ENHANCING ASIA'S TRADE: TRANSPORT COSTS MATTER

*By Prabir De**

Introduction

Direct evidence on border costs shows that tariff barriers are now low in most countries. On average (trade-weighted), they are less than 5 per cent for rich countries and, with a few exceptions, between 10 and 20 per cent for developing countries (WTO 2006a, and WTO and ITC 2007). While the world has experienced a drastic fall in tariffs over the last two decades, several barriers that penalize trade remain. Some are referred to as "soft" barriers, others as hard barriers. Soft barriers are addressed through trade and business facilitation measures, and "hard" barriers, which are considered to comprise physical or infrastructure barriers, are addressed through transport facilitation measures. The costs arising from these two broad types of trade barriers can be clubbed together and referred to collectively as trade costs.

Trade costs are often cited as an important determinant of trade volume. High trade costs create obstacles to trade and impede the realization of gains from trade liberalization.[1] Most studies on trade costs show that integration is the result of reduced costs of transportation in particular and other improved services in general. Supply constraints are the primary factors that have limited the capacity of many developing and least developed countries to exploit the trade opportunities arising from trade liberalization. An optimal gain from trade, therefore, depends not only on tariff liberalization but also on the quality of infrastructure and related services associated with cross-border trading.

Trade costs have large welfare implications. Current policy-related costs are often valued at more than 10 per cent of national income (Anderson and van Wincoop 2004). Obstfeld and Rogoff (2000) commented that all the major puzzles of international macroeconomics hang on trade costs. Some studies, for example Francois and others (2005), have estimated that for each 1 per cent reduction of trade transaction costs, world income could increase by $30 billion to $40 billion.[2] The gains from streamlining customs procedures have exceeded those resulting from trade liberalization, such as tariff reduction.

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* Research and Information System for Developing Countries, India. Paper presented at the Economic and Social Commission for Asia and the Pacific (ESCAP) Regional Expert Group Meeting on Trade and Transport Facilitation for Export Competitiveness, Yangzhou, China, 25 and 26 September 2008. The author would like to acknowledge the research grant provided by ESCAP for this study.

1 A growing literature in this regard has documented the impact of trade costs on the volume of trade (see Duval 2007). Seminal studies carried out on this topic in recent years include Hummels (1999, 2007), Limão and Venables (2001), Anderson and van Wincoop (2004), and Brooks (2008).

2 See also APEC (2002), Walkenhorst and Yasui (2003).

One Asia Pacific Economic Cooperation (APEC) study (2002) estimated that gains from effective trade facilitation would account for about 0.26 per cent of real gross domestic product (GDP) of APEC members (about $45 billion) for 2006, while the gains from trade liberalization would represent 0.14 per cent of real GDP (about $23 billion). The same study also indicated that efforts to achieve the APEC commitment to reduce trade-related transaction costs by 5 per cent by 2006 could raise the APEC GDP by 0.9 per cent ($154 billion a year in 1997 prices) and lift real consumption to 5.5 per cent above what it would be otherwise.[3] Wilson, Mann and Otsuki (2002) estimated that raising trade facilitation performance across the region to half the level of the APEC average could result in a 10 per cent increase—worth roughly $280 billion—in intra-APEC exports.

The cost of international transport is a crucial determinant of a country's trade competitiveness. The doubling of a country's transport costs leads to a drop in its trade of 80 per cent or even higher (Limão and Venables 2001). In many cases, the effective rate of protection provided by the international transport costs[4] was found to be higher than that provided by tariffs. Thus, transportation costs represent a greater barrier than tariffs, and, in turn, a more binding constraint to greater participation in international trade.[5] Complementary trade policies focusing on inland and international transport costs have, therefore, gained immense importance in enhancing international trade and integration.

How are Asian countries faring in reducing trade costs? Which barriers weigh heavier: tariffs or transport costs? Is the influence of inland transportation costs on Asian trade stronger than that of international transportation costs? How do the estimates of freight rates compare across Asian countries? Do indirect methods, such as adjacency effects, facilitate or impede cross-border trade? The purpose of this study, which is based on direct and indirect evidence related to trade barriers, is to explore responses to these questions, thereby enhancing the understanding of the role trade costs play in enhancing trade competitiveness. Such an understanding could facilitate initiatives to integrate production across Asia as well as those aimed at promoting deeper trade integration in the region.

First we explore why it is so important to study transportation costs in the context of Asia. Which has a higher incidence on trade in Asia—tariffs or freight costs? This is debated in section A. Since international transport costs, to a great extent, depend on ocean freight rates, the next step is to understand the relative importance of ocean freight rates in trade in Asia. Section B provides an illustration of the trends in such rates in selected Asian countries, leading into estimates of freight costs across countries and

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[3] See APEC (2002).

[4] In the case of a cross-border shipment of goods, transport costs comprise two major elements: (a) international transport costs, which include costs associated with the shipment of goods from one country to another; and (b) the inland (domestic) transport costs, which include the costs of inland transportation of merchandise in both exporting and importing countries.

[5] According to the World Bank (2001), for 168 of 216 trading partners of the United States of America, transport costs barriers outweighed tariff barriers. For the majority of countries in sub-Saharan Africa, Latin America and the Caribbean, and a large part of Asia, the transport cost incidence for exports is five times higher than the tariff cost incidence.

commodities. We then attempt to measure the movement of Asian countries in the tariff-freight plane in a comparative static framework. Section C draws on the aforesaid discussion for a formal assessment of the relationship between trade costs and trade flows. Econometric results are presented and discussed in that section, followed by conclusions in section D.

A. Trade flows in Asia: the rise of intermediate and capital goods

It is important to study trade costs in context of Asia, because the costs of the vast majority of traded goods are exogenous. Countries in Asia suffer higher trade costs, which leads to high prices of imported goods. At the same time, trade in the region covers an increasing number of intermediate and capital goods, and expensive imports resulting from high trade costs can escalate the cost of production.

Overall trade volume in Asia has been rising at a very rapid pace, with China and India standing out (Brooks and Hummels 2009; Brooks 2008). Goods from Asia represented about 18 per cent of world trade when China began liberalizing its economy in 1978, and about 26 per cent when India adopted serious economic reform in 1991. By 2006, about 30 per cent of world exports originated in Asia (table 1), and about 50 per cent of Asia's exports were being sent to countries within the region (figure 1). Within Asia, East Asia

Table 1. Merchandise exports of Asia, by region

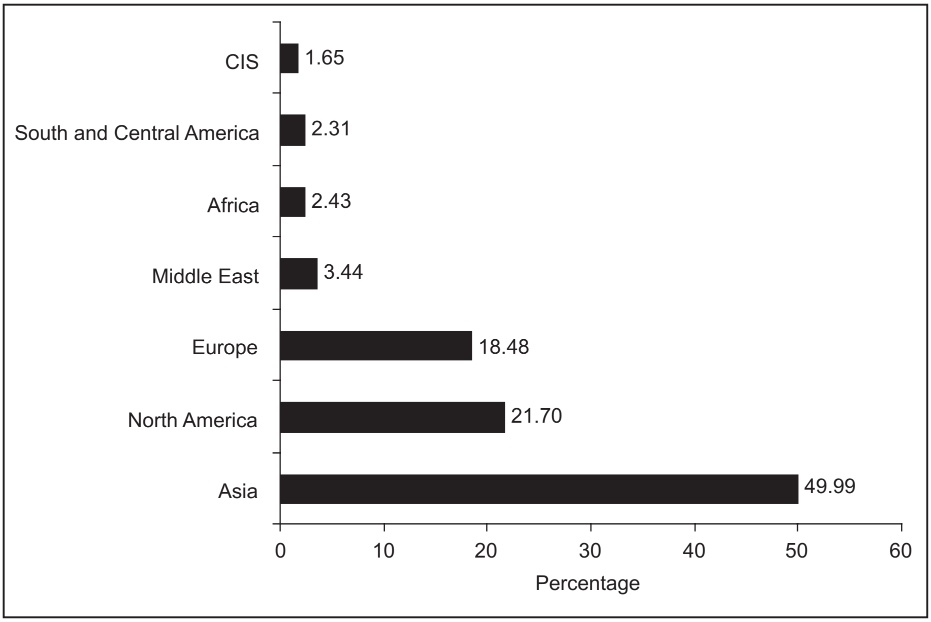
Exports to	*Exports (US$ billion)*		*Share in world exports (percentage)*		*AAGR (percentage)*
	2000	*2006*	*2000*	*2006*	*2000-2006*
World	6 454.00	12 083.00	100.00	100.00	14.54
North America	1 224.98	1 678.32	18.98	13.89	6.17
South and Central America	195.80	429.90	3.03	3.56	19.93
Europe	2 633.93	4 962.98	40.81	41.07	14.74
European Union (25)	2 437.36	4 532.49	37.77	37.51	14.33
Commonwealth of Independent States	145.73	425.59	2.26	3.52	32.01
Africa	147.80	363.30	2.29	3.01	24.30
Asia	1 837.30	3 577.70	28.47	29.61	15.79
East Asia Summit	1 808.85	3 529.27	28.03	29.21	15.85
ASEAN+3	1 689.32	3 263.32	26.17	27.01	15.53
ASEAN	432.03	769.99	6.69	6.37	13.04

Source: WTO (2007).

Abbreviations: AAGR, average annual growth rate; ASEAN, Association of Southeast Asian Nations.

Figure 1. Destination of exports from Asia, 2006

(Percentage of regional trade flows in Asia's total merchandise exports)



Source: WTO (2007b).

Summit countries hold a strong position in terms of level and growth in trade in goods (table 1).

The growth in exports from China to Asia and world is unparalleled—increasing by 19 per cent annually between 2000 and 2006, thereby driving exports throughout entire Asia. Due to the increase in trade interdependency in Asia, efforts to lower trade costs and provide a better enabling environment for trade have gained momentum.[6]

The trade composition in Asia is evolving quickly as well. While Asia's share of the trade in food and fuels decreased marginally during the period 2002-2006, there was a subsequent sharp expansion in the exports of most manufactures as countries in Asia increasingly specialized in trade in intermediate and capital goods. Table 2 shows that by 2006, about 33 per cent of world exports in manufactures ($2.68 trillion) originated in Asia, up from about 29 per cent ($1.36 trillion) in 2002. In some products, Asia is becoming the single major source. For example, about 68 per cent of world trade in integrated circuits ($267 billion in 2006) comes from Asia; this is up from about 58 per cent in 2002. Office and telecom equipment and textiles and clothing are the two major commodity groups dominating Asia's exports to the world. In this context, increasing trade infrastructure efficiency becomes an even more important factor in sustaining Asia's trade growth.

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[6] See, for example, the review of trade costs in ADB (2006) and Brooks and Hummels (2009).

Table 2. Merchandise exports of Asia by product, 2006

	Exports to world (US$ billion)		*Share in world exports (percentage)*			*Intra-Asia exports (percentage)*		
	2002	*2006*	*2002*	*2006*	*Up/ down*	*2002*	*2006*	*Up/ down*
Total merchandise exports	1 624.51	3 277.79	25.79	27.82	Up	49.05	49.99	Up
Agricultural products	108.64	179.08	18.53	18.96	Up	61.32	57.06	Down
Food	85.75	135.93	18.19	18.01	Down	59.74	54.48	Down
Fish	19.81	30.27	35.78	36.67	Up	62.29	50.64	Down
Other food products	65.94	105.67	15.85	15.72	Down	58.98	55.57	Down
Raw materials	22.90	43.14	19.95	22.74	Up	67.25	65.25	Down
Fuels and mining products	114.26	334.66	14.53	14.70	Up	82.44	79.84	Down
Ores and other minerals	16.68	53.37	25.69	26.61	Up	70.56	79.26	Up
Fuels	76.74	215.30	12.56	12.16	Down	85.90	81.04	Down
Non-ferrous metals	20.84	65.98	18.82	21.56	Up	79.17	76.45	Down
Manufactures	1 360.31	2 683.21	28.62	32.50	Up	45.36	45.73	Up
Iron and steel	34.12	105.83	23.62	28.30	Up	73.77	57.89	Down
Chemicals	106.46	235.80	15.92	18.90	Up	64.92	64.61	Down
Pharmaceuticals	9.84	21.17	5.88	6.81	Up	34.35	30.00	Down
Other chemicals	96.62	214.63	19.27	22.91	Up	68.03	68.03	—
Other semi-manufactures	95.58	188.42	20.53	23.71	Up	45.77	41.78	Down
Machinery and transport equipment	800.00	1 565.21	31.27	35.87	Up	44.93	45.71	Up
Office and telecom equipment	423.74	801.40	49.93	55.22	Up	50.18	51.00	Up
EDP and office equipment	166.13	283.10	50.70	54.99	Up	39.50	39.04	Down
Telecommunications equipment	112.26	251.51	41.25	46.22	Up	36.56	35.47	Down
Integrated circuits	145.34	266.78	58.40	68.00	Up	72.90	78.33	Up
Transport equipment	176.85	334.34	19.78	22.83	Up	21.59	23.50	Up
Automotive products	123.69	223.55	19.70	22.00	Up	19.40	21.50	Up
Other transport equipment	53.16	110.80	19.98	24.70	Up	26.71	27.53	Up
Other machinery	199.41	429.47	24.44	29.66	Up	54.49	53.15	Down
Textiles	67.48	104.36	43.73	47.74	Up	56.09	47.16	Down
Clothing	92.84	162.84	45.72	52.29	Up	24.63	22.34	Down
Other manufactures	163.83	320.75	29.36	33.89	Up	35.93	41.62	Up
Personal and household goods	40.81	73.69	32.99	37.51	Up	21.81	20.42	Down
Scientific and controlling instruments	25.64	84.44	20.88	35.12	Up	51.60	61.35	Up
Miscellaneous manufactures	97.39	162.62	31.27	31.92	Up	37.73	40.99	Up

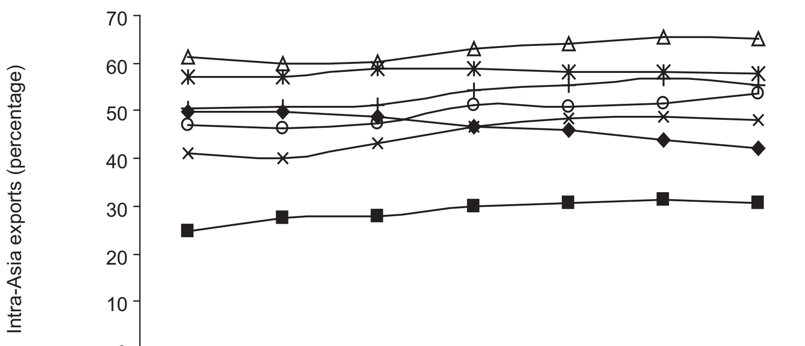
Source: WTO (2007b).

Abbreviation: EDP, electronic data processing.

Intra-Asia trade in manufactures is also quite large (46 per cent in 2006). Unlike intra-Asian trade in other major areas, such as agriculture, fuels and minerals, trade in manufactures increased slightly between 2002 and 2006. The notable increases were in office and telecom equipment, chemicals, and transport equipment. A majority of this vast intraregional trade consists of intermediate and capital goods, feeding a country's production or import demand. As such, variations in trade cost elements could be crucial for the region's competitiveness in manufactures.[7] A reduction in trade costs is likely to help Asian countries get their goods to market more quickly and cheaply, and more effective transport infrastructure would facilitate the integration of international trade and production.

Given the structural differences in regional economies in Asia, trade is not evenly distributed. Asia's increased trade in goods, including manufactures, (and the corresponding production) is dominated mainly by seven countries: China, India, Indonesia, Japan, Malaysia, Republic of Korea and Thailand. The share of intraregional trade in total exports of these countries is high, from about 31 per cent (India) to 65 per cent (Indonesia) in 2006 (figure 2). Intra-Asia exports of India, Indonesia, Japan, Republic of Korea and Thailand

Figure 2. Trends in intra-Asia exports



	2000	2001	2002	2003	2004	2005	2006
China	49.96	49.78	48.87	46.65	45.82	43.79	42.31
India	24.78	27.60	28.00	29.97	30.57	31.29	30.80
Indonesia	61.40	59.80	60.13	63.02	64.11	65.34	65.17
Japan	41.25	40.07	43.16	46.51	48.49	48.61	47.99
Malaysia	57.17	57.18	58.74	58.70	58.22	58.08	57.93
Republic of Korea	46.99	46.32	47.50	51.03	50.83	51.47	53.76
Thailand	50.38	50.70	51.32	54.47	55.30	56.62	55.45

Source: Calculated based on data from IMF (2006).

Note: Figures for 2006 are estimates.

7 See also Kuroiwa (2006).

Table 3. Exports of selected Asian countries

	Exports (United States dollars)				*Average annual growth rate, 2000-2006 (percentage)*	
	To world 2000	*To Asia 2000*	*To world 2006*	*To Asia 2006*	*To world*	*To Asia*
China	249.21	124.51	969.28	410.13	48.16	38.23
India	42.63	10.56	119.00	36.65	29.86	41.16
Indonesia	62.12	38.14	113.21	73.78	13.71	15.57
Japan	478.36	197.31	642.35	308.24	5.71	9.37
Malaysia	98.15	56.11	160.66	93.07	10.61	10.98
Republic of Korea	172.26	80.94	326.86	175.73	14.96	19.52
Thailand	68.96	34.74	130.78	72.51	14.94	18.12

Source: Calculated based on data from IMF (2006).

Note: Data for 2006 are estimates.

increased substantially between 2000 and 2006. In those same countries, growth in intra-Asia exports exceeded the growth of exports to the world (table 3).

Although comparatively low in absolute terms, the trade interdependence of India with Asia is a case in point. Growth in exports from India to Asia (up 41 per cent between 2000 and 2006) was much higher than the growth in the country's exports to the world (30 per cent)—the highest such increase among the seven countries. India is thus showing comparatively greater integration to Asia.

As a region, Asia accounts for about one third of the world's manufacture exports. When viewed by individual manufacturing sector (excluding pharmaceuticals), the region's contributions to world exports range from 19 per cent (chemicals) to 68 per cent (integrated circuits). With this rising trade, Asia as a whole has reduced tariffs in manufactures, but overall, tariffs in Asia are still a crucial barrier to trade.[8] Furthermore, unlike in developed economies, transport costs continue to penalize trade in Asia, and as noted above, trade is more likely to increase through the reduction of transport costs, rather than through the reduction of tariffs.[9] In all sectors, with the exception of transport equipment (classified as project goods used for infrastructure development), trade is influenced by tariffs, transport costs and infrastructure quality.[10] This is further exemplified in figure 3, which clearly indicates that tariffs and freight rates in Asia are comparatively high.

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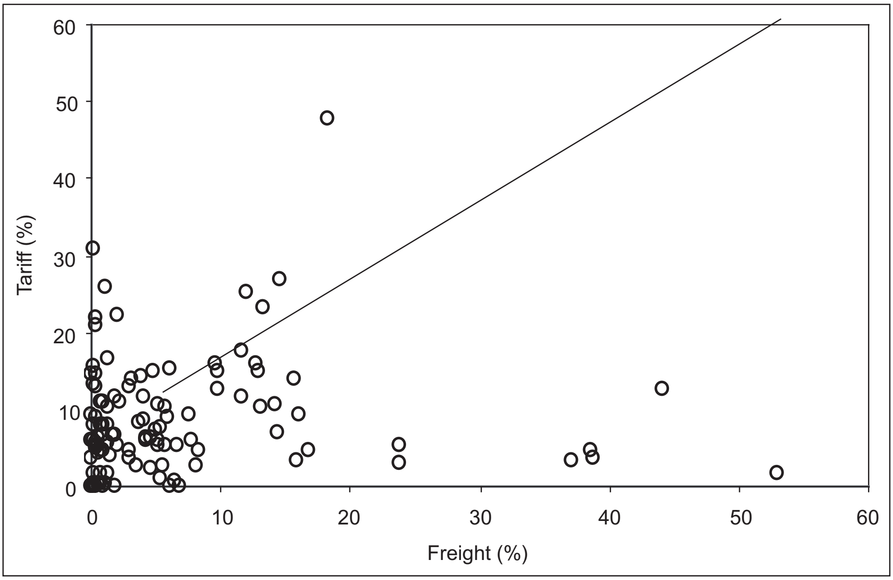
8 According to De (2007), a 10 per cent reduction in tariffs would increase bilateral trade by about 2 per cent in Asia.

9 See, for example, De (2007, 2008a, 2008b, 2009a, 2009b).

10 For transport equipment, bilateral tariffs play a less significant role as trade is more demand-driven (De 2008b).

Figure 3. Tariff and freight incidence in Asia, 2005



Source: De (2006a).

Note: Both tariff and freight rates are the trade-weighted average for bilateral merchandise trade among seven Asian countries (China, India, Indonesia, Japan, Malaysia, Republic of Korea and Thailand) in 2005.

Therefore, Asia, on the demand side, has been experiencing a sharp rise in merchandise trade and showing greater regional trade interdependence with respect to a large variety of goods. However, on the supply side, rising trade costs continue to impede trade. With the rise of regionalism (and also bilateralism) in Asia, trade policymakers have increasingly recognized the importance of trade and transport facilitation initiatives that help improve trade efficiency and reduce trade costs as well as deepen the integration of the economies of the region. Next we examine how changes in trade cost components affect merchandise trade in Asia, and assess the corresponding implications for the facilitation of trade and transport.

B. Asian countries in the tariff-freight plane[11]

Ocean freight, a major component of international transport costs, varies widely in Asia. In this section we examine the levels and variations of freight and tariff rates (at the disaggregated commodity level) of seven Asian countries, namely, China, India, Indonesia, Japan, Malaysia, Republic of Korea and Thailand. To this end, we (a) estimate freight rates and their composition, which later allows us to estimate the transport costs, and

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[11] The analytical part of this section draws on De (2009a).

(b) observe the movement of countries on a tariff and transport cost plane within a comparative static framework, in order to understand the relative importance of trade costs components in trade flows.

1. Aggregated freight rate

The cost of transporting merchandise between countries is a combination of two major components: inland and international transport costs. Understanding the unit freight rate in each of the two legs of the journey—inland and international—helps us calculate the variations in cost of transportation across commodities in Asia.

We first estimate the country-wise freight rate, which is a weighted average of all commodity groups across all trading partners for both the international and inland segments of the shipment of a container from one country to another (equations (1) and (2)).

$$F_{ij} = \frac{\sum_k Q_{ij}^{kl} \; f_{ij}^{kl}}{\sum_k Q_{ij}^{kl}} \tag{1}$$

$$F_i = {}^1\!/_n \, (F_{ij}) \, , \tag{2}$$

where F_i represents the weighted-average freight rate per container of country i, which is averaged over all commodity groups across all trading partners of country i; F_{ij} denotes the weighted-average freight rate per container for country i for the import of commodity k from country j; Q_{ij}^{kl} stands for the import of commodity k in twenty-foot equivalent units (TEU) by country i from country j; f_{ij}^{kl} represents freight rate per TEU of the import of commodity k by country i from country j; l is the commodity traded (at the 4-digit level of the Harmonized System (HS)) between partners i and j; where $l \in k$, and n is the number of bilateral trading partners of i. We collect f_{ij}^{kl} for inland and international transportation separately. F_i is estimated from the 4-digit HS code for the imports of country i from its partner for 2000 and 2005.[12] Commodity freight rates for inland and international shipment were collected from Maersk Sealand (2007), whereas country imports at 4-digit HS were collected from the United Nations Commodity Trade Statistics Database (Comtrade) (2007).[13] Table 4 provides estimated freight (F_i) per container for selected Asian countries for 2005.

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[12] See annex I, which provides the commodity classification for *k* commodity groups adopted in this paper. In general, the United Nations Commodity Trade Statistics Database does not provide information on weight at 2-digit HS—only at 4-digit HS. Thus, we must classify the commodity groups at 4-digit HS.

[13] Systematic data on Asia's imports by origin and commodity are not available. The problem becomes more acute with respect to data on trade by weight in TEUs. As a result, we turned to Maersk Sealand, which provides freight rates for commodities at a bilateral level. Since the United Nations Commodity Trade Statistics Database does not provide trade data in TEU, we converted the data on weight in kilograms into weight in TEU. The conversion rate used was 12,000 kg ≅ 1 TEU to represent a loaded 20-foot container (popularly known as an FCL, or "fully loaded container").

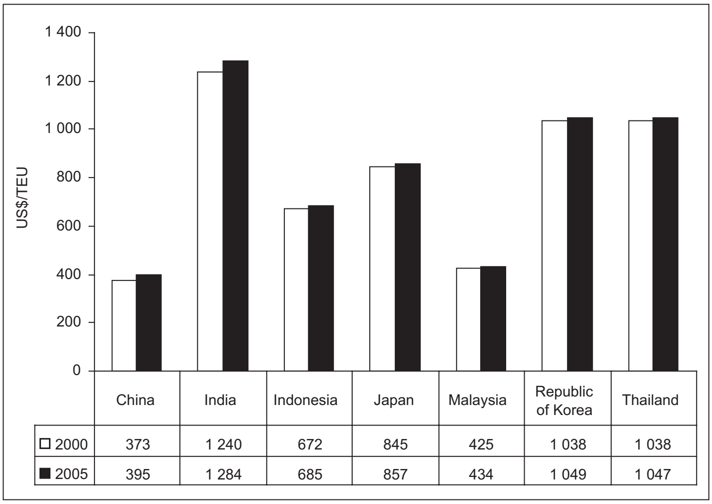
First, we find that the estimated freight rate varies across countries. The freight per container is highest in India ($3,488 per TEU in 2005), and lowest in Malaysia ($1,284 per TEU). At $1,409 per TEU, China has the second-lowest freight rates. India experiences the highest rates for both inland and international freight (figures 4 and 5). China offers the lowest inland rates ($395 per TEU in 2005) and Thailand the lowest international rates ($704 per TEU in 2005)—significantly lower than those of other Asian countries.

Table 4. Estimated freight rate

Country	*Total freight rate (United States dollars/ Twenty-foot equivalent unit)*		*Share in total freight rate*			
			Inland freight rate (percentage)		*International freight rate (percentage)*	
	2000	*2005*	*2000*	*2005*	*2000*	*2005*
China	934	1 409	40	28	60	72
India	2 343	3 488	53	37	47	63
Indonesia	1 323	1 633	51	42	49	58
Japan	1 740	2 148	49	40	51	60
Malaysia	1 079	1 284	39	34	61	66
Republic of Korea	1 732	1 855	60	57	40	43
Thailand	1 532	1 751	68	60	32	40

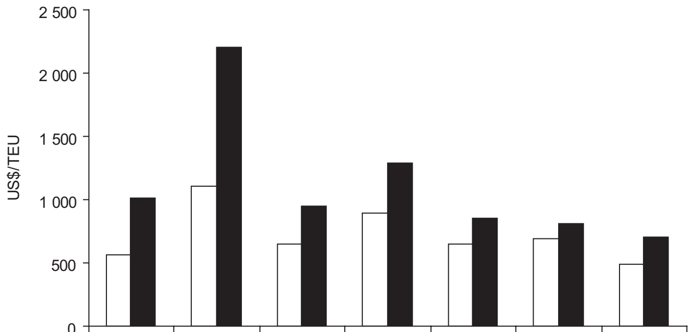
Source: Based on data from the United Nations Commodity Trade Statistics Database and author's calculations.

Figure 4. Inland freight per container



Source: De (2009a).

Figure 5. International freight per container



	China	India	Indonesia	Japan	Malaysia	Republic of Korea	Thailand
□ 2000	561	1 103	651	895	654	694	494
■ 2005	1 014	2 204	948	1 291	850	806	704

Source: De (2009a).

Second, Asian countries experienced an absolute rise in both inland and international freight per container during the period 2000-2005, even though the changes in weighted average freight vary across countries. The rise in inland freight per container is marginal compared to that of international freight, which also demonstrated much wider variation among countries. For example, India experienced a steep rise in international freight—from $1,103 per TEU to $2,204 per TEU—the highest among all the Asian countries considered in this study (figure 5). In contrast, the increase to international freight in the Republic of Korea appeared much smaller.

Third, the estimated costs of inland freight in the Republic of Korea and Thailand are higher than that of their international freight; the reverse is true in the other Asian countries considered in this study. Why is the international freight per container so expensive in India? Perhaps it is due to the high terminal handling charges (THC)[14] ($795 per TEU) and other ocean freight charges[15] ($1,408 per TEU) at ports.[16]

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[14] By this term we mean the cost of handling containers at ports. According to De (2007), about 60 per cent of total shipping costs for movement of cargo between origin and destination countries is charged by shipping lines as base ocean freight, whereas 28 per cent is container handling charges, recovered by the terminal or port operators.

[15] Other ocean freight charges represent several explicit and implicit auxiliary shipping charges. For example, they comprise all shipping charges other than basic ocean freight, such as peak season surcharge, congestion surcharge, bunker adjustment factor, Yen Appreciation Surcharge, fuel adjustment factor and delivery order, which often increase the cost of shipping between countries. For example, in 2004 exporters had to pay, on average, $35 per 20-foot container for the bunker adjustment factor, which was imposed by the shipping lines as a fuel surcharge, and an average of $30 per 20-foot container for the Yen Appreciation Surcharge for cargoes going to Japan (De 2007).

[16] See annex II for average terminal handling charges, by country.

2. Estimated transport cost

Next, we use equation (3) to estimate the commodity distribution of inland transport cost (*InlTC*) for imports of country *i* from country *j*. Equation (4) is used to estimate the commodity distribution of international transport costs (*IntTC*).

$$InlTC_i^k = \frac{\sum_l Q_{ij}^{kl} \; f_{ij}^{inland}}{\sum_l Q_{ij}^{kl} \; f_{ij}^{total}} * 100 \tag{3}$$

$$IntTC_i^k = \frac{\sum_l Q_{ij}^{kl} \; f_{ij}^{international}}{\sum_l Q_{ij}^{kl} \; f_{ij}^{total}} * 100 , \tag{4}$$

where $InlTC_i^k$ and $IntTC^k$ represent inland and international transport costs, respectively, for country *i* for commodity *k*; Q_{ij}^{kl} stands for import of commodity group *k* in weight (here, in TEU) by country *i* from country *j*; f_{ij}^{inland} represents inland freight rate per TEU for the import of commodity *k* by country *i* from country *j*; $f_{ij}^{international}$ represents international freight rate per TEU for the import of commodity *k* by country *i* from country *j*; f_{ij}^{total} represents total freight rate per TEU for the import of commodity *k* by country *i* from country *j*; *l* is the commodity traded at 4-digit HS, falling under the commodity group *k* ($l \in k$). The transport cost is estimated for *k* commodity groups for imports of country *i* from its partner for 2000 and 2005.

The commodity composition of inland and international freight rates are estimated as a percentage of total transport costs. Here also, inland and international fright rates were collected from Maersk Sealand (2007), whereas country imports at 4-digit HS were collected from the United Nations Commodity Trade Statistics Database (2007). Tables 5 and 6 provide the estimated commodity distribution of inland and international transport costs across seven Asian countries for 2005.[17] A number of broad observations can be made based on these tables.

Although the share of inland transport cost in total transport cost is similar across commodities and countries, the cost of inland transportation (weighted average across all commodity groups) is high in Thailand and the Republic of Korea compared to other Asian countries. In terms of international transport cost, about 73 per cent of total transportation costs for China’s imports from its partners are from the international leg of the journey, whereas such costs seems to be about 40 per cent in Thailand and 44 per cent in of the Republic of Korea.

Second, the international transport cost percentage shares in Indonesia, Japan, the Republic of Korea and Thailand are lower than the Asian average of 60.32 per cent, thereby indicating a relatively better performance compared to China, India and Malaysia.

[17] Since there was not much change in the composition of transport costs between 2000 and 2005, we discuss only the broad features of transport cost for the year 2005. Interested readers may contact the author regarding information for the year 2000.

However, in the case of inland transport cost percentage shares, Indonesia, the Republic of Korea and Thailand score higher than the Asian average of 39.68 per cent.

Third, the cost of inland transportation is higher for bulky products, such as fuels, mining and forest products (except in China), transport equipment, machinery and mechanical appliances and automobiles, than for less-bulky products, such as office and telecom equipments, electronic integrated circuits and chemicals. However, the reverse is true with regard to international transport, where costs to move bulky products are comparatively less than those for less-bulky products.

Table 5. Commodity distribution of inland transport costs, 2005

(Percentage of total transport costs)

Commodity group	*China*	*India*	*Indonesia*	*Japan*	*Malaysia*	*Republic of Korea*	*Thailand*	*Commodity total*[a]
Transport equipment	42.26	35.37	42.45	44.11	34.21	60.28	62.15	54.84
Automobiles and components	40.97	35.77	42.35	44.08	34.36	58.39	61.02	45.85
Chemicals	36.65	36.49	41.20	43.47	31.31	58.62	60.09	37.59
Electrical and Electronics	39.53	36.59	42.76	43.74	35.17	57.03	61.18	42.59
Electronic integrated circuits	39.52	36.26	43.39	45.47	33.97	59.18	62.01	36.97
Food products	27.45	34.66	36.45	42.96	30.81	52.63	52.62	42.16
Fuels, mining and forest products	23.24	37.43	42.13	38.69	32.01	55.52	59.24	38.59
Iron and steel	37.93	35.93	42.60	47.73	35.94	59.33	60.47	44.47
Leather	34.40	35.00	42.23	43.53	30.88	55.92	59.89	44.50
Machinery and mechanical appliances	41.06	35.77	43.14	44.93	35.94	58.78	60.69	46.57
Metal	40.31	35.79	42.80	43.16	34.93	56.24	58.88	39.74
Office and telecom equipment	39.76	35.49	43.14	42.56	35.86	57.10	61.39	38.48
Paper and pulp	37.76	34.17	41.77	42.53	31.99	56.41	60.88	41.51
Pharmaceuticals	36.53	36.60	43.29	43.89	32.10	59.76	58.76	45.78
Rubber and plastics	36.31	36.05	42.25	42.91	36.23	58.31	61.27	40.74
Textile and clothing	38.32	35.75	41.25	43.40	34.00	56.27	59.65	43.63
Country total[a]	27.00	36.08	41.59	39.61	33.45	56.35	59.67	39.68

[a] Weighted average.

Table 6. Commodity distribution of international transport costs, 2005
(Percentage of total transport costs)

Commodity group	*China*	*India*	*Indonesia*	*Japan*	*Malaysia*	*Republic of Korea*	*Thailand*	*Commodity total*[a]
Transport equipment	57.74	64.63	57.55	55.89	65.79	39.72	37.85	45.16
Automobiles and components	59.03	64.23	57.65	55.92	65.64	41.61	38.98	54.15
Chemicals	63.35	63.51	58.80	56.53	68.69	41.38	39.91	62.41
Electrical and Electronics	60.47	63.41	57.24	56.26	64.83	42.97	38.82	57.41
Electronic integrated circuits	60.48	63.74	56.61	54.53	66.03	40.82	37.99	63.03
Food products	72.55	65.34	63.55	57.04	69.19	47.37	47.38	57.84
Fuels, mining and forest products	76.76	62.57	57.87	61.31	67.99	44.48	40.76	61.41
Iron and steel	62.07	64.07	57.40	52.27	64.06	40.67	39.53	55.53
Leather	65.60	65.00	57.77	56.47	69.12	44.08	40.11	55.50
Machinery and mechanical appliances	58.94	64.23	56.86	55.07	64.06	41.22	39.31	53.43
Metal	59.69	64.21	57.20	56.84	65.07	43.76	41.12	60.26
Office and telecom equipment	60.24	64.51	56.86	57.44	64.14	42.90	38.61	61.52
Paper and pulp	62.24	65.83	58.23	57.47	68.01	43.59	39.12	58.49
Pharmaceuticals	63.47	63.40	56.71	56.11	67.90	40.24	41.24	54.22
Rubber and plastics	63.69	63.95	57.75	57.09	63.77	41.69	38.73	59.26
Textile and clothing	61.68	64.25	58.75	56.60	66.00	43.73	40.35	56.37
Country total[a]	73.00	63.92	58.41	58.39	66.55	43.65	40.33	60.32

[a] Weighted average.

3. Estimated ad valorem transport costs

In this section, we estimate the ad valorem transport costs (both international and inland) for the shipment of a container from one country to another. This is crucial for evaluating the size of the barriers, which later helps us assess the impact of transport costs on regional trade, controlling for other variables. Equation (5) is used to estimate the commodity distribution of ad valorem inland transport cost (*AdvInlTC*) for the import of country i from country j; equation (6) is used to estimate the commodity distribution of ad valorem international transport costs (*AdvIntTC*).

$$AdvInlTC_i^k = \frac{\sum_l Q_{ij}^{kl} f_{ij}^{inland}}{\sum_l M_{ij}^{kl}} * 100 \quad (5)$$

$$AdvIntTC_i^k = \frac{\sum_l Q_{ij}^{kl} f_{ij}^{international}}{\sum_l M_{ij}^{kl}} * 100\ , \qquad (6)$$

where $AdvInlTC_i^k$ and $AdvIntTC_i^k$ represent inland and international ad valorem transport costs, respectively, for country *i* for commodity *k*; Q_{ij}^{kl} stands for the import of commodity group *k* in weight (here, in kilograms) by country *i* from country *j*; f_{ij}^{inland} represents the inland freight rate per kilogram for the import of commodity *k* by country *i* from country *j*; $f_{ij}^{international}$ represents the international freight rate per kilogram for the import of commodity *k* by country *i* from country *j*; M_{ij}^{k} stands for the import of commodity group *k* in value (here, in United States dollars) by country *i* from country *j*; *l* is the commodity traded at 4-digit HS, falling under the commodity group *k* ($l \in k$). The transport cost is estimated for *k* commodity groups for imports of country *i* from its partner for the years 2000 and 2005. The commodity composition of inland and international transport costs is estimated as a percentage of total import. Inland and international freight rates were collected from Maersk Sealand (2007), whereas country imports at 4-digit HS were collected from the United Nations Comtrade database (2007). Tables 7 and 8 show the level and distribution of transport costs for each importer by commodity across seven Asian countries for the year 2005.[18]

Table 7. Ad valorem inland transport cost (trade-weighted), 2005

(Percentage of import value)

Commodity group	*China*	*India*	*Indonesia*	*Japan*	*Malaysia*	*Republic of Korea*	*Thailand*	*Commodity total[a]*
Transport equipment	3.59	0.05	4.71	3.18	0.14	8.29	7.38	3.06
Automobiles and components	0.36	1.04	1.14	1.37	0.51	0.97	1.26	0.82
Chemicals	3.06	6.93	7.20	5.87	9.77	6.35	9.18	7.02
Electrical and electronics	0.08	3.44	1.33	0.33	0.15	0.33	0.39	0.33
Electronic integrated circuits	0.01	24.98	0.12	0.02	0.03	0.01	0.02	0.09
Food products	6.89	27.21	16.17	5.14	16.02	5.22	7.21	7.35
Fuels, mining and forest products	21.33	7.13	15.71	32.75	29.58	45.67	37.02	22.29
Iron and steel	3.29	11.09	7.87	7.23	14.01	13.92	10.39	12.49
Leather	0.39	1.96	1.67	0.48	0.37	1.25	1.27	0.61
Machinery and mechanical appliances	0.31	0.78	1.21	1.41	0.59	0.77	0.99	0.72
Metal	1.71	4.29	6.26	4.08	6.72	4.74	3.24	2.24

[18] Since there is not much change between 2000 and 2005, we discuss only the broad features of transport costs for 2005. Interested readers may contact the author for data relating to 2000.

Table 7. *(continued)*

Commodity group	*China*	*India*	*Indonesia*	*Japan*	*Malaysia*	*Republic of Korea*	*Thailand*	*Commodity total*[a]
Office and telecom equipment	0.09	7.37	1.20	0.25	0.29	0.24	0.45	0.62
Paper and pulp	7.37	15.10	5.27	6.20	10.11	13.47	11.33	8.77
Pharmaceuticals	0.04	0.12	0.79	0.66	0.87	0.58	0.84	0.53
Rubber and plastics	1.89	6.07	3.64	3.11	6.69	2.49	2.44	2.74
Textile and clothing	0.70	5.58	2.30	0.56	1.13	1.61	2.32	0.90
Country total[a]	2.40	6.70	6.34	4.28	7.87	5.11	5.71	5.45

[a] Weighted average.

Table 8. Ad valorem international transport cost (trade-weighted), 2005

(Percentage of import value)

Commodity group	*China*	*India*	*Indonesia*	*Japan*	*Malaysia*	*Republic of Korea*	*Thailand*	*Commodity total*[a]
Transport equipment	4.90	0.09	6.39	4.03	0.26	5.46	4.50	2.52
Automobiles and components	0.52	1.86	1.55	1.74	0.98	0.69	0.80	0.97
Chemicals	5.29	12.07	10.27	7.63	15.00	4.48	6.10	8.95
Electrical and electronics	0.12	5.96	1.78	0.42	0.27	0.25	0.25	0.44
Electronic integrated circuits	0.01	43.92	0.16	0.02	0.05	0.01	0.01	0.15
Food products	18.20	51.30	28.19	6.82	35.99	22.71	15.50	12.83
Fuels, mining and forest products	70.45	11.91	21.57	51.90	55.26	36.59	25.47	32.34
Iron and steel	5.39	19.78	10.60	7.92	26.54	9.55	6.79	9.60
Leather	0.75	3.64	2.29	0.63	0.82	0.99	0.85	0.76
Machinery and mechanical appliances	0.45	1.40	1.59	1.73	1.04	0.54	0.64	0.83
Metal	2.53	7.70	8.37	5.37	19.39	5.24	2.26	12.50
Office and telecom equipment	0.14	13.39	1.58	0.34	0.53	0.18	0.28	0.98
Paper and pulp	12.14	29.08	7.35	8.38	21.48	10.41	7.28	12.35
Pharmaceuticals	0.06	0.21	1.03	0.85	1.83	0.39	0.59	0.63
Rubber and plastics	3.31	10.77	4.97	4.13	11.77	1.78	1.54	3.98
Textile and clothing	1.12	10.04	3.28	0.73	2.19	1.25	1.57	1.17
Country total[a]	6.50	10.10	8.90	11.09	13.56	7.83	3.86	9.80

[a] Weighted average.

Some broad observations can be made based on the data in these tables:

(a) Ad valorem international transport cost exceeds ad valorem inland transport cost in all countries, with the exception of Thailand. The ad valorem international transport cost for all goods was lowest in Thailand (3.86 per cent) and highest in Malaysia (13.56 per cent). Malaysia also showed the highest inland transportation cost (7.87 per cent) with regard to all goods; China had the lowest (2.40 per cent);

(b) Ad valorem transportation cost varies across commodities. Both inland and international transportation costs are lower for manufactured goods than for traditional commodities. Fuels, mining and forest products incur the highest transportation costs in both cases. In Malaysia in particular, transport costs for the import of chemical, fuels, mining and forest products, iron and steel and metal are comparatively much more expensive than those for manufactures;

(c) Ad valorem transportation cost varies across countries. For example, India experiences significantly higher-than-average transportation costs, both inland and international, for the import of food products, electronic integrated circuits, electrical and electronics, office and telecom equipment, textile and clothing and paper and pulp. International transportation cost for the import of transport equipment is higher in Indonesia than in other Asian countries. However, the Republic of Korea and Thailand become costlier than Indonesia in transport equipment when inland transport cost is considered.

The variation in ad valorem international transportation costs across countries and commodities reflects differences in terminal handling charges and auxiliary shipping charges (tables 9 and 10). On average, auxiliary shipping charges are much higher than THCs, both across commodities and countries. Both charges are highest in India, by a wide margin; there, manufactures, such as electronics, and office and telecom equipment, which make up a large percentage of total imports, are costlier than traditional commodities. Malaysia imports a large amount of traditional items, such as food products, chemicals, paper and pulp, and fuel, mining and forest products, thus showing comparatively higher ocean charges.

The combined incidence of THCs and auxiliary shipping charges on high-value manufactures, such electronic integrated circuits, office and telecom equipment, and electrical and electronics, is higher than that on traditional commodities and mining and forest products.

Table 9. Terminal handling charges (weighted average), 2005

(United States dollars/Twenty-foot equivalent units)

Commodity group	*China*	*India*	*Indonesia*	*Japan*	*Malaysia*	*Republic of Korea*	*Thailand*	*Commodity total*[a]
Electronic integrated circuits	238	768	316	459	316	252	240	626
Office and telecom equipment	231	720	298	412	278	251	243	510
Fuels, mining and forest products	542	817	360	550	370	316	308	468
Food products	422	986	476	408	386	363	386	409
Electrical and electronics	228	734	303	364	276	247	232	384
Chemicals	272	824	357	425	402	249	267	368
Textile and clothing	249	785	361	360	322	264	248	349
Paper and pulp	245	1 010	351	471	380	327	258	325
Pharmaceuticals	260	784	341	361	353	243	249	324
Leather	311	775	312	336	369	255	262	321
Rubber and plastics	274	885	360	452	274	270	253	320
Metal	214	795	303	380	299	251	272	298
Automobiles and components	212	906	325	381	313	244	238	296
Machinery and mechanical appliances	205	750	303	366	270	238	242	282
Iron and steel	245	839	324	371	279	235	236	279
Transport equipment	187	793	318	340	283	225	233	228
Country total [a]	437	795	358	521	337	295	279	403

[a] Weighted average.

Table 10. Auxiliary shipping charges (weighted average), 2005

(United States dollars/Twenty-foot equivalent units)

Commodity group	*China*	*India*	*Indonesia*	*Japan*	*Malaysia*	*Republic of Korea*	*Thailand*	*Commodity total*[a]
Electronic integrated circuits	336	1 419	565	557	514	466	398	1 126
Office and telecom equipment	337	1 541	592	731	486	530	412	1 034
Electrical and electronics	346	1 422	600	726	511	537	428	737
Fuels, mining and forest products	697	1 263	567	793	537	518	409	665

Table 10. *(continued)*

Commodity group	*China*	*India*	*Indonesia*	*Japan*	*Malaysia*	*Republic of Korea*	*Thailand*	*Commodity total*[a]
Food products	569	1 359	701	717	573	573	552	646
Textile and clothing	355	1 451	601	744	507	545	456	646
Leather	404	1 535	611	763	586	565	436	622
Pharmaceuticals	392	1 371	543	722	550	458	482	587
Chemicals	377	1 341	606	676	535	485	425	523
Metal	341	1 436	599	735	496	558	455	517
Machinery and mechanical appliances	333	1 484	587	672	491	491	432	516
Automobiles and components	329	1 328	593	694	502	497	427	510
Rubber and plastics	383	1 322	563	675	478	474	405	485
Iron and steel	368	1 379	586	557	482	478	445	485
Paper and pulp	373	1 386	590	674	528	477	411	477
Transport equipment	326	1 481	597	733	539	460	401	437
Country total[a]	577	1 408	590	770	512	511	425	602

[a] Weighted average.

4. The weight-to-value ratio of trade and transport costs

The changing composition of Asia's trade has been a striking phenomenon and an important issue. Driven by China, Asian countries are gradually specializing in trade in intermediate and finished goods, which increases their import demand. However, to evaluate transport needs, it is useful to compare the trade growth with transport cost. The weight-value ratio for the regional trade among Asian countries was calculated using equation (7),[19]

$$w_{it} = \sum_k S_{ikt} w_k \ , \qquad (7)$$

where w_k is the median weight-value ratio for each HS 4-digit commodity k in imports (exports) for the year 2005; S_{ikt} is the share of product k in the trade bundle of country i at time t; and w_{it} is the aggregate weight-value ratio for country i's imports for the year t. We report the weight-value ratio (measured in TEU per $10,000) for each country's imports in table 11. The following patterns are worth noting:

(a) Asian countries were engaging in more trade in automobiles and transport equipment. As a result, transport equipment across all the Asian countries showed a high weight-value ratio, particularly with regard to Japan;

[19] Here, the methodology follows Hummels (2009).

Table 11. Estimated weight-value ratio, 2005

(Twenty-foot equivalent unit/10,000 United States dollars)

Commodity groups	*China*	*India*	*Indonesia*	*Japan*	*Malaysia*	*Republic of Korea*	*Thailand*
Transport equipment	417.436	12.086	192.917	1 301.104	246.684	148.328	130.887
Automobiles and components	1.957	2.330	1.443	2.330	19.922	11.318	2.266
Chemicals	0.815	0.557	1.066	0.693	18.682	0.611	0.882
Electrical and Electronics	2.216	0.458	7.098	3.202	4.164	4.244	1.848
Electronic integrated circuits	0.092	1.732	9.523	0.508	4.636	0.592	0.195
Food Products	20.728	8.964	0.975	0.349	5.676	0.916	1.957
Fuels, mining and forest products	0.049	0.052	0.435	0.143	1.926	0.190	0.156
Iron and steel	0.365	0.206	0.055	0.142	0.523	0.090	0.072
Leather	2.217	3.799	13.233	0.541	7.087	1.433	4.656
Machinery and mechanical appliances	0.031	0.967	0.039	0.081	0.136	0.035	0.046
Metal	0.118	1.063	0.444	0.207	0.158	0.082	0.112
Office and telecom equipment	0.020	0.010	0.428	0.017	0.039	0.009	0.047
Paper and pulp	0.406	1.419	0.770	1.097	0.261	0.674	0.482
Pharmaceuticals	0.449	0.375	0.033	0.051	0.476	0.031	0.097
Rubber and plastics	0.019	0.003	0.057	0.006	0.009	0.120	0.052

(b) China imports a comparatively high amount of transport equipment, electrical and electronics, automobiles and components, food products, and leather, which are basically heavier raw materials and intermediate products used as inputs for high-value production and exports. In contrast, with the exception of transport equipment, automobiles and components, and electrical and electronics, Japan imported largely low-weight finished products;

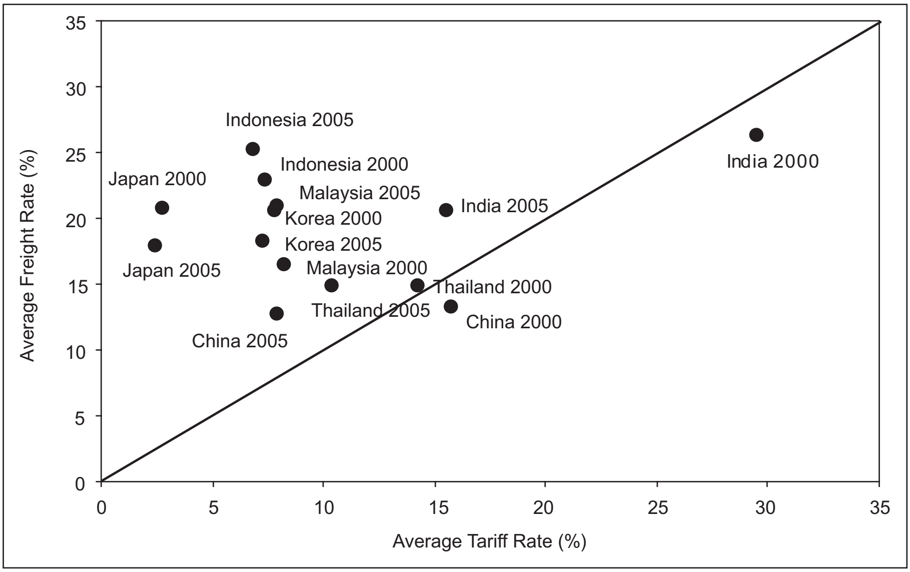
(c) All the Asian economies considered here (except Japan) are importers of high-weight semi-finished capital goods and raw materials.

The cost of transportation of heavier goods would certainly be higher than that of lighter goods. In other words, the weight-value ratio of a product is the major determinant of the transport cost. Hummels and Skiba (2004) commented that a 10 per cent increase in product weight-value leads to a 4 per cent increase in ad valorem shipping cost. Since most of the Asian countries are net importers of weight, and two are geographically large (China and India), it would be important to understand the relationship between transport cost and weight-value ratio, which in turn allows us to evaluate the transportation needs in Asian countries more precisely. We found that the heavier the good, the greater the transportation cost—except in Japan. Japan, being a developed country, has a relatively superior transport infrastructure and also imports much less weight; this leads to less transport congestion and subsequently less ad valorem transportation costs.

Further evidence on the transport barrier is provided in figure 6, which plots the trade-weighted average tariffs and international transport costs of countries in a cross-section pooled framework for the years 2000 and 2005. (Annex III provides the same for nine commodity groups.) There is an absolute fall in tariffs between 2000 and 2005, indicating that most of the countries were successful in reducing average applied tariffs. International transport costs are shown to be much higher than tariff rates, since all countries appear above the 45-degree line for 2005. However, all countries, except Indonesia and Malaysia, reduced such costs between 2000 and 2005. Lastly, transportation cost has a higher incidence than tariffs in aggregate terms (see annex III).

All these changes are reflected in the slight upward-left shift of the countries' locus in the tariff-freight plane over time, which changes the trajectory representing the locus. Figure 7, shows the change in both the slope and intercept between 2000 and 2005. This suggests a relatively higher incidence of transport cost, as well as a reduction in the relative distances among the countries in the tariff-freight plane.[20]

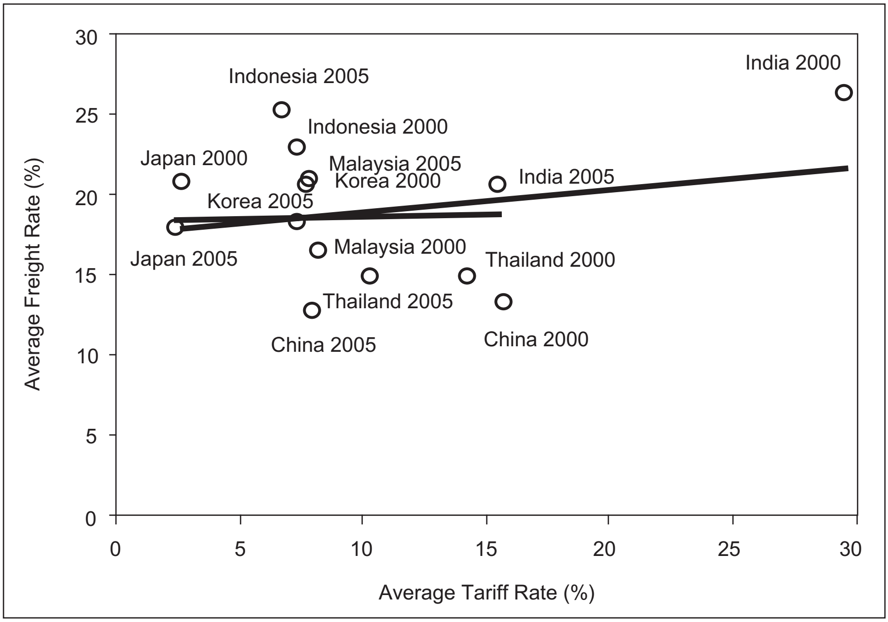
Figure 6. Countries in the tariff-freight plane, 2000 and 2005



Source: De (2006a).

[20] This is further confirmed by the estimated coefficient of variations, which declined in both tariff and freight rates. The coefficient of variations of tariffs decreased from 0.67 in 2000 to 0.44 in 2005, whereas that of freight declined from 0.22 in 2000 from 0.21 in 2005.

Figure 7. Countries in the tariff-freight plane, 2000 and 2005



Source: De (2006a).

In short, Asian countries, with the exception of Japan, experienced a comparatively greater incidence of transportation costs, where variation across countries and commodities is driven by differences in ocean freights. The higher the ocean freight rates, the higher the transportation cost. The evidence also indicates that tariffs as a barrier are not yet dead. In the next section, we further analyse how tariffs and transport costs impede trade and competitiveness.

C. Assessing barriers to trade in selected Asian countries

Having estimated the ad valorem transport costs, we now assess the impact of trade costs (barriers to trade) on trade flows (and competitiveness) in the context of seven Asian countries. In other words, we will test how changes in trade cost components affect import demand. First we estimate the impact of transport costs and other barriers on regional trade and competitiveness, controlling for other variables, in the framework of a gravity model. We deal with those barriers (components of trade costs) which are imposed by both price (e.g. freight and tariff rates) and non-price (infrastructure) factors.

(a) The model

Of all the components of transaction cost, transport cost has been studied the most extensively. Generally, there are two approaches to transport modelling in trade: (a) one in which transport is modelled implicitly with the traded goods;[21] and (b) one which involves explicit transport sector modelling. The former relates to price factors, while the latter deals predominantly with non-price factors. As trade costs are heavily dependent on both types of factors, we explore both approaches here.

In order to understand the impact of trade costs on trade flows, the following baseline constant elasticity of substitution (CES) equation is considered.

$$X_{ij} = Y_i Y_j \left(\frac{T_{ij}}{P_i P_j} \right)^{1-\sigma}, \qquad (8)$$

where X_{ij} denotes country *i* 's imports from country *j*; Y_i and Y_j represent aggregate sizes of import demand and export supply of countries *i* and *j* respectively;[22] T_{ij} accounts for trade costs components; P_i and P_j reflect the implicit aggregate equilibrium prices; and σ is the elasticity of substitution parameter between all goods in the consumption utility function.[23]

We assume from equation (8) that T_{ij} can be divided into several components, namely, infrastructure quality, tariff barriers, transport costs and other border effects. Assuming a monopolistically competitive market, the term (1-σ) should be negatively related to the volume of trade.

We assume that the shipment of a container from country *j* to country *i* incurs three major costs: (a) inland transportation costs at exporting country *j* (T_j^{Inl}); international transportation costs (port to port) between *j* and *i* (T_{ij}^{Int}); and inland transportation costs at importing country *i* (T_i^{Int}). Therefore, equation (8) can be rewritten as

$$X_{ij} = Y_i \left(\frac{T_j^{Inl} + T_{ij}^{Int} + T_i^{Intl}}{P_i P_j} \right)^{1-\sigma}. \qquad (9)$$

In terms of the demand side of import, the final estimable equation is expressed as follows:[24]

$$\ln X_{ij} = \alpha_0 + \alpha_i + \alpha_j + \beta_1 \ln Y_i + \beta_2 \ln TII_i + \beta_3 \ln TII_j + \beta_4 \ln Port_i + \beta_5 \ln Port_j + \beta_6 \ln T_j^{Inl} + \beta_7 T_{ij}^{Int} + \beta_8 T_i^{Inl} + \beta_9 \ln TR_{ij} + \beta_{10} \ln ER_j + \beta_{11} D + \beta_{12} D_1 + \beta_{13} D_2 + \varepsilon_{ij}. \qquad (10)$$

[21] Transport is implicit in the “iceberg” model (Samuelson 1954)—the most widely used. That model assumes that a part of the transported good is consumed in transportation.

[22] These terms are used to represent the supply capability of the exporter and the demand availability of the importer for a given period of time in a static sense.

[23] We assume that all goods are differentiated by the place of origin and that each country is specialized in the production of only one good. Therefore, the supply of each good is fixed (n_i = 1), but it allows preferences to vary across countries subject to the constraint of market clearing (constant elasticity of substitution).

[24] This equation closely follows equation (18) of Hummels (1999). Here, export supply capability (Y_j) is not included since we are considering imports in a bilateral pair.

On the impact of non-price barriers to trade, we have

$$\ln X_{ij} = \alpha_0 + \alpha_i + \alpha_j + \beta_1 \ln Y_i + \beta_2 \ln TII_i + \beta_3 \ln TII_j + \beta_4 \ln Port_i + \beta_5 \ln Port_j + \beta_6 D + \beta_7 D_1 + \beta_8 D_2 + \varepsilon_{ij}, \qquad (11)$$

whereas, on price barriers to trade, we consider

$$\ln X_{ij} = \alpha_0 + \alpha_i + \alpha_j + \beta_1 \ln Y_i + \beta_2 \ln T_j^{Inl} + \beta_3 T_{ij}^{Int} + \beta_4 T_i^{Inl} + \beta_5 \ln TR_{ij} + \beta_6 \ln ER_j \beta_7 D + \beta_8 D_1 + \varepsilon_{ij}. \qquad (12)$$

With respect to explicit tariff and freight rates, we revise equation (12) as follows:

$$\ln X_{ij} = \alpha_0 + \alpha_i + \alpha_j + \beta_1 \ln Y_i + \beta_2 \ln (T_{ij} + TR_{ij}) + \beta_3 \ln ER_j + \beta_4 D + \beta_5 D_1 + \varepsilon_{ij}. \qquad (13)$$

To understand the variability of inland and international transport costs, we use

$$\ln X_{ij} = \alpha_0 + \alpha_i + \alpha_j + \beta_1 \ln Y_i + \beta_2 \ln (T_{ij}^{Int} + T_i^{Inl}) + \beta_3 \ln (TR_{ij}) + \beta_4 \ln ER_j + \beta_5 D + \beta_6 D_1 + \varepsilon_{ij} \qquad (14)$$

and

$$\ln X_{ij} = \alpha_0 + \alpha_i + \alpha_j + \beta_1 \ln Y_i + \beta_2 \ln (T_{ij}^{Int}) + \beta_3 \ln (TR_{ij}) + \beta_4 \ln ER_j + \beta_5 D + \beta_6 D_1 + \varepsilon_{ij}, \qquad (15)$$

where *i* and *j* are importing and exporting countries, respectively; X_{ij} represents the bilateral import of country *i* from country *j* of commodity *k*; Y_i denotes the total import of country *i* from country *j*; TII represents the country's infrastructure quality, measured through an index; Port represents performance of a country's port; T_{ij} stands for transport costs (ad valorem) for bilateral trade between countries *i* and *j*; TR_{ij} stands for the bilateral average (ad valorem) tariff by country *i* for imports from country *j*; and ER_i represents the annual average exchange rate in exporting country *i*. D is capital-to-capital distance between bilateral trading paris. Dummies 1 and 2 refer to adjacency and electronic data interchange, respectively.[25] We avoid placing proxies for other indirectly measured border effects such as language similarity or regional free trade agreements. The parameters to be estimated are denoted by β, and ε_{ij} is the error term. Annex IV provides the methodology adopted to derive TII and Port.

The model considered here uses data for the years 2000 and 2005 at 4-digit HS for imports of seven Asian countries, namely, China, India, Indonesia, Japan, Malaysia, Republic of Korea and Thailand. The model considers data at a bilateral level for all the variables for each country's individual partners. By focusing on tariffs and transport costs, we cover a major portion of trade costs. Bilateral trade, transport costs, and tariffs are taken at 4-digit HS for the years 2000 and 2005. The pooled data set comprises about 57,629

[25] Electronic data interchange (EDI) is normally used by customs and port authorities to facilitate trade, and is an indication of e-governance. An efficient port uses EDI (the nomenclature varies across countries) for faster movement of goods and services.

observations, 16 identical commodity groups for each year and seven countries all through.[26] Annex VI provides the data sources.

The decision to use either a fixed or random effects model was based on the Hausman χ^2 test. For the fixed-effect specifications, we used the least squares dummy variable model, while the random-effect models are estimated using the generalized least squares method, correcting for possible heteroscedastic errors and panel-specific serial correlation. The Durbin-Watson test was applied; no presence of serial correlation was detected. Of the two models, the fixed-effect model (two-way) appeared most significant. Before estimating the models, we obtained a matrix of correlation coefficients among the explanatory variables to rule out any possibility of multicollinearity problems. Where such problems were detected, we excluded some variables.[27]

(b) Results

Tables 12 and 13 present estimation results for the two combined years (2000 and 2005), all commodity groups, for two scenarios (price and non-price variables). We expect that the price (barrier) variables will be negatively correlated with the volume of imports, and non-price (barrier) variables will be positively related to imports, respectively. The estimated coefficients show elasticity, which is useful as an indicator of the effect of trade barriers on trade volumes. The model performs well, as most of the variables had the expected signs. Given the cross-sectional nature of the data at 4-digit HS for the years 2000 and 2005, the estimated models (1 to 4 in table 12) explained about 86 per cent of the variations in the direction of trade flows when price variables were considered, and 87 per cent when non-price variables were analysed (table 13).

The size of the importers' market has a positive impact on the volume of imports, while barriers—price as well as non-price—impede imports. The most interesting result is the strong influence that the ad valorem price factor (T_{ij} + TR_{ij}) had on trade: the higher the price barriers between each pair of partners, the less they trade. In other words, a 10 per cent ad valorem price (transport and tariff) increase lowers trade by 2 per cent. Tariff and transport costs, considered separately, also influence the trade flow in the same direction, with more or less same magnitude. The coefficients of price variables in most of the cases are statistically significant at the 1 per cent level, and are always negative, except in model 3. International transport cost, when considered separately, had a positive sign and was significant at the 5 per cent level, thereby indicating that it is more important to address inland rather than international transportation costs. It may be said that, under the given conditions, as Asian trade increases overall,[28] trade among Asian countries will

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[26] About 8.36 per cent of the total observations in the pooled framework show illogical values (missing, negative or extremely high); most such values (27 per cent) were observed in the category of fuels, mining and forest products (see annex V).

[27] Annex VII presents partial correlations among the dependent and independent variables (in natural logs).

[28] In 2005, about 51.2 per cent of Asia's exports were conducted within the region, and about 27 per cent of world exports came from Asia (WTO, 2007).

Table 12. Log-linear least squares estimates of import demand: price effects

	Model 1		Model 2		Model 3		Model 4	
	Coefficient	*t-value*	*Coefficient*	*t-value*	*Coefficient*	*t-value*	*Coefficient*	*t-value*
T_{ij} (Transport)							-0.044**	4.840
TR_{ij} (Tariff)			-0.253***	-16.190	-0.250***	-15.550	-0.239***	-15.120
$T_{ij} + TR_{ij}$ (Transport + tariff)	-0.202***	-21.340						
$T_{ij}^{Int} + T_i^{Inl}$ (International transport + inland transport of importer)			-0.223***	-32.920				
T_{ij}^{Int} (International transport)					0.051**	4.790		
ER_j (Exchange rate)	0.009*	2.360	0.006	1.680	0.010*	2.820	0.010*	2.800
Y_j (Importer market size)	0.503***	576.090	0.485***	396.870	0.484***	362.820	0.484***	361.320
D (Distance)	-0.725***	-12.883	-0.709***	-14.128	-0.674***	16.809	-0.720***	-15.187
D_1 (Adjacency dummy)	0.280***	10.570	0.276***	10.490	0.239***	9.000	0.236***	8.900
Number of observations	57 929		57 929		57 929		57 929	
R^2	0.862		0.864		0.862		0.862	

Notes: Dependent variable is log of import of goods (at 4-digit HS) in bilateral pair.
Cross-section pooled for the years 2000 and 2005.
Country and time fixed effect are included in the model.
* Significant at the 10 per cent level; ** significant at the 5 per cent level; *** significant at the 1 per cent level.

Table 13. Log-linear least squares estimates of import demand: non-price effects

	Coefficient	*t-value*
$Port_i$ (Performance of importer's port)	0.12**	3.73
$Port_j$ (Performance of exporter's port)	0.41***	13.24
TII_i (Trade mobility infrastructure of importer)	0.39***	17.62
TII_j (Trade mobility infrastructure of exporter)	0.59***	32.13
Y_j (Importer market size)	0.35***	53.70
D (Distance)	-0.655***	17.237
D_1 (Adjacency dummy)	0.39***	14.56
D_2 (Electronic data interchange dummy)	0.61***	18.98
Number of observations	57 929	
R^2	0.865	

Notes: Dependent variable is log of import of goods (at 4-digit HS) in bilateral pair. Cross-section pooled for the years 2000 and 2005.

Country and time fixed effect are included in the model.

* Significant at the 10 per cent level; ** significant at the 5 per cent level; *** significant at the 1 per cent level.

grow even if international transport costs rise. This also suggests that there are huge infrastructure bottlenecks inside countries in Asia (barring perhaps Japan) that call for immediate attention. Costlier inland transportation prohibits and taxes trade as much as tariffs do. If not checked, it is likely to wipe out the benefits attributed to the advancements in international shipping. Therefore, infrastructure has a strong role to play in reducing trade costs and raising competitiveness in Asia.

Contrary to expectations, in all models, the exchange rate in the exporting country appeared with positive coefficient. Possible explanations include the following: (a) currency depreciation had little effect on aggregate trade flow during the period of our study; or (b) there was appreciation against the United States dollar. In all models, distance had the correct sign, and was statistically significant. The adjacency dummy, which is a proxy of indirectly measured barriers, has a positive sign in all the models, which indicates that sharing a border does matter to trade in Asia.

In the case of non-price variables, the estimated results indicate that the trading infrastructure of exporting countries is much more important than that of importing countries; this coefficient is statistically significant at the 1 per cent level. Similarly, the port performance of exporting countries has a comparatively higher positive effect on trade flow than does the port performance of importing countries. The adjacency dummy has the expected sign and is also significant. Interestingly, the electronic data interchange dummy also has a positive effect on trade flow.

The direction of the influence of price and non-price factors on trade flow has been researched extensively. However, the combined effect of explicit barriers, such as transport and tariffs, on Asian trade was unknown. As mentioned above, estimated coefficients indicated that a 10 per cent increase in price barriers such as tariffs and transport costs would lower Asian aggregate trade by 2 per cent. We would expect an analysis of disaggregated data to reveal variations in the effects of barriers. To this end, we examined estimates at the commodity levels for the effects of price and non-price factors (annexes VIII and IX, respectively) on trade flows.

Tariffs were shown to be highly significant (negative) barriers in 10 of the 16 commodity groups included in the study. Tariffs are no longer a barrier to trade flow in some commodity groups, such as fuels, mining and forest products; metal; and paper and pulp, which have statistically significant coefficients. These commodity groups are "all weather" and demand driven, and feed the manufacturing sector in Asia. The category of automobiles and components also had a positive coefficient, but it was not statistically significant. The extensive production network of the automobile sector in Asia had forced tariffs down, thus they were gradually losing significance as a barrier; however, high tariffs still existed on certain automobile parts. Tariffs were still penalizing trade in the office and telecom sector in Asia. Overall, based on the estimated coefficients, a 10 per cent decrease in tariffs would lead to a 2 to 6 per cent rise in trade in 10 commodity groups in Asia.

Among the price factors, the estimated coefficients of transport costs are significant and negative in most of the sectors: electrical and electronics, pharmaceuticals, leather, machinery and mechanical appliances, metal, paper and pulp, chemicals, textiles and clothing, food, and office and telecom equipment. In the remaining sectors, namely, automobiles and components; transport equipment; and fuels, mining and forest products, the estimated coefficients of transport costs components have a positive sign but are not always significant. A careful scrutiny of the differentials of the estimated coefficients in the former group of commodities clearly indicates that inland transportation costs are more significant than international transport costs, except perhaps in the automobiles and components sector. Therefore, larger or medium-sized countries, such as China, Japan, India, Indonesia, Malaysia, the Republic of Korea and Thailand, which are producers and/or exporters of manufactures such as electrical and electronics, pharmaceuticals, leather, machinery and mechanical appliances, or office and telecom equipment, still had not been able to reap many trade benefits due to the presence of comparatively higher price barriers, such as higher tariffs and transport costs.

The adjacency dummy shows mixed results: having a common border is advantageous for trade in only some commodity groups (such as textiles and clothing, leather, food, and fuels, mining and forest products). Contrary to the finding above, a depreciation of the exchange rate might lead to an increase in trade flows in certain commodities, such as office and telecom equipment, automobiles and components, chemicals, electrical and electronics, and fuels, mining and forest products. Trade in commodity groups such as leather might not increase in response to a further depreciation of currency.

The ad valorem combined effect of tariffs and transport is highly significant and negative in the cases of textile and clothing, office and telecom equipment, machinery and mechanical appliances, electrical and electronics, and leather. Of the significant estimates, the size of the effects varies widely. The estimated coefficients show that a 10 per cent reduction in ad valorem tariffs and transport costs would lead to a rise of about 2 to 9 per cent in bilateral trade flows of manufactures (except automobiles and transport equipment) in Asia. The usual caveat is that R^2 reported in annex VIII explains only a small part (a third or less) of the variation in trade flows. Perhaps the inappropriateness of the structural model or omitted variable bias could be the plausible reasons for poor fit.

When we consider non-price effects on trade flows, we get comparatively better results in all sectors except transport equipment (see annex IX). There is strong empirical evidence that non-price components, namely, a country's infrastructure quality and the performance of its ports, are important for international trade patterns of 15 prominent sectors in Asia. The importing country's infrastructure quality is the most important determinant of cross-country variations of trade flows.

Among dummies, the results of electronic data interchange and adjacency are mixed. In some sectors, the estimated coefficient of the electronic data interchange dummy was positive, in others, negative. Trade in the textile and clothing and chemical sectors had benefited from electronic data interchange at ports. The estimated coefficients of the adjacency dummy (positive and significant) show that trade in office and telecom equipment, and rubber and plastic had benefited from common borders. Interestingly, the estimated coefficients of exchange rate in most sectors show a negative correlation with trade flows, thereby suggesting that further depreciation of the currency would lead to a rise in trade flows except in the sectors of paper and pulp, and leather. This contradicts the results calculated using aggregate trade data (equation (10)).

D. Conclusion

The fundamental conclusion of this paper is that transportation cost is relatively more important than tariffs, ceteris paribus, in enhancing Asia's trade. The analysis carried out in this study provides sufficient evidence to ascertain that variations in tariffs and transport costs, along with the quality of infrastructure facilities, have significant influence on regional trade flows in Asia. This paper also offers evidences of price and non-price effects on trade barriers.

In terms of specific aspects, the following conclusions have been drawn:

(a) Asia experienced a sharp increase in merchandise trade and was showing greater trade interdependence on a large variety of goods, particularly in intermediate and capital goods. However, rising trade costs (attributable to higher tariffs and freight rates) continued to impede trade in Asia;

(b) Freight (ocean) cost is one of the major components of international transport costs. It has an impact on trade equivalent to customs tariffs or the exchange rate. Freight costs vary across regions; inefficient transport services that result in longer delivery times could account for some of this variation. In Asia, the freight rate of container shipments (at the bilateral level) increased significantly. The freight rate for every bilateral pair increased between 2000 and 2005, with variations in levels as well as in growth. Differences across countries and regions in ocean freight rates could be a source of absolute and comparative advantage and affect trade in very much the same way high tariffs do;

(c) The estimated commodity distribution of freight rates indicated that the incidence of inland transportation costs was much higher than that of international transportation costs in Asia. In other words, trade in Asia could be suffering more from bottlenecks in infrastructure quality associated with the movement of goods inside the country rather than international infrastructure involved in shipping goods between the ports of two countries;

(d) The incidence of freight creates havoc in Asia's trade. Generally speaking, the estimated freight rates are lower for manufactured goods than for traditional commodities. In Indonesia, the freight rates are exceptionally high when country-to-country freight rates are considered. However, the port-to-port freight in Indonesia is relatively low, indicating that Indonesia incurs high costs related to inland transportation;

(e) There was an absolute fall in tariffs between 2000 and 2005, indicating that most of the countries in Asia were successful in reducing average applied tariffs. While slight, there was an upward shift of the countries' locus, even though marginal, in the north-western direction in the tariff-freight plane over time. This suggests a relatively higher incidence of freight in Asia, as well as a reduction of relative distances among the Asian countries in the tariff-freight plane;

(f) Having estimated the ad valorem freight rates, we then assessed the impact of trade costs (barriers to trade) on trade flows, looking particularly at price factors (freight and tariff rates) and non-price factors (infrastructure). The estimated model explained about 86 per cent of the variations in the direction of trade flows when price variables were considered, and 87 per cent when non-price variables were considered in the model. The importers' market size has a positive impact on the volume of imports, and the impact of the barriers (both price and non-price) on imports is negative. The most interesting result was the strong influence that the ad valorem price factor (T_{ij} + TR_{ij}) had on trade: the higher the price barriers between countries in a pair, the less they traded. In other words, a 10 per cent increase in the ad valorem price (transport and tariff) lowered trade by 2 per cent. Tariff and transport costs, each considered separately, also influence the trade flow in the same direction, to more or less the same extent;

(h) The estimated coefficient of international transportation costs indicated that it was more important to address inland rather than international transportation cost if the goal was to enhance Asian trade in selected commodities. There were indications of huge domestic infrastructure bottlenecks in countries in Asia (barring perhaps Japan) that call for immediate attention in order to enhance trade flows in Asia. Costlier inland transportation limits and taxes trade in the way tariffs do. If not checked, it is likely to negate the benefits gained from advancements in international shipping and tariff reductions. Therefore, infrastructure has an important role to play in reducing trade costs in Asia;

(i) Tariffs were shown to have a relatively large and negative impact on trade when we considered individual sectors. Trade in all sectors, with the exception of transport equipment, is influenced by tariffs, transport costs and infrastructure quality. In the case of transport equipment, bilateral tariffs had a less significant role, as trade in that sector is more demand driven in Asia;

(j) The ad-valorem combined effect of tariff and transport is highly significant and negative in the cases of textiles and clothing, office and telecom equipment, machinery and mechanical appliances, electrical and electronics, and leather. The size of the effects varies widely. Estimated coefficients show that a 10 per cent reduction in ad valorem tariffs and transport costs would lead to an increase of about 2 to 9 per cent in bilateral trade flows of manufactures (except automobiles and transport equipment) in Asia.

(k) Larger or medium-sized countries, such as China, Japan, India, Indonesia, Malaysia, the Republic of Korea and Thailand, which are producers and exporters of manufactures such as electrical and electronics, pharmaceuticals, leather, machinery and mechanical appliances, and office and telecom equipments, still had not been able to reap benefits due to the presence of comparatively higher price barriers, such as higher tariffs and transport costs.

Given these broad findings, we can say that with the rise of regionalism (and also bilateralism) in Asia, any attempt towards deeper integration of the economies of the region holds high promise only if accompanied by initiatives that help improve trade efficiency and reduce trade costs. Reductions in inland transportation costs should be a priority in any new policy for Asia’s infrastructure development, since a decrease in inland transportation costs, as an outcome of improved infrastructure, will stimulate trade. The challenge for Asian countries is thus to identify improvements in logistics services and related infrastructure that can be achieved in the short-to-medium term and that would have a significant impact on the competitiveness of Asian countries.

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Annex I

Classification of commodity groups

	Corresponding 2/4 -digit HS (2002)	*Remarks*
Agriculture products	01-24, 50-53	Taken at 4-digit HS excluding
Food	16-23	HS 01 and HS 06
Fuels, mining and forest products	25-27, 44	Taken at 4-digit HS, excluding HS 45
Manufactures	28-43, 45-49, 54-70, 72-92, 94-96	Taken at 4-digit HS, excluding HS 44, 50-53, 71, 93
Chemical	28-36, 38	Taken at 4-digit HS, excluding
Pharmaceuticals	30	HS 37
Rubber and plastics	39-40	
Leather	41-43, 64	
Paper and pulp	47-48	
Textile and clothing	54-63	Taken at 4-digit HS, excluding
Iron and steel	72-73	HS 64-67, 71
Metal	68-70, 74-81	
Machinery and mechanical appliances	82-84	Taken at 4-digit HS, excluding HS 8415, 8418, 8471, 8473
Electrical and electronics	85, 90, 91, 92, 95	Taken at 4-digit HS, including
Office and telecom equipment	8517-8548	HS 8415, 8418, 8471, 8473
Electronic integrated circuits	8542	
Transport equipment	86-89	
Automobiles and components	87	

Annex II

Components of international transport cost

(United States dollars/Twenty-foot equivalent unit)

	Terminal handling charges[a]		*Ocean freight charges*[b]	
	2000	*2005*	*2000*	*2005*
China	223	437	338	577
India	374	795	729	1 408
Indonesia	235	358	416	590
Japan	339	521	556	770
Malaysia	245	337	409	512
Republic of Korea	238	295	456	511
Thailand	184	279	310	425

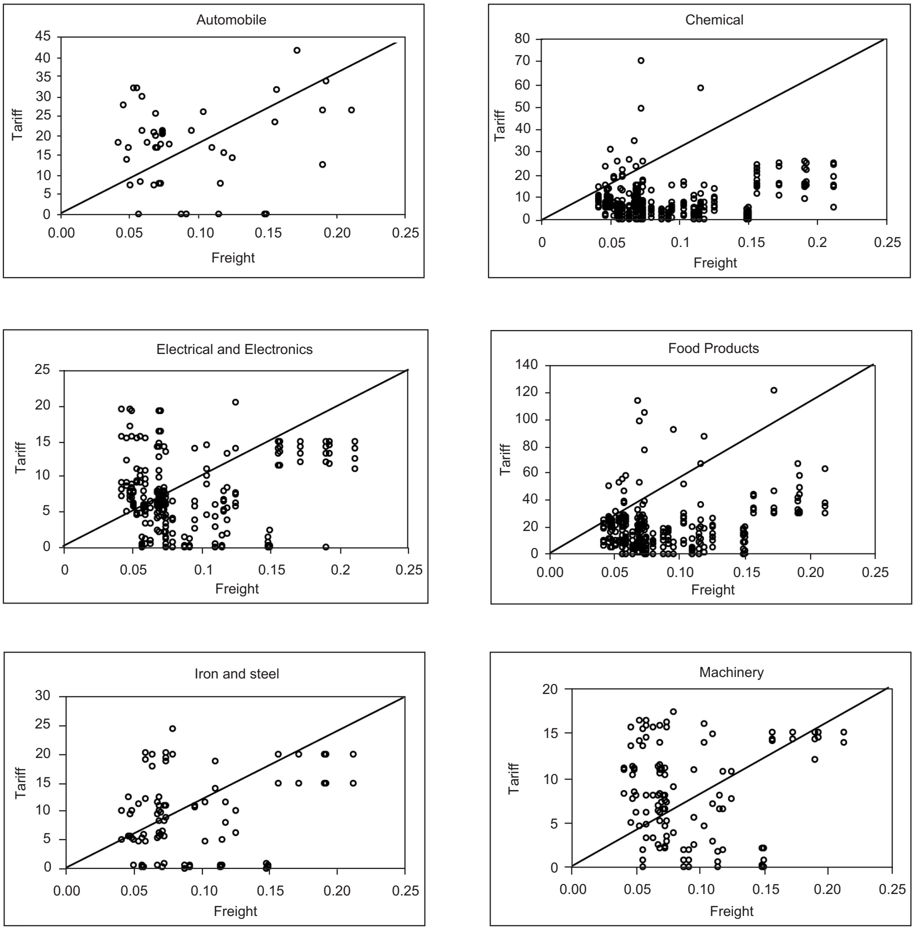
Source: Calculated based on data from Maersk Sealand (2007).

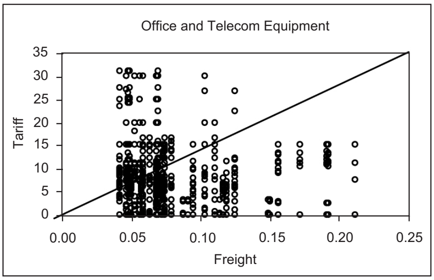
[a] Average (weighted) over all commodities.

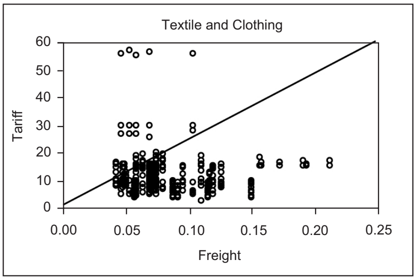
[b] Other than terminal handling charges.

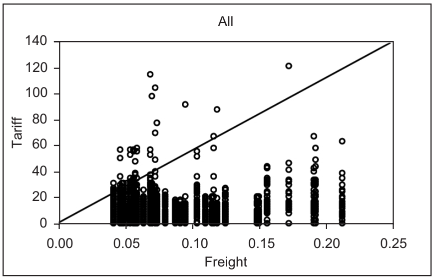
Annex III

Incidence of ad valorem tariff and freight by commodity groups, 2005




Office and Telecom Equipment
Tariff
Freight
0.00
0.05
0.10
0.15
0.20
0.25
0
5
10
15
20
25
30
35


Textile and Clothing
Tariff
Freight
0.00
0.05
0.10
0.15
0.20
0.25
0
10
20
30
40
50
60


All
Tariff
Freight
0.00
0.05
0.10
0.15
0.20
0.25
0
20
40
60
80
100
120
140

Annex IV

Building an infrastructure index

To assess country characteristics and domestic (inland) transport costs, we focus on infrastructure measures—the country's ability to enhance the merchandise trade. Infrastructure is treated here as a proxy for those costs, because it responsible for the movement of goods across and within countries.

To assess the impact of infrastructure facilities on bilateral trade, we have constructed the Trade Infrastructure Index, comprising nine infrastructure variables for each individual country. The Index is designed to measure the costs of travel across a country. In theory, the export and import prices are border prices, and thus it would seem that own and trading partner infrastructures as defined here should not affect these rates. However, interactions between the variables are possible. The simplest example is that an increase in land distance would increase transport cost. The Index is based on principal component analysis, and it measures the relative position of a country considering a set of observables. Briefly, the Index is a linear combination of the unit free values of the individual facilities, such that

$$II_{ij} = \sum W_{kj} X_{kij} \ ,$$

where II_{ij} is the infrastructure index of the i^{th} country in j^{th} time, W_{kj} is weight of the k^{th} facility in j^{th} time; and X_{kij} = unit free value of the k^{th} facility for the i^{th} country in the j^{th} time point.

While indexing the infrastructure stocks of the countries, we considered the following nine variables, which are directly involved in moving merchandise between countries: (a) railway length density (km per 1,000 km^2 of surface area); (b) road length density (km per 1,000 km^2 of surface area); (c) air transport freight (million tons per km); (d) air transport, passengers carried (percentage of population); (e) aircraft departures (percentage of population); (f) country's percentage share in world fleet; (g) container port traffic (twenty-foot equivalent units per terminal); (h) fixed-line and mobile phone subscribers (per 1,000 people); and (i) electric power consumption (kwh per capita).

Table IV.1. Estimated weights: principal component analysis

Infrastructure Indicator	*Factor loadings*[a]	
	2000	*2005*
Air transport freight (million tons per km)	0.76	0.80
Air transport, passengers carried (percentage of population)	0.83	0.88
Aircraft departures (percentage of population)	0.86	0.91
Country's percentage share in world fleet	0.31	0.36
Container port traffic (TEUs per terminal)	0.50	0.53

Table IV.1. *(continued)*

Infrastructure Indicator	*Factor loadings*[a]	
	2000	*2005*
Electric power consumption (kwh per capita)	0.79	0.90
Fixed-line and mobile phone subscribers (per 1,000 people)	0.86	0.93
Railway length density (km per 1,000 km^2 of surface area)	0.85	0.92
Road length density (km per 1,000 km^2 of surface area)	0.82	0.90
Explanatory variable (percentage of total)	0.65	0.67

[a] Unrotated.

Abbreviation: TEU, twenty-foot equivalent units.

Table IV.2. Estimated trade infrastructure index, 2000 and 2005

	2000	*2005*
China	1.66	1.87
India	0.51	0.58
Indonesia	0.41	0.45
Japan	4.12	4.23
Malaysia	1.62	1.70
Republic of Korea	3.01	3.18
Thailand	0.86	0.91

Source: International Association of Ports and Harbours.

Note: Average of country's top three largest container ports.

Table IV.3. Performance of ports: number of containers (twenty-foot equivalent units) handled per hour, 2000 and 2005

	2000	*2005*
China	19	39
India	11	27
Indonesia	9	12
Japan	27	35
Malaysia	38	52
Republic of Korea	32	44
Thailand	12	30

Source: International Association of Ports and Harbours.

Note: Average of country's top three largest container ports.

Annex V

Excluded values by country and commodity

Table V.1. By country

	Total excluded observations	*Total number of observations*
China	263	8 594
India	1 029	7 558
Indonesia	311	8 699
Japan	505	7 852
Malaysia	2 052	8 881
Republic of Korea	354	7 682
Thailand	328	8 663
Total	**4 842**	**57 929**

Table V.2. By commodity group

Commodity group	*Total excluded observations*	*Total observations*
Transport equipment	61	604
Automobiles and components	92	839
Chemicals	324	9 748
Electrical and electronics	1 007	5 775
Electronic integrated circuits	20	84
Food products	200	2 719
Fuels, mining and forest products	1 066	3 885
Iron and steel	165	3 741
Leather	26	1 001
Machinery and mechanical appliances	723	7 481
Metal	296	7 060
Office and telecom equipment	278	2 488
Paper and pulp	40	1 766
Pharmaceuticals	0	404
Rubber and plastics	88	3 334
Textile and clothing	456	7 000
Total	**4 842**	**57 929**

Annex VI

Sources of data

Particular	*Source*
Bilateral trade	United Nations Commodity Trade Statistics Database (UN Comtrade); International Monetary Fund, Direction of Trade Statistics (DOTS) Database
Bilateral tariff	World Bank, World Integrated Trade Solution (WITS); United Nations Conference on Trade and Development, Trade Analysis and Information System (TRAINS)
Gross domestic product, gross domestic product per capita, surface area, population	World Bank, *World Development Indicators 2008* (Washington, D.C., World Bank, 2008).
Infrastructure variables: (a) railway length; (b) road length; (c) air transport freight; (d) air transport passengers carried; (e) aircraft departures; (f) container traffic; (g) fixed-line and mobile phone subscribers; (h) Internet users; and (i) electric power consumption Freight	World Bank, *World Development Indicators 2008* (Washington, D.C., World Bank, 2008); CIA International database. Data from Maersk Sealand, Denmark

Annex VII

Pair-wise correlation coefficients

	X_{ij}	Y_i	TR_{ij}	T_{ij}^{Int}	T_{ij}	T_i^{Inl}	ER_j	$Port_i$	$Port_j$	TII_i	TII_j
X_{ij}	1										
Y_i	0.926*	1									
TR_{ij}	-0.627*	-0.646*	1								
T_{ij}^{Int}	0.363*	0.405*	-0.159*	1							
T_{ij}	-0.467*	0.511*	-0.278*	0.858*	1						
T_i^{Inl}	-0.061*	-0.011*	-0.007	0.357*	0.484*	1					
ER_j	0.021*	0.023*	0.029*	0.024*	0.015*	-0.057*	1				
$Port_i$	-0.881*	-0.956*	0.551*	-0.407*	-0.511*	0.031*	0.026*	1			
$Port_j$	-0.410*	-0.461*	0.299*	-0.304*	-0.308*	-0.010*	-0.427*	0.433*	1		
TII_i	-0.889*	-0.965*	0.560*	-0.428*	-0.538*	0.053*	-0.023*	0.978*	0.459*	1	
TII_j	-0.045*	0.001	0.021*	-0.137*	-0.088*	-0.096*	-0.177*	-0.000	0.705*	0.005	1

Notes: Taken in log scale.

* Significant at the 5 per cent level.

Annex VIII

Log-linear least squares estimates of import demand: price effects

	Model 1		*Model 2*		*Model 3*		*Model 4*	
	Coefficient	*t-value*	*Coefficient*	*t-value*	*Coefficient*	*t-value*	*Coefficient*	*t-value*
				Automobiles and components				
$T_{ij} + TR_{ij}$ (Transport + tariff)	0.175	0.590						
T_{ij}^{Int} (International transport)			-0.687**	-3.120				
T_{ij} (Transport)					0.284*	1.860		
$T_{ij}^{Int} + T_i^{Inl}$ (International transport + inland transport of importer)							0.234*	1.410
TR_{ij} (tariff)			0.493	1.200	0.386	0.940	0.395	0.960
Y_j (Importer market size)	1.206***	10.180	1.206***	10.090	1.224***	10.100	1.216***	10.020
ER_j (Exchange rate in the exporting country)	-0.100*	-2.010	-0.100*	-1.990	-0.101*	-2.010	-0.101*	-2.000
D_1 (Adjacency dummy)	-0.678*	-2.160	-0.569*	-1.780	-0.629*	-1.960	-0.634*	-1.970
Number of observations	839		839		839		839	
R^2	0.162		0.173		0.166		0.165	
				Chemicals				
$T_{ij} + TR_{ij}$ (Transport + tariff)	-0.374***	-10.88						
T_{ij}^{Int} (International transport)			-0.384***	-13.87				
T_{ij} (Transport)					-0.355***	15.18		
$T_{ij}^{Int} + T_i^{Inl}$ (International transport + inland transport of importer)							-0.362***	-14.72
TR_{ij} (Tariff)			-0.237**	-4.710	-0.231**	-4.590	-0.235**	-4.660
Y_j (Importer market size)	0.951***	32.660	0.969***	33.300	0.959***	33.150	0.959***	33.100
ER_j (Exchange rate in the exporting country)	-0.032*	-2.540	-0.028*	-2.210	-0.030*	-2.380	-0.026*	-2.100
D_1 (Adjacency dummy)	-0.239**	-3.070	-0.232**	-2.980	-0.232**	-2.980	-0.241**	-3.100
Number of observations	9 748		9 748		9 748		9 748	
R^2	0.133		0.142		0.146		0.145	
				Electrical and electronics				
$T_{ij} + TR_{ij}$ (Transport + tariff)	-0.648***	-7.790						
T_{ij}^{Int} (International transport)			-0.268**	-4.090				
T_{ij} (Transport)					-0.083*	-1.570		
$T_{ij}^{Int} + T_i^{Inl}$ (International transport + inland transport of importer)							-0.110*	-1.880

Annex VIII *(continued)*

	Model 1		*Model 2*		*Model 3*		*Model 4*	
	Coefficient	*t-value*	*Coefficient*	*t-value*	*Coefficient*	*t-value*	*Coefficient*	*t-value*
	Electrical and electronics							
TR_{ij} (Tariff)			-0.545**	-6.550	-0.579***	-6.990	-0.578***	-6.970
Y_j (Importer market size)	1.530***	36.360	1.531***	36.410	1.533***	36.430	1.534***	36.460
ER_j (Exchange rate in the exporting country)	-0.110***	-6.590	-0.111***	-6.620	-0.108***	-6.470	-0.109***	-6.500
D_1 (Adjacency dummy)	-0.154	-1.400	-0.160	-1.450	-0.159	-1.440	-0.155	-1.410
Number of observations	5 775		5 775		5 775		5 775	
R^2	0.258		0.259		0.257		0.257	
	Food							
$T_{ij} + TR_{ij}$ (Transport + tariff),	-0.320**	-4.070						
T_{ij}^{Int} (International transport)			-0.337***	-5.770				
T_{ij} (Transport)					-0.305***	-5.850		
$T_{ij}^{Int} + T_i^{Inl}$ (International transport + inland transport of importer)							-0.320	-5.960
TR_{ij} (Tariff)			-0.109*	-1.630	-0.109*	-1.640	-0.105*	-1.570
Y_j (Importer market size)	0.454***	7.740	0.511***	8.620	0.502***	8.510	0.503***	8.530
ER_j (Exchange rate in the exporting country)	-0.094***	-4.080	-0.093***	-4.070	-0.092***	-4.020	-0.090***	-3.920
D_1 (Adjacency dummy)	0.348**	2.270	0.327**	2.140	0.332**	2.180	0.323**	2.120
Number of observations	2 719		2 719		2 719		2 719	
R^2	0.175		0.184		0.184		0.183	
	Fuels, mining and forest products							
$T_{ij} + TR_{ij}$ (Transport + tariff)	0.497***	12.170						
T_{ij}^{Int} (International transport)			0.394***	11.140				
T_{ij} (Transport)					0.414***	12.190		
$T_{ij}^{Int} + T_i^{Inl}$ (International transport + inland transport of importer)							0.442***	12.740
TR_{ij} (Tariff)			0.181*	2.200	0.202*	2.460	0.215*	2.620
Y_j (Importer market size)	0.406***	7.470	0.419***	7.630	0.414***	7.590	0.421***	7.720
ER_j (Exchange rate in the exporting country)	-0.048*	-2.170	-0.049*	-2.220	-0.048*	-2.180	-0.044*	-1.980
D_1 (Adjacency dummy)	0.493**	3.450	0.488**	3.390	0.496**	3.460	0.474**	3.310
Number of observations	3 885		3 885		3 885		3 885	
R^2	0.148		0.143		0.149		0.152	

Annex VIII *(continued)*

	Model 1		*Model 2*		*Model 3*		*Model 4*	
	Coefficient	*t-value*	*Coefficient*	*t-value*	*Coefficient*	*t-value*	*Coefficient*	*t-value*
				Iron and steel				
$T_{ij} + TR_{ij}$ (Transport + tariff)	-0.691***	-11.70						
T_{ij}^{Int} (International transport)			-0.563***	-13.46				
T_{ij} (Transport)					-0.594***	-15.44		
$T_{ij}^{Int} + T_i^{Inl}$ (International transport + inland transport of importer)							-0.581***	-14.62
TR_{ij} (Tariff)			-0.47**	-4.39	-0.44**	-4.11	-0.45**	-4.19
Y_j (Importer market size)	1.41***	30.04	1.43***	30.66	1.41***	30.44	1.41***	30.37
ER_j (Exchange rate in the exporting country)	-0.02	-1.15	0.00	0.11	0.00	-0.05	0.00	0.24
D_1 (Adjacency dummy)	-0.67***	-5.48	-0.61**	-4.96	-0.61**	-4.97	-0.62***	-5.10
Number of observations	3 741		3 741		3 741		3 741	
R^2	0.243		0.257		0.267		0.263	
				Leather				
$T_{ij} + TR_{ij}$ (Transport + tariff)	-0.707***	-5.470						
T_{ij}^{Int} (International transport)			-0.587***	-4.900				
T_{ij} (Transport)					-0.400***	-4.160		
$T_{ij}^{Int} + T_i^{Inl}$ (International transport + inland transport of importer)							-0.432***	-4.150
TR_{ij} (Tariff)			-0.237*	-2.030	-0.238*	-2.030	-0.236*	-2.010
Y_j (Importer market size)	0.513***	5.570	0.511***	5.550	0.517***	5.590	0.519***	5.610
ER_j (Exchange rate in the exporting country)	0.087*	2.130	0.079*	1.930	0.082*	1.990	0.079*	1.920
D_1 (Adjacency dummy)	0.336	1.290	0.376	1.440	0.362	1.380	0.369	1.400
Number of observations	1 001		1 001		1 001		1 001	
R^2	0.147		0.145		0.139		0.139	
				Machinery and mechanical appliances				
$T_{ij} + TR_{ij}$ (Transport + tariff)	-0.419***	-7.360						
T_{ij}^{Int} (International transport)			-0.349***	-6.740				
T_{ij} (Transport)					-0.263***	-6.190		
$T_{ij}^{Int} + T_i^{Inl}$ (International transport + inland transport of importer)							-0.335***	-7.250
TR_{ij} (Tariff)			-0.118*	-2.060	-0.152*	-2.690	-0.148*	-2.630
Y_j (Importer market size)	1.626***	49.440	1.626***	49.410	1.623***	49.220	1.621***	49.220

Annex VIII *(continued)*

	Model 1		*Model 2*		*Model 3*		*Model 4*	
	Coefficient	*t-value*	*Coefficient*	*t-value*	*Coefficient*	*t-value*	*Coefficient*	*t-value*
	Machinery and mechanical appliances							
ER_j (Exchange rate in the exporting country)	-0.049**	-3.700	-0.055**	-4.090	-0.053**	-3.950	-0.055**	-4.140
D_1 (Adjacency dummy)	-0.508***	-6.010	-0.500***	-5.910	-0.497***	-5.880	-0.487***	-5.760
Number of observations	7 481		7 481		7 481		7 481	
R^2	0.278		0.278		0.278		0.279	
	Metal							
$T_{ij} + TR_{ij}$ (Transport + tariff)	-0.142**	-3.730						
T_{ij}^{Int} (International transport)			-0.156***	-4.840				
T_{ij} (Transport)					-0.169***	-6.310		
$T_{ij}^{Int} + T_i^{Inl}$ (International transport + inland transport of importer)							-0.167***	-5.930
TR_{ij} (Tariff)			0.107*	1.990	0.090*	1.670	0.092*	1.720
Y_j (Importer market size)	1.071***	30.130	1.082***	30.310	1.088***	30.550	1.085***	30.480
ER_j (Exchange rate in the exporting country)	-0.038*	-2.600	-0.038*	-2.590	-0.038*	-2.580	-0.036*	-2.480
D_1 (Adjacency dummy)	-0.095	-1.020	-0.120	-1.280	-0.124	-1.330	-0.127	-1.360
Number of observations	7 060		7 060		7 060		7 060	
R^2	0.172		0.174		0.176		0.175	
	Office and telecom equipment							
$T_{ij} + TR_{ij}$ (Transport + tariff)	-0.451***	-6.920						
T_{ij}^{Int} (International transport)			-0.234**	-3.920				
T_{ij} (Transport)					-0.327***	-5.160		
$T_{ij}^{Int} + T_i^{Inl}$ (International transport + inland transport of importer)							-0.348***	-5.010
TR_{ij} (Tariff)			-0.262***	-5.110	-0.256***	-5.020	-0.258***	-5.050
Y_j (Importer market size)	1.780***	34.410	1.780***	34.330	1.779***	34.390	1.782***	34.440
ER_j (Exchange rate in the exporting country)	-0.092**	-4.600	-0.092**	-4.570	-0.093**	-4.650	-0.094**	-4.700
D_1 (Adjacency dummy)	0.054	0.400	0.059	0.430	0.058	0.430	0.065	0.480
Number of observations	2 488		2 488		2 488		2 488	
R^2	0.405		0.403		0.406		0.405	
	Paper and pulp							
$T_{ij} + TR_{ij}$ (Transport + tariff)	-0.912***	-9.150						

Annex VIII *(continued)*

	Model 1		*Model 2*		*Model 3*		*Model 4*	
	Coefficient	*t-value*	*Coefficient*	*t-value*	*Coefficient*	*t-value*	*Coefficient*	*t-value*
	Paper and pulp							
T_{ij}^{Int} (International transport)			-0.783***	-9.990				
T_{ij} (Transport)					-0.754***	-11.060		
$T_{ij}^{Int} + T_i^{Inl}$ (International transport + inland transport of importer)							-0.757***	-10.750
TR_{ij} (Tariff)			0.615***	5.720	0.643***	6.010	0.630***	5.880
Y_j (Importer market size)	1.098***	15.490	1.146***	16.210	1.116***	15.950	1.119***	15.970
ER_j (Exchange rate in the exporting country)	0.160***	5.920	0.158***	5.880	0.154***	5.760	0.160***	5.970
D_1 (Adjacency dummy)	0.212*	1.190	0.137	0.770	0.140	0.790	0.120	0.680
Number of observations	1 766		1 766		1 766		1 766	
R^2	0.198		0.211		0.220		0.217	
	Pharmaceuticals							
$T_{ij} + TR_{ij}$ (Transport + tariff)	-0.03	-0.12						
T_{ij}^{Int} (International transport)			-0.07	-0.29				
T_{ij} (Transport)					-0.06	-0.33		
$T_{ij}^{Int} + T_i^{Inl}$ (International transport + inland transport of importer)							-0.06	-0.29
TR_{ij} (Tariff)			-0.18	-0.69	-0.18	-0.68	-0.18	-0.68
Y_j (Importer market size)	0.84***	6.63	0.83***	6.50	0.83***	6.51	0.83***	6.54
ER_j (Exchange rate in the exporting country)	0.05	0.97	0.05	0.96	0.05	0.95	0.05	0.95
D_1 (Adjacency dummy)	0.03	0.08	0.04	0.12	0.04	0.12	0.04	0.12
Number of observations	404		404		404		404	
R^2	0.171		0.172		0.173		0.172	
	Rubber and plastics							
$T_{ij} + TR_{ij}$ (Transport + tariff)	-0.02	-0.28						
T_{ij}^{Int} (International transport)			0.12*	2.16				
T_{ij} (Transport)					0.26***	5.28		
$T_{ij}^{Int} + T_i^{Inl}$ (International transport + inland transport of importer)							0.21***	3.96
TR_{ij} (Tariff)			0.06	0.59	0.07	0.65	0.07	0.61
Y_j (Importer market size)	1.24***	25.31	1.26***	25.63	1.28***	26.19	1.27***	25.96
ER_j (Exchange rate in the exporting country)	-0.03*	-1.77	-0.03*	-1.80	-0.03*	-1.81	-0.03*	-1.74

Annex VIII *(continued)*

	Model 1		*Model 2*		*Model 3*		*Model 4*	
	Coefficient	*t-value*	*Coefficient*	*t-value*	*Coefficient*	*t-value*	*Coefficient*	*t-value*
	Rubber and plastics							
D_1 (Adjacency dummy)	-0.02	-0.16	-0.05	-0.42	-0.08	-0.64	-0.07	-0.59
Number of observations	3 334		3 334		3 334		3 334	
R^2	0.198		0.199		0.204		0.201	
	Textile and clothing							
$T_{ij} + TR_{ij}$ (Transport + tariff)	-0.43***	-5.64						
T_{ij}^{Int} (International transport)			-0.28***	-5.97				
T_{ij} (Transport)					-0.22***	-5.58		
$T_{ij}^{Int} + T_i^{Inl}$ (International transport + inland transport of importer)							-0.22***	-5.21
TR_{ij} (Tariff)			-0.55***	-7.87	-0.51***	-7.07	-0.52***	-7.24
Y_j (Importer market size)	0.95***	27.44	0.99***	28.41	0.98***	28.27	0.97***	28.21
ER_j (Exchange rate in the exporting country)	-0.01	-0.79	-0.01	-0.75	-0.01	-0.77	-0.01	-0.69
D_1 (Adjacency dummy)	0.22*	2.30	0.17*	1.78	0.18*	1.94	0.18*	1.89
Number of observations	7 000							
R^2	0.197		0.206		0.205			
	Transport equipment							
$T_{ij} + TR_{ij}$ (Transport + tariff)	0.26*	1.99						
T_{ij}^{Int} (International transport)			-0.16	-0.80				
T_{ij} (Transport)					-0.08	-0.42		
$T_{ij}^{Int} + T_i^{Inl}$ (International transport + inland transport of importer)							0.30**	2.62
TR_{ij} (Tariff)								
Y_j (Importer market size)	0.82***	5.68	0.84***	5.73	0.82***	5.63	0.84***	5.80
ER_j (Exchange rate in the exporting country)	-0.04	-0.66	-0.04	-0.72	-0.04	-0.70	-0.03	-0.58
D_1 (Adjacency dummy)	0.24	0.70	0.21	0.60	0.24	0.70	0.23	0.65
Number of observations	604							
R^2	0.098		0.092		0.092		0.102	

Notes: Dependent variable is log of import of goods (at 4-digit HS) in bilateral pair.

Cross-section pooled for the years 2000 and 2005.

Country and time fixed effects are included in the model.

For corresponding HS codes, see annex I.

* Significant at the 10 per cent level; ** significant at the 5 per cent level; *** significant at the 1 per cent level.

Annex IX

Log-linear least squares estimates of import demand: non-price effects

	Coefficient	*t-values*	*Coefficient*	*t-values*
	Automobiles and components		*Chemical*	
Y_j (Importer market size)	0.833***	4.310	0.745***	15.050
$Port_i$ (Performance of importers' port)	0.367	0.390	0.064	0.270
$Port_j$ (Performance of exporters' port)	1.414**	2.700	0.989***	7.430
TII_i (Trade mobility infrastructure of importer)	10.433	1.400	5.851**	3.000
TII_j (Trade mobility infrastructure of exporter)	1.128**	3.040	0.646***	6.800
ER_j (Exchange rate in the exporting country)	-0.157**	-2.720	-0.081***	-5.430
D_1 (Adjacency dummy)	-0.425	-1.300	-0.066	-0.800
D_2 (Electronic data interchange dummy)	-0.104	-0.210	0.218*	1.760
Number of observations	839		9 748	
R^2	0.175		0.129	
	Electrical and electronics		*Food*	
Y_j (Importer market size)	1.267***	18.480	0.860***	9.070
$Port_i$ (Performance of importers' port)	0.527*	1.550	-0.018	-0.030
$Port_j$ (Performance of exporters' port)	1.135***	6.270	-0.256	-0.950
TII_i (Trade mobility infrastructure of importer)	4.516*	1.670	5.703*	2.190
TII_j (Trade mobility infrastructure of exporter)	0.909***	6.970	0.654**	3.420
ER_j (Exchange rate in the exporting country)	-0.164***	-7.980	-0.165**	-5.640
D_1 (Adjacency dummy)	0.034	0.290	0.077	0.480
D_2 (Electronic data interchange dummy)	-0.113	-0.640	-0.299	-1.080
Number of observations	5 775		2 719	
R^2	0.259		0.186	
	Fuels and mining		*Iron and steel*	
Y_j (Importer market size)	1.019***	11.040	0.765***	9.640
$Port_i$ (Performance of importers' port)	0.272	0.580	0.101	0.260
$Port_j$ (Performance of exporters' port)	0.328	1.330	-0.817***	-3.940
TII_i (Trade mobility infrastructure of importer)	10.552**	2.850	-3.093	-1.010
TII_j (Trade mobility infrastructure of exporter)	1.268***	7.160	1.368***	9.110
ER_j (Exchange rate in the exporting country)	-0.107**	-3.830	-0.019	-0.800
D_1 (Adjacency dummy)	0.118	0.770	-0.168	-1.290
D_2 (Electronic data interchange dummy)	0.197	0.850	-0.367*	-1.860
Number of observations	3 885		3 741	
R^2	0.137		0.240	

Annex IX *(continued)*

	Coefficient	*t-values*	*Coefficient*	*t-values*
	Leather		*Machinery and appliances*	
Y_j (Importer market size)	0.833***	5.200	0.945***	17.680
$Port_i$ (Performance of importers' port)	0.423	0.510	0.292	1.120
$Port_j$ (Performance of exporters' port)	0.721*	1.590	1.449***	-10.480
TII_i (Trade mobility infrastructure of importer)	-1.417	-0.210	4.648*	-2.240
TII_j (Trade mobility infrastructure of exporter)	-0.819*	-2.540	1.678***	16.630
ER_j (Exchange rate in the exporting country)	0.099*	2.000	-0.093***	-5.930
D_1 (Adjacency dummy)	0.043	0.160	-0.037	-0.420
D_2 (Electronic data interchange dummy)	0.153	0.360	-0.034	-0.250
Number of observations	1 001		7 481	
R^2	0.128		0.302	
	Metal		*Office and telecom equipment*	
Y_j (Importer market size)	1.036***	17.570	1.381***	16.560
$Port_i$ (Performance of importers' port)	0.605*	2.100	-0.464	-1.090
$Port_j$ (Performance of exporters' port)	0.348*	2.230	-0.171	-0.780
TII_i (Trade mobility infrastructure of importer)	9.314**	4.050	2.138	0.640
TII_j (Trade mobility infrastructure of exporter)	0.165	1.470	0.770**	4.880
ER_j (Exchange rate in the exporting country)	-0.061**	-3.430	-0.048*	-1.900
D_1 (Adjacency dummy)	-0.058	-0.590	0.360*	2.510
D_2 (Electronic data interchange dummy)	0.104	0.700	-0.159	-0.730
Number of observations	7 060		2 488	
R^2	0.173		0.406	
	Paper and pulp		*Pharmaceuticals*	
Y_j (Importer market size)	1.130***	9.670	0.627**	2.990
$Port_i$ (Performance of Importers' Port)	0.010	0.020	-0.679	-0.650
$Port_j$ (Performance of Exporters' Port)	0.589*	1.900	1.499*	2.620
TII_i (Trade Mobility Infrastructure of Importer)	-2.353	-0.510	6.190	0.740
TII_j (Trade Mobility Infrastructure of Exporter)	0.074	0.340	0.864*	2.120
ER_j (Exchange rate in the exporting country)	0.116**	3.360	-0.027	-0.430
D_1 (Adjacency dummy)	0.260	1.340	0.147	0.410
D_2 (EDI dummy)	-0.338	-1.160	0.197	0.370
No of observations	1 766		404	
R^2	0.163		0.186	

Annex IX *(continued)*

	Coefficient	*t-values*	*Coefficient*	*t-values*
	Rubber and plastic		*Textile and clothing*	
Y_j (Importer market size)	0.807***	10.290	1.088***	18.990
$Port_i$ (Performance of importers' port)	0.268	0.680	0.665*	2.260
$Port_j$ (Performance of exporters' port)	0.361*	1.770	0.644**	4.100
TII_i (Trade mobility infrastructure of importer)	-3.672	-1.180	10.769***	4.600
TII_j (Trade mobility infrastructure of exporter)	0.871***	5.910	0.041	0.360
ER_j (Exchange rate in the exporting country)	-0.005	-0.220	-0.069**	-3.980
D_1 (Adjacency dummy)	0.300*	2.270	0.061	0.610
D_2 (Electronic data interchange dummy)	-0.029	-0.150	0.269*	1.800
Number of observations	3 334		7 000	
R^2	0.212		0.200	
	Transport equipment			
Y_j (Importer market size)	0.552*	2.370		
$Port_i$ (Performance of importers' port)	0.261	0.240		
$Port_j$ (Performance of exporters' port)	-0.777	-1.250		
TII_i (Trade mobility infrastructure of importer)	9.630	1.120		
TII_j (Trade mobility infrastructure of exporter)	0.635*	1.500		
ER_j (Exchange rate in the exporting country)	-0.087	-1.290		
D_1 (Adjacency dummy)	0.393	1.030		
D_2 (Electronic data interchange dummy)	-0.199	-0.360		
Number of observations	604			
R^2	0.098			

Notes: Dependent variable is log of import of goods (at 4-digit HS) in bilateral pair.

Cross-section pooled for the years 2000 and 2005.

Country and time fixed effects are included in the model.

For corresponding HS codes, see annex I.

* Significant at the 10 per cent level; ** significant at the 5 per cent level; *** significant at the 1 per cent level.