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Transport infrastructure and trade facilitation in the Greater Mekong Subregion

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ADB Working Paper Series

**Transport Infrastructure and Trade
Facilitation in the Greater Mekong
Subregion**



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Abstract

As trade is an important driver of growth and infrastructure is a necessity for trade, infrastructure development has a key role to play in economic development. This study aims to quantify the potential benefits of the development of the economic transport corridors, along with the implementation of the Cross-Border Transport Agreement (CBTA) in the Greater Mekong Subregion (GMS). Some of the key linkages between upgraded infrastructure, economic growth, and sectoral responses are explored using a computable general equilibrium (CGE) framework. The study provides a static view of one-off gains from a conservative estimate in a reduction in transport costs and improvements in trade facilitation. The findings show clear gains from improvements in physical land transport and the more substantial gains from improved trade facilitation. The results also provide a glimpse into the potential gains from intra-regional trade, highlighting the potential markets within the GMS. The implications of these results are that once a sufficient physical system is in place, additional benefits are marginal compared with improvements in policy initiatives under the heading of trade facilitation. While the GMS does not have the level of physical infrastructure that would be considered adequate for its desired level of economic activity, the results show that investing in soft aspects now still has substantial payback. In the future, as a greater physical base is put in place, the region should enjoy further benefits from expanded markets having a solid trade facilitation system in place. In sum, the CBTA and transport corridor development can significantly improve transit times and trade service costs, albeit with some drawbacks, throughout the region.

JEL Classification: F15, I32, L91, O19

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1. INTRODUCTION

The rise in international trade in the world economy is a well documented phenomenon, with total exports of goods and services rising from 13% of world gross national product (GDP) in 1970 to 27% by 2005 (World Bank 2008b). Successive rounds of trade liberalization under first the General Agreement on Tariffs and Trade (GATT), then the World Trade Organization (WTO), have led to deeper and broader tariff reductions. However, as tariff reduction and reform have entered increasingly sensitive areas, leading to more protracted and contentious negotiations, attention has turned to reform in the rules of trade. Harmonization and simplification became recognized as sources of potential gains even as tariff reductions stalled. Indeed, recent studies have postulated that the potential gains from reforms in expanded access or trade facilitation may be even greater than those from tariff reduction (Organisation for Economic Co-operation and Development [OECD] 2003).

This move toward greater emphasis on process was demonstrated through the inclusion of trade facilitation to the Doha Round negotiations. These negotiations did not attempt to target the entire logistical supply chain but rather focused on how nations control the way in which goods move across their borders through various inspection and approval stages. Improving existing rules, providing less-developed countries with technical assistance and support, and improving coordination between customs authorities were identified as priority areas in these negotiations.

With further multilateral tariff reductions at a standstill, firms' access to international markets depends more and more on their ability to obtain efficient and low-cost trade services and logistics, including transparent and harmonized rules and regulations among markets. The crux of the trade and transport facilitation agenda is to maximize efficiency while safeguarding legitimate regulatory objectives. This is a challenge given that the concept of trade facilitation covers a broad range of obstacles, both deliberate and unintended, limiting market access.¹ These obstacles may comprise human and physical infrastructure, along with institutions including customs and trade related services. Physical infrastructure, especially transport infrastructure, is a fundamental piece of this puzzle.

As trade is an important driver of growth and infrastructure is a necessity for trade, infrastructure development has a key role to play in economic development. This has long been recognized in the Greater Mekong Subregion (GMS).² The transport sector was one of the first areas of cooperation under the GMS Cooperation Program which began in 1992.³ At the time, national boundaries in the region were, for all practical purposes, closed and most of the region's infrastructure was of a very poor quality (Ishida 2007). The program set out to open borders and improve connections to make trade easier, spur development, and strengthen the region's ability to compete in the face of globalization.

To further the Cooperative Program, in 1995, the GMS adopted the Transport Master Plan which identified priority transport links—mostly road projects—designed to generate the greatest and most immediate improvements in connectivity. This was seen as an important step in economic development, with improvements in transportation infrastructure boosting economic opportunities in the region by, for example, significantly reducing travel times and costs. As the GMS countries have moved away from a strategy of self sufficiency to one of

¹ For a definition of trade facilitation see: http://www.wto.org/english/thewto_e/glossary_e/glossary_e.htm (accessed 26 August 2008).

² The GMS comprises Cambodia, Lao People's Democratic Republic (PDR), Myanmar, Thailand, and Viet Nam, as well as Yunnan Province and Guangxi Zhuang Autonomous Region of the People's Republic of China (PRC).

³ The GMS Economic Cooperation Program is an ADB-supported comprehensive program of economic cooperation among the countries of the Greater Mekong Subregion.

regional cooperation, major efforts have been made to develop the infrastructure linking the GMS and beyond.

Once priority road networks were identified, the GMS turned its attention to other issues of trade facilitation. In 2003, the economies entered into a Cross-Border Transport Agreement (CBTA) which was developed to set up agreements between GMS countries to ease the movement of people and goods across borders. The CBTA covers facilitation of border-crossing formalities, the exchange of commercial traffic rights, establishment of transit traffic regimes, and also the setting of infrastructure standards and requirements for road vehicles in cross-border traffic. As of March 2007, all GMS countries had signed the agreement. The CBTA, in conjunction with the transport corridor development, has the potential to significantly improve time and costs of goods transportation throughout the region.

The purpose of this study is to quantify the potential benefits of the development of the economic transport corridors, along with the implementation of the CBTA in the GMS. Some of the key linkages between the upgraded infrastructure, economic growth, and sectoral responses will be explored with a computable general equilibrium (CGE) framework. This framework is particularly well-suited to this task, since it explicitly accounts for all sectors within an economy, as well as the interactions between them. This framework can be used to quantify how the costs and benefits of improved infrastructure are transmitted between markets and how they impact on different sectors within markets. As well as highlighting trade-offs for particular sectors, CGE models can quantify the anticipated overall economic impact of infrastructure improvement.

We begin by outlining key economic and infrastructure issues in the GMS (section II), followed by discussion of currently available estimates of how the infrastructure development is likely to impact the region (section III). We then introduce a global trade model that will be used to generate insights into some of the likely impacts of improved trade facilitation and infrastructure development on GMS countries (section IV). This is followed by development and analysis of some specific scenarios that explore the potential impact of the improved infrastructure and trade facilitation measures (section V). We discuss some potential adverse impacts of the infrastructure development, before drawing some tentative conclusions (section VI).

2. INFRASTRUCTURE AND DEVELOPMENT IN THE GMS

Almost 320 million people live in the GMS region which is strategically located, bridging South, Southeast, and East Asia. While the Mekong region is widely considered to have the potential to be one of the world's fastest growing areas, economic development continues to elude some of the countries in the region and alleviating poverty remains a significant challenge.⁴ Thus, the GMS has outlined an ambitious program of infrastructure investment and trade facilitation. Infrastructure investment has been shown to be an important mechanism to facilitate growth and development in a developing economy.⁵

Table 1 presents summary data for the GMS. Populations range from under 6 million people in Lao People's Democratic Republic (Lao PDR) to over 90 million in the combined Yunnan/Guanxi region of People's Republic of China (PRC). Likewise the economies range widely in size, with Lao PDR's GDP value at US\$3.4 billion while Thailand's GDP is around 60 times as large, at over US\$206 billion. Gross national income (GNI)/GDP per capita ranges from US\$500 or under in Cambodia, Lao PDR, and Myanmar, to over US\$3,000 in Thailand. While there is some variation across the GMS, overall it remains a relatively poor region.

⁴ For more information about the GMS, see www.adb.org/GMS/about.asp

⁵ For a review of infrastructure and growth in developing countries, see Straub (2008).

Table 1: Selected Aggregate Indicators for the GMS and PRC, 2006⁶

	Population (m)	GDP (US\$b)	GNI per capita (USD)	Intra-GMS share of total Exports ¹		Intra-GMS share of total Imports ¹	
				No PRC	PRC	No PRC	PRC
Cambodia	14.2	7.3	490	2.5%	3.6%	2.5%	3.9%
Lao PDR	5.8	3.4	500	17.9%	20.7%	19.6%	22.6%
Myanmar	48.4	..	281 ²	36.3%	43.2%	35.9%	43.1%
Thailand	63.4	206.3	3,050	3.0%	13.8%	3.1%	14.0%
Viet Nam	84.1	61.0	700	1.7%	10.3%	1.8%	10.6%
PRC Total	1,311.8	2,644.7	2,000	2.1%		2.2%	
PRC GMS ³	92.3	75.4	702	n/a		n/a	

Source: World Bank 2008b, except the following:

1. GTAP Database V7 base year 2004, without PRC/with PRC.

2. ADB 2008a.

3. Yunnan and Guangxi: Population 2003, GDP 2004, GDP per capita, 2005 (Akrasanee 2006); n/a- not available.

There is also variation across the region in terms of intra-regional trade dependence and the degree to which the PRC plays a role in that dependence (last two columns of Table 1).⁷ The highest dependency rate is found in Myanmar where over 35% of its imports and exports are sourced within the GMS. The PRC appears to play a small but significant role, increasing those shares by about 7%. Cambodia and Lao PDR do not appear to be overly dependent on the PRC. Indeed, their intra-GMS trade shares change little whether the PRC is included or not. The two economies most dependent on the connection with the PRC appear to be Thailand and Viet Nam. The share of Thailand's imports sourced from GMS changes by a factor of 4.6 depending on whether the PRC is included. For Viet Nam it is even higher, increasing 5.5 times. This closer link with the PRC in terms of trade is apparent in the results shown later in the paper.

In terms of physical measures, such as population density and land area, again GMS countries vary. Land area ranges from under 180 million km² in the case of Cambodia to over 650 million km² for Myanmar (Table 2). Population density ranges from 25 people per square kilometer in Lao PDR to over ten times this density in Viet Nam, at 271 people per square kilometer. It is notable from Table 2, that the poorest countries—i.e., Cambodia, Lao PDR, and Myanmar—all have limited road networks with less than 15% of roads paved. These are also countries with relatively low population densities and limited resources to provide rural populations with access to markets and the accompanying opportunities. Movement by rail in the region is also fairly limited.

⁶ Gross national income (GNI) per capita is the measure now favored by the World Bank; it used to be known as gross national product (GNP) per capita.

⁷ Table A3 presents detailed intra-GMS export flows. The variation in intra-GMS exports is substantial for some industries as shown in the table.

Table 2: Selected Geographic, Population, and Infrastructure Indicators for the GMS, 2006

	Land area (mil km ²)	Population density (per km ²)	Rural Pop (% tot)	Roads (mil km) ¹	Paved roads (% tot) ¹	Rail lines (mil km) ¹
Cambodia	176.52	80.4	79.7	38.3	6.3	0.7
Lao PDR	230.80	25.0	79.0	31.2	14.4	..
Myanmar	657.55	73.6	68.7	28.0	11.4	..
Thailand	510.89	124.2	67.4	57.4	98.5	4.0
Viet Nam	310.07	271.3	73.1	222.2	25.1	2.7
PRC	9,327.49	140.6	58.7	1,930.5	81.6	62.2
PRC GMS ²	630.80	150.4		288.8		5.0

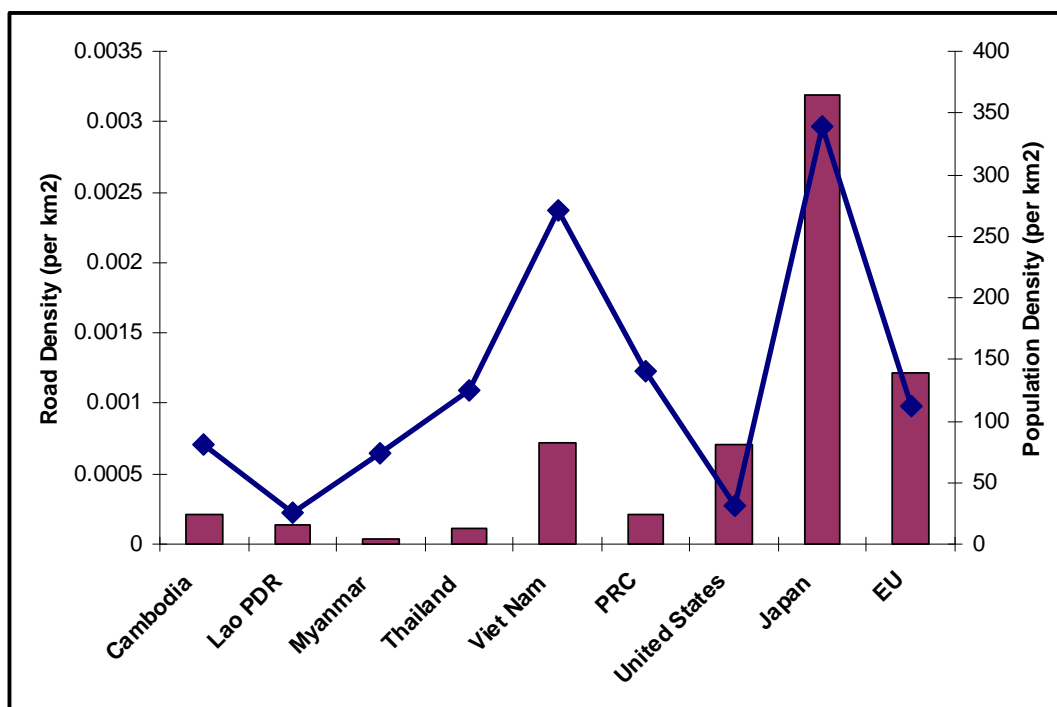
1. PRC 2005; Cambodia 2004; Lao PDR 2003; Viet Nam Roads and Rail lines 2004, paved roads 1998, PRC GMS sourced from National Bureau of Statistics of China 2007, Table 16.14.

2. Yunnan and Guanxi, source UNESCAP 2008, average population density calculated from 2000 data.

Source: World Bank 2008b.

Looking at the land area and road coverage, an indication of road density can be calculated; that is, the kilometers of road per square kilometer of land. As a basis for comparison, we have shown this road density figure with population density and have included the United States (US), Japan, and the EU. The results are shown in Figure 1 with the bars referring to the road density and the line to population density. As the figure shows, the population density for all GMS countries is well above road density (the exception being Lao PDR). While the US and Viet Nam have very similar road density figures (roughly 0.0007 kilometer of road for every square kilometer of land), their population densities are very different (254 for Viet Nam and 31 for the US). If one assumes that the developed world has a roughly appropriate level of road networks for a given level of economic activity, the substantial differences between the level of service in the GMS countries and the US, Japan, and the EU provide an indication of the great need to expand transport networks within the GMS.

Figure 1: Road vs. Population Density



Source: Table 2 above and authors' calculations.

This gap in road networks has a direct impact on the GMS' ability to attract investment to the region. The changing nature of global production patterns has affected economic development both within and outside the GMS region depending on, among other things, transport service availability and quality. Variations in the logistics costs among countries stem from differences in the quality and cost of infrastructure services, including customs procedures and institutional quality. Opportunities for trade expansion and foreign investment depend on improving trade facilitation and road transport services.

There are several sources of comparison data among economies for trade facilitation. The World Bank's (2008a) *Doing Business* database provides measures on regulation and other business costs for 178 economies. Tables 3 and 4 present some summary statistics for trading costs in the GMS. Table 3 shows the main trade indicators for the region along with the OECD average. What is immediately apparent from the table is the discrepancy between the costs of handling a container, both importing and exporting, and the time involved in conducting trade. The export and import container costs, with the exception of Lao PDR, are all less than the OECD average. However, the time involved for each is considerably higher. While the cost to export a container from the GMS (excluding Lao PDR) averages about 34% less than the OECD average, the time needed for exporting from the GMS region (again, excluding Lao PDR) is 250% higher than the OECD average. This is a significant matter in global competition as time costs for trade are an important factor for most businesses.⁸

⁸ See Djankov, Freund, and Pham. (2008) for a discussion of time costs in trade in general and Brooks and Hummels (forthcoming 2009) for Asia in particular.

Table 3: Main Indicators for Trading Across Borders, GMS

Region or Economy	Documents for export (number)	Time for export (days)	Cost to export (US\$ per container)	Documents for import (number)	Time for import (days)	Cost to import (US\$ per container)
Cambodia	11	37	722	11	46	852
Lao PDR	9	50	1750	10	50	1930
Thailand	7	17	615	9	14	786
Viet Nam	6	24	669	8	23	881
PRC	7	21	390	6	24	430
Avg. OECD	5	10	905	5	10	986

Source: World Bank 2008a

Table 4 provides some details as to where these time delays can be found. Document preparation is a large stumbling block, taking as long as 33 days for exports from Lao PDR but still as many as 9 days for Thailand and 14 days for the PRC. Inland transport and customs clearance are also sources of delay. Shepherd and Wilson (2008) show that Association of Southeast Asian Nations (ASEAN) countries in general have much to gain from improved trade facilitation, in particular from improved transport infrastructure and information technology that affect timing issues like document preparation and inland transport.

In addition to work done by the World Bank, the World Economic Forum (WEF) has turned its attention to trade facilitation through the Global Enabling Trade Report (WEF 2008).

Table 4: Time Taken for Procedures to Trade Across Borders, GMS (in days)

	Cambodia	Lao PDR	Thailand	Viet Nam	PRC	High income OECD ¹
<u>Exports</u>						
Documents preparation	29	33	9	12	14	
Customs clearance	3	3	1	5	2	1.9
Ports	3	4	4	3	2	1.1
Inland transportation	2	10	3	4	3	2.1
Total	37	50	17	24	21	
Total without document preparation	8	17	8	12	7	5.1
<u>Imports</u>						
Documents preparation	34	33	8	12	15	
Customs clearance	3	8	2	5	4	1.4
Ports	5	2	2	4	2	2.5
Inland transportation	4	7	2	2	3	1.6
Total	46	50	14	23	24	
Total without document preparation	12	17	6	11	9	5.5

1. Average of high income/OECD economies.

Source: World Bank 2008a

The report's aim is to measure the extent to which countries have in place factors and policies that enable trade. Several indices contained in the report measure these factors, along with policies and services facilitating the movement of goods over borders. Tables 5 and 6 present some of these statistics for the GMS.

Of the 188 economies examined in the WEF report, the regional economies of Singapore and Hong Kong, China rank numbers 1 and 2, respectively, on the list. Not surprisingly, GMS countries do not rate nearly as highly. Even the PRC, while considered a powerhouse of trade, ranks fairly low due to time consuming border administration, including a lack of

transparency and high tariff and non-tariff barriers. Market access and border administration are well below average for all GMS countries reported.

Table 5: Selected Variables from Enabling Trade Index¹

	Overall Ranking ²	Market Access ³		Border Administration ⁴	
		Rank	Score	Rank	Score
Cambodia	113	108	2.62	107	2.74
PRC	48	71	4.07	43	4.51
Thailand	52	62	4.25	56	4.07
Viet Nam	91	112	2.50	76	3.60
Hong Kong, China	1	1	6.66	7	5.99

1. No statistics were reported for Lao PDR or Myanmar.

2. Out of 118.

3. Based on tariff and non-tariff barriers and proclivity to trade measures. Score is out of 7.

4. Based on efficiency of customs administration, import/export procedures and transparency. Score is out of 7.

Source: WEF 2008.

Table 6: Transport and Communication Infrastructure¹

	Transport and Communication Total		Availability and quality of transport infrastructure		Availability and quality of transport services		Availability and use of ICT	
	Rank	Score	Rank	Score	Rank	Score	Rank	Score
Cambodia	105	2.48	98	2.81	101	2.94	112	1.69
PRC	36	4.15	36	4.42	17	5.10	55	2.92
Thailand	41	3.93	29	4.62	30	4.47	64	2.70
Viet Nam	75	3.08	100	2.81	48	3.89	71	2.54
Hong Kong, China	4	5.66	14	5.18	4	5.96	6	5.84

1. No data were reported for Lao PDR or Myanmar.

Source: WEF 2008.

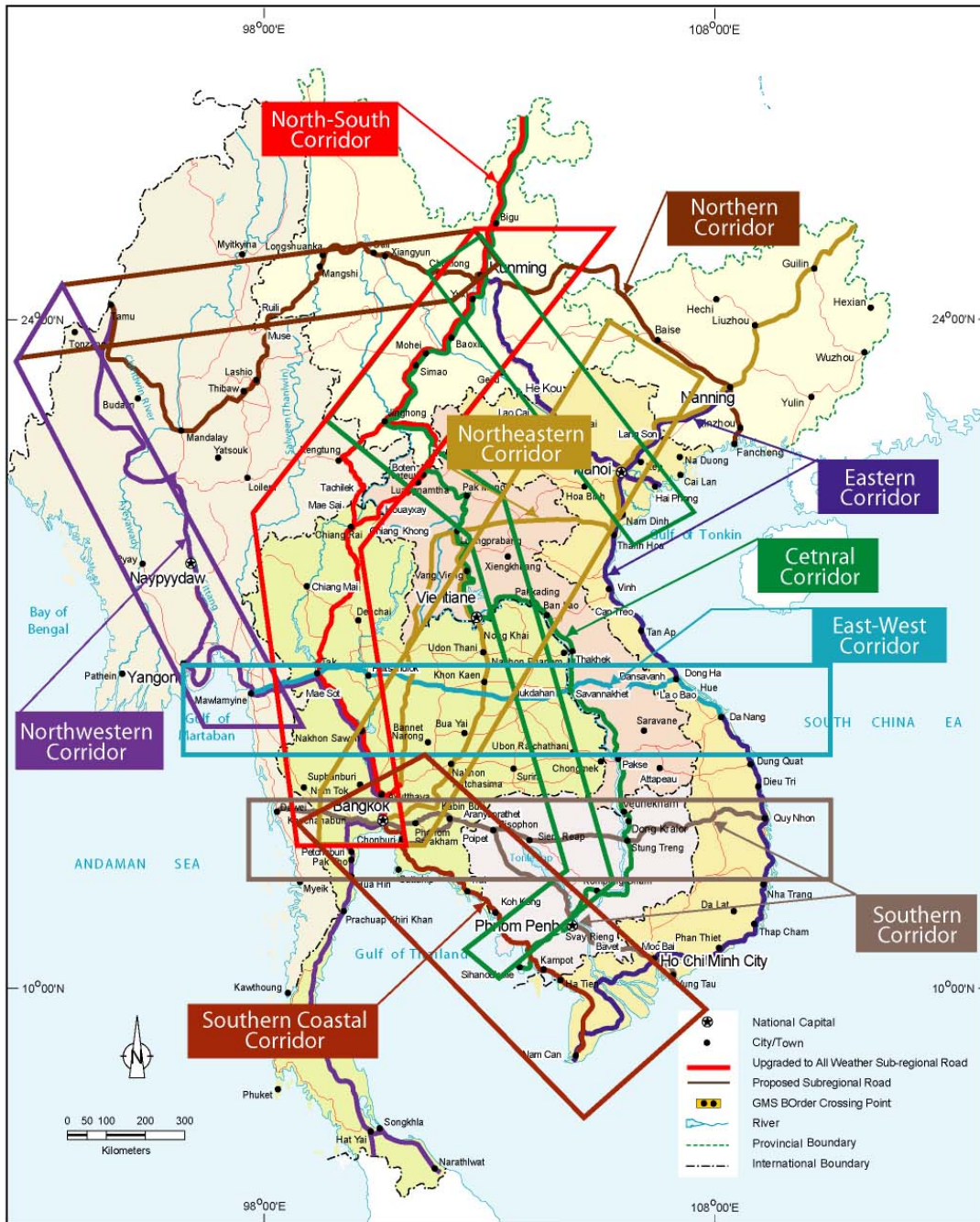
Specifically looking at transport and communications, the areas cited by Shepherd and Wilson (2008) as offering the most promise from reform, rankings for GMS economies were slightly better than the overall rank shown in Table 5. The best performance for the GMS generally came in the category of availability and quality of transport services, suggesting that the GMS transport strategy is having a positive affect.

Finally, in a study examining the logistics performance for the ASEAN region as a whole, Nathan Associates (2007) found that transporting goods by road between Lao PDR and the Thai border, for instance, cost shippers four times more than the international norm (including Asia). While the national logistics costs relative to GDP were approximately 8% for Singapore, they were found to be closer to 20% for Viet Nam and Thailand. Across ASEAN, the report found that export logistics costs expressed on an *FOB* basis were as high as 25% for some products. A breakdown of logistics costs are as follows: procurement, 17%; inventory holding, 10%; warehousing, 11%; transport, 28%; and export processing, 34%. The largest categories are transport and export processing, two that have been directly targeted through the GMS Transport Strategy and the CBTA.

The GMS regional economic corridors program was undertaken to address problems such as those identified in the reports and studies outlined above. The goal is to stimulate the

effective and efficient growth of direct investment and production facilities through the identification of corridors for major transport infrastructure development. This economic corridor approach to sub-regional development was adopted as a fundamental strategy to accelerate the pace of GMS cooperation and to help realize the region's potential. Three corridors were identified as flagship programs under this approach: the North-South Economic Corridor (NSEC), East-West Economic Corridor (EWEC), and Southern Economic Corridor (SEC). In 2007, the GMS ministers agreed to expand the program to a total of nine economic corridors (Figure 2).

Figure 2: Nine GMS Economic Corridors



Source: ADB.

3. ESTIMATION OF IMPACTS OF THE GMS ECONOMIC CORRIDORS

Economic corridors are meant to attract investment and generate economic activities along a region, usually with the aim toward development. They are meant to provide two fundamental attributes for development: lower distribution costs and improved land supply for economic activities. However, physical links and logistics facilitation must be in place in the corridors for them to achieve these aims. Therefore, the GMS adopted the CBTA and the economic corridor development strategy. We move now to examine a range of studies that attempt to estimate and quantify the benefits of these programs and the associated trade facilitation developments.

A study of the SEC's impact on Cambodia conducted by the Mekong Institute found an increase in living standards of those along the corridor (Phyrum, Sothy, and Horn 2007). The study reported improved access to healthcare, education, and markets as well as the development of additional public service facilities. It also reported an improvement in trade routes and reduced trade costs at cross-border points.⁹ The tourism sector was said to have added more than 560,000 jobs in light of the SEC, representing over 8% of total employment in 2004. The authors of the study also estimated that this sector added almost 5 percentage points to GDP in direct economic activity and another 10.5% in indirect.

The Japan International Cooperation Agency (JICA), along with the ALMEC Corporation, has undertaken a series of studies on cross border infrastructure. Phase 2 was conducted in 2007 and focused on the GMS (JICA 2007). The study estimated expected regional GDP growth as a result of the cross-border transport initiatives, including the CBTA and the three original economic corridors. Under varying assumptions the study estimated that potential GDP growth in each country ranges from 0.2% in the PRC, under relatively conservative assumptions on road development, to an almost threefold increase for Lao PDR under more ambitious assumptions (Table 7).

Table 7: JICA/ALMEC Projections for Regional GDP Growth¹

	Case 1	Case 2	Case 3	Case 4	Case 5
Cambodia	2.4	55.7	126.5	149.9	137.1
Lao PDR	55.8	0.6	234.3	266.8	231.4
Myanmar	2.8	2.8	4.5	111.0	91.5
Thailand	23.5	19.1	81.6	97.7	89.4
Viet Nam	8.1	10.2	37.7	110.9	104.1
PRC	0.2	0.1	1.7	4.5	4.1

1. Demand forecasts were made based on various scenarios of cross border linkages including abolishing all border-crossing procedures in the region, essentially creating a common market (Case 4). See report for details.

Source: JICA 2007.

A 2006 Japan External Trade Organization (JETRO) study found that with improvements in the land transport network of Thailand, Lao PDR, and Viet Nam, including completion of the Second Mekong International Bridge linking Lao PDR and Thailand (part of the EWEC), transit times could be reduced by 25% (JETRO 2005). These findings were based on surveys of Japanese firms operating in the region.

⁹ Empirical estimates were not provided.

Banomyong (2007) analyzed the impact of the NSEC on logistics in the GMS region. He found major improvements in both time savings and shipping costs with the full implementation of the economic corridor. Table 8 outlines the results for the two case studies examined. The projected reduction in shipping costs varies between 17% and 60%. Time savings estimates are in a tighter range, averaging under 40%. The author states that while the NSEC may lead to substantial savings, the institutional framework is still weak, leading to an uncertain environment for shippers and consignees. The report concludes that with improved border crossings, the NSEC will evolve into a true logistics corridor.

Table 8: Trends in the North-South Economic Corridor

Bangkok-Kunming	US\$ per Ton	% Change	Transit Time (hours)	% Change	Perception of reliability (based on a 5 pt scale)
R3W (via Myanmar)					
• 2000	639		77		2.2
• 2006	470	26.5	46	40.3	3.0
• 2015	269	42.8	30	34.8	3.5
R3E (via Lao PDR)					
• 2000	563		78		2.6
• 2006	392	30.4	51	34.6	3.3
• 2015	210	46.4	30	41.2	4.0
Via Mekong					
• 2000	406		128		2.7
• 2006	271	33.3	88	31.7	3.4
• 2015	107	60.5	70	24.5	3.7
Hai phong-Kunming					
• 2000	105		85		2.4
• 2006	87	17.0	58	32.0	2.7
• 2015	43	50.5	26.5	54.3	3.8

Source: Banomyong 2007.

The immediate benefit of the EWEC was the improved connectivity and integration with the neighboring countries—Thailand, Lao PDR, and Viet Nam—resulting in reduced travel time and transport costs. A 75% reduction in travel time between Dansavahn in Lao PDR and Khanthabouly in Viet Nam over values reported in 2001 was found by Luanglatbandith (2007). During the past five year, growth in this transport sector has been substantial, with the number of passenger buses along the corridor increasing 160% and the number of freight operators doubling between 2000 and 2005 (Luanglatbandith 2007).

Following the opening of the second Mekong Bridge at the end of 2006, the first two months of 2007 alone saw an 8% increase in tourists compared to the same period in 2006. With the improvement in Route 9 (also part of the EWEC), the province of Savannakhet in Lao PDR, saw the number of tourist arrivals increase almost 145%, rising to 222,063, compared with 1999 levels (Luanglatbandith 2007). More than half of such tourism is regionally based originating in Thailand, Lao PDR, and Viet Nam. According to the study, easier access to new farming technology and cheaper inputs from Thailand and Viet Nam has increased the productivity of the agricultural center in Savannakhet. Annual growth in this sector averaged 7.2%, well above the national average of 3.4%.

In a country-specific study, Menon and Warr (2006) estimated the impact of improvement in road conditions for Lao PDR of the kind covered in the GMS Transport Strategy. They found that vehicle operating costs (VOC) would be reduced anywhere from 16% to 65% depending on the type of road initially in place (including no road) and the type of upgrade performed on the road in question.

A broader, more indicative approach to the determination of the potential gains of the GMS economic corridor programs can be found using the Nathan Associates report on ASEAN logistics (Nathan Associates 2007). Table 9 presents the costs and time to shippers along two corridors in the GMS, versus international norms as reported in the study. As shown, most measures for the corridors are rated fair to poor.

The report cites that a lack of funding for road maintenance on international routes, a low standard for international truck facilities at border crossing and transloading areas, and a lack of agreements allowing trucks to travel easily from one country to another with transit goods as chief reasons for the corridors' poor performance. All these measures are covered under the recently signed CBTA. Notably, customs were cited as a stand out in good performance for both corridors examined.

Table 9: Selected Variables for Logistics Costs

	Cost to Shipper (\$)		Time to Shipper		Overall Rating
	Actual	Norm ^a	Actual	Norm ¹	
<i>Vientiane-Laem Chabang Corridor</i>					
Port and Terminal Operations	70	50–150	3.5 days	3–5 days	Good
Seaport customs	0	0–50	0.5 hrs	0.5–1.5 hrs	Good
Rail transport	35	0–50	3.5 hrs	2.5–3.5 hrs	Good
Inland clearance Operations	62.5	10–30	2.5 days	1–2 days	Fair
Road transport	845	200–300	16 hrs	12–15 hrs.	Fair-Poor
Transloading	50	50–150	2 hrs	2–4 hrs	Good
Inland customs	180	100–300	3 hrs	2–4 hrs	Good
Export Formalities	120	50–150	12 days	3–5 days	Poor
Total²	1,362	820 avg.	18.5 days	10.5 days	Fair
<i>Danang-Mukdaharn Corridor</i>					
Import formalities	200	50–150	10 days	2–3 days	Poor
Port and Terminal Operations	107	50–150	0.5 days	0.5–2 days	Good
Seaport customs	262	50–150	1 day	1–3 days	Fair
Road transport	581	120–180	10.5 hrs	0.5–1 day	Fair-Poor
River crossing	132	50–100	3.5 hrs	2–4 hrs	Fair
Transloading	316	50–150	2 hrs	2–4 hrs	Fair
Inland customs	28	100–300	1 hrs	2–4 hrs	Good
Total²	1,626	825 avg	18.5 days	7 days	Fair-Poor

1. Based on international standards for given task/distance.

2. Total does not add as reporting selected components of total logistics costs.

Source: Nathan Associates 2007.

If full implementation of the CBTA, and the economic transport strategy were to bring the transport network in the GMS on par with well performing roads in the Asian region, according to these numbers, costs would be reduced by between 40% and 50% for both corridors. Total costs to shippers along the Vientiane-Laem Chabang corridor would be

reduced 40% and along the Danang-Mukdaharn corridor by almost 50%. Time savings would be 43% and 63%, respectively.

Several ADB studies were also consulted. The first (ADB 2007a), a detailed study of part of the EWEC, analyzes the effects of the Second Mekong International Bridge, Mekong Bridge Access Roads, Road 9 Rehabilitation, Highway 1 Periodic Maintenance, and Da Nang Port Improvement on Lao PDR and Viet Nam. The report found that VOC were reduced between 2% and 32% with a median of 16% and that transit times were reduced by around 25%. The value of trade across the border of the two countries was found to increase by 41% between 2003 and 2006. The report concludes that these projects were successful in achieving their primary objectives of increasing the movement of people and goods, reducing the VOC and travel time while increasing the level of traffic achievable in the region.

The second study (ADB 2007b), examined the impacts of improvements in the highway links between Phnom Penh in Cambodia and Ho Chi Minh City in Viet Nam. It estimated that VOC were reduced 10% for passenger cars and by 15% for trucks and buses. In Cambodia, travel time from Phnom Penh to the border was reduced by 30%, with similar reductions achieved in Viet Nam. The value of trade along the border increased by over 40% per annum between 2003 and 2006.

Finally, some preliminary work evaluating the entire EWEC by ADB (ADB 2008c) has shown that while Thailand is relatively efficient in its trade facilitating environment, compared with “best practice” countries such as Singapore, it is still far behind almost all of the national logistics performance indicators. The study estimated time needed to export averaged 17 days in Thailand while in Singapore it averaged just 5 days. Importers experience a smaller but still significant gap: 9 days in Thailand and 3 days in Singapore. Once the EWEC corridor is completed, and policies have been implemented, estimates suggest that the travel time along the corridor will be cut in half.

The evidence suggests that improvements in transport infrastructure and trade facilitation in the GMS can bring substantial gains to the region. The studies reviewed above report cost-saving values ranging from 16% to 65% with the median value being around 45%. The last three studies report time savings between 25% and 50%.

Benefits from the economic corridor project and the CBTA can manifest themselves in two ways: reductions in the direct cost of operating vehicles on roads and reductions in the costs of trading goods across borders. Some estimates suggest that indirect costs from time delays can have a greater impact on trade volumes than direct costs (OECD 2003). Within the model, we can adjust the direct costs of transport through the international transport margins and the trade costs of trade facilitation through technology changes. Both approaches are applied in this work.

4. THE GTAP MODEL

The GTAP model draws on a set of economic accounts for each country/region, with detailed inter-industry links. Using a global CGE model such as GTAP enables interactions between regions and sectors to be captured within a fully consistent framework. Although it is a very comprehensive global trade model, simplifications, and abstractions from the real world still have to be made.

The model we used for this study is comparative, static, and assumes perfectly competitive markets with constant returns to scale, as in the standard version of the GTAP model (Hertel 1997). Other standard features of the model are also retained, for example, the behavior of private individuals, firms, and governments is modeled, along with responses to changing resource and market conditions. Consumers maximize welfare, subject to their budget limitations, with a relatively sophisticated representation of consumer demand, allowing for regional differences in the price and income elasticities of demand. Firms maximize profits

using the limited resources available in the economy. In particular, five primary factors of production (land, natural resources, physical capital, and skilled and unskilled labor) are combined with intermediate inputs, including imports, to produce final output. Armington elasticities allow differentiation between imports from different countries in the GMS and elsewhere, specifying the extent to which substitution is possible between imports from various sources, as well as substitution between imports and domestic production. When the impact of the infrastructure improvement is simulated, prices and quantities of marketed commodities, along with impacts on incomes and GDP, are all endogenously determined within the model.¹⁰

4.1 The GTAP Database

For the current version of this paper, we used version 7 of the GTAP database, covering 113 countries/regions and 57 sectors, with a base year of 2004. This version of the GTAP database includes Cambodia, Lao PDR, Myanmar, Thailand, and Viet Nam. While the PRC is available in the GTAP database, Yunnan Province and Guangxi Zhuang Autonomous Region are not available separately, therefore we included the PRC in the analysis.¹¹ We aggregated the GTAP 7 database to cover available GMS regions and incorporate relatively heavy disaggregation of sectors of key importance to the region. Details of the regional and commodity aggregation used are in Tables A1 and A2.

The GTAP model includes international transportation margins for air, water and other transportation (which is primarily land transport). Tables A4.a and A4.b of the Appendix show the cost of bilateral GMS land transport margins as a proportion of the value of exports as calculated from the GTAP database. Cross-border land transport costs are likely to be relatively significant for poorer economies with less-developed infrastructure. This appears to be reflected to some extent in the database, with cross-border land transport margins appearing most significant for the relatively poor countries of Cambodia, Myanmar, and Lao PDR.¹²

5. SCENARIOS AND RESULTS

This section presents the results of three scenarios. Scenario 1 examines the impact of reducing transport costs in the GMS region by 45%. This was the median value found by many of the studies outlined above. The margins for the PRC were also reduced, but by 25% to reflect that smaller amount of trade by land transport that takes place in the two provinces associated with the GMS versus the country as a whole. The effect is to lower the costs of the land transport of goods within the GMS.

The second scenario explores the effects of an improvement in trade facilitation and time costs reducing overall trade costs. We implemented an approach introduced in Hertel, Walmsley, and Ikatra (2001) and further refined in Minor and Tsigas (2008). The approach allows for region specific shift in the Armington demand function, effectively lowering the foreign market price. The market price reduction is simulated by a technical change. Again, based on the studies of expected time savings if the CBTA were to achieve improved facilitation to world standards, we assume a reduction in costs of 25%. We need to differentiate the shock for the PRC to take account of the fact that the entire economy is represented in the model while only the Yunnan Province and Guangxi Zhuang Autonomous Region are part of GMS. According to Chinese national statistics, these two regions account

¹⁰ The model is solved using GEMPACK software (Harrison and Pearson 1996), using the RunGTAP interface.

¹¹ Further details of full GTAP 7 database are available at:
www.gtap.agecon.purdue.edu/databases/contribute/iotables.asp.

¹² In the absence of available actual transportation cost data to produce a complete set of bilateral margins for the GTAP dataset, these transport margins are estimates (Gehlhar and McDougall 2006).

for about 5% of the trade and economic activity of the country (National Bureau of Statistics of China 2007). Therefore, we reduced costs in the PRC by 5% to proxy a reduction on the relevant regions.

The third and final scenario combines the two scenarios outlined above. The first scenario is an attempt to capture the improvements in the physical connectivity associated with the GMS Transport Strategy and three economic corridors in the region. Estimates of the cost savings through reduced VOC, improved efficiency of trucks, and drivers and other cost savings are proxied by a reduction in the international land transport costs in the GTAP model. The second scenario attempts to capture the benefits of the time savings from these road improvements, but more importantly, the implementation of the CBTA. Through improved border crossing, harmonization of registration and other bureaucratic matters, trade facilitation should be improved throughout the GMS. As previously cited, these cost savings have the potential to surpass cost savings in tariff reductions over time.

We have based the estimated cost reductions for first two scenarios on studies which have attempted to quantify such savings in the region. However, it is likely these savings estimates include aspects of each process; i.e., the physical road improvements and the trade facilitation aspects embodied in the CBTA. By applying a straight combination of the two scenarios there is no attempt to account for any potential redundancies. However, given the dynamic effects observed in the anecdotal studies reported here (e.g., Luanglatbandith 2007; Phyrum, Sothy, and Horn 2007; JICA 2007), we believe that the cost reductions we have applied may be an understatement of the true effects. Thus, combining the two may provide a better indication of the potential benefits available to the region. We believe this provides some partial indication of the types of potential benefits from the dynamic changes likely to take place in the region.

Table 10 presents the results of the 45% reduction in the land transport margin on each of the GMS economies, including the PRC (at 25%). Welfare has improved in each economy with Viet Nam benefiting the most in dollar terms. Viet Nam has higher land transport margins on its exports than any other GMS country with significant trade flows, thus it has the most to gain from a reduction in these costs (Tables A4.a and A4.b). Lao PDR and Myanmar, which have the largest trade weighted land transport costs, have smaller dollar value gains due to their smaller trade base (Tables A3.a and A3.b).

Table 10: Results Scenario 1-Transport cost reduction

	Cambodia	Lao PDR	Myanmar	Thailand	Viet Nam	PRC ¹
Welfare, Equivalent Variation (US\$m)	7.22	20.04	49.61	85.79	168.94	109.25
GDP (%)	0.08	0.06	0.06	0.01	0.10	0.00
GDP (US\$m)	4.02	1.50	4.33	10.33	42.71	13.00
Change in Imports (%)	0.22	1.97	1.61	0.13	0.69	0.04
Change in Imports (US\$m)	6.92	17.51	53.77	134.05	229.18	212.31
Change in Exports (%)	0.12	-1.47	0.13	-0.08	-0.04	0.02
Change in Exports (US\$m)	4.83	-8.65	4.06	-101.52	-11.21	121.81

1. Individual results for Yunnan Province and Guangxi Zhuang Autonomous Region are not available.

GDP increased in every country, though albeit by small amounts. These small changes can be attributed to the relatively small level of economic activity being affected by the cost

reductions applied.¹³ Imports increase at a greater rate with dollar value trade expanding for every economy. Exports expand to a much lesser extent and even decrease in Lao PDR, Thailand, and Viet Nam, though the latter two by very small amounts.

As the trade in the GMS expands and markets open up due to the full implementation of the CBTA and economic corridors program, gains from reduced transport margins will certainly increase. While CGE models provide abundant insights to the interconnections and detailed workings of the global economy, they do not capture the benefits of the dynamic synergies expected to arise from the investment in the economic corridors in the region. As noted above, our third scenario is an attempt to capture some of this potential.

Table 11 presents the results from the second scenario, measuring the effects of improvements in trade facilitation in the GMS. The gains here are much larger than the first scenario as they impact a much larger share of economic activity. Thailand and Viet Nam gain the most in terms of overall welfare. As shown in Table A3, these two economies have the largest dollar value trade flows in the region.¹⁴ GDP growth is strong across all economies, as is import growth. While Thailand has the highest dollar value increase in imports, Lao PDR has the largest percentage increase. Lao PDR also have the largest percentage decrease in exports. Thailand is the only other economy to experience a decline in exports in this scenario.

Table 11: Results Scenario 2-Trade Cost Reduction¹

	Cambodia	Lao PDR	Myanmar	Thailand	Viet Nam	PRC
Welfare, Equivalent Variation (US\$m)	355.29	236.26	613.44	3,286.30	1,809.91	1,189.74
GDP (%)	6.71	6.32	4.22	0.87	3.15	0.06
GDP (US\$m)	327.69	154.99	325.96	1,411.09	1,355.66	1,051.75
Change in Imports (%)	3.63	10.86	10.22	4.43	5.76	0.26
Change in Imports (US\$m)	114.23	96.63	340.96	4,524.43	1,925.43	1,524.00
Change in Exports (%)	0.18	-15.48	1.26	-3.22	0.14	0.25
Change in Exports (US\$m)	7.57	-91.30	38.00	-3,863.77	40.57	1,614.13

1. Specific information on Yunnan Province and Guangxi Zhuang Autonomous Region is not available so the PRC is included.

Lao PDR's major exports are wood and paper (to Thailand) and textiles and apparel (to Europe). While exports to Thailand in wood and paper increase in this scenario, sales in textiles and apparel to Europe decline. The price differential resulting from improved trade facilitation in the GMS expands regional trade at the expense of trade outside the GMS. Sales to other GMS members such as Thailand and Viet Nam help the overall state of the Lao PDR economy (as evidenced by improvements in welfare and GDP growth) but overall exports do fall.

¹³ There is a high probability that trade flows in the GMS region are underreported due to informal or unofficial trade in the region. Athukurola (2007) estimated these could be as high as 20–30% of trade. However, in the absence of validated estimates of these flows, we have not attempted to include them in this exercise.

¹⁴ While the PRC has the largest absolute amount, only a fraction of the trade flows is attributable to the two regions belonging to the GMS.

Thailand experiences much the same effect in its export sales in electronics and other manufacturing. Regional sales increase but sales to traditional markets in North America and Europe fall, leading to a small overall decline in exports.

These results highlight the potential benefits of improved trade facilitation to development within the region. Right now trade within the region is small compared with trade outside. When trade increases within the region, even by large amounts, it is not as yet a significant enough proportion to offset losses in larger markets outside the region. Despite these export declines, GDP and welfare in the region rises due to gains through improved import pricing. This implies that as the share of trade within the GMS countries increases, the gains from improved trade facilitation within the region will translate into much larger impacts on welfare and GDP and subsequently to larger potential export markets.

Taking the two scenarios and putting them together, the results from the third scenario are presented in Table 12. Here, gains in welfare and GDP are significant but only slightly more than those reported in scenario 2 (Table 11). A possible explanation could be differentiating the gains from “soft” infrastructure versus “hardware” alone. In the first scenario, when physical transport infrastructure costs are reduced, total trade, welfare, and GDP within the region all increase. In the second scenario, costs are reduced due to technological changes owing to improvements in time and other facilitation measures; i.e., the software aspects and all measures increase by even greater amounts. When these are both are combined, we do not see a distinct increase over the “software” analysis alone. Rather, trade increases, GDP growth, and welfare gains are somewhat more than trade facilitation alone. These results provide some insight into the value of facilitation over physical infrastructure improvements alone.

Table 12: Results Scenario 3-Transport and Trade Cost Reduction

	Lao					
	Cambodia	PDR	Myanmar	Thailand	Viet Nam	PRC
Welfare, EV (US\$m)	379.31	264.21	677.81	3,416.51	2,021.12	1,306.13
GDP (%)	7.01	6.43	4.35	0.89	3.29	0.06
GDP (US\$m)	342.31	157.75	336.38	1,436.78	1,415.07	1,068.63
Change in Imports (%)	4.41	14.19	12.15	4.62	6.62	0.30
Change in Imports (US\$m)	139.30	126.27	405.23	4,723.20	2,211.91	1,747.25
Change in Exports (%)	0.66	-16.53	1.39	-3.35	0.14	0.27
Change in Exports (US\$m)	27.16	-95.56	41.94	-4,012.58	41.47	1,747.75

We have argued that a clear benefit of trade facilitation is the expansion of inter-regional trade and the development force which that could be for the GMS. It has also been noted that there is the potential for increases in foreign investment and improved market access to outside the region. Given the small base of intra-regional trade and foreign investment reflected in the base numbers relied upon in this paper, it can be expected that the benefits to the GMS economies of trade facilitation and improved transport facilities will only increase.

That is not to say, however, that physical infrastructure improvements are not as important. Reductions in the costs of operating land transport due to improvements in the GMS' physical infrastructure showed real gains in the region's welfare. Total welfare increased by over US\$330 million, and when the PRC is included, that grows to over US\$440 million. It is important to keep in mind these numbers are generated based on a costs reduction that affects a small margin of a small proportion of economic activity. If more pervasive measures

of land transport infrastructure were available, it is a reasonable assumption that even larger numbers would be generated.

What may be inferred from this result is that once the physical infrastructure is in place, diminishing returns set in rather quickly. Physical infrastructure is a necessary but not sufficient condition for an economy to obtain benefits from trade expansion. Marginal benefits from a physical base are highest when policy programs include trade facilitation.

As a means for estimating the potential increase in regional trade, a base from which synergies and investment benefits can grow, we looked at the change in intra-regional trade flows as a result of the three scenarios. Tables 13 through 15 present the changes in intra-regional GMS trade from each scenario. Due to low reported initial values, Myanmar's results are not reported.

As shown in Tables 10 through 12, overall trade within the region expands under all scenarios. Intra-regionally the pattern is more diverse. The PRC experiences a decline in exports to Cambodia and Lao PDR, but an expansion in Thailand and Viet Nam (Table 13). Lao PDR experiences a slight decline in trade with Cambodia, Viet Nam, and the PRC but these are a reflection of trade diversion to Thailand. All are very small movements and can be expected to improve as trade with Cambodia and Viet Nam grows. Viet Nam experiences the greatest increase in intra-regional imports, while it follows the PRC in export gains.

Table 13: Change in the Value of Intra-GMS Exports (US\$m), Scenario #1

From/To	Cambodia	Lao PDR	Thailand	Viet Nam	PRC	Total
Cambodia	--	-0.01	22.39	7.08	-0.39	29.06
Lao PDR	-0.03	--	18.87	-0.01	-0.22	18.6
Thailand	2.81	21.79	--	26.50	-14.65	36.46
Viet Nam	-0.02	0.00	14.52	--	117.81	132.31
PRC	-1.08	-0.81	147.62	409.90	--	555.64
Total	1.68	20.98	203.40	443.47	102.54	

Examining the second scenario (Table 14) we see much larger increases in intra-regional trade, with all trading partners increasing the size of their trade in the region. Thailand's exports and imports experience the largest gains in dollar value terms, again being the largest trading partner in the region. Viet Nam also exhibits substantial import gains with trade from Cambodia, nearly doubling over its previous levels. Exports from other GMS members to Viet Nam expanded by over US\$4 billion while Thailand alone increases its exports by over US\$7 billion, almost half of it going to Viet Nam. The PRC also expands its trade in the region, the vast majority with Thailand.

Table 14: Change in the Value of Intra-GMS Exports (US\$m), Scenario #2

From/To	Cambodia	Lao PDR	Thailand	Viet Nam	PRC	Total
Cambodia	--	1.51	119.18	82.94	9.62	213.26
Lao PDR	0.07	--	103.63	0.20	-4.36	99.55
Thailand	543.74	220.58	--	3,590.68	2,928.84	7,283.84
Viet Nam	61.80	0.70	1,701.36	--	691.13	2,554.98
PRC	-52.54	-41.67	2,451.48	638.02	--	2,995.29
Total	553.07	181.12	4,375.64	4,311.85	3,625.23	

Examining the effects of both a reduction in land transport costs and improved trade facilitation, we see significant increases in trade flows but not the same level of increase as

seen between the first and second scenarios. Thailand and Viet Nam continue to dominate the results, in addition to the PRC. Half of Thailand's increase in exports go to Viet Nam and the majority of Viet Nam's go to Thailand, although the PRC continues to play a large role in Viet Nam's trade. Cambodia and Lao PDR also substantially increases their exports to Thailand while Cambodia doubles its exports to Viet Nam over initial levels.

Table 15: Change in the Value of Intra-GMS Exports (US\$M), Scenario #3

From/To	Cambodia	Lao PDR	Thailand	Viet Nam	PRC	Total
Cambodia	--	1.46	194.77	100.32	8.17	304.74
Lao PDR	0.03	--	128.39	0.18	-4.80	123.80
Thailand	559.48	249.82	--	3,641.14	2,895.31	7,345.76
Viet Nam	61.91	0.73	1,753.84	--	818.84	2,635.32
PRC	-55.34	-42.39	2,635.13	1,079.77	--	3,617.16
Total	566.08	209.61	4,712.12	4,821.43	3,717.51	

Total trade (imports plus exports) within the GMS expands in all three scenarios. Thailand and Viet Nam expand the most in the two scenarios involving trade facilitation and the PRC in the land transport only scenario. The increasing trade flows for the rest of the GMS are quite large relative to initial values. For example, the US\$123.8 million increase in exports from Lao PDR in scenario 3 represents an 82% increase in exports to the region (almost exclusively to Thailand). The trade between Viet Nam and Cambodia alone increases by a factor of three.

To examine in more detail the nature of this intra-regional increase in trade, Table 16 presents changes exports in selected sectors for all three scenarios. These sectors generally have high land transport margins or are significant items of trade within the GMS. Changes for the selected export sector for each scenario are presented by bilateral partners for the GMS economies where such information is available.

A general trend to note is that the change in total exports for each of the countries listed is less than that for intra-regional trade changes. In all sectors there are scenarios where total exports decline while intra-regional exports rise substantially. For example, fruit and vegetable trade in Cambodia, Thailand, and Viet Nam all decline in scenarios 2 and 3 and increase only marginally in scenario 1. In contrast, intra-regional exports increase substantially. Lao PDR experiences a general decline in exports from trading partners other than Thailand. However, exports in textiles and other manufacturing increase substantially across the region for Lao PDR in scenarios 2 and 3.

As noted earlier, Lao PDR exports 84% of its wood and paper to Thailand at a relatively high cost in land transport: 18% of export value (Tables A3.a and A4.a). In scenario 1 in which land transport margins are reduced, this trade expands nearly 15%. However, when both trade facilitation and margins are reduced, trade increases over three times that amount, by 46%.

An example of the potential of trade facilitation can be seen in Viet Nam's exports of fruit and vegetables. These exports incur very high land transport costs; 28% for the PRC and 11% for trade going to Thailand. When land transport costs are reduced, not unexpectedly, Viet Nam's exports to the PRC increase more than twice as fast as those to Thailand: 15.7% versus 6% (Table 16). However, when trade facilitation is added, all else equal, Viet Nam's begins to export fruit and vegetables to Thailand at nearly four times the rate as it does to the PRC: 74% increase versus 18%.

Table 16: Change in Intra-GMS Exports for Selected Sectors (%)

Exports from:	Fruit & Vegetables			Other Crops			Wood and Paper			Textile			Other Manufacturing		
	Scen1	Scen2	Scen3	Scen1	Scen2	Scen3	Scen1	Scen2	Scen3	Scen1	Scen2	Scen3	Scen1	Scen2	Scen3
Cambodia															
Lao PDR	-3.42	22.41	16.45	0.62	184.01	177.09	-8.66	40.58	20.13	15.77	20.54	37.21	-2.60	60.47	52.57
Myanmar	-6.62	47.23	35.11	-1.14	159.44	148.51	-5.24	107.72	85.24	-5.00	193.34	171.88	-3.18	158.34	142.53
Thailand	21.10	50.82	76.49	13.87	117.92	138.41	32.33	170.34	242.56	17.67	324.66	392.79	67.88	264.72	508.48
Viet Nam	27.46	43.10	75.84	7.26	97.42	103.72	34.54	143.49	210.47	19.37	282.42	348.61	12.47	205.95	239.38
PRC	-2.06	-11.17	-14.98	-1.98	-3.53	-8.43	-1.48	8.41	3.61	-0.51	41.82	39.37	-0.72	44.08	41.12
World total	0.28	-14.33	-15.20	4.15	34.96	40.20	8.88	44.07	61.40	-0.55	4.73	2.95	14.05	96.04	144.48
Lao PDR															
Cambodia	-6.25	-6.67	-11.99	-7.91	9.08	-0.81	-13.59	-2.47	-16.34	-6.00	80.09	62.96	-2.00	64.37	57.32
Myanmar	-12.07	-11.97	-22.92	-7.69	35.99	22.74	-18.98	-6.18	-27.65	-9.84	74.44	50.93	-5.15	100.19	79.44
Thailand	25.19	3.75	22.37	8.70	21.01	25.24	14.91	36.51	46.65	21.78	165.90	209.94	11.41	192.15	212.05
Viet Nam	-16.57	-19.75	-33.89	-9.81	1.84	-10.53	-17.85	6.23	-15.91	-7.66	127.54	103.07	-4.40	137.42	117.71
PRC	0.15	-42.99	-44.19	-2.29	-47.19	-50.06	2.91	-45.34	-46.43	1.53	-13.47	14.93	4.86	12.72	13.74
World total	12.29	-19.05	-9.85	-2.90	-33.98	-35.64	10.93	22.87	30.62	-5.04	-34.73	-39.19	-1.34	1.23	-2.14
Thailand															
Cambodia	1.46	81.09	87.16	0.81	155.12	160.05	1.58	111.35	118.34	-0.49	143.27	139.41	0.62	71.58	74.60
Lao PDR	4.68	42.13	49.72	11.96	249.22	291.20	9.49	50.00	58.49	-0.07	-3.06	4.10	4.76	31.15	35.56
Myanmar	5.41	71.34	81.21	15.93	219.78	270.44	15.87	120.99	148.43	6.69	135.16	146.68	7.96	111.06	123.35
Viet Nam	6.74	57.77	67.38	0.39	138.33	138.60	10.82	152.20	174.98	2.90	207.91	214.04	0.62	150.40	150.99
PRC	-0.18	4.67	4.44	0.16	17.74	17.83	0.23	11.95	12.06	-0.16	14.07	13.68	-0.05	17.72	17.56
World total	0.05	-0.58	-0.54	0	-0.59	-0.63	0.34	-6.36	-5.85	-0.11	-6.30	-6.45	0.02	1.93	1.95
Viet Nam															
Cambodia	0.85	80.71	84.72	0.22	162.33	165.34	0.55	116.48	121.13	-0.37	171.42	167.62	-0.02	73.24	74.84
Lao PDR	-3.44	38.92	34.86	2.11	256.06	263.38	-7.69	50.82	34.66	-7.82	7.68	-1.53	-5.99	31.36	21.77
Myanmar	-6.64	67.08	56.45	0.32	225.25	225.92	-4.23	122.83	107.64	-4.65	160.93	145.47	-3.20	111.79	100.87
Thailand	6.03	65.67	74.31	14.60	169.89	207.64	11.14	185.45	214.97	7.84	280.57	308.67	4.76	208.25	221.20
PRC	15.72	2.88	18.42	7.75	19.98	28.82	13.92	14.21	29.43	16.77	27.41	148.40	6.74	18.77	26.30
World total	1.44	-5.75	-4.43	-0.43	-3.11	-3.54	-0.66	-10.09	-10.78	0.46	-1.79	-1.17	0.13	0.92	1.20

Table 16: Change in Intra-GMS exports for selected sectors (%) (continued)

Exports fr:	Fruit & Vegetables			Other Crops			Wood and Paper			Textile			Other Manufacturing		
	Scen1	Scen2	Scen3	Scen1	Scen2	Scen3	Scen1	Scen2	Scen3	Scen1	Scen2	Scen3	Scen1	Scen2	Scen3
PRC															
Cambodia	0.80	20.69	23.60	0.70	19.21	21.49	1.06	-4.00	-1.20	-0.50	-6.21	-7.55	0.46	-26.93	-25.69
Lao PDR	13.77	-5.32	8.58	8.65	62.65	77.16	6.07	-31.68	-29.72	-2.96	-62.51	-63.87	-1.09	-44.05	-45.27
Myanmar	9.95	13.86	25.90	9.03	48.58	62.30	9.97	0.95	8.29	2.96	-9.51	-7.63	2.66	-9.79	-8.99
Thailand	9.12	11.66	21.50	3.72	21.89	26.21	8.19	27.23	37.32	3.80	31.54	36.22	2.68	30.31	33.55
Viet Nam	7.49	3.84	30.78	8.48	11.26	20.48	15.29	14.30	30.14	9.40	18.51	28.86	8.89	6.99	16.19
World total	0.45	0.36	0.84	0.15	0.16	0.33	0.02	-0.16	-0.13	0.11	0.39	0.51	0.14	0.29	0.44

Source: Authors' calculations

6. MITIGATING FACTORS AND CONCLUSIONS

The gains from improvements in transport and trade facilitation presented above must be tempered by the potential negative impacts of improved transport networks in the region. These impacts include:

1. Increasing income disparities (international, regional, and ethnic)
2. A deterioration in regional economy in some areas and countries along the border crossing routes
3. Spread of HIV and AIDS,¹⁵ avian flu, and other infectious diseases
4. Human and drug trafficking, a potential spread of terrorism
5. Deterioration of traffic safety.

As transit countries with fewer resources and low economic competitiveness, Lao PDR and Cambodia may suffer from worsening traffic safety and deterioration of the natural environment as a result of growing flows of transit cargo. There is also a concern among the people that only foreign multinational companies will reap the benefits of cross border trade expansion (JICA 2007).

The spread of HIV and AIDS has been known to closely follow the progress of economic integration in the GMS. For instance, it was reported that the number of HIV-positive persons and AIDS patients rose sharply in Savannakhet during and after the construction of the Second Mekong Bridge (Takao 2007).¹⁶

Human trafficking and illegal trade in narcotics are also deeply rooted in the problem of poverty. According to a report on Laotian villages, those who wanted to work outside their own countries were often victimized (ADB 2006). This report stated that a third of those obtaining such outside work were given false information about their earnings or forced to work in a job different from the initial promise (often prostitution in the case of women).

Traffic accidents are a concern across the developing world. Indeed, the World Bank has instituted a road safety program whose purpose is to raise awareness and understanding of road safety problems, including monitoring and evaluation of the effectiveness of road safety activities.¹⁷ A World Bank study (Kopits and Cropper 2003) found that while most other forms of death rates fall with development, traffic accidents is a notable exception. The report found road traffic death per capita increasing across the developing world, including Southeast Asia. If historical trends continue, fatality rates in the region are expected to climb from 10.9 (deaths per 100,000 persons) to 16.8.

An ADB (2005) study provided estimates of annual economic loss from road accidents for GMS countries to be over US\$4.7 billion, or over 2% of annual GDP. This value is substantiated by EU estimates which state that road crashes cost approximately 1% to 3% of a country's GDP (Ministry of Road Transport and Highways, India, 2008). Lost time, damaged cargo and vehicles, lack of insurance, injuries, and even death all add to the high costs of traffic accidents.

¹⁵ HIV is human immunodeficiency virus; AIDS is acquired immunodeficiency syndrome.

¹⁶ From a series of articles titled "Facing AIDS: Laos Thailand Report" published in the Mainichi Shimbun between 26 February and 1 March.

¹⁷ See <http://www.worldbank.org/transport/roads/safety.htm> for more details on the road safety program.

6.1 Conclusions

There are clear gains, albeit with some drawbacks, in the region from improvements in land transport costs and improved trade facilitation. Gains in regional trade reported here are even greater than those found in earlier ADB studies of approximately 40% (ADB 2007a and 2007b). This study takes a more comprehensive view of the GMS CBTA and economic corridor strategies when examining impacts. While there was some trade diversion of exports, overall impacts were still positive. One of the policy implications arising from this study is the impact of focusing on improving the so-called soft aspects of trade facilitation which improve transit times and trade service costs.

The results also provided a glimpse into the potential gains as the region develops. Trade between the GMS countries currently tends to be in favor of importing while exports go outside the region. The results presented here show the gains to intra-regional trade, highlighting the potential markets within the GMS. As the region develops, it is reasonable to assume that the welfare and GDP gains reported here will increase significantly.

Thus, the results presented here must be seen for what they are: a static view of one-off gains from a conservative estimate in a reduction in transport costs and improvements in trade facilitation. They do not adequately capture the synergies developed by businesses starting along the economic corridors, the foreign investment likely to be attracted as facilities improve, or the spillovers from these types of investments throughout the economy. Finally, the degree to which trade flows are understated in the underlying database will impact the size of the results presented here.

What the study does show are the clear gains from improvements in physical land transport and the more substantial gains from improved trade facilitation. The implications of these results are that physical infrastructure must be in place for trade to take place. However, once in place, attention should turn to soft aspects of trade facilitation. Based on the results presented here, once a sufficient physical system is in place, additional benefits are marginal compared with improvements in policy initiatives under the heading of trade facilitation.

While the GMS does not have the level of physical infrastructure that would be considered truly adequate for its desired level of economic activity, the results show that investing in soft aspects now still has substantial payback. In future, as a greater physical base is put in place, the region should enjoy further benefits from expanded markets having a solid trade facilitation system in place.

APPENDIXES

Table A1: Regional Aggregation

Region	Detailed Description
Cambodia	Cambodia
Lao PDR	Lao PDR
Myanmar	Myanmar
Thailand	Thailand
Viet Nam	Viet Nam
PRC	PRC
Other ASEAN	Indonesia, Malaysia, Philippines, Singapore
High Income Asian Economies	Japan; Korea; Hong Kong, China; and Taipei,China
South Asia	Bangladesh, India, Pakistan, Sri Lanka, rest of South Asia
ANZ	Australia and New Zealand
Europe	EU25, EFTA, rest of Europe
NAFTA	Canada, US, Mexico
CAREC	Central Asia Regional Economic Cooperation
ROW	rest of the world

Table A2: Commodity Aggregation

Sector	Detailed Description
Rice	Paddy and processed rice
FruitVeg	Vegetables and fruit
OtherCrops	Other crops
Forestry	Forestry
Fishery	Fisheries
CoalOilGas	Coal, oil, gas, other minerals
Animal Products	Animal products
Other Foods	Other processed foods
WoodPaper	Wood and paper products
Textiles	Textiles
WearingApp	Wearing Apparel
Leather	Leather products
Electronics	Electronic equipment and machinery
Other Manufactures	Other manufactures
Land Transport	Other transport
Water Transport	Water transport
Air Transport	Air transport
Services	Other services

Table A3.a: Intra-GMS Exports and Exports to the World (US\$m)

Exports from	Rice	Fruit & Veg	Other Crops	Forest	Fishery	Coal OilGas	Animal Prods	Other Foods	Wood Paper	Textile	Wear Apparel	Leather	Elec-tronic	Other Mfg.	Total
<u>Cambodia</u>															
Lao PDR	0.00	0.00	0.00	0.00	0.00	0.16	0.00	0.00	0.00	0.01	0.00	0.00	0.22	0.15	0.57
Myanmar	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.00	0.00	0.11	0.00	0.00	0.01	0.03	0.36
Thailand	0.06	0.21	3.08	0.50	1.29	0.91	1.14	1.00	3.76	0.16	0.22	0.12	3.14	29.11	49.78
Viet Nam	0.01	0.14	0.72	0.03	0.02	0.00	0.07	0.86	6.50	1.19	0.02	0.06	0.22	32.81	43.86
PRC	0.26	0.12	0.10	0.15	1.48	2.04	0.35	0.96	14.15	9.40	0.94	0.44	0.30	4.13	55.38
World total	11.4	5.7	9.1	3.1	10.1	43.0	12.1	67.8	34.5	813.3	2056.7	209.2	14.4	164.0	4133.9
<u>Lao PDR</u>															
Cambodia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.27	0.00	0.00	0.00	0.00	0.01	0.31
Myanmar	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
Thailand	0.14	2.54	6.56	3.98	0.00	4.77	1.98	0.10	71.74	0.61	0.44	0.34	4.76	2.11	101.24
Viet Nam	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.38
PRC	0.30	0.79	0.36	7.04	0.00	0.14	0.05	0.24	1.74	0.09	0.07	0.01	0.00	1.51	16.24
World total	6.6	4.5	21.4	14.6	0.0	24.6	3.9	8.4	84.1	58.3	111.7	6.3	5.8	32.6	572.6
<u>Myanmar</u>															
Cambodia	0.00	0.17	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.02	0.24
Lao PDR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Thailand	0.10	6.37	8.26	59.56	45.70	848.83	13.59	10.93	15.26	0.10	0.22	0.02	1.20	78.04	1089.4
Viet Nam	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.01	0.44
PRC	0.46	4.65	9.53	96.98	0.40	23.79	0.30	7.41	37.00	0.85	0.05	0.10	0.22	18.77	206.04
World total	21.7	213.8	57.9	444.7	59.5	888.4	17.2	195.1	153.7	183.3	375.7	30.2	14.0	142.5	2999.8

Source: GTAP Version 7 database

Table A3.b: Intra-GMS Exports and Exports to the World (US\$m)

Exports from	Rice	Fruit & Veg	Other Crops	Forest	Fishery	Coal OilGas	Animal Prods	Other Foods	Wood Paper	Textile	Wear/ Apparel	Leather	Electronic	Other Mfg.	Total
Thailand															
Cambodia	3.7	0.1	0.8	0.0	3.2	4.2	17.1	87.7	16.7	55.8	2.1	6.7	64.6	291.0	555.8
Lao PDR	2.1	6.3	0.2	0.2	0.0	0.6	9.0	64.3	9.2	52.3	2.9	3.2	92.6	211.3	454.2
Myanmar	0.1	3.2	0.4	0.0	0.1	0.5	18.0	135.4	11.5	41.1	6.0	6.7	60.9	327.7	613.4
Viet Nam	0.5	1.7	18.5	0.3	1.5	10.7	3.5	77.6	60.4	87.0	5.6	65.9	269.8	1345.8	1978.0
PRC	193.4	399.6	17.3	2.9	8.2	48.4	10.2	248.7	380.5	360.1	20.5	129.7	6680.3	3823.4	12786
World total	2779.4	1044.5	510.0	39.2	186.3	514.9	980.9	8444.4	3339.8	4448.1	3295.1	1788.9	41489	33863	118252
Viet Nam															
Cambodia	0.2	0.0	1.0	0.0	0.1	0.2	0.0	4.2	1.3	17.5	0.3	1.1	1.8	22.9	51.1
Lao PDR	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Myanmar	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Thailand	0.1	3.4	8.7	0.0	2.3	58.2	4.8	26.1	5.2	9.3	1.3	7.3	236.3	71.2	451.7
PRC	5.4	70.6	8.7	18.8	1.6	1734.6	6.1	83.4	21.5	43.8	4.8	47.3	176.0	224.8	2516.1
World total	524.1	459.7	909.9	26.2	80.1	5502.9	132.2	2360.9	1696.7	1351.9	3735.2	4766.9	2369.6	2508.0	29249
PRC															
Cambodia	0.0	1.2	2.5	0.0	0.0	1.6	0.3	31.9	8.0	412.2	9.0	11.7	50.4	83.4	624.3
Lao PDR	0.0	0.4	0.2	0.0	0.0	0.1	0.0	0.6	1.4	10.6	0.5	0.2	46.1	25.6	86.1
Myanmar	0.0	11.1	4.7	0.0	0.0	0.7	7.1	27.9	7.8	157.5	8.2	9.7	287.3	434.9	959.8
Thailand	1.2	62.0	13.5	0.9	3.4	46.3	23.8	165.5	81.8	505.6	55.8	77.9	3222.4	2472.0	7148.2
Viet Nam	11.6	96.8	61.5	0.7	0.5	8.3	6.4	76.0	71.4	673.4	81.2	167.3	754.3	2760.0	4863.4
World total	467	2815	2612	114	1119	6877	3599	13533	20364	47649	53865	28365	256004	154572	637506

Source: GTAP Version 7 database

Appendix Table A4.a: Ratio of Land Transport Margins to Bilateral Export Value (%)

Exports from	Rice	Fruit & Veg	Other Crops	Forest	Fishery	Coal OilGas	Animal Prods	Other Foods	Wood Paper	Textile	Wear Apparel	Leather	Electronic	Other Mfg.	Total
<u>Cambodia</u>															
Lao PDR	0.00	0.00	0.00	0.00	12.93	0.00	0.00	0.00	0.00	12.05	0.00	0.00	0.42	1.86	0.97
Myanmar	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.11
Thailand	0.00	25.79	9.16	36.19	21.32	0.00	5.34	6.69	18.08	8.07	5.36	1.70	3.49	34.57	23.70
Viet Nam	0.00	42.72	6.07	13.41	9.25	0.00	5.36	31.03	19.86	9.48	0.00	6.36	4.08	7.58	9.77
PRC	0.00	0.00	0.04	0.01	0.09	0.00	0.01	0.22	0.27	0.04	0.02	0.01	0.00	0.02	0.08
World total	1.79	5.96	5.98	6.25	3.88	0.00	0.60	1.13	6.90	1.46	0.40	1.42	0.99	7.97	0.99
<u>Lao PDR</u>															
Cambodia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.22	0.00	0.00	0.00	0.00	0.00	0.19
Myanmar	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Thailand	11.33	36.98	10.29	12.33	24.12	20.26	4.50	6.78	17.98	12.21	5.50	3.52	3.90	7.28	16.33
Viet Nam	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PRC	6.79	11.38	5.68	9.92	0.00	1.33	0.00	0.00	16.93	4.92	2.57	0.00	0.00	6.12	7.54
World total	0.65	22.74	4.95	8.33	6.05	6.03	2.39	0.68	16.03	1.45	1.36	2.08	3.55	4.32	3.94
<u>Myanmar</u>															
Cambodia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lao PDR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Thailand	0.96	40.93	8.88	13.13	23.86	4.58	4.20	7.33	16.54	7.63	6.39	4.60	4.59	4.35	6.27
Viet Nam	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PRC	0.22	12.50	7.83	8.47	7.54	2.85	9.26	5.11	15.29	17.85	1.55	6.65	1.46	6.19	8.56
World total	0.96	4.20	3.22	3.83	18.51	4.45	3.63	1.78	10.28	1.62	2.06	0.54	0.71	3.31	3.81

Source: Authors' calculations from GTAP v7 database

Appendix Table A4.b: Ratio of Land Transport Margins to Bilateral Export Value (%)

Exports from	Rice	Fruit & Veg	Other Crops	Forest	Fishery	Coal OilGas	Animal Prods	Other Foods	Wood Paper	Textile	Wear Apparel	Leather	Electronic	Other Mfg.	Total
<u>Thailand</u>															
Cambodia	0.58	0.46	0.04	0.01	0.06	0.18	0.14	0.12	0.24	0.08	0.05	0.07	0.04	0.12	0.11
Lao PDR	19.65	6.14	5.31	1.66	3.29	1.03	4.56	7.77	9.28	3.74	2.87	4.12	2.34	5.70	5.16
Myanmar	21.56	10.20	8.80	2.44	4.03	1.57	7.53	8.12	10.21	5.19	3.34	4.28	2.89	5.63	5.99
Viet Nam	14.41	19.12	1.05	1.68	2.16	0.18	2.60	4.38	7.31	2.47	1.06	0.70	0.87	1.35	1.61
PRC	0.29	0.94	0.18	0.01	0.02	0.00	0.11	0.22	0.19	0.05	0.01	0.02	0.01	0.04	0.06
World total	6.99	13.36	1.93	1.03	2.53	0.11	1.85	2.68	3.02	1.34	0.57	0.79	0.39	1.32	1.18
<u>Viet Nam</u>															
Cambodia	0.85	1.14	0.05	0.00	0.04	0.00	0.04	0.20	0.19	0.09	0.05	0.05	0.04	0.08	0.09
Lao PDR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Myanmar	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Thailand	0.00	10.88	9.84	2.13	1.16	1.10	3.47	4.62	7.08	3.94	1.57	2.65	1.05	3.02	1.96
PRC	22.96	28.09	7.55	7.51	8.60	1.92	5.52	21.59	12.41	11.75	3.98	5.28	4.07	6.00	4.22
World total	11.49	7.57	2.20	5.72	0.94	0.76	1.85	2.20	5.23	1.49	0.67	1.57	0.77	2.26	1.70
<u>PRC</u>															
Cambodia	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lao PDR	0.00	26.29	5.28	0.00	0.00	0.68	0.00	4.44	11.72	3.59	2.84	4.00	0.98	3.68	2.45
Myanmar	0.00	25.54	7.33	0.00	0.00	2.10	3.21	6.78	11.62	5.43	3.73	4.03	1.76	4.38	4.12
Thailand	0.00	21.92	3.79	2.04	1.38	0.53	3.76	6.67	7.92	3.26	1.91	1.97	0.76	2.46	1.92
Viet Nam	9.15	31.33	8.88	41.77	6.16	12.76	3.67	8.80	14.44	8.02	5.26	5.88	4.19	8.64	8.09
World total	4.76	10.25	3.23	2.17	3.52	0.51	1.39	2.96	3.23	1.85	1.36	1.33	0.53	1.71	1.19

Source: Authors' calculations from GTAP v7 database

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