	OLS	OLS	OLS	2SLS	OLS	OLS	OLS	2SLS
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
Δ ln tariffs	0.014***	-0.0003	-0.035***	-0.116***	-0.037***	-0.064***	-2.021***	-0.169***
	(0.0014)	(0.0015)	(0.0057)	(0.0062)	(0.0128)	(0.0172)	(0.2540)	(0.0551)
status96	0.542***	0.449***	0.218***	0.518***				
	(0.0031)	(0.0036)	(0.0046)	(0.0048)				
Δ ln tariffs	0.006***	0.009***	-0.006**	0.091***				
* status96	(0.0020)	(0.0025)	(0.0029)	(0.0051)				
Fixed Effects:								
Country-pair	no	yes	yes	yes	no	yes	yes	yes
Importer-product	no	no	yes	yes	no	no	yes	yes
Observations	115,990	115,990	115,784	104,059	32,894	32,894	26,764	28,812
Adj. R-squared	0.2707	0.3865	0.5215	0.3556	0.0002	0.1047	0.2732	0.1050

Note: robust standard errors are clustered at the country-pair product level and reported in brackets. Columns (a) until (d) report the estimation results for the extensive margin specification where the dependent variable is a dummy variable equal to 1 if a product category is traded in 2008, and 0 otherwise. Columns (e) until (h) report the estimation results for the intensive margin specification where the dependent variable is the change in the logarithm of the import value between 2008 and 1996. Columns (d) and (h) report the 2SLS estimation of equation (2) and (3) respectively, where the implemented preferential tariffs are instrumented with the scheduled preferential tariffs.
*** Significance at the 1 percent level
** Significance at the 5 percent level
* Significance at the 10 percent level

In addition to these baseline regressions, this paper tests whether the predictions of Chaney's (2008) model hold true by distinguishing between differentiated goods

and homogeneous goods. For this, the paper uses the Rauch (1999) classification, which is available at the Standard International Trade Classification Revision 2 (SITC - 2). Following Rauch (1999), product categories that are either traded on organized exchanges or for which a reference price is quoted in trade publications are defined as homogeneous goods. Product categories for which there are no reference prices are defined as differentiated goods.[21] To match this allocation to the HS 6-digit level data, the concordance table available from the United Nations Statistics Division is used.

Panel A and B of Table 5 report the regression results based on equation (2) and (3) for homogenous- and differentiated goods separately. When focusing on the 2SLS estimation, it shows that for the extensive margin, the effect of a reduction in the preferential tariff rate is on average almost twice as large for differentiated goods in comparison to homogeneous goods (column (b)). When it comes to the extensive margin, the Chaney (2008) prediction is therefore held to be true. This can be explained by the fact that differentiated products are less confined by competition. Consequently, a decrease in the preferential tariff rate lowers the export cut-off productivity level more than what is the case for homogeneous goods. For the intensive margin, however, a reduction in the preferential tariff rate only has a significant impact on differentiated goods. Hence, for the intensive margin, the Chaney (2008) prediction is not held to be true. However, the Rauch (1999) classification relates to one drawback, specifically that only a limited amount of the product categories are included in the classification. This substantially reduces the number of observations in the analysis.

To further differentiate between different types of goods, panels C and D of Table 5 report the regression results of equation (2) and (3) for agricultural and industrial goods separately. This allocation is provided by the WTO and is available at the HS 6-digit level, allowing for the entire sample to be included in the analysis. Focusing on column (b) in Table 5, for industrial goods the effect of a reduction in the preferential tariff rate on the extensive margin is on average larger than for agricultural goods. For the intensive margin, column (d) shows that for agricultural goods the effect of a reduction in the preferential tariff rate is on average substantially larger than for industrial goods. One could argue that agricultural products are less differentiated than industrial products, translating in a relatively elastic demand for

[21] The Rauch (1999) classification comes in a conservative version and a liberal version. The conservative version minimizes the number of product categories that are classified as homogeneous, while the liberal version maximizes this number. In the analysis I use the conservative version, but results do not differ when based on the liberal version.

the former. Hence, when there is a reduction in the tariff rate, this will result in a larger increase in the value of trade compared to industrial products. Following this argumentation, these findings support the Chaney (2008) predictions.

TABLE 5 Regression results for different types of products

	Extensive margin		**Intensive margin**	
	Dependent variable: y^{*}_{ijk}		Dependent variable: $\Delta\ln(y_{ijk})$	
	OLS	2SLS	OLS	2SLS
	(a)	(b)	(c)	(d)
Panel A				
Δ ln tariffs: homogeneous goods	-0.027	-0.068***	-4.158***	-0.342
	(0.0227)	(0.0277)	(1.1402)	(0.2733)
Observations	7,371	6,245	1,137	1,249
Adj. R-squared	0.4847	0.3672	0.2567	0.0630
Panel B				
Δ ln tariffs: differentiated goods	-0.004	-0.137***	-1.815***	-1.815***
	(0.0142)	(0.0204)	(0.4560)	(0.1354)
Observations	15,652	13,247	5,341	5,048
Adj. R-squared	0.5594	0.4074	0.3002	0.1388
Panel C				
Δ ln tariffs: industrial goods	-0.038***	-0.116***	-2.084***	-0.166***
	(0.0058)	(0.0064)	(0.2633)	(0.0569)
Observations	103,442	96,937	24,117	27,225
Adj. R-squared	0.5260	0.3582	0.5447	0.1092
Panel D				
Δ ln tariffs: agricultural goods	0.046*	-0.077***	-2.851**	-0.592**
	(0.0274)	(0.0163)	(1.1730)	(0.2464)
Observations	8,684	7,122	1,542	1,587
Adj. R-squared	0.4756	0.3386	0.2496	0.0793

Note: robust standard errors are clustered at the country-pair product level and reported in brackets. Columns (a) and (b) report the estimation results for the extensive margin where the dependent variable is a dummy variable equal to 1 if a product category is traded in 2008, and 0 otherwise. Columns (c) and (d) report the estimation results for the intensive margin where the dependent variable is the change in the logarithm of the import value between 2008 and 1996. Columns (b) and (d) report the 2SLS estimation of equation (2) and (3) respectively, where the implemented preferential tariffs are instrumented with the scheduled preferential tariffs.
*** Significance at the 1 percent level.
** Significance at the 5 percent level
* Significance at the 10 percent level

VII. Robustness Measures

As the baseline analysis compares two points in time, the results could be biased when in fact trade relationships are short-lived (Besedeš & Prusa, 2011). To

accommodate this problem, this paper redefines product category groups in a stricter form as follows:

New: product category k, imported from country j, is considered new if imports in 2008 - 2010 were positive and imports were zero in 1994 - 1996.

Disappearing: product category k, imported from country j, is considered disappearing if imports in 2008 - 2010 were zero and imports were positive in 1994 - 1996.

Continuous: product category k, imported from country j, is considered continuous if imports in 2008 - 2010 and 1994 – 1996 were positive.

Panel B of Appendix D.1 shows the corresponding regression results for this stricter definition. Column (b) shows that the magnitude of β_1 is somewhat reduced; but the difference with the baseline regression is not substantially large (from -0.116 to -0.098). In addition, the estimated coefficient is still significant at the 1% level, which indicates that a reduction in the preferential tariff rate on average increases the probability that a product category is imported, ceteris paribus.

For comparison purposes, this paper also runs regressions using a weaker definition. In this case, for a good to be considered traded in 2008, it is only required that it is imported in one of the three years between 2008 and 2010. Similarly, for a good to be considered traded in 1996, it is only required that it is imported in one of the three years between 1994 and 1996. Panel C of Appendix D.1 shows that the estimation of β_1 still shows the expected negative sign and is statistically significant at the 1% level, although the magnitude of the coefficient is somewhat lower compared to the stricter definition.

An additional robustness check excludes product categories that are never imported by any of the countries in neither of the two years. Following Disdier et al. (2015) including never imported product categories could bias the estimation of the extensive margin if for instance a lack of endowments limits the exporting country's capability to produce this product category in the first place. Column (b) of panel D in Appendix D.1 shows that the estimated coefficient is barely affected by this exclusion. In fact, the number of product categories that are excluded is very small, which creates no major problem in the analysis. Estimation of the intensive margin is of course unaffected, since no changes are made regarding continuously traded product categories.

The last two robustness measures in Appendix D.1 check how results differ by excluding observations for which preferential tariffs either increased or did not change (Panel E) and by only excluding observations for which preferential tariffs increased (Panel F). The results reported in Panel E are similar to the baseline regression in Panel A. Panel F shows more notable results. The estimated coefficient in column (b) remains to show the expected negative sign and is statistically significant at the 1% level. The magnitude of the coefficient, however, is twice as large as the baseline regression in Panel A. More specifically, a 1% reduction in the preferential tariff rate increases the probability that a product category is imported with 0.253 percentage points (instead of 0.116 percentage points). This indicates that results are somewhat driven by the observations for which tariffs remained stable between 1996 and 2008.

Remarkably, for the intensive margin, column (d) shows that the effect of a reduction in the preferential tariff rate is highly insignificant. This result seems rather unexpected and demands further investigation. As it appears, endogeneity of preferential tariffs that is present for the extensive margin estimation is not present for the intensive margin estimation in this specific case.[22] Hence, this paper focuses on the OLS estimation reported in column (c) instead, which shows that the magnitude of the estimation of δ_1 is higher in comparison to the baseline regression in Panel A. More specifically, a 1% reduction in the preferential tariff rate increases the value of imports on average by 3.76%, instead of 2.02% in the baseline regression.

In the following, this paper elaborates on the implications of the results and discusses some limitations to the conducted research.

VIII. Discussion

The above-presented results show that tariff reductions have a significant effect on both the extensive- and intensive margins of trade. This emphasizes the importance of distinguishing between these two margins when analysing the true welfare effects of tariff liberalisation measures. Not only does the paper show that tariff reductions increase the value of import for existing trade relationships, it also facilitates the establishment of new trade relationships where new products become available to the consumer. This is an important gain from trade as it satisfies a wider range of

[22] Results of the Durbin-Wi-Hausman test of endogeneity report a p-value equal to 0.9554, which means that we cannot reject the null hypothesis that changes in preferential tariffs are exogenous.

consumer tastes. Studies that estimate gravity equations on positive trade flows only, discard this additional gain from trade.

Another important derivation from the above-presented results is that even in the event of a seemingly exogenous trade policy change, endogenous tariffs in relation to import status and import growth can result in biased coefficient estimates. To my knowledge this study is the first in its attempt to alleviate this endogeneity problem in a study of trade margins by effectively instrumenting implemented preferential tariffs with scheduled preferential tariffs. Such instrumental variables are usually hard to find, which increases the value-added of this paper.

A difficulty, however, that this study was not able to account for is related to the definition of product variety. Similar to earlier conducted studies, product variety is defined as the number of disaggregated product categories, which is based on HS 6-digit product level data. Yet, the true definition of product variety would require firm-level data, as it is in fact firms who produce different versions of a disaggregated product category. Estimation of the extensive margin is thus less precise when the analysis is based on product-level data. A problem with firm-level data, however, is that it is usually costly to obtain, or simply not availably when analysing multiple countries at the same time. Notwithstanding, Helpman et al. (2008) argue that such firm-level data is not a necessity when observing the characteristics of the marginal exporter to different destinations. In other words, product-level data allows for analysing the combined set of heterogeneous firms into export markets and their associated aggregate trade volumes.

Another limitation of this study relates to the lack of incorporation of the effect of non-tariff barriers (NTBs), which are likely to play an important role in establishing new trade relationships. Unfortunately, data on NTBs is limited and prone to measurement errors as such barriers are usually more complex to quantify. To the extent that the NTBs are time-invariant, they are accounted for by the inclusion of importer-product fixed effects. Although the focus of AFTA has been placed on the reduction or elimination of tariffs, some non-tariff barriers have also been reduced (Elimination of Other Non-Tariff Barriers, 2012). If in fact NTBs are correlated with tariff changes, this can generate bias in the results.

IX. Conclusions

This paper analyses the effect of tariff liberalisation on the intensive- and extensive margins of trade for the ASEAN Free Trade Agreement. While the intensive margin refers to the average import value of existing imported product categories, the extensive margin refers to the import of new product categories. Using HS 6-digit product level data for the initial six member countries, this paper finds robust evidence for both the intensive- and extensive margins of trade, when analysing tariff changes between 1996 and 2008. The results show that a reduction in the preferential tariff rate increases the probability of import of a new product category. When the elasticity of substitution between varieties is higher, the effect of a decrease in the preferential tariff rate on aggregate trade is smaller. In addition, for continuously traded products, the paper finds robust evidence that a reduction in the preferential tariff rate increases the value of imports. In this case, a higher elasticity of substitution between varieties leads to a larger magnitude of the effect.

These results are derived from an identification strategy where the implemented preferential tariffs are instrumented with the scheduled preferential tariffs, which were determined during negotiations in 1992. This provides to be a strong instrument that alleviates the endogeneity problem, which is usually encountered when analysing tariff changes in relation to import status and import value. This is an important contribution of the paper.

The results presented in this paper provide important implications in relation to consumer welfare. Firstly, it shows that tariff liberalization measures not only deepen existing trade relationships, but also facilitates the establishment of new trade relationships. This allows the consumer to choose from a greater spectrum of goods, which positively contributes to the consumers' welfare as it satisfies a wider range of consumer tastes. Hence, besides changes in aggregate trade volumes, policy makers should weigh changes in product variety when considering trade liberalization measures.

In addition, as countries continue to reduce their tariffs towards zero, a further step of trade liberalization would be the reduction of NTBs. Future research should therefore be focused on analysing this form of trade barrier in relation to the margins of trade. It would be interesting to analyse the relative contribution between tariff- and non-tariff barriers on product variety. This also stresses the importance of improving the collection of NTB data to facilitate this type of research.

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APPENDIX A – Data Availability

APPENDIX A.1 Data Availability Per Data Source for 1996 and 2008

Country	Data Source		
	UN COMTRADE	UNCTAD TRAINS	WTO IDB
Brunei	-	2008	1996 & 2008
Indonesia	1996 & 2008	1996 & 2008	1996 & 2008
Malaysia	2008	1996 & 2008	1996 & 2008
Philippines	2008	2008	1996 & 2008
Singapore	2008	2008	1996 & 2008
Thailand	2008	2008	1996 & 2008

APPENDIX A.2 Correlation Between Data Sources

Data Sources	Year	
	1996	2008
UNCTAD TRAINS *versus* UN COMTRADE	1.0000	0.9007
UNCTAD TRAINS *versus* WTO IDB	0.9993	0.9317
UN COMTRADE *versus* WTO IDB	0.9993	0.9665

APPENDIX B – Additional Descriptive Statistics

APPENDIX B.1 Number of Product Categories Imported in 1996.

Importer \ Exporter	Brunei	Indonesia	Malaysia	Philippine	Singapore	Thailand
Brunei		1,189	2,766	641	3,212	1,320
Indonesia	60		1,735	517	3,418	1,372
Malaysia	94	1,932		693	3,349	2,110
Philippines	53	1,732	1,921		3,043	2,013
Singapore	449	1,500	3,945	1,540		2,889
Thailand	15	1,147	1,182	377	1,760	

Note: potential number of imported product categories is equal to 4,154 categories.

APPENDIX B.2 Number of Product Categories Imported in 2008.

Importer \ Exporter	Brunei	Indonesia	Malaysia	Philippine	Singapore	Thailand
Brunei		1,215	2,542	674	2,532	1,283
Indonesia	91		3,381	1,406	4,081	2,911
Malaysia	209	2,294		1,024	3,080	2,718
Philippines	10	1,473	1,794		3,048	2,420
Singapore	414	2,757	3,466	1,546		2,693
Thailand	147	2,108	2,652	1,354	2,684	

Note: potential number of imported product categories is equal to 4,154 categories.

APPENDIX B.3 Percentage Change in the Number of Product Categories Imported.

Importer \ Exporter	Brunei	Indonesia	Malaysia	Philippine	Singapore	Thailand
Brunei		2.2%	-8.1%	5.1%	-21.2%	-2.8%
Indonesia	51.7%		94.9%	172.0%	19.4%	112.2%
Malaysia	122.3%	18.7%		47.8%	-8.0%	28.8%
Philippines	-81.1%	-15.0%	-6.6%		0.2%	20.2%
Singapore	-7.8%	83.8%	-12.1%	0.4%		-6.8%
Thailand	880.0%	83.8%	124.4%	259.2%	52.5%	

APPENDIX C – Statistical Tests

APPENDIX C.1 Durbin & Wu-Hausman Test of Endogeneity

	Extensive Margin Estimation [a]	Intensive Margin Estimation [b]
Durbin *(p-value)*	0.0000	0.0223
Wu-Hausman *(p-value)*	0.0000	0.0224

Note: for both the extensive margin estimation and the intensive margin estimation we reject the following null hypothesis, H0: Δ ln tariff is exogenous.

[a] Endogeneity test correspond to the 2SLS estimation in Table 5, column (d)

[b] Endogeneity test correspond to the 2SLS estimation in Table 5, column (h)

APPENDIX C.2 First Stage Regression Results From 2SLS Estimation

	Extensive Margin Estimation [a]	Intensive Margin Estimation [b]
Δ ln tariffs (scheduled)	0.377***	0.487***
R-squared	0.5363	0.5271
F-test	5518.91	2620.72

[a] First stage regression results correspond to the 2SLS estimation in Table 5, column (d)

[b] First stage regression results correspond to the 2SLS estimation in Table 5, column (h)

*** Significance at the 1 percent level

APPENDIX D – Additional Regression Results

APPENDIX D.1 Various Robustness Measures

	Extensive margin		**Intensive margin**	
	Dependent variable: y^*_{ijk}		Dependent variable: $\Delta\ln(y_{ijk})$	
	OLS	2SLS	OLS	2SLS
	(a)	(b)	(c)	(d)
Panel A: Baseline				
Δ ln tariffs	-0.035***	-0.116***	-2.021***	-0.169***
	(0.0057)	(0.0062)	(0.2540)	(0.0551)
Observations	115,784	104,059	26,764	28,812
Adj. R-squared	0.5215	0.3556	0.2732	0.1050
Panel B: Stricter definition				
Δ ln tariffs	0.044***	-0.098***	-2.394***	-1.007***
	(0.0061)	(0.0049)	(0.5117)	(0.0706)
Observations	115,784	104,059	8,942	13,351
Adj. R-squared	0.5497	0.3766	0.2668	0.0863
Panel C: Weaker definition				
Δ ln tariffs	-0.026***	-0.085***	-0.556***	-0.151***
	(0.0052)	(0.0051)	(0.0970)	(0.0486)
Observations	115,784	104,059	33,974	34,875
Adj. R-squared	0.5436	0.3838	0.3251	0.1281
Panel D: Excl. never traded				
Δ ln tariffs	-0.035***	-0.112***	-2.021	-0.169***
	(0.0056)	(0.0064)	(0.2540)	(0.0551)
Observations	113,009	101,449	26,764	28,812
Adj. R-squared	0.5194	0.3561	0.2732	0.1050
Panel E: Δ ln tariffs < 0				
Δ ln tariffs	-0.037***	-0.103***	-2.663***	-0.157***
	(0.0061)	(0.0057)	(0.2078)	(0.0541)
Observations	110,075	99,053	25,850	27,792
Adj. R-squared	0.5239	0.3705	0.2743	0.1062
Panel F: Δ ln tariffs ≤ 0				
Δ ln tariffs	-0.056***	-0.253***	-3.756***	-0.002
	(0.0145)	(0.0210)	(0.3681)	(0.1851)
Observations	56,433	49,665	12,799	13,209
Adj. R-squared	0.5115	0.2419	0.2704	0.1133

Note: robust standard errors are clustered at the country-pair product level and reported in brackets. Columns (a) and (b) report the estimation results for the extensive margin where the dependent variable is a dummy variable equal to 1 if a product category is traded in 2008, and 0 otherwise. Columns (c) and (d) report the estimation results for the intensive margin where the dependent variable is the change in the logarithm of the import value between 2008 and 1996. Columns (b) and (d) report the 2SLS estimation of equation (2) and (3) respectively, where the implemented preferential tariffs are instrumented with the scheduled preferential tariffs.
*** Significance at the 1 per cent level