The Impact of AEC Trade Facilitation Improvement on Thailand's Goods in Transit and Inter-state Trade

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Abstract

This paper studies the effect of improvement in trade facilitation according to ASEAN Economic Community (AEC) on cross-border freight and trans-border trade of Thailand. To do so, we collect trade facilitation and trade performance at 10 border checkpoints of Thailand and construct the augmented gravity model to see the relationship between trade facilitation and trade performance at the border checkpoints of Thailand. The findings show that the implementation of ASEAN Framework Agreement on the facilitation of goods in transit and inter-state transit will improve the export values at the border locations of Thailand. If only ASEAN Single Window (ASW) is implemented, the exports passing all border locations of Thailand will increase 308.88 million bahts. If the EDI system is installed in all neighboring countries, an increase in exports will be 723.97 million bahts. Furthermore, if the CLM countries can reduce the time spent in their customs procedures for one hour, the export values at all border locations of Thailand will rise by 1,029.33 million bahts without the implementation of EDI system in the mentioned countries and 4,109.92 million bahts with the implementation of EDI system.

Keywords: Cross-border Freight, Trans-border Trade, ASEAN Economic Community, Trade Facilitation

1. Introduction

Due to enormous immense of preferential trade agreement and multilateral trade agreement, tariff and non-tariff barriers have decreased tremendously. As a result, trade facilitation and transport costs become the major obstacles to international trade nowadays. Duval and Utoktham (2011) estimates that trade costs of intra-regional trade among ASEAN countries are 53% of value of goods and those of trade between ASEAN and South Asia and East Asia are about 139% - 141%. The evidence suggests that ASEAN countries have a room to improve their trade facilitation in order to reduce trade costs.

Ariyasajjakorn and Cheewatrakoolpong (2012) employs the augmented gravity model to evaluate the impact of trade facilitation improvement on export values of ASEAN+6 countries. The study finds that the improvement in trade facilitation, both in the reduction of time and costs, has significant impact on trade flows, especially in food and agricultural exports. These evidences suggest the importance of intra-regional connectivity improvement.

Considering the levels of trade facilitation in the member countries of ASEAN, we find that the member countries have high gap among development of transport and trade facilitation and are not well-developed on average. The advanced economies in terms of transport and trade facilitation are Singapore and Malaysia while the least developed countries, namely Cambodia, Lao PDR, Myanmar and Vietnam (CLMV), and Indonesia have a low level transport and trade facilitation development as seen in Table 1.

Table 1: Trade Facilitation Indexes in the ASEAN+3 Region

	Ease of Doing Business	Trading Across Border	Logistics Performance Index (overall)	Logistics Performance Index (infrastructure)	Logistics Performance Index (custom)	Port efficiency
Country/Year	2011	2011	2009	2009	2009	2000
Brunei Darussalam	83	35	N/A	N/A	N/A	N/A
China	91	60	3.49	3.54	3.16	3.49
Indonesia	129	39	2.76	2.54	2.43	3.41
Japan	20	16	3.97	4.19	3.79	5.16
Cambodia	138	120	2.37	2.12	2.28	N/A
Korea	8	4	3.64	3.62	3.33	4.12
Lao PDR	165	168	2.46	1.95	2.17	N/A
Myanmar	N/A	N/A	2.33	1.92	1.94	N/A
Malaysia	18	29	3.44	3.5	3.11	4.95
Philippines	136	51	3.14	2.57	2.67	2.79
Singapore	1	1	4.09	4.22	4.02	6.76
Thailand	17	17	3.29	3.16	3.02	3.98
Vietnam	98	68	2.96	2.56	2.68	3.81

Note: Ease of Doing Business is the ranking of 183 countries and Logistics performance is the index with the scale of 0-5 with 0 = worst and 5 = best.

Source: The World Bank's Ease of Doing Business Index (2011) for Ease of Doing Business and Trading Across Border, The World Development Indicators for Logistics Performance Index and Clark, et al. (2003) for Port Efficiency

Due to high transport and trade costs in the APT region and low development in connectivity infrastructure, especially in low income member countries, the trade facilitation initiatives become one of the important aspects in ASEAN economic cooperation.

An enhanced ASEAN connectivity is regarded as one of the key elements to achieve ASEAN Economic community. With that regard, ASEAN has developed a Master Plan on ASEAN connectivity. The ASEAN connectivity's key elements are composed of:

1) Physical connectivity consisting of:
   - Transport
   - ICT
   - Energy
2) Institutional Connectivity consisting of:
   - Liberalization of trade in goods, services and investment
   - Facilitation of trade in goods, services and investment
   - Mutual recognition agreements
   - Regional transport agreements
   - Cross-border procedures
   - Capacity Building
3) People-to-people connectivity consisting of:
   - Tourism
   - Education
   - Culture

The examples of ASEAN connectivity initiatives are ASEAN highway network, The Singapore-Kunming Rail Link (SKRL) project, the development of ASEAN Single Aviation Market (ASAM), ASEAN Single Shipping, the Roadmap for Integration of Air Travel Sector and the Roadmap towards an Integrated and Competitive Maritime Transport in ASEAN.

One of the important factors to achieve ASEAN connectivity is to promote transport and trade facilitation via the establishment and improvement of institutional connectivity. As a result, ASEAN has 2 framework agreements on transport facilitation including ASEAN Framework Agreement on the Facilitation of Goods in Transit (AFAFGT), and ASEAN Framework Agreement on the Facilitation of Inter-State Transport (AFAGIST).

The two mentioned framework agreements will play an important role in facilitating international trade via border checkpoints, including goods in transit and inter-state trade. The examples of important initiatives under these framework agreements are to establish ASEAN single window inspection, to initiate Electronic Data Interchange (EDI) system and Information and Communication Technology (ICT) in customs procedures and to have harmonization in customs procedures and product standard.[4]

Thailand is one of the ASEAN member countries with land borders connected with 4 other member countries including Cambodia, Lao PDR, Malaysia and Myanmar. Therefore, the implementation of the two transport facilitation framework agreements inevitably affects Thailand's goods in transit and inter-state trade. The implementation of these two initiatives is expected to improve international trade at Thailand's border checkpoints which are still low in comparison with Thailand's total international trade due to poor trade facilitation in connected countries such as Lao PDR, Myanmar and Cambodia.

This study aims to quantify the impact of the implementation of ASEAN Framework Agreement on the Facilitation of Goods in Transit, and ASEAN Framework Agreement on the Facilitation of Inter-State Transport on trade performance at Thailand's border checkpoints. To do so, we collect trade statistics and current trade facilitation-related performance at 10 border checkpoints. Then, we construct the econometric model to see the relationship between trade facilitation and trade performance at these border checkpoints. Lastly, we simulate trade performance at the border checkpoints after the implementation of the two mentioned framework agreements.

The paper proceeds as follows. The next section illustrates literature review. The conceptual framework and methodology are depicted in Section 3. Section 4 shows the results of the study. The last section concludes all the findings.

2. Literature Review

In this section, we consider the previous literature regarding trade facilitation. The related literature are divided into three groups: 1) The theoretical perspective of trade facilitation 2) The impact of trade facilitation on trade and export volumes and 3) The quantitative assessment of trade facilitation improvement of economies using the computable general equilibrium (CGE) method.

2.1 The Theoretical Perspective of Trade Facilitation

In theory, trade facilitation is considered as the reduction of transaction

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[4] EDI system is the system that allows the exporters to exchange data or forms required in customs procedures electronically instead of using paper.

cost. Samuelson (1954) introduces the iceberg transportation cost as the method to capture the impact of transaction cost on trade and it is widely used to study transportation cost, non-tariff barriers, and trade facilitation.

Sengupta (2007) adds transaction cost into the Krugman's new trade theory which explains gains from trade from economies of scale and monopolistic competition. The study finds that an increase in transaction cost reduces product differentiation which in turn decreases social welfare. When transaction cost becomes very high, two countries produce homogenous products instead.

Alchian and William (1964) shows that, in the case of two substitute goods with different quality, an increase in transaction cost brings about the export of high-quality goods and the domestic sale of low-quality goods. Extending Alchihian and William (1964), Hummels and Skiba (2004) introduces the cases of per unit freight rate and ad valorem transaction costs and find that the ratio of high-quality to low-quality imports increases according to the per unit freight rate and decreases according to the ad valorem costs.

2.1 The Impact of Trade Facilitation on Trade and Export Volumes

The studies that estimate the benefit of trade facilitation on trade and exports mainly employ the gravity model or the probit model.

The studies of Wilson, et al. (2004) and Hausmann, et. al. (2005) try to capture affects of trade facilitation improvement on trade flows. The results from both studies lead to the conclusion that the improvement in trade facilitation increases trade flows for all countries involved in trade. Wilson, et al. (2004) considers the effect of trade facilitation improvement in 75 countries using the gravity model. The study also divides trade facilitation into 4 aspects, consisting of customs procedures, infrastructure, port efficiency, and regulatory environment. It finds that the improvement in trade facilitation increases trade flows for 377 billion dollars. Also, improvement in infrastructure has the greatest impact, following by port efficiency.

Similar to the previous studies, Hausmann, et al. (2005) employs the gravity model to quantify the effect of total time using in customs procedures, technical control, and in-land transportation on trade flows. The study finds that the logistics and transaction times have significant effect on trade flows with the greatest impact on exporters than importers. Also, a decrease in transaction cost significantly raises trade flows.

On the other technique used to study trade facilitation, Hummels (2001) and Nordas, et al. (2006) modify the probit model to assess the impact of trade facilitation. The conclusions from both studies lead to the same conclusion as previous studies. Hummels (2001) uses the selection corrected probit model to estimate the effect of

transport time on international trade. It finds that the probability of exports to the US will increase 1% to 1.5% if trading time reduces for one day. Also, a one-day increase in transportation is equivalent to 0.9% tariff reduction in the case of industrial goods.

Similarly, Nordas, et al. (2006) also employs the probit model to quantify the impact of trading and logistics time on trade flows. The study finds that a reduction in the trading and logistics time significantly increases exports, particularly in electronic goods. The study also finds higher impact of time in case of developing countries in contrast to developed ones.

2.3 The Quantitative Assessment of Trade Facilitation Improvement of Economies Using the Computable General Equilibrium (CGE) Method

Various studies employ the CGE method to assess the impact on trade facilitation improvement on economic variables. Minor and Tsigas (2008) finds that a decrease of transport time significantly increases GDP of developing countries. OECD (2001) and Mirza (2007) show that a reduction of transaction costs has significant impact on trade flows and economic welfare.

Fox, et al. (2003) and Walkenhorst and Yasui (2003) also employ the CGE model to assess the effect of trade facilitation improvement on economics. However, they divide the effect into direct and indirect costs and treat the direct cost as a tariff rate while the indirect one in form of an iceberg cost. The studies also find significant impact of improvement in trade facilitation on economic welfare.

In this study, we employ the augmented gravity model method which is more suitable for the micro data level of border checkpoint's trade statistics. We revise the augmented gravity model proposed by Hausmann, et al. (2005) and Nordas, et al. (2006) so that it fits well with the border checkpoints' trade performance. The methodology will be illustrated in the next section.

3. Methodology

This section depicts methodology employed in this study. We use the augmented gravity model to assess the impact of trade facilitation time on export volumes.

3.1 The Augmented Gravity Model

The basic augmented gravity model depicts the relationship between trade volumes and countries' sizes and distance. In general, trade is an increasing function of their sizes and a decreasing function of distance between the exporter and its trading partners. In this study, we adjust the model in Nordas, et al. (2006) to estimate the effect of trade facilitation costs and time on export volumes at each border check points. The gravity model can be represented as followed:

$$InEXP_{ij} = \alpha_1 InGDP_i + \alpha_2 InGDP_j + \alpha_3 InD_{ij} + \alpha_4 time_i + \alpha_5 CPIj + \varepsilon_{ij}$$

$$In[EXP]_{\downarrow ij} = \alpha_\downarrow 1 \, In \, [GDP]_{\downarrow i} + \alpha_\downarrow 2 \, In \, [GDP]_{\downarrow j} + \alpha_\downarrow 3 \, InD_\downarrow ij + \alpha_\downarrow 4 \, Iny_\downarrow i +$$

$$\alpha_\downarrow 5 \, Iny_\downarrow j + \alpha_\downarrow 64 \, [time]_\downarrow i + \alpha_\downarrow(758e \, \textit{first cent countrytime since the shipment}$$

reaches the border check   (1)

Where EXP_{ij} is an export volume at the border checkpoint from Thailand to the country j adjacent to that particular border checkpoint,

GDP_i is per capita GDP of Thailand,

GDP_j is per capita GDP of the importing Country j adjacent to the border checkpoints of Thailand,

D_{ij} is the distance from the border checkpoint in Thailand to the important destination of the exported goods in Country j,

$time_i$ is the trade facilitation time relating to export procedures in Thailand at the border checkpoint. We consider the time when the shipment reaches the border checkpoint till it proceeds to the adjacent country,

CDP_j is the corruption perception index in Country j.

The corruption perception index is added into the gravity model as a control variable for the countries' transparency in trade procedures.

In order to capture the improvement in trade facilitation according to the ASEAN framework agreements, we add one more variable indicating whether the country j has EDI system in customs procedures or not. It is a dummy variable called EDI_j. The revised augmented gravity model is shown below:

$$InEXP_{ij} = \alpha_1 InGDP_i + \alpha_2 InGDP_j + \alpha_3 InD_{ij} + \alpha_4 Iny_i + \alpha_5 Iny_j + \alpha_{64} time_i$$

$$+ \alpha_{75} CPI_{ij} + \alpha_8 EDI_J + \varepsilon_{ij}$$ (2)

The source of data used to estimate the augment gravity equation (2) is indicated in the next section.

3.2 Sources of Data

There are two types of data used to estimate the gravity equation (2). The first one is the primary data collected from customs officers and the shipping that routinely use the border checkpoints.[5] The primary data is composed of:

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[5] We interviewed the customs officers at all sample border checkpoints and use phone-interview or in-person interviews with all shipping agencies that register with customs officers at the sample border checkpoints. The samples are 10 customs officers and 55 shipping agencies.

- The implementation of EDI and e-customs system at the border checkpoint
- The trade facilitation time since the shipment reaches the border checkpoint till it is released and passes to the adjacent country

We collect the data from 10 border checkpoints composed of:
- Aranyaprathet, Sa Kaew province (adjacent to Cambodia)
- Mukdahan, Mukdahan province (adjacent to Lao PDR)
- Nakhon Panom, Nakorn Panom province (adjacent to Lao PDR)
- Nong Kai, Nong Kai province (adjacent to Lao PDR)
- Sadao, Song Kla province (adjacent to Malaysia)
- Padan Besar, Song Kla province (adjacent to Malaysia)
- Mae Sad, Tak province (adjacent to Myanmar)
- Chong Mek, Ubonratchathani (adjacent to Lao PDR)
- Ranong, Ranong province (adjacent to Myanmar)
- Bungkan, Bungkan province (adjacent to Lao PDR)

As for the secondary data, we obtain from several sources indicated below:

- Trade statistics at the border checkpoints obtained from Department of Customs, Thailand
- GDP and per capita income are obtained from the World Bank
- Corruption Perception Index (CPI) are obtained from Transparency International
- Distance from Thailand's border checkpoint to the first city that majority of exporting goods reaches from Google map.[6]

3.3 Estimation of the Impact of ASEAN Transport Facilitation Framework Agreements on Goods in Transit and Inter-state Freights

After estimating the gravity equation (2) using the pooled regression covering the period of 2003-2008 and 10 border checkpoints as mentioned in Section 3.2, we will quantify the impact of ASEAN transport facilitation framework agreements on trade volumes of each border checkpoint by assuming that:
- All adjacent countries implement the EDI system in their customs procedures.
- All ASEAN member countries implement ASEAN single window inspection. As a result, the time used in customs procedures of the exporting country (i.e. Thailand) will be eliminated.

The results will be depicted in Section 4.

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[6]   The first city that majority of exporting goods reaches is obtained from interview with shipping agencies.

4. Results

This section shows the results of the study. First, we depict the results from the augmented gravity model which estimates the impact of trade facilitation time on export volumes at the border checkpoints. Then, we simulate the impact of the implementation of AEC's two transport facilitation framework agreements on trade at the border checkpoints. The descriptive data used in the augmented gravity model is illustrated in Appendix.

4.1 The Results from the Augmented Gravity Model

We first estimate the gravity equation (2) using the estimated generalized least square (EGLS) method. With the presence of heteroskedasticity, EGLS is the more efficient estimator comparing with the ordinary least square (OLS) method. The data set used to estimate equation (2) are from 10 border checkpoints in the period 2003-2008.

Table 2 depicts the results from the augmented gravity model.

Table 2: Results from the Augmented Gravity Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	30.7316	11.0342	2.7851	0.0084
Log of Exporter's per capita GDP	-3.9390	1.6463	-2.3926	0.0219
Log of Importer's per capita GDP	1.6164	0.2934	5.5088	0.0000
Importer's CPI	0.0129	0.0061	2.1201	0.0408
Time	-0.0037	0.0017	-2.1583	0.0375
Time x EDI	-0.0079	0.0028	-2.7676	0.0088
Log of Distance	-0.3228	0.0906	-3.5632	0.0010
Weighted Statistics				
R-squared	0.9019	Mean dependent var		13.2949
Adjusted R-squared	0.8860	S.D. dependent var		9.3887
S.E. of regression	0.7705	Sum squared resid		21.9670
F-statistic	56.7125	Durbin-Watson stat		0.4226
Prob(F-statistic)	0.0000			

Source: Author's calculation

Due to high correlation between GDP and per capita GDP, we use per capita GDP as a proxy for a country's mass in the gravity model. The finding in Table 2 is not surprising. The bigger the income of the adjacent country is, the higher the export volumes to that country are. Also, distance has negative impact on export volumes of a border checkpoint. In contrast, corruption deteriorates trade flows at the border checkpoints. The adjacent country with lower corruption promotes higher trade activities at the border check point than the one with higher corruption. The only variable with an unexpected sign is the exporter's per capita GDP. However, this might comes from the fact that there is only one export country for all border checkpoints, which is Thailand.

Considering the impact of transport facilitation on exports at the border checkpoints, we can see that the time to transit goods across the border checkpoints, including customs procedures, has a significant effect on export values at the border check points. A one minute reduction of trade facilitation related time brings about 0.0037% improvement in export values at border checkpoints.

The impact of transport facilitation improvement will be amplified if the EDI system is used in the customs procedures. As seen in Table 2, when the EDI system is implemented, a one minute reduction of trade facilitation related time will improve export at the border checkpoints by 0.0079%.

4.2 The Simulation Outcome

In this section, we use the augmented gravity model from Section 4.1 to simulate the benefits of ASEAN Framework Agreement on the Facilitation of Goods in Transit and ASEAN Framework Agreement on the Facilitation of Inter-State Transport on exports at border checkpoints of Thailand. We consider the impact of two framework agreements via the implementation of ASEAN single window inspection and the EDI system in the customs procedures. We consider simulation outcomes in three scenarios which are:

- When only ASEAN single window inspection is implemented which results in the reduction of time to pass customs procedures at the exporting country.
- When only ASEAN single window inspection is implemented together with EDI in customs procedures of all member countries.[7]
- When both ASEAN single window inspection and EDI system are implemented together with the reduction of customs procedures related time in Lao PDR, Cambodia and Myanmar for 1 hour.

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[7] For all Thailand's neighboring countries, only Malaysia implements EDI system in its customs procedures. Cambodia, Lao PDR and Myanmar still use paper systems.

The simulation outcome is depicted in Table 3. We can see that if ASEAN single window inspection is implemented together with EDI system, the export values via all border checkpoints of Thailand will increase for 723.97 million bahts. The highest increase occurs at Sadao border checkpoint, following by Mae Sod and Nongkai. The great improvement at Sadao border checkpoint comes from the fact that it has long customs procedures time due to its high traffic volumes. As for Mae Sod and Nong Kai, the main contribution comes from the implementation of the EDI system in Lao PDR and Cambodia.

Table 3: Simulation Outcome (Export Values in Million Bahts)

Border checkpoint	Mae Sod	Chongmex	Ranong	Padan Besar	Sadao	Bungkan	Nong Kai	Nakhon Pan	Mukdahan	Aranyaprathe	Total
Export values	24,291.37	6,771.20	14,531.56	14,531.56	147,429.49	6,076.24	36,542.47	4,886.71	9,824.70	28,361.36	486,488.00
Trade facilitation related time	30.00	30.00	5.00	10.00	20.00	15.00	15.00	15.00	5.00	5.00	17.16
An increase in exports after implementing ASEAN single window	26.96	7.52	2.69	5.38	109.10	3.37	20.28	2.71	1.82	5.25	308.88
An increase in exports after implementing ASEAN single window and EDI system in neighboring countries	84.53	23.56	8.43	5.38	109.10	10.57	63.58	8.50	5.70	16.45	723.97
An increase in exports after implementing ASEAN single window and the CLM reduces their customs related time by 1 hour	80.89	22.55	34.95	5.38	109.10	16.86	101.41	13.56	23.63	68.21	1,029.33
An increase in exports after implementing ASEAN single window and the EDI system and the CLM reduces their customs related time by 1 hour	253.60	70.69	109.57	5.38	109.10	52.86	317.92	42.51	74.08	213.84	4,109.92

Source: Author's calculation

Considering the first scenario when only ASEAN single window inspection is implemented, we can see that the framework agreements can promote Thailand's exports at the border checkpoints for 308.88 million bahts. As a result, the implementation of EDI system is one of the key success factors to improve trade activities via border checkpoints.

Also, according to our interviews with customs officers and shipping agencies, we found that the main obstacle to trade via border checkpoints of Thailand are very long, unpredictable and instable time used in customs procedures of Lao PDR, Cambodia and Myanmar. While customs procedures of Thailand spend around 15-30 minutes after the implementation of e-customs system, the procedures in Lao PDR, Cambodia and Myanmar take more than one hour and can vary to half a day in some cases.

Therefore, we consider the simulation outcome in the case that Lao PDR, Cambodia and Myanmar can reduce their customs procedures related time by one hour. Table 3 shows that this case can improve trade performance at the border checkpoints of Thailand tremendously. In the case that only ASEAN single window inspection is implemented, the export values via all border checkpoints of Thailand improve by 1,029.33 million bahts. If both ASEAN single window inspection and EDI system are implemented, the export values at the border checkpoints increase by 4,109.92 million bahts. The results suggest that the key success factor of the two framework agreements to promote cross-border and trans-border trade is to improve customs procedures of least developed member countries such as Lao PDR, Cambodia and Myanmar.

5. Conclusion and Policy Recommendation

This study quantifies the impact of ASEAN Framework Agreement on the Facilitation of Goods in Transit and ASEAN Framework Agreement on the Facilitation of Inter-State Transport on exports at border checkpoints of Thailand. This study is very first paper to employ the augmented gravity model on the pooled data of several border checkpoints. The study includes 10 border checkpoints of Thailand in the period of 2003-2008 and relies on both secondary data and primary data from interviews with customs officers and shipping agencies.

The results from the augmented gravity model suggest that the reduction of trade facilitation related time at border checkpoints, the implementation of EDI system in customs procedures and the elimination of corruption in customs procedures significantly improve trade performance via border checkpoints. As a result, the implementation of ASEAN Framework Agreement on the Facilitation of Goods in Transit and ASEAN Framework Agreement on the Facilitation of Inter-State Transport would result in higher cross-border and trans-border trade between Thailand and its neighboring countries.

The simulation outcome indicates that if ASEAN single window inspection is implemented alone, the export values via border checkpoints of Thailand will increase for 308.88 million bahts. However, if EDI system is introduced to customs procedures of Lao PDR, Cambodia and Myanmar, the improvement of Thailand trans-border and cross-border exports will be 723.97 million bahts instead. Finally, the reduction of customs procedures related time in Lao PDR, Cambodia and Myanmar play the most important role in the promotion of trans-border and cross-border trade. The simulation outcome shows that a one-hour reduction in the mentioned time will promote exports via border checkpoints of Thailand for 1,029.33 million bahts in case that only ASEAN single window inspection is implemented and 4,109.92 million bahts in case that both ASEAN single window inspection and EDI system are implemented.

The results from this study suggest that the rely solely on ASEAN single window inspection can improve trans-border and cross-border trade of ASEAN member countries very little. The key success factor of ASEAN transport facilitation framework agreements are to promote the implementation of EDI and e-customs systems in the least developed countries such as Lao PDR, Myanmar and Cambodia. Also, it is important for the least developed countries to speed up their customs procedures, increase transparency in the process and reduce corruption.

6. Limitation of the Study

First of all, this study collects primary data from customs officers and shipping agencies of Thailand, not from the neighboring countries. As a result, the outcome of simulation is based on the assumption that the coefficient of transport facilitation time reduction on cross-border and trans-border trade in the neighboring countries is the same as the coefficient in Thailand.

Secondly, this study have three simulation scenarios, namely when ASEAN single window is implemented, when both ASEAN single window and EDI system are implemented, and when both are implemented together with the reduction of customs procedures related time in Lao PDR, Cambodia and Myanmar. However, the third scenario might cause duplication in simulation as the implementation of ASEAN single window and EDI system themselves also bring about the reduction of customs procedures related time. As a result, the simulation outcome in this scenario might be exaggerated. However, the model explains the best under the constraint on data limitation.

7. Acknowledgements

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Appendix

Table A1: Trade Facilitation Related Time in Each Border Checkpoints of Thailand

Border Checkpoints	Time (minutes)	
	EDI	**e-Customs**
Mae Sod	40	30
Chong Mek	45	30
Ranong	15	5
Padang Besar	30	10
Sadao	45	20
Bungkan	n.a.	15
Nongkai	45	15
Nakorn Panom	30	15
Mukdahan	90	5
Aranyaprathet	30	5

Note: Customs procedures in Thailand have implemented the e-Customs system (or paperless system) since January 1, 2007. Unlike the EDI system, all forms and data will be submitted electronically to Department of Customs via Value Added Network Services (VANS). The exporters and importers do not have to print out forms and submit them the Department of Customs which are required in the EDI system.

Source: Interviews with customs officers and shipping agencies

Figure A1: Thailand's Export Values at Border Checkpoints
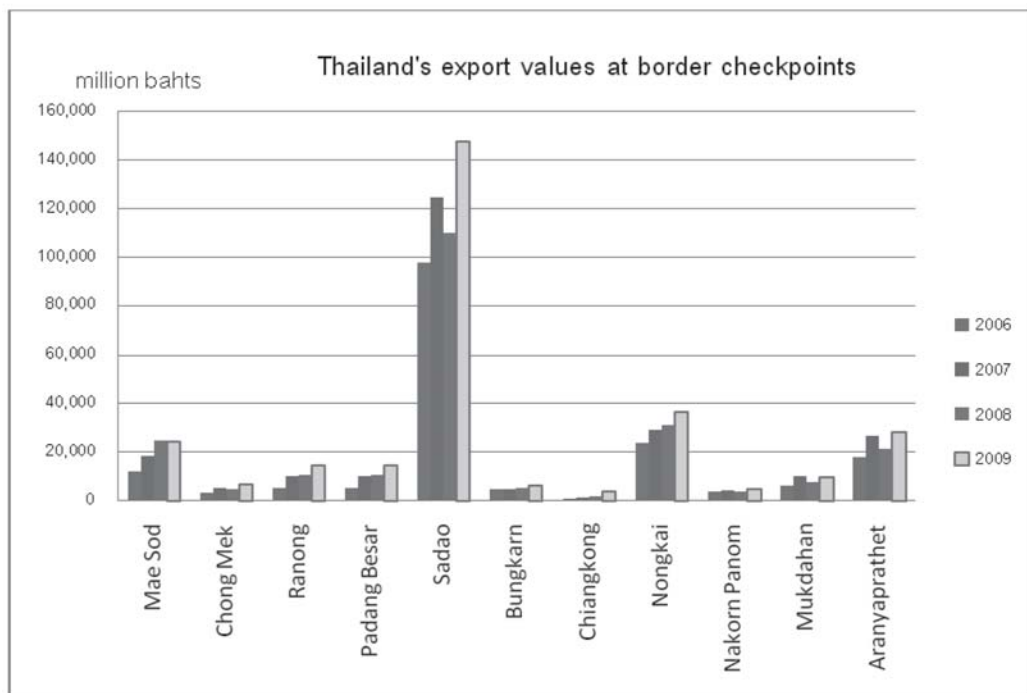
Source: Bank of Thailand

Table A2: Corruption Perception Index

Year	Thailand		Malaysia		Lao PDR		Myanmar		Cambodia	
	Score	**Rank**	**Score**	**Rank**	**Score**	**Rank**	**Score**	**Rank**	**Score**	**Rank**
2004	3.8	59	5.1	39	3.30	77	1.8	155	2.30	130
2005	3.6	63	5.0	44	2.60	111	1.9	160	2.10	151
2006	3.3	84	5.1	43	1.90	168	1.4	179	2.00	162
2007	3.5	80	5.1	47	2.00	151	1.3	178	1.80	166
2008	3.4	84	4.5	56	2.00	158	1.4	178	2.00	158

Source: Transparency International

Table A3: Distances from Border Checkpoints of Thailand to the First Cities that Majority of Exports Reach

Border Checkpoints	The First City that Majority of Exports Reach	Distance (km)
Aranyaprathet	phnom penh, Cambodia	421
Mukdahan	savannakhet, Lao PDR	10
Nakorn Panom	thakhek, Lao PDR	5
Nongkai	Vientiane, Lao PDR	55
Sadao	kedah, Malaysia	48
Padang Besar	State of Perlis, Malaysia	34
Mae sod	Yangkung, Myanmar	340
Chong Mex	Pakse, Lao PDR	46
Ranong	Myeik, Myanmar	300
Bungkarn	Vientiane, Lao PDR	102

Source: Google map and interviews