Chapter 5

Quantifying the Benefit of Trade Facilitation in ASEAN

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This chapter assesses the performance and progress of the ASEAN economies in trade facilitation, and the effect of improved trade facilitation on the region's manufacturing trade with a focus on port efficiency, customs environment, regulatory environment and service sector infrastructure. Under a scenario of raising the below-average countries halfway to the global average, ASEAN's trade is estimated to increase by $99 billion, three-quarters of which comes from the region's own improvements. Also, regulatory reforms, for example, enhancing transparency of trade-related regulations and ensuring law-abiding operations of the regulatory authorities, are found to be most effective.

1. Introduction

Trade facilitation is becoming an increasingly important driving factor in trade expansion, as tariffs and major non-tariff barriers such as import quotas and voluntary export restraint have substantially dropped in the last three decades (ADB and UNESCAP 2009). Trade facilitation implies trade liberalization, through reduction of the trade costs associated with unnecessarily complex customs and border procedures, and inefficient transit arrangements (ADB and UNESCAP 2009).

Many developing countries have substantially liberalized trade in goods and services, but those reforms have been mostly in the area of tariffs. Some countries are still unsuccessful in reforms in a broader area of trade barriers. Trade facilitation is believed to have a growth promotion effect, not only by increasing trade flows but also because policy reforms and infrastructure development may help spur the internal economic growth of the country.

Thus, trade facilitation is becoming an important area of focus as a measure of trade liberalization. ASEAN initiated their concerted effort toward a free trade area in 1992, and the member economies have liberalized intra-regional trade substantially until recently particularly in the area of tariff reduction. Further commitment to trade liberalization was proposed within ASEAN in relation to their new goal of establishing an ASEAN Economic Community (AEC). This is specifically intended to establish a single market and production base, a competitive economic region, equitable economic development and integration into the global economy. Reducing transaction costs associated with trade and other economic interchange is one of the primary goals of economic integration in ASEAN

(Lee and Plummer, 2011). The ASEAN Economic Community Blueprint[1] states specific focus related to trade facilitation, namely, (1) developing simple, harmonized and standardized trade an customs processes, procedures and related information flows, (2) integration of customs structures and e-customs system, and (3) establishing developing national single windows as well as an integrated ASEAN single window, among others (Layton, 2007).

ASEAN comprises a diverse set of countries, in terms of their level of trade facilitation, ranging from countries that are far behind the global average to Singapore which is one of the world's best. Those countries which lag behind are also not active in international trade and are characterized by low income. This highlights the importance of countries catching-up in the process of economic integration, and in the regional economic growth of ASEAN.

The complexities in regard to non-tariff measures in general, and the lack of a precise definition of trade facilitation, have, however, made it difficult to quantify the benefits of trade facilitation reform and, thus, to provide targets for each country. This report tries to evaluate the extent of trade facilitation of countries worldwide, by constructing relevant indices as an effort to quantify the level of trade facilitation according to Wilson, Mann and Otsuki (2005), but with a greater time period coverage (2004-2008) and more countries (99 countries). A particular focus is given to the ASEAN member countries. Performance of the ASEAN countries is investigated over time, and is compared with the other developing regions, as well as with the OECD countries. As the next step, a regression analysis is used to estimate the effect of trade facilitation on trade flows, by using a gravity model, and a

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[1] "ASEAN Economic Community Blueprint" http://www.aseansec.org/21083.pdf.

simulation analysis is conducted to demonstrate gains from trade facilitation reforms.

This chapter is organized as follows. Section 2 investigates the trade profile of the ASEAN region. Section 3 explains our approach to measuring trade facilitation, and evaluates regions and individual countries in terms of their level of trade facilitation. Section 4 explains the empirical model to be used to estimate the effect of trade facilitation on trade flows. Section 5 conducts simulations of trade gains under alternative scenarios. Section 6 provides conclusions and policy implications.

2.   Trade profile of the ASEAN region

Figure 1 indicates that ASEAN's manufacturing trade nearly doubled from 2000 to 2008. Intra-regional trade in ASEAN accounted for approximately one-third of its total trade in 2000. This implies that the ASEAN region relies for its trade, predominantly exports, on the countries outside ASEAN. The share of its exports to countries outside the region grew very rapidly, to account for approximately three quarters of its total trade. The growth in ASEAN's intra-regional trade was positive but relatively slow. This perhaps implies that the potential for growth in intra-regional trade has not been fully exploited.

The decline of tariffs in the ASEAN countries can partly account for ASEAN's trade expansion in the 2000s. But, improved trade facilitation also may have contributed to the trade expansion. For example, the number of days needed for an import decreased dramatically in Cambodia from 55 days in 2005 to 30 days in 2009 according to the World Trade Indicators of the World Bank. We will investigate the trends of trade facilitation in

ASEAN in more detail in Section 3.

Figure 1. ASEAN's intra- and inter-regional trade in manufactured goods 2000-2008

(billion USD)
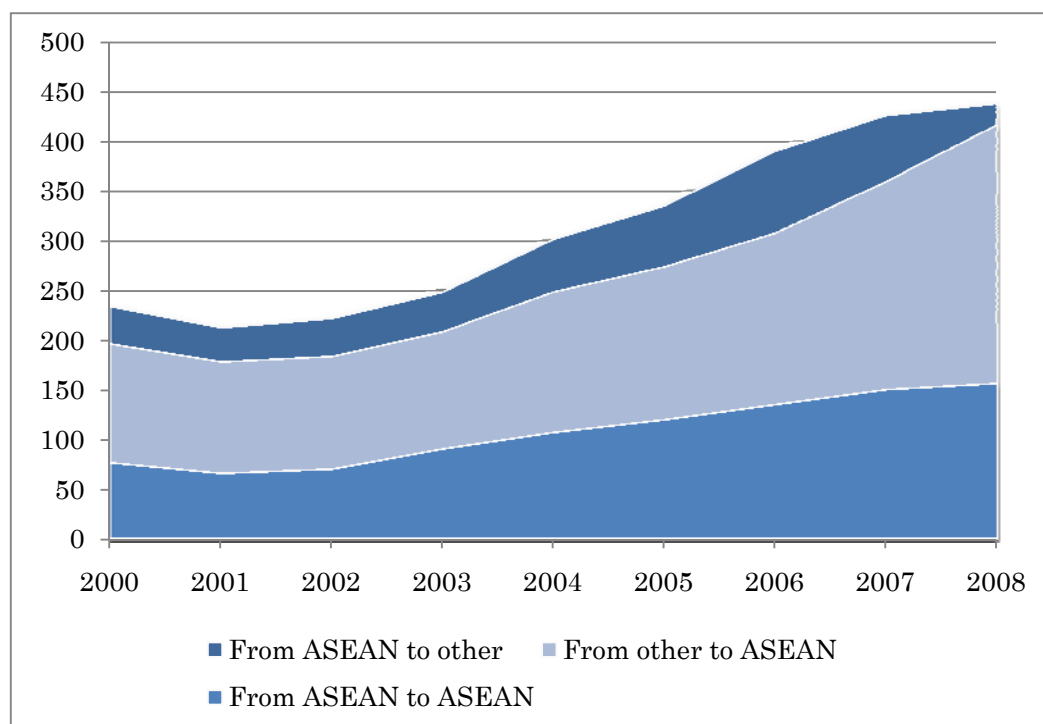
3.   Evaluating performance of ASEAN in trade facilitation

There is no clear definition of trade facilitation, since it varies depending on the extent of measures to be included.   In a broader sense, it covers all the measures that affect the movement of goods between buyers and sellers, along the entire international supply chain (ADB and UNESCAP, 2009).   In a narrow sense, trade facilitation simply addresses the logistics of moving goods through ports or at customs checkpoints at national borders.   A

broader framework for understanding trade facilitation includes a number of inter-related measures or factors, such as port reform and modernization, streamlining regulatory requirements and harmonizing standards, as well as customs regimes. For example, OECD adopts a broad definition i.e. "the simplification and harmonization of international trade procedures including the activities, practices and formalities involved in collecting, presenting, communicating and processing data, and other information required for the movement of goods in international trade". Wilson, Mann and Otsuki (2005) provided multiple indices to measure a country's performance in trade facilitation, following the broader definition. We follow the broader definition of trade facilitation in our analysis of its effect.

3.1. Constructing the Indicators of Trade Facilitation

Based on a broader definition of trade facilitation, there are various measures and measurement approaches proposed in the literature. The class of direct measurements includes; time needed for customs clearance, need for irregular payment at customs, and shipping charges. These types of measures are likely to be direct and specific. Indirect measurements include those derived from the gap between the domestic and international prices of goods, including the tariff equivalent of non-tariff barriers. Indirect measurements- frequently indices- are typically abstract and unit free, and, sometimes, qualitative rather than quantitative.

The time needed for customs clearance is a frequently used measurement of trade

facilitation.   The World Bank's "Doing Business" reports present a variety of measurements of trade facilitation based on cross-country firm surveys.   These include days to clear customs, port and terminal handling, and number of inspections for imports.   Fink, Mattoo and Neagu (2002) use the share of liner transport charges in import values of a particular good as their measure of maritime transport cost.   In the World Bank "Technical Barriers to Trade" survey, product redesign costs and other costs incurred in complying with foreign standards, are directly collected from surveyed firms in developing countries.

The Asia-Pacific Economic Cooperation forum (APEC) (1999) has proposed the use of the amount of reduction of unit import prices as a measure of trade cost reduction. Similarly, a tariff equivalent has often been mentioned as a measure of insufficient trade facilitation, more generally of non-tariff barriers.   A tariff equivalent is useful when one is unable to identify individual influencing factors, since it represents the effect of all influencing factors.   The drawback is that it is difficult to isolate the effects of individual factors.   More sophisticated approaches try to identify the degree to which particular barriers, such as technical regulations, contribute to the total tariff equivalent (Kee, Nicita and Olarreaga, 2006).

Wilson, Mann and Otsuki (WMO, hereafter) (2003) developed indicators to measure four areas of trade facilitation, namely; port efficiency, customs environment, regulatory environment and E-business usage, for APEC member economies.   WMO (2005) extended this study to cover 75 countries, with a minor modification of the indexed inputs of E-business usage and a name-change to "service sector infrastructure".   APEC (2004) applied the gravity model framework of WMO (2003) to estimate the impact of trade facilitation and

tariff reduction on trade in 15 APEC member countries. Walkenhorst and Yasui (2003) also constructed an index of border process quality, and an index of time for border clearance. It was made up of sub-indices, namely, customs efficiency, hidden import barriers, administrative integrity and trade facilitation commitments. Index approaches allow utilization of qualitative information as well as quantitative data, and thus make comparison possible between different types of data. Layton (2007) developed logistic performance index and sub-components such as documents required to export and import, and customs clearance time, for the ASEAN and OECD countries. Hollweg and Wong (2009) also developed various logistics restrictiveness indices for the ASEAN + 6 countries, including the barriers to trade and investment in the areas of customs procedures and maritime/aviation/road transport.

Each class of measures has advantages and disadvantages. The direct measures allow a relatively straightforward interpretation of how specific trade costs affect bilateral trade, as there is no or little data manipulation. Such measures, however, capture only very specific aspects of trade facilitation. The indirect measures are useful in measuring the aggregate effects of various barriers, but it is difficult or impossible to isolate each effect. The indexed measures reflect various distinct aspects of trade facilitation, and the possibility of data manipulation leaves researchers a certain flexibility to construct data from different sources. The drawback of these measures is, however, that interpretation is quite arbitrary. Therefore, their association with policy goals is not always straightforward.

Quantitative measures are useful in understanding to what extent developing countries lag behind in each area of trade facilitation. The World Bank report (2006) provides

evidence that addresses this point.   While the total time taken to import was 14 days on average in OECD countries and 28 days in East Asia and the Pacific, it took 47 days in South Asia.   Trade in Africa took the longest time -59 days on average- to make an import. Typical regulations in Sub-Saharan Africa required 18 signatures from domestic regulatory agencies as compared to 3 signatures in OECD countries and 7 signatures in East Asia and the Pacific.   On average it still takes 3 times as many days, nearly twice as many documents and 6 times as many signatures to trade in a poor country as it does in rich countries.

In this report we update the trade facilitation indicators developed for a single time-period in WMO (2005) to include more countries (99 countries) and a longer time (from 2004-2008).   Our trade facilitation indicators are;

- Port efficiency for each country J is the average of two indexed inputs from the Global Competitiveness Report (GCR):
    - Port facilities and inland waterways (integers from 1 (poorest) to 7 (best))
    - Air transport (integers from 1 (poorest) to 7 (best))
- Regulatory environment for each country J is constructed as the average of indexed inputs from the World Competitiveness Yearbook (WCY) and World Bank Governance Indicators (WBGI):
    - Transparency of government policy is satisfactory (WCY)
    - Control of corruption (WBGI)
- Customs environment for each country J is constructed from an indexed input from GCR:

- o Hidden import barriers (integers from 1 (poorest) to 7 (best))

- Service sector infrastructure for each country *J* is from the Global Information

  Technology Report (GITR):

  - o Effect of internet on business (integers from 1 (poorest) to 7 (best)) .

First, we normalize each input into the range from 1 to 7 in order to be consistent with the range used in GCR and GITR because the majority (four out of the six) of the raw data come from these reports.

An "indexed input" for economy J (J = 1,2, .. , N):

$$\overline{II}_J = 1 + 6 * \frac{II_J - \min II_J}{\max II_J - \min II_J},$$

where the numeral denotes the "raw" data for economy J such as "air transport".   In the case of two inputs (port efficiency and regulatory environment), we take an average of the two inputs.

## 3.2. Performance of the ASEAN countries in trade facilitation

Table 1 shows the descriptive statistics of the indexed indices and the aggregated indices. Figure 2 shows the average index scores of the ASEAN countries and the world average; they are quite similar.   This is perhaps because ASEAN includes countries with diverse stages of development.   The highly developed countries such as Singapore seem to keep the average performance of the ASEAN higher than the developing regions as a whole.

Table 1. Descriptive statistics of the trade facilitation indicators

Category	Indexed Inputs	Mean	Std. Dev.	Min	Max
Port Efficiency	Water transport facilities	3.955	1.355	1.100	6.900
	Air transport facilities	4.607	1.164	1.700	6.900
Aggregated index		4.287	1.201	1.450	6.900
Regulatory	Transparency of government policies	3.797	1.724	1.000	7.000
Environment	Control of corruption	3.742	1.244	1.000	7.000
Aggregated index		3.693	1.267	1.075	6.913
Customs Environment	Prevalence of trade barriers (inverse)	4.596	0.848	2.100	6.700
Service Sector Infrastructure	Extent of Business Internet Use	4.098	1.003	1.790	6.410

Source: Author's calculation based on GCR, GITR, WBGI, and WCY.

Figure 2.   Four trade facilitation indicators of ASEAN and the world in 2004 and 2008
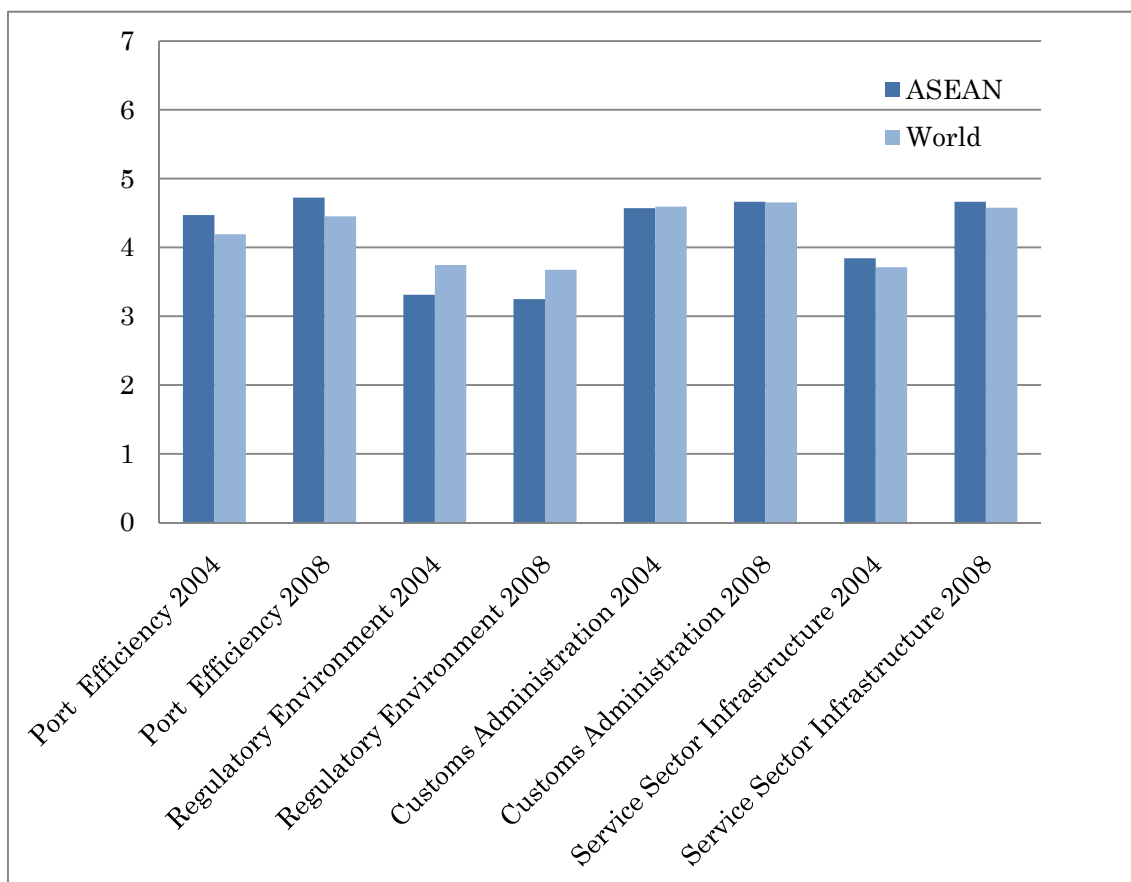
Source: Author's calculation based on GCR, GITR, WBGI, and WCY.

Figures 3a-3d depict average index scores across regions from 2004 to 2008. Overall, the performance of the ASEAN is relatively better than other developing regions. Port efficiency of the ASEAN or the East Asia and Pacific region (EAP) is the second largest among the developing regions.   The EAP average is slightly lower than the ASEAN average. The score is still far below the OECD average, but the ASEAN's score is slightly increasing over time, indicating that it is catching up with the OECD.

The regulatory environment indicator of the ASEAN or EAP is close to LAC (Latin America and Caribbean) and ECA (Europe and Central Asia), and far lower than MENA (Middle East and North Africa).   Its average scores are also not significantly higher than the

region with the lowest score. The variation of customs environment scores is quite small across the regions. The ASEAN's score is also a little lower than that of MENA in most periods. Growth is slightly positive overall but not monotonic. The relative position of the regions in regard to regulatory environment is almost unchanged over time. This implies that the ASEAN did not experience distinguishable improvement relative to the other regions. Yet one needs caution in interpreting the score of regulatory environment, as the scores of regulatory environment are almost unchanged over time. This is mainly because "control of corruption", one of the inputs to this indicator, is normalized such that the mean is constant over time.

In customs environment, the ASEAN or EAP is the second highest next to MENA among the developing regions. It exhibits positive but very small improvement from 2004 to 2008. The gap from the OECD and MENA is still significant in 2008. The difference between the developing regions is not large in this category of trade facilitation.
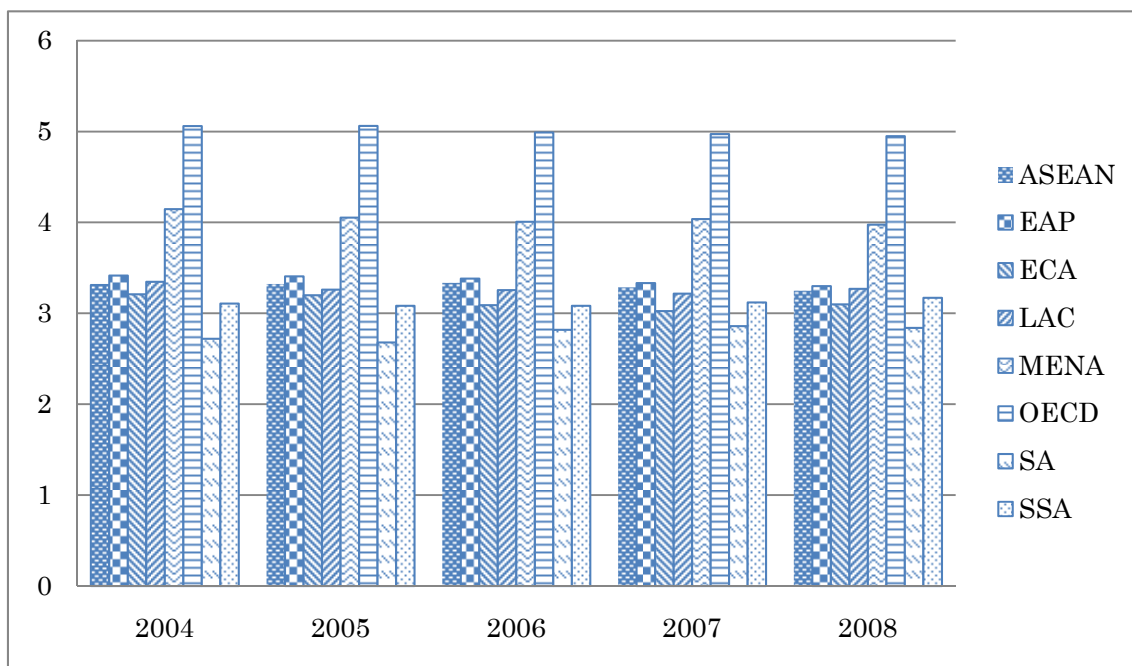
In service sector infrastructure, the ASEAN or EAP is the highest among the developing regions. The gap from the OECD is large, but this region shows a rapid improvement toward 2008. However, the other developing regions grew rapidly as well, with some regions exhibiting even higher growth rates.
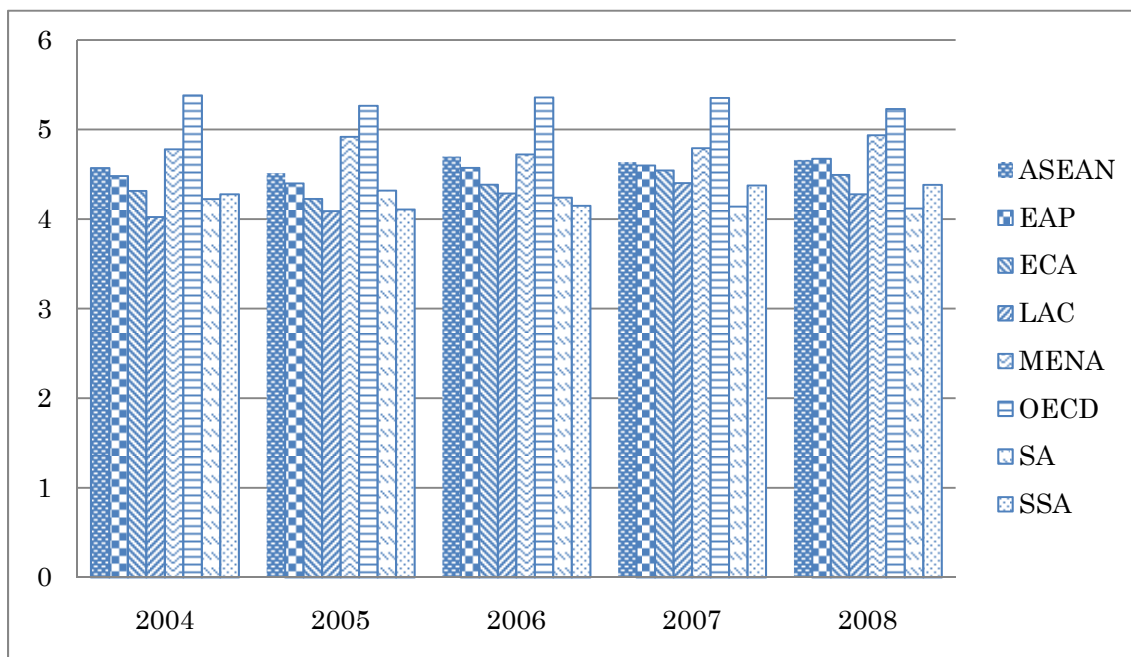
Figure 3a.   Port efficiency by region 2004-2008
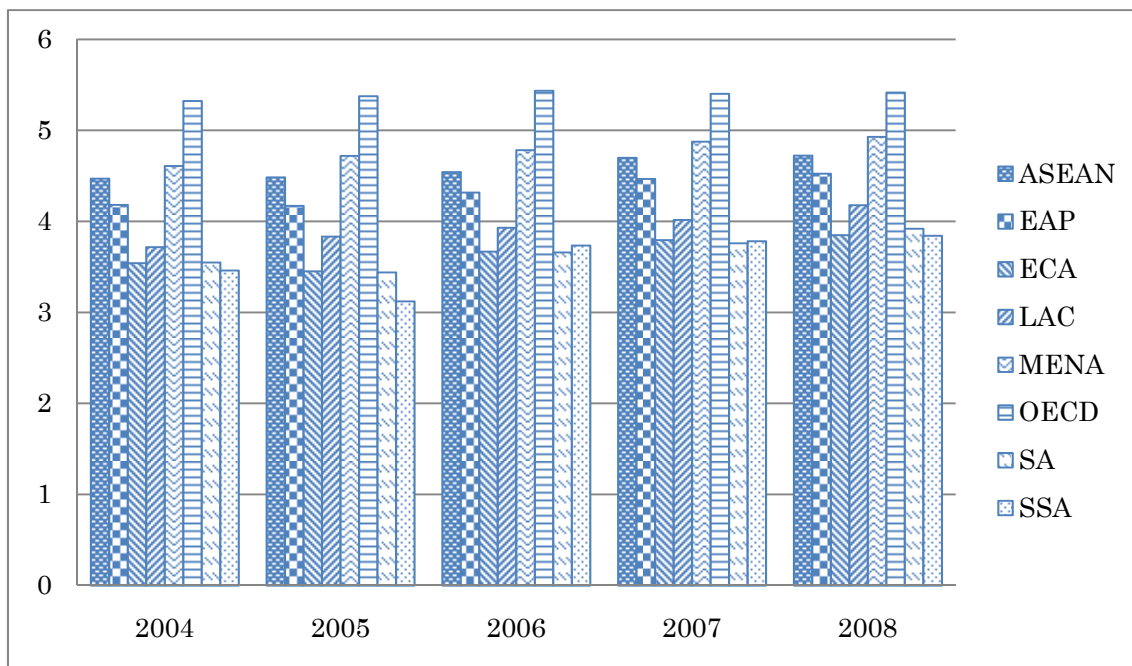
Source: Author's calculation based on GCR, GITR, WBGI, and WCY.

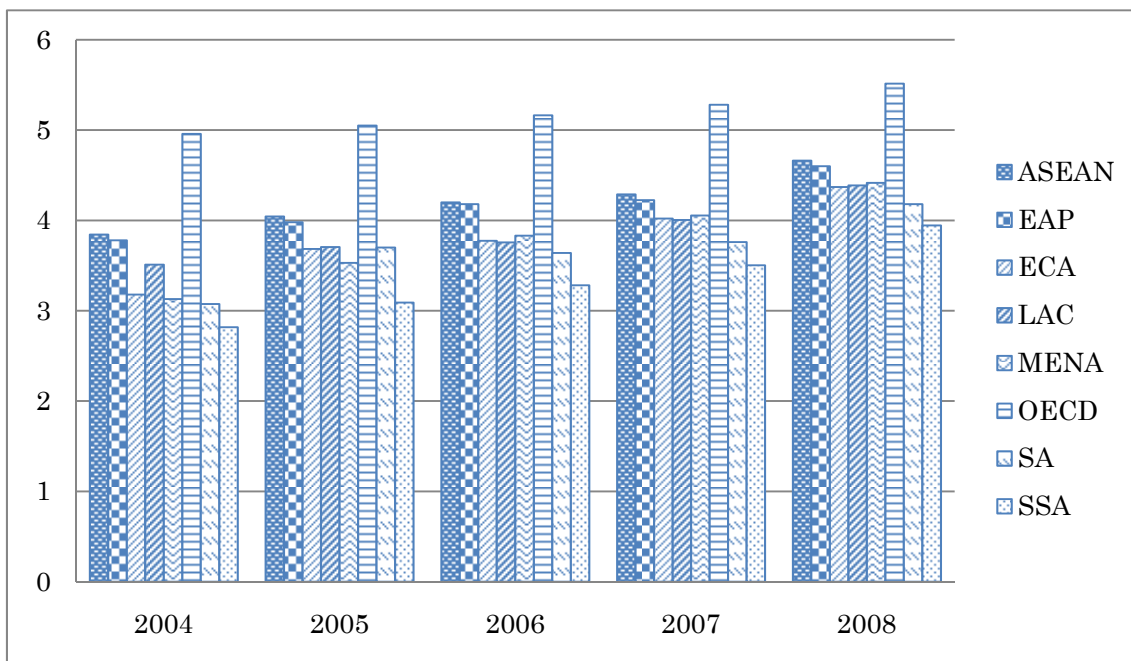**Figure 3b.   Regulatory environment by region 2004-2008**

Source: Author's calculation based on GCR, GITR, WBGI, and WCY.

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Figure 3c. Customs environment by region 2004-2008

Source: Author's calculation based on GCR, GITR, WBGI, and WCY.

Figure 3d. Service sector infrastructure by region 2004-2008

Source: Author's calculation based on GCR, GITR, WBGI, and WCY.

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Figures 4a-4d present the trade facilitation scores of each of the ASEAN member countries in 2004 and 2008. There are countries in ASEAN that are missing in 2004 or both 2004 and 2008; Brunei is missing in 2004 except Figure 4b and Lao PDR and Myanmar are missing in both years.

In port efficiency, Singapore is 6.9 in both years, and is highest in the sample. The second highest is Malaysia, 5.9 in 2004 and 5.7 in 2008. The third is Thailand which grew substantially from 4.9 in 2004 to 5.3 in 2008. Indonesia is the fourth, having 3.8 in 2004 and 4.1 in 2008. The Philippines was the fifth in 2004, but its score decreased in 2008 from 3.4 to 3.3, making it the lowest. Vietnam and Cambodia which were the lowest, grew from 3.2 to 3.7 and 3.8, respectively. In 2008 ASEAN countries above the global average (4.4) included Singapore, Malaysia, Thailand and Brunei.

In regulatory environment, Singapore is highest (6.3) in both years, followed by Brunei (4.2 in 2004 and 4.4 in 2008), and Malaysia (3.6 in 2004 and 3.3 in 2008). There is very little change in their scores from 2004 to 2008, and some countries reduced their scores in 2008. Unlike the other categories, all but Singapore and Brunei are below the global average both in 2004 and 2008, indicating substantial inefficiencies in the area of regulatory environment.

In customs environment, Singapore also shows the highest scores in both 2004 and 2008. Malaysia and the Philippines were second and third in 2004, respectively, but became fifth, and sixth, both declining by 0.6 points. Cambodia and Vietnam remained the lowest two, but their scores rose by 0.5 and 0.7, respectively; thus, the gap between the high-score and low-score countries were narrowed. Nevertheless, 6 countries were on or below

the global average, and further improvement is needed for the region as a whole.
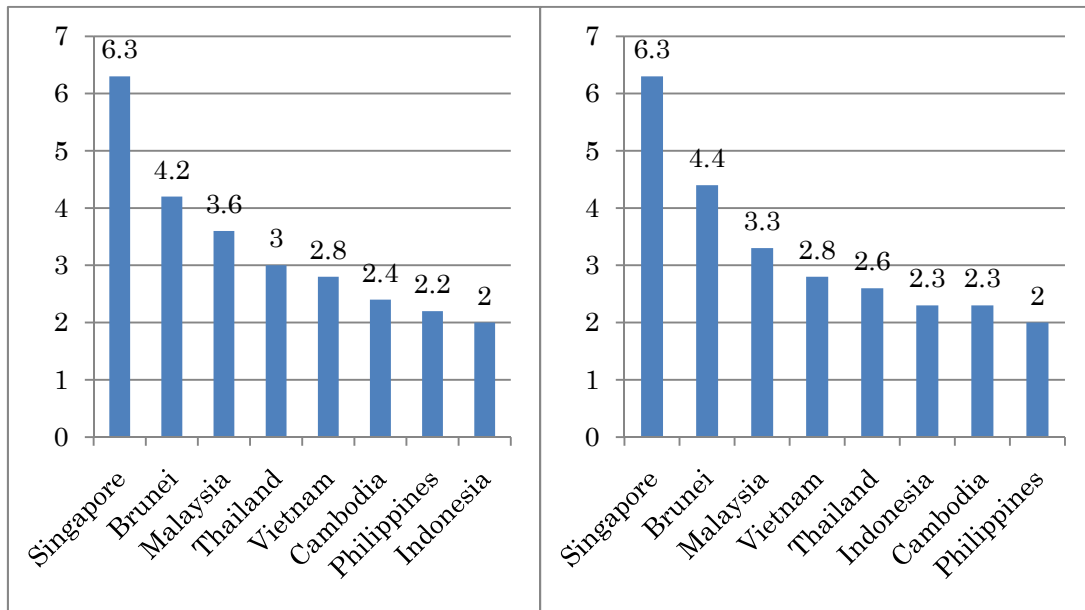
In service sector infrastructure, Singapore was top, and Malaysia was the second, in both years.   The remaining countries changed ranking; the most outstanding one is Vietnam which moved up to fifth with a score of 4.5 in 2008, from the lowest position, with a score of merely 2.2 in 2004.   Overall, the ASEAN achieved notable improvement from 2004 to 2008.   Compared to the global average, five countries still fall short in 2008, but only by a small degree.

Figure 4a.   Port efficiency of the ASEAN countries in 2004 (left) and 2008 (right)
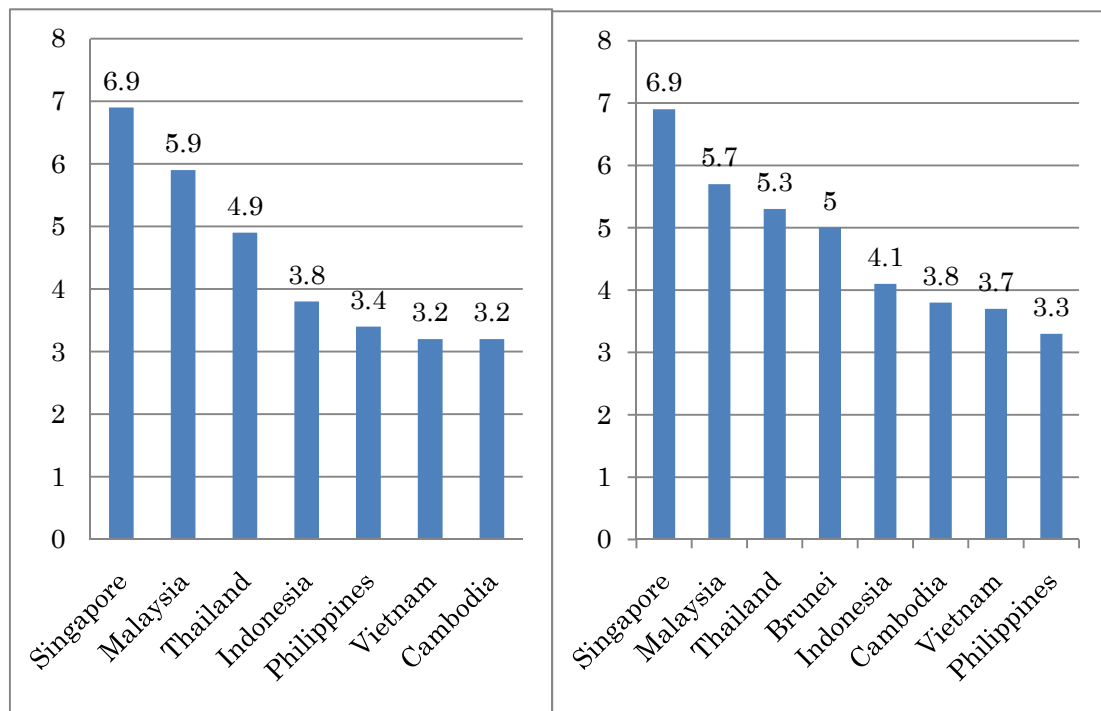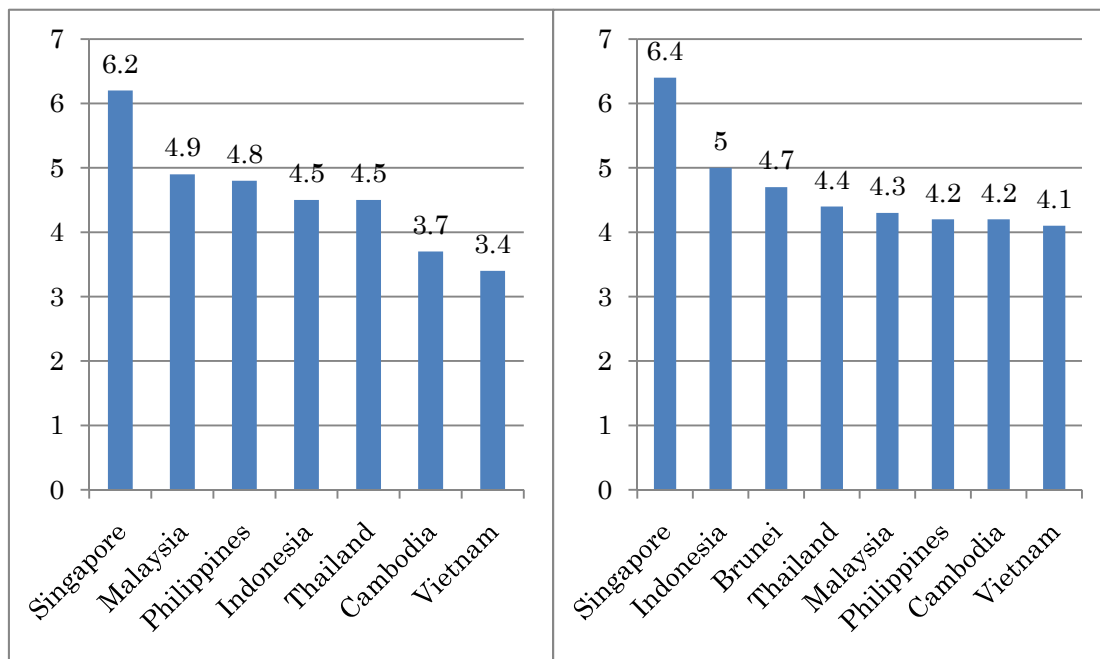

Source: Author's calculation based on GCR, GITR, WBGI, and WCY.

Figure 4b.   Regulatory environment of the ASEAN countries in 2004 (left) and 2008 (right)
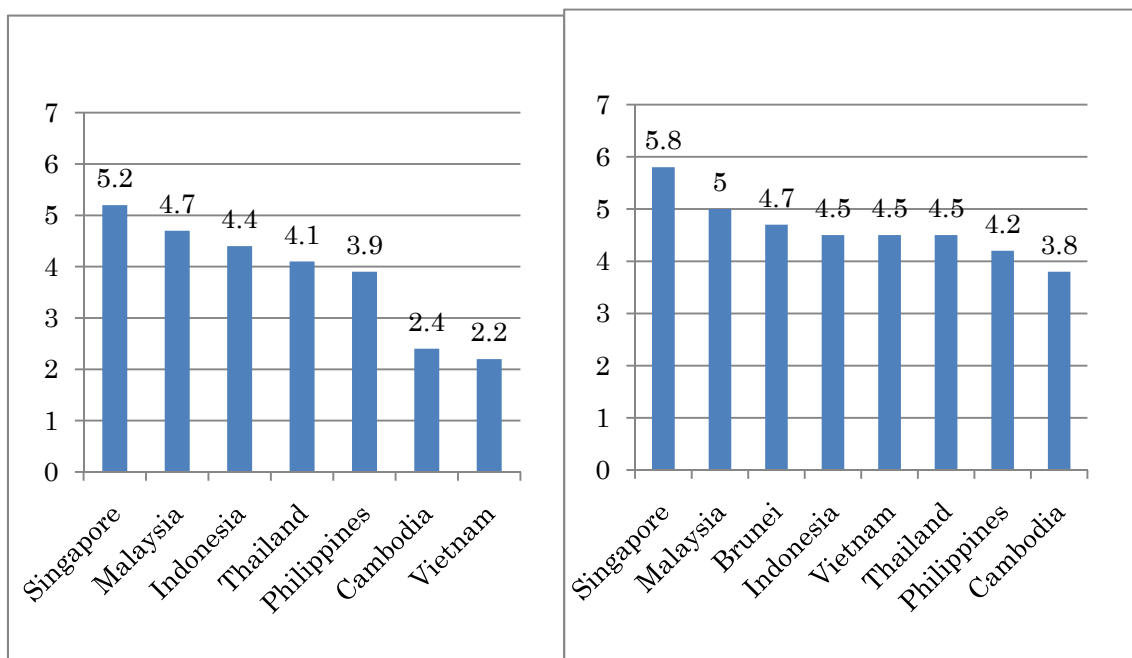

Source: Author's calculation based on GCR, GITR, WBGI, and WCY.

Figure 4c.   Customs environment of the ASEAN countries in 2004 (left) and 2008 (right)

Source: Author's calculation based on GCR, GITR, WBGI, and WCY.

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Figure 4d. Service sector infrastructure of the ASEAN countries in 2004 (left) and 2008 (right)

Source: Author's calculation based on GCR, GITR, WBGI, and WCY.

ASEAN countries which are also members of APEC had undertaken efforts to facilitation facilitate trade earlier than those which are not (namely, Cambodia, Lao PDR and Myanmar) as APEC had made a commitment to reduce trade-related transaction costs by 5 percent by 2006 according to the Shanghai Accord in 2001 in line with the Bogor Goals.   It is generally evident that the early-committers increased their scores in most categories from 2004 to 2008. Also, our observation that Cambodia is the lowest or, at best, the third lowest among the ASEAN countries in our data confirms the superior position of the early-committers.

The above results of the four trade facilitation indicators are largely consistent with

those of Hollweg and Wong (2009). They found that Singapore was rated as one of the least restrictive countries in the world in terms of logistic regulations as barriers to trade. On the other hand, Malaysia, Indonesia, Lao PDR, the Philippines and Vietnam were found to be the most restrictive among ASEAN+6 countries.

The above results can also be confirmed by investigating performance indicators from other data sources. More direct measures are available from the World Trade Indicators of the World Bank, where information on Lao PDR is also available. Among the indices that are comparable to ours, we investigated data on the number of days required for import, and data on import cost per container in 2005 and 2009. As shown in Figures 5a and 5b, Singapore again exhibits the best performance (the smallest number of days for import, and the lowest import costs, respectively) in both categories and both years, and Malaysia the second in both categories in 2005 while it was the second and the third in the former and the latter categories in 2009, respectively. The ranking and trend among the ASEAN countries is quite close to what we observed earlier. A notable improvement is found in the cases of Lao PDR and Cambodia in the number of days for import while the rest are keeping up with the world in the pace of improvement. On the other hand, import cost is almost unchanged in the ASEAN countries except in Lao PDR whose cost increased dramatically. In a relative sense, the performance of the ASEAN group is slightly better than the world on average, since the cost increased slightly in the world on average. Data for Myanmar is not available in these categories of trade facilitation, but Myanmar tends to lag behind the other ASEAN countries according to Layton's (2007) comparative analysis of the ASEAN countries in logistic performance.

Figure 5a.   The number of days needed for import in ASEAN in 2005 (left) and 2009 (right)
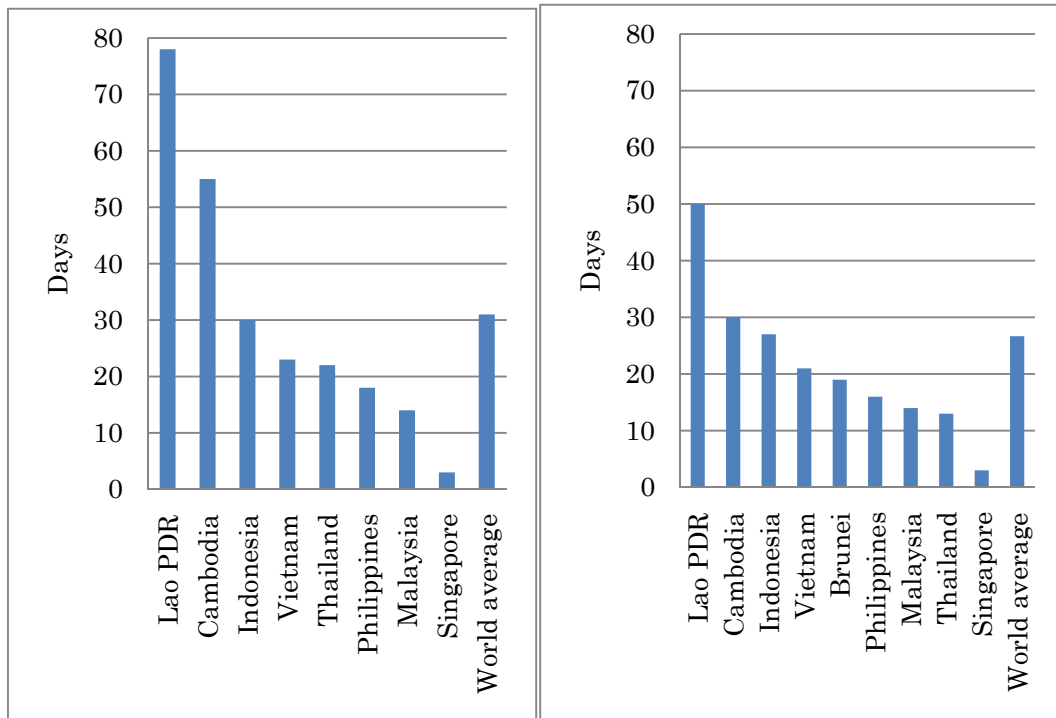
Figure 5b.   Import costs in ASEAN in 2005 (left) and 2009 (right)
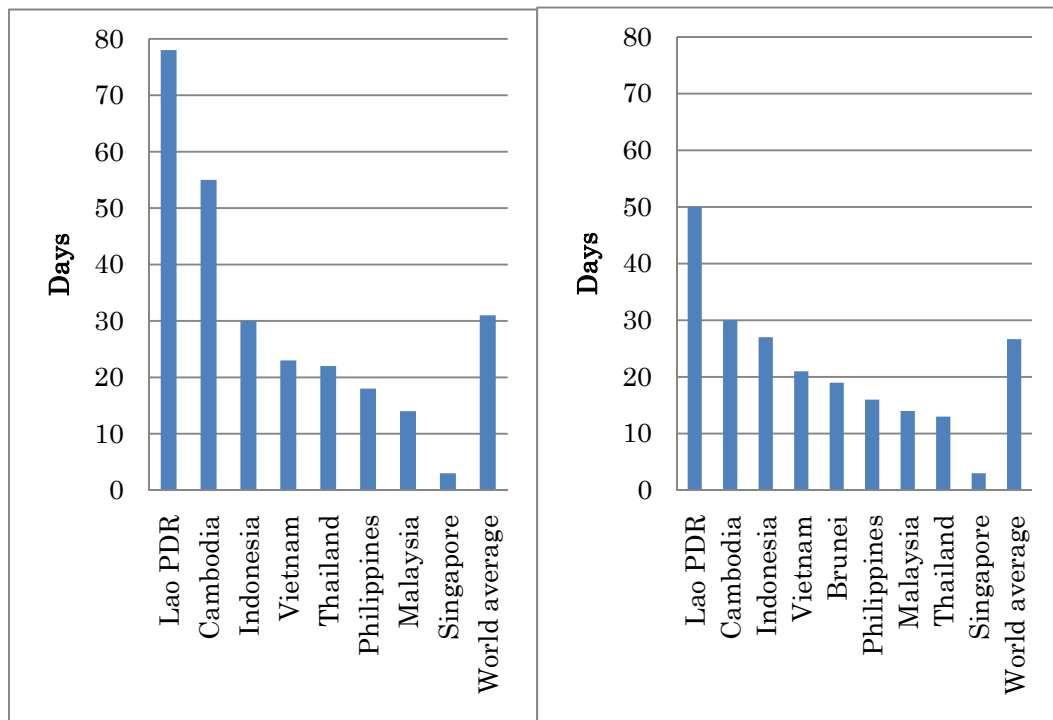
4.   The empirical model to estimate the effect of trade facilitation

4.1 Previous studies

A critical question of direct relevance to trade facilitation in a development context concerns the extent to which factors affecting trade transaction costs matter to trade flows, economic growth or welfare.   Quantifying the gains from trade facilitation is complex and challenging, but the typically used methodologies can be categorized into the following two groups; macro-level econometric methods, and computable general equilibrium (CGE) methods.

The macro-level econometric methods attempt to estimate the impact of facilitation by regressing macro-level variables, such as trade flows and economic growth, on factors related to trade facilitation and other controls.   In trade flow analysis, gravity models are typically employed. McCallam (1997) estimates the border costs in US- Canada trade, and started the trend of the gravity model application for the estimation of trade (transactions) costs. Variation or elaboration of this application can be found in many studies.   Those studies largely try to isolate the trade costs that are unaccounted for by distance as a proxy for transportation costs.   WMO (2005) used a simple log-linear gravity model where the trade costs are considered to vary with the above mentioned four trade facilitation indicators.

Using a computable general equilibrium (CGE) method, Walkenhorst and Yasui (2003) estimated the benefit of reducing trade transaction costs, which can be accounted for by time for border clearance and quality of border process.   They point out that the potential benefits of trade facilitation vary across countries, sectors, and types of traders.

For instance, the authors find that trade transaction costs (TTCs) range from 1-15 percent of traded goods, depending on the country's pre-trade facilitation condition. Furthermore, border costs for agro-food products are 50 percent higher than those for manufactured products, and TTCs for small/ medium enterprises are 50 percent higher than those for big enterprises.

4.2 Gravity model

We follow a standard gravity model, where bilateral trade flow is regressed on GNP and other gravity variables along with the trade facilitation indicators for both importers and exporters.

$$\ln Trade = \mathbf{X}'\boldsymbol{\beta} + \mathbf{z}'\boldsymbol{\gamma} + \varepsilon,$$

where $\mathbf{X}$ includes regular gravity variables such as GNP and bilateral distance between trading countries, and $\mathbf{z}$ includes other influencing factors such as free trade agreements (FTAs) and trade facilitation. More specifically, our estimation model is as follows:

$$\ln(Trade_{JI}^{t}) = b_1 \ln Port_J + b_2 \ln Customs_J + b_3 \ln Regulatory_J + b_4 \ln Service_J + b_5 \ln Port_I$$

$$+ b_6 \ln Customs_I + b_7 \ln Regulatory_I + b_8 \ln Service_I + b_9 \ln(GNP_I^{t}) + b_{10} \ln(GNP_J^{t})$$

$$+ b_{11} \ln(GNPPC_I^{t}) + b_{12} \ln(GNPPC_J^{t}) + b_{13} \ln(DIST_{IJ}) + b_{14} D_{Adjacent} + b_{15} D_{FTA} + b_{16} D_{Lang}$$

$$+ \gamma_P \overline{Port_t} + \gamma_C \overline{Customs_t} + \gamma_R \overline{Regulatory_t} + \gamma_S \overline{Service_t} + e_{JI}^{t},$$

where *J* denotes exporter *J* and *I* denotes importer *I*. The subscript *t* denotes time period. *GNP* denotes gross national product, *GNPPC* denotes per capita GDP, and *DIST* denotes bilateral distance between the capital cities of countries *I* and *J*. $D_{Adjacent}$, D_{FTA}, and D_{Lang} denote the dummy variables for two countries being adjacent, two countries being members of at least one common FTA and two countries having a common official language, respectively. $\overline{Port_t}$ is the global average of the port efficiency indicator in time *t*, and the same applies to the rest of the indicators. The inclusion of the average over the cross-section samples is equivalent to including time dummies. They are included in order to see the temporal efficiency change in each indicator; the coefficients can be interpreted as temporal efficiency. The inclusion of cross-section average is equivalent to including time fixed effects, or time dummies, and hence, we will obtain the identical results on the coefficients for the rest of the regressors. However, the above specification is employed because it is useful to know how the marginal effect of raising an indicator changes over time.

When a panel dataset is available, the fixed effects model is a reasonable specification where an *I-J* pair is considered to be the cross-sectional unit, because unobservable country-pair-specific effects are controlled. Inclusion of country-pair-fixed effects rather over-controls the variations due to the differing conditions with respect to trade facilitation, the effects of any FTA and other bilateral dummies, which are of our central interest. Therefore, we use the random effects model to estimate the coefficient parameters.

We also estimate an alternative model with interaction terms between trade facilitation indicators and time dummies in order to capture the efficiency change, allowing

for the coefficients of the trade facilitation indicator to vary at each period.

Tables 2 and 3 show the regression results. The major gravity variables have expected signs. Also, the coefficients of the trade facilitation indicators are all positive. They are also all significant, except that for the importer's customs environment indicator. The positive signs imply that trade flow increases as trade facilitation is improved. From the regression model with average index variables, it is found that the coefficient for port efficiency is negative, but those for the other categories are positive. These signs can be interpreted as the direction of efficiency change, with the positive sign being efficiency growth in that category and the negative sign being efficiency regress.

Table 2. Regression results of the gravity model (random effects model)

Variables	Model with time dummies	Model with time average
log of exporter GDP	1.426***	1.426***
	(0.0164)	(0.0164)
log of exporter GDP per capita	0.0348	0.0348
	(0.0274)	(0.0274)
log of importer GDP	0.863***	0.863***
	(0.0152)	(0.0152)
log of importer GDP per capita	-0.106***	-0.106***
	(0.0258)	(0.0258)
log of exporter's port efficiency	0.851***	0.851***
	(0.113)	(0.113)
log of exporter's regulatory environment	0.174*	0.174*
	(0.0952)	(0.0952)
log of exporter's customs environment	0.805***	0.805***
	(0.118)	(0.118)
log of exporter's service sector infrastructure	0.435***	0.435***
	(0.107)	(0.107)
log of importer's port efficiency	0.325***	0.325***
	(0.0846)	(0.0846)
log of importer's regulatory environment	0.411***	0.411***
	(0.0954)	(0.0954)
log of importer's customs environment	0.0543	0.0543
	(0.0971)	(0.0971)
log of importer's service sector infrastructure	0.170**	0.170**
	(0.0857)	(0.0857)
log of distance	-1.440***	-1.440***
	(0.0334)	(0.0334)
FTA dummy	0.233***	0.233***
	(0.0454)	(0.0454)
language dummy	0.937***	0.937***
	(0.0852)	(0.0852)
adjacency dummy	0.672***	0.672***
	(0.166)	(0.166)
2005 dummy	0.0131	
	(0.0164)	
2006 dummy	-0.0782***	
	(0.0191)	
2007 dummy	-0.00175	
	(0.0214)	
2008 dummy	0.0669**	
	(0.0280)	
mean of port efficiency		-0.751***
		(0.157)
mean of regulatory environment		1.926***
		(0.350)
mean of customs environment		0.975***
		(0.216)
mean of service sector infrastructure		0.370***
		(0.0510)
constant	-33.35***	-43.26***
	(0.554)	(1.799)
Observations	34,861	34,861
Number of id	8,700	8,700

Source: Author's estimation.

Note: The significance levels at 10 per cent, 5 per cent and 1 per cent are denoted by *, ** and ***, respectively.

Table 3 also shows the results for the model with interaction terms between indicator and time, where only coefficient estimators for trade facilitation indicators are presented. The mixed signs within category indicate a non-monotonic trend of effects of trade facilitation in all categories. Table 4 compares the coefficients across our two models as well as those estimated in WMO (2005). They show similar signs in overall. The results regarding efficiency change between our two models are quite similar.

Table 3. Regression results of the gravity model with time-indicator interaction terms (random effects model, only coefficients of the indicator variables)

Indicator Name	Year	Exporter	Importer
Port Efficiency	Base year (2004)	1.008***	0.469***
	2005	-0.185	-0.0802
	2006	-0.111	0.0874
	2007	0.0264	-0.169
	2008	0.0513	-0.194
Regulatory Environment	Base year (2004)	0.271**	0.561***
	2005	-0.189**	-0.171**
	2006	-0.259***	-0.239**
	2007	-0.218**	-0.234**
	2008	-0.180*	-0.204**
Customs Environment	Base year (2004)	0.575***	-0.0741
	2005	0.425***	0.121
	2006	0.847***	0.262*
	2007	0.401***	0.316**
	2008	0.372***	0.221
Service Sector Infrastructure	Base year (2004)	0.377***	-0.00813
	2005	0.294**	0.102
	2006	0.263*	0.112
	2007	0.194	0.207*
	2008	0.439**	0.278*

Source: Author's estimation.

Note: The significance levels at 10 per cent, 5 per cent and 1 per cent are denoted by *, ** and ***, respectively.

Table 4. Comparison of estimated coefficients for indicators and their temporary

efficiency change

		WMO (2005)	With time-averaged TF	With time-interacted TF
Port Efficiency	Exporter	0.924***	0.851***	1.008***
	Importer	0.307*	0.325***	0.469***
Regulatory Environment	Exporter	0.620***	0.174*	0.271**
	Importer	0.281*	0.411***	0.561***
Customs Environment	Exporter	n.a.	0.805***	0.575***
	Importer	0.472**	0.0543	-0.0741
Service Sector Infrastructure	Exporter	1.943***	0.435***	0.377***
	Importer	0.729***	0.170**	-0.00813
Efficiency change in Port Efficiency		n.a.	-	Mixed
Efficiency change in Regulatory Environment		n.a.	+	Largely -
Efficiency change in Customs Environment		n.a.	+	Largely +
Efficiency change in Service Sector Infrastructure		n.a.	+	Largely +
Number of countries		75	99	99
Number of years		2	5	5

Source: WMO (2005) and author's estimation.

5. Simulation analysis – gains from trade facilitation reforms in the world and the ASEAN countries

The gravity model allows us to examine how much trade among the countries in the sample might increase from improved trade facilitation. We will examine scenarios that focus on improved port efficiency, improved customs environments, improved service sector infrastructure, and improvements in regulatory environments. Thus, we can inform stakeholders on which specific trade facilitation initiatives might have the greatest potential to increase trade.

We base our policy simulation on the estimated coefficients in the model in Table 2. For the simulation of alternative trade facilitation improvements, we first examine the formula with all countries improving trade facilitation by 5 percent. Then we examine the formula which brings the *below-average* countries in the group *half-way* to the global average (approximated by the average for the entire set of countries). Since each economy has a specific value for each trade facilitation indicator, each country that is below-average on that indicator will improve by a different amount so as to climb half-way to the average.

The countries for which we will simulate an improvement in trade facilitation will differ for each trade facilitation indicator. However, because trade facilitation links exporters and importers, all economies enjoy an increase in trade between each other, even when only some have an improvement in their trade facilitation indicator. Having the coefficients for both importers' and exporters' trade facilitation measures enables us to simulate the change in trade flow from different perspectives: i.e. the country itself and the region or world as a whole.

From the standpoint of a specific country, improvement in, for example, port efficiency should increase both its own imports and exports. The same can be expected for regulatory environment, and service sector infrastructure, as well as customs on the import side. But, a country will export more not only because of its own reforms, but also because of reforms undertaken by its trading partners as importers. Thus export gains are the sum of the simulated effect on exports of unilateral domestic reform and of import reforms undertaken by the country's trading partners. On the import side, a country's imports increase first on account of its unilateral domestic reforms, and secondarily on account of the reforms

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undertaken by its trading partners as exporters. Examining the relative gains to trade from unilateral reforms as compared to partner's reforms, and on exports vs. imports, and across trade facilitation indicators, offers three dimensions of potential insight to policymakers, donors, and the private sector.

5.1. A 5% improvement

Table 5 presents the result of a 5% improvement of trade facilitation indicators. The trade gains in percentage are simply equal to 5% times the coefficient of the indicator of interest. Therefore, the magnitude of the percent change is in the same order as the coefficients. The total gains from an improvement in all indicators at the same time are $1,634 billion, or 16%. The total gains from exporters, improvement are $1,148 billion, or 11%, whereas those from importers' improvement is $487 billion, or 4.8%.

Table 5. Result of simulation: a collective 5% improvement of trade facilitation (million USD)

Indicator	Exporter's change		Importer's change		Total	
	value	% change	value	% change	value	% change
Port Efficiency	431,362	4.26	164,823	1.63	596,186	5.88
Regulatory Environment	88,140	0.87	208,073	2.05	296,214	2.92
Customs Environment	408,018	4.03	27,498	0.27	435,516	4.30
Service Sector Infrastructure	220,390	2.17	86,196	0.85	306,586	3.02
Total	1,147,911	11.32	486,590	4.80	1,634,502	16.12

Source: Author's estimation.

5.2. The below-average countries halfway to the global average

The total gain to the world in terms of trade value is found to be $716.4 billion. Table 6 shows that gains from reforms are greatest ($387.9 billion) in regulatory environment followed by the port efficiency category ($199.6 billions). The gain from customs improvement is $104.3 billion and that from service improvement is $24.6 billion. The gains to a country increase either by its own trade in facilitation improvement or by its partners' improvement in trade facilitation.

Figure 6 shows gains from ASEAN's own improvement in trade facilitation and its partners' improvement. The increase in ASEAN's intra-regional trade from its own improvement is quite small. The gain in its trade with the rest of the world from ASEAN's own improvement is three times greater than that from ASEAN's intra-regional trade gains. The gain is about halved if only the rest of the world improves trade facilitation. Thus, ASEAN's aggressive improvement would pay off to the region even though the rest of the world does not make any improvement.

Table 6. Result of simulation: the below-average countries halfway to the global average

(million USD)

Indicator	Exporter's change		Importer's change		Total	
	value	% change	value	% change	value	% change
Port Efficiency	132,392	1.31	67,247	0.66	199,639	1.97
Regulatory Environment	120,436	1.19	267,425	2.64	387,861	3.83
Customs Environment	95,925	0.95	8,412	0.08	104,337	1.03
Service Sector Infrastructure	14,057	0.14	10,553	0.10	24,610	0.24
Total	362,809	3.58	353,637	3.49	716,446	7.07

Source: Author's estimation.

Figure 6. Trade gains from ASEAN's own effort v.s. partners' efforts (million USD)
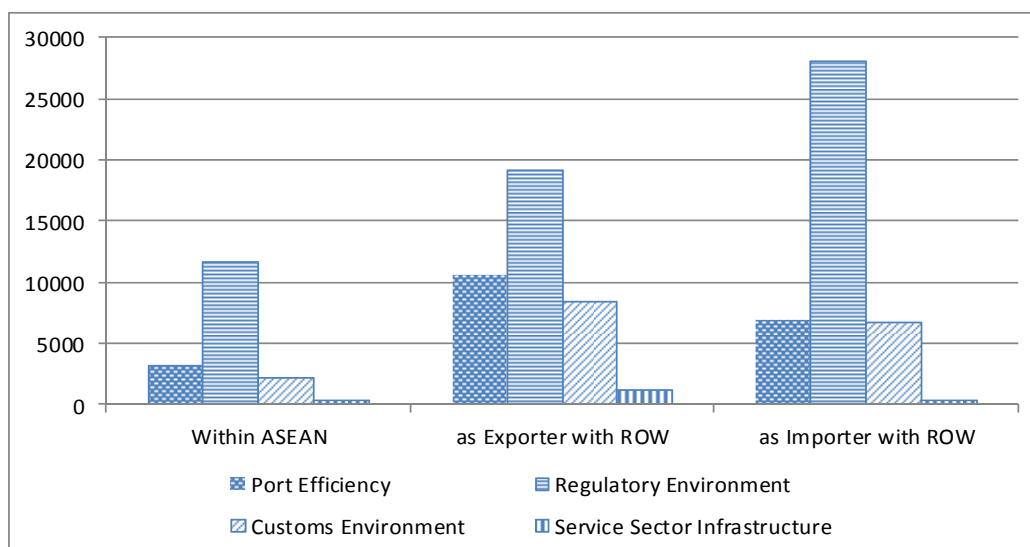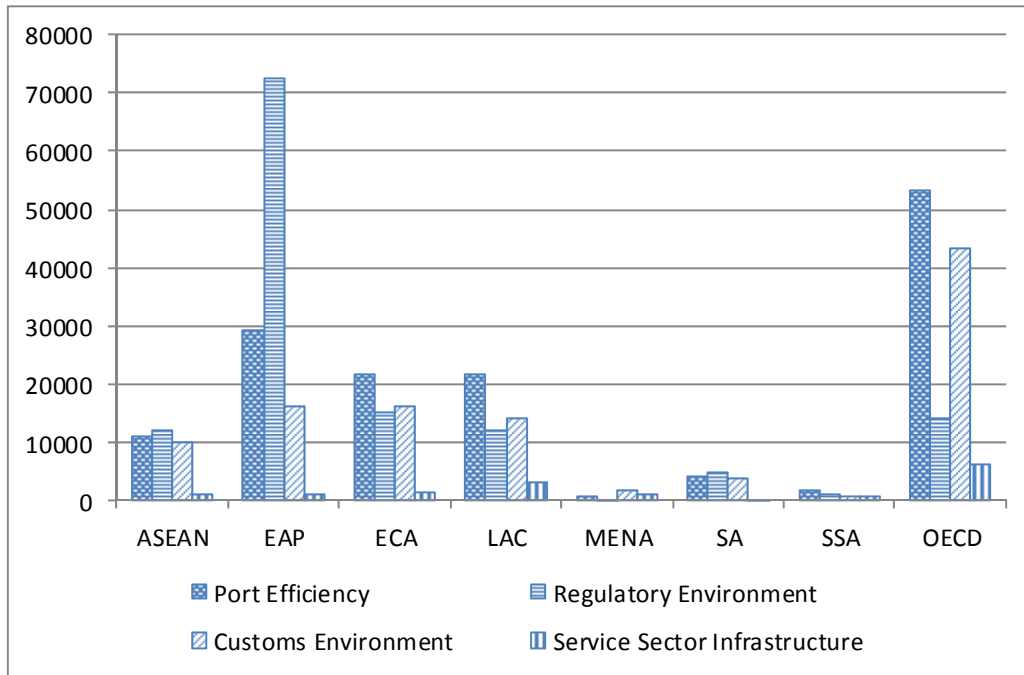

Source: Author's estimation.

Figures 7 and 7b show total trade gains in each region from the exporters' and importers' perspectives respectively.   In Figure 7a, ASEAN's exports are estimated to increase by approximately $34 billion.   Gains are around $10 billion in the port, regulatory and customs categories, but only $1 billion in the service category.   The gains from service improvement tend to be small both because the elasticity of trade with respect to the service sector infrastructure indicator is small, and because most ASEAN countries have been successful in their performance in service sector infrastructure improvement.   The ASEAN region's estimated total gain is generally greater than MENA, SA and SSA and smaller than EAP, and LAC.
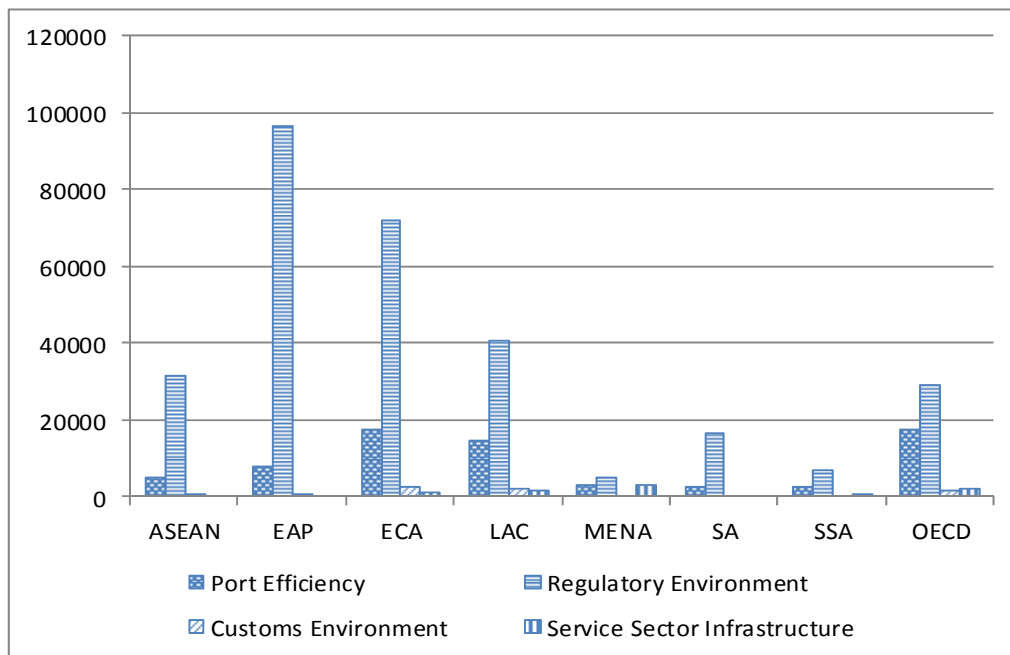
Figure 7b shows that gains are greatest in ASEAN in the regulatory environment category; it is approximately $30 billion.   On the other hand, the gains are much smaller in the other categories.

Figure 7a. Trade gains as exporter by region (million USD)

Source: Author's estimation.

Figure 7b. Trade gains as importer by region (million USD)

Source: Author's estimation.

Figure 8a shows trade gains in ASEAN as an exporter, arising from its own improvement in trade facilitation. In terms of trade value, the Philippines gains most from its own improvement, in particular $5.6 billion from its improvements in ports. Thailand gains $4.2 billion from its improvement in its regulatory environment. Malaysia gains $3.8 billion from its improvement in its customs environment. In percentage terms, the Philippines' gain is the largest (13.9%) from port improvement, followed by improvement in its regulatory environment (8.5%). Cambodia also gains 7.2% from port improvements. Thus, different countries gain from their own improvements in different categories of trade facilitation. The countries with high trade facilitation scores have less or zero estimated gain, simply because they improve only slightly or not at all under the current formula.

Figure 8a. Trade gains of the ASEAN countries as exporter by own improvement (million USD)
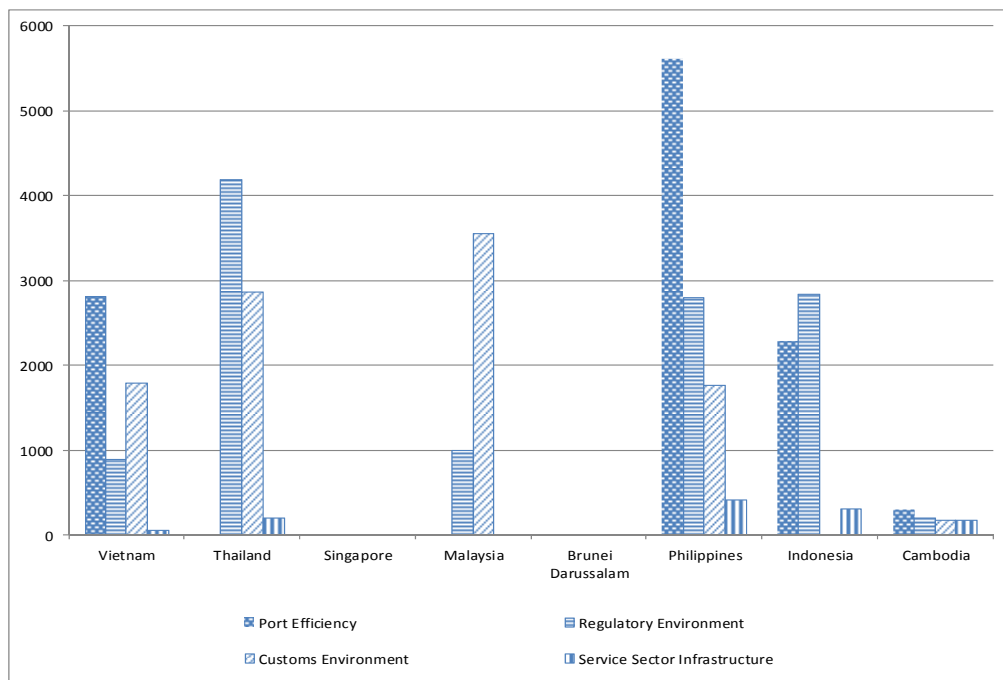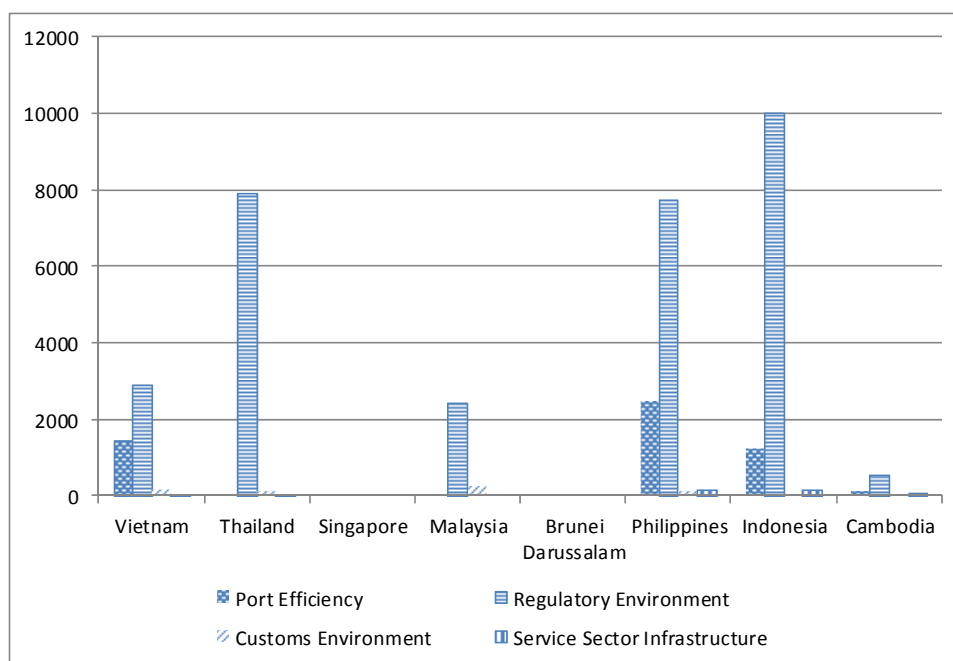
Source: Author's estimation.

Figure 8b. Trade gains of the ASEAN countries as importer by own improvement (million USD)
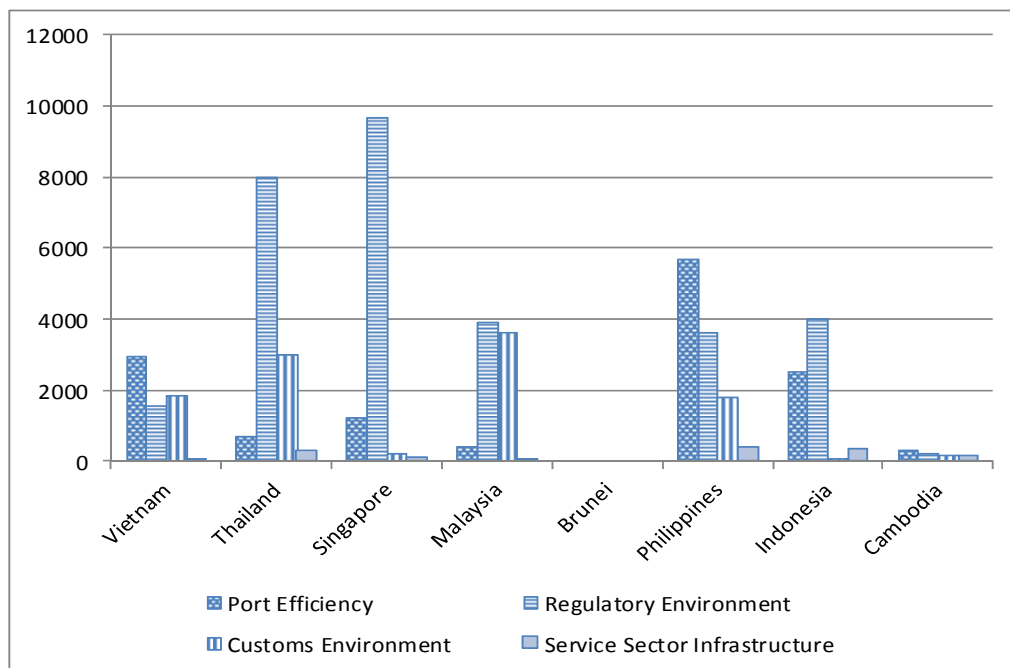

Source: Author's estimation.

Figure 8b shows trade gains in ASEAN as an importer from its own improvement in trade facilitation. Overall, trade gains are large from the group's own improvements in its regulatory environment. In terms of trade value, Indonesia, the Philippines and Thailand enjoy large gains. In percentage terms, the Philippines' gain from improvement in its regulatory environment is the greatest (16.1%), followed by Indonesia (11.8%).

Figures 9a-9b show trade gains as exporter and importer, respectively, from both own and partners' improvements in trade facilitation. According to Figure 9a, Singapore's gain as exporter from improvement in its regulatory environment is the greatest ($9.6 billion), followed by Thailand ($7.9 billion). Given that Singapore and Thailand themselves do not make an improvement under the current scenario, this result is mainly because of the large

trade gains from improvement of their major trading partners, most importantly Malaysia and China, whose regulatory environment scores are lower than the global average. It should be noted, however, that their trade gains are measured in terms of trade value, and that they are not necessarily the largest in terms of percentage. For example, Singapore's gain in percentage is only 4.2%. In percentage, the Philippines' gain from port improvement is the greatest (14%), followed by its gain from improvement in its regulatory environment (9%). According to Figure 9b, Indonesia's gain is the greatest ($14.2 billion), followed by Thailand ($12.2 billion) and Philippines ($12.2 billion), and their gains in percentage are also high. Those countries gain dominantly from improvement in regulatory environment. From the fact that their regulatory environment scores were far lower than the global average, those countries are expected to gain substantially from their own improvement.

Figure 9a. Trade gains of the ASEAN countries as exporter by global improvement (million USD)

Source: Author's estimation.

Figure 9b. Trade gains of the ASEAN countries as importer by global improvement (million USD)
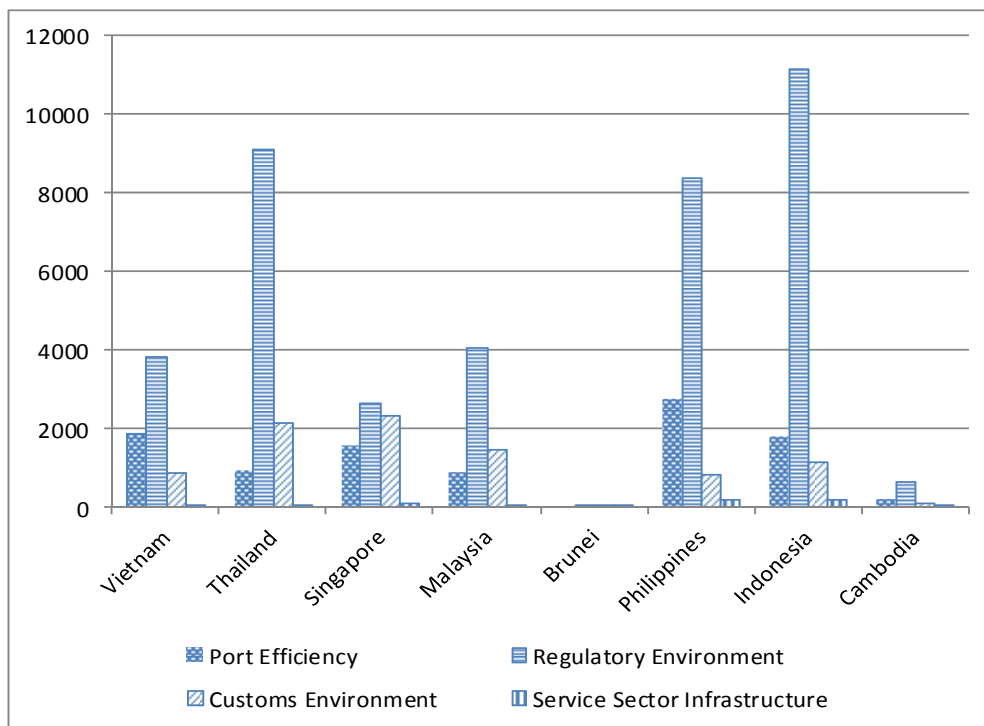
Source: Author's estimation.

In summary, the results suggest that the ASEAN countries can gain in trade both from their own improvement of trade facilitation as well as from their partners' improvement. The most prominent trade gain is witnessed from improvement in regulatory environments, whereas not much gain is expected from improvement in service sector infrastructure. A crucial shortfall is that Lao PDR and Myanmar are not included in our analysis. According to the other studies, performance of those countries in trade facilitation is similar to or poorer than the lowest-ranked countries in our analysis. Thus, those countries are likely to gain substantially from their own improvement in trade facilitation under the formula used for the simulation analysis while contribution of their efforts to trade expansion in ASEAN as a whole will be limited due to their relatively small share of trade flow in the region's trade.

6. Conclusions

This chapter develops measures of trade facilitation, in line with Wilson, Mann and Otsuki's (2005) indicators, using data that are more up to date, and with a broader country coverage It investigates their changes over time and their variation across countries and regions, with particular focus on the ASEAN economies.   We consider four categories of trade facilitation – port efficiency, the customs environment, the regulatory environment and service sector infrastructure.   The chapter then estimates the effect of trade facilitation on trade flows of manufactured goods using a gravity model.   Catching-up by countries with relatively poor performance in terms of trade facilitation is found to increase trade substantially, through both import and export channels.

The major findings are as follows:

- ASEAN countries' performance in trade facilitation is diverse.   Singapore, Malaysia and Brunei are far better than the global average in all categories, whereas the Philippines, Vietnam and Cambodia fall behind the global average in most categories.

- When compared with other regions, ASEAN's average performance is better than most developing regions.   It is close to that of Europe, Central Asia and Latin America and the Caribbean, but is behind the Middle East and North Africa.

- There is slight improvement in ASEAN's score over time in port efficiency, and a remarkable improvement in service sector infrastructure.

- The gravity model estimation supports the positive effect of all the four trade facilitation indicators on bilateral trade flows, and indicates that the effect of

improvement in the regulatory environment is greatest.   The efficiency change is detected in the categories of customs environment, regulatory environment, and service sector infrastructure.

- A simulation analysis is conducted under a scenario that brings below-average countries halfway to the global average with respect to each of the four trade facilitation categories.   The improvement goal is set halfway to the global average for the below-average countries, whereas the above-average countries are left unchanged.   Trade gain arises 1) when a country improves trade facilitation by its own efforts, or 2) when its trading partner improves trade facilitation.   The greater is the gain 1) the greater is the estimated elasticity or, 2) the smaller its original score is (thus the higher is the target level is), or 3) the smaller is its partners' original score.

- The total global trade gain is estimated to be $716 billion.   The gain from improvement is greatest ($387 billion) in the regulatory environment category, followed by port efficiency ($199 billions).   The gain from improvement in customs efficiency is $104 billion and that from improvement in service sector infrastructure is $25 billion.

- ASEAN's total gain is estimated to be $99 billion.   About 75% of the gain comes from the region's own improvement, which encourages aggressive commitment to investment in trade facilitation.

- Within ASEAN, Vietnam, Cambodia and the Philippines tend to experience a greater percentage increase in their trade flows as a result of their own efforts, thus

supporting the idea of capacity building in countries with relatively poor performance. Yet, countries with no change in trade facilitation can still enjoy trade gains from their partners' improvements. For example, Singapore can gain nearly $10 billion from its partners' improvements in their regulatory environments.

Thus, capacity building in the below-average countries is found to be particularly effective in promoting intra-ASEAN trade, and its trade with the rest of the world. Thus, the current focus of the ASEAN in trade facilitation is proved to be rewarding, particularly under the current situation where there is limited room for further tariff reduction. It is recommended that ASEAN focus primarily on regulatory reforms concerning trade through making policies more transparent and ensuring effective and law-abiding operations of the regulatory authorities, in order to realize the returns to their effort rapidly, and on fostering capacity building in the member countries that lag behind in terms of trade facilitation.

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