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Asian Trade Flows: Trends, Patterns, and Projections

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Asian Trade Flows: Trends, Patterns, and Projections

Prema-chandra Athukorala

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Asian Trade Flows: Trends, Patterns, and Projections

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January 2011

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Abstract

This paper provides trade flow projections for major Asian developing economies (ADEs) up to 2030 against the backdrop of an in-depth analysis of policy shifts and trade patterns over the past 4 decades. Merchandise trade of ADEs has grown at a much faster rate in the global context, with a distinct intraregional bias. Global production sharing has become a unique feature of the economic landscape of the region, with the People's Republic of China playing a pivotal complementary role as the premier assembly center within the regional production networks. According to the projections made within the standard gravity modelling framework, total real nonoil trade of ADEs would increase at an average annual rate of 8.2 during the next 2 decades, with a notable convergence of individual countries' rates to the regional average. The share of intraregional trade in total nonoil trade would increase steadily from 53% in 2010 to 58% in 2030. The trade-to-GDP ratio would increase from 39.4% and 74.4% between these 2 years. These predictions need to be treated with caution as they are based on the assumption that the trade structure pertaining to the estimation period will remain unchanged in the next 2 decades.

I. Asian Trade Flows: Trends, Patterns, and Projections to 2030

The purpose of is paper is two-fold: to examine emerging trends and patterns of merchandise trade in Asia over the past 4 decades and to generate projections for Asian trade through to 2030 using the standard gravity model of international trade. The paper covers 12 major Asian developing economies (ADEs), namely, the People's Republic of China (PRC); Hong Kong, China; India; Indonesia; the Republic of Korea; Malaysia; Pakistan; the Philippines; Singapore; Taipei,China; Thailand; and Viet Nam.[1] To gain perspective, trends and patterns of merchandise trade of the ADEs are examined in the context of the commercial policy environment, growth and structural change in these countries, and institutional and technological factors governing international production and global trade. Relating to the latter, a key theme running through this paper is the implications of global production sharing[2]—that is, the geographic separation of activities involved in producing a good (or service) across two or more countries—for rapid trade growth in these countries.

The paper is organized as follows. Section II briefly surveys the policy environment shaping countries' participation in the global economy. Section III examines general patterns of trade since 1970, encompassing trade flows over time in aggregate, by major partners, and by major commodity groups. This section also examines geographic patterns of trade, with emphasis on the implications of the growing importance of global production sharing. Section IV presents the estimates of trade equations for the 12 economies and preliminary trade flow predictions based on these estimates. The final section summarizes the main findings and draws out some general inferences.

II. The Policy Context

Rapid growth and structural change in ADEs over the past 4 decades has been underpinned by notable reduction in barriers to international trade. There has been significant import liberalization in the PRC; Indonesia; the Republic of Korea; Malaysia; the Philippines; Taipei,China; and Thailand since the mid-1980s. India and Viet Nam embarked on trade reforms in the early 1990s. Trade liberalization in all these economies

[1] These economies account for over 96% of total foreign trade of all countries in Northeast and Southeast Asia.

[2] An array of alternative terms have been used to describe this phenomenon, including international production fragmentation, vertical specialization, slicing the value chain, and outsourcing.

has been predominantly unilateral and nondiscriminatory, and was also aided by multilateral liberalization under the General Agreement on Tariffs and Trade and its successor, the World Trade Organization (since 1991). Historically countries in Asia have not been enthusiastic toward preferential trading agreements (PTAs), with the exception of some trade preferences within the ASEAN region that presumably had only trivial trade flow effects. Since then, the advent of the European Union and the rise of regionalism in North America led to a proliferation of PTAs in the region. It is too early to assess the trade flow implications of these PTAs, but the available circumstantial evidence suggest that so far the impact would have been rather small. The preference utilization rates of the PTAs remains very low, given the narrow preference margins resulting from the ongoing process of multilateral and unilateral tariff reductions, and the administrative cost and complications involved in meeting the rules of origins involved for benefiting from tariff preferences (Plummer 2007, Baldwin 2006).

This section aims to provide an overview of the process of trade opening in the region and the current state of openness to trade. The discussion is based on three broad sets of indicators of openness to international trade, namely, the Sachs–Warner binary classification, revealed trade orientation measured as exports or total trade (exports + imports) as a percentage of GDP, and average tariff rate. All these measures have their shortcomings (as discussed below), but together they enable us to assert with reasonable confidence whether an economy is broadly open.

Table 1 depicts the patterns and chronology of liberalization status of Asian economies based on the Sachs–Warner binary index of trade regime shifts. The index classifies the postwar trade policy history of a given economy into two subperiods (closed economy = 0 and open economy = 1) based on the timing of sustained trade opening.[3] This is of course a somewhat blunt characterization of liberalization status. Given the complexity of economic policy reform, a binary classification of liberalization status naturally involves a significant element of subjectivity (Rodriguez and Rodrik 2000), simply binary (0/1) classification. However it has the attraction of a clear analytical foundation, a long time series, and comprehensive country coverage.

According to this classification, Hong Kong, China; Malaysia; Singapore; and Thailand have always remained open throughout the postwar era. Japan; the Republic of Korea; and Taipei,China completed the transition from closed to open trade regimes by the 1960s. By the turn of the century (the end point of the time coverage of Wacziarg and Welch 2003), only the PRC and Viet Nam, which are not covered in the classification, remained closed. However, in the ensuing years these two countries have undertaken significant tariff cuts (Table 2) and dismantled most nontrade barriers (NTBs) and restrictions on foreign exchange dealings on current account transactions mainly as

[3] See Table 2, Note 1 for the criteria used in identifying the year of demarcation. The original Sachs–Warner classification covered 100 countries (78 developing and 22 developed countries) over the period 1945–1994. Wacziarg and Welch (2003) have updated the classification to 2000, while expanding the coverage to 131 countries.

part of their WTO accession commitments[4] (Bergesten et al. 2009, Athukorala 2006). Consequently, from about 2005, the "socialist economic system" characterization remains the only Sachs–Warner closed economy criterion applicable to these countries.

Table 1: Liberalization Status/Dates and Data on Trade Policy[1]

	Liberalization Status/Dates during[1] 1945–2000	Data on Trade Policy (Sachs–Warner criteria)			
		Average Tariff[2] (1990–99) (%)	NTB Coverage[3] (1990–98) (%)	Black-market Premium[4] (1990–99) (%)	Export Marketing Boards/Socialist State
Hong Kong, China	Always open	—	2.1	-0.02	0
Malaysia	Always open	11.7	19.6	1.35	0
Singapore	Always open	0.32	2.1	0.8	0
Thailand	Always open	29.54	17.5	1.8	0
Taipei,China	1963	9.85	—	0.95	0
Korea, Rep. of	1968	11.3	25.0	0.03	0
Indonesia	1970	16.27	31.3	7.1	0
Philippines	1988	19.09	—	4.36	0
Pakistan	1991	54.73	—	9.74	0
India	1994	48.63	93.8	7.45	0
China, People's Rep. of[5]	Remains closed	31.06	—	35.89	1

NTB = nontrade barrier.
— means exact figure is not available, but it is commonly believed to be well below the Sachs–Warner criteria.
[1] Based on the application of Sachs–Warner criteria, which classifies a country as open if does not satisfy all these five criteria for the entire duration of a give time period: (i) Nontariff barrier coverage of intermediate and capital goods imports of 40% or more; (ii) Average tariff on intermediate and capital goods imports of 40% or more; (iii) A black market exchange rate that is depreciated by 20% or more relative to the official exchange rate; (iv) A socialist economic system (as defined by Kornai 1992); and (v) A state monopoly on major exports.
[2] Unweighted average tariff.
[3] Core nontariff barrier frequency on capital goods and intermediates, including quotas, licensing, prohibitions, and administered pricing.
[4] [(parallel exchange rate/official exchange rate) – 1]*100.
[5] Remains closed, based on the black market exchange rate premium.
Sources: Sachs and Warner 1995 and Wacziarg and Welch (2003).

Average applied most favored nation (MFN) tariff rates of ADEs are summarized in Table 2. It is important to note at the outset that tariff rates can be used to compare trade openness across countries when there is little reliance on NTBs; in the presence of binding NTBs, tariff rates naturally tend to understate the trade-impeding impact of the trade regime. Average tariff comparisons also need to allow for partial reforms. Most countries in the region have been compensating exporters for duties paid on imported inputs. These typically take the form of duty exemptions or drawbacks, or the establishment of export processing zones. However there is evidence that almost all countries in the region have dismantled most binding NTBs and scaled down selective incentives for export producers (Panagariya 2007, Krueger 2010).

[4] After the PRC's accession to membership in January 2001 and Viet Nam in January 2006, all 12 ADEs are now bound by WTO multilateral disciple.

Table 2: Average Applied Tariff Rates[1] in Asian Developing Economies, 1980–2004 (percent)

Economy/Group	1980–1984	1985–1989	1990–1994	1995–1999	2005–2006
China, People's Rep. of	49.5	39.3	40.0	18.8	12.8
Korea, Rep. of		17.5	9.7	9.3	8.0
Taipei,China	26.5	16.8	12.5	8.4	5.5
Indonesia	—	13.7	13.4	6.4	8.5
Malaysia	—	14.9	14.3	6.9	7.6
Singapore	—	0.5	0.4	0.3	0.2
Philippines	29.3	27.8	23.7	13.3	5.9
Thailand	41.2	40.3	37.2	19.6	8.9
Viet Nam	—	—	13.4	13.7	14.4
India	74.3	93.5	57.0	33.7	16.8
Pakistan		66.7	58.5	41.6	13.1
Memo Items					
Developing Countries	45.4	42	34.0	19.7	13.2
Low Income	73.3	64	46.7	23.1	15.7
Middle Income	32.9	28.9	27.3	15.0	9.5
High Income	22.9	9.1	0.4	3.6	2.8

— means data not available.
[1] Simple averages of most favored nation rates.
Sources: Nicita and Olarreaga (2006) and WTO (2006).

There has been a universal trend toward lower tariffs across the ADEs over the past 2 decades. In some economies, the declines have been very large, more than halving since the 1980s as in the PRC; India; Japan; the Republic of Korea; the Philippines; Taipei,China; and Thailand. Within Asia, the East Asian economies are generally more open than those of South Asia. In 2004, India and Pakistan had the highest average tariffs, with the Indian figure being three times that of the PRC. Hong Kong, China and Singapore have of course always had negligible protection. The average tariff rates in other countries mostly range up to 10%. Importantly, though not adequately recorded here, the East Asian economies were much quicker than the two major South Asian countries to adopt partial reforms that enabled exporters to operate on an effective free-trade footing.

The export/GDP ratio,[5] the standard revealed openness measure, is reported in Table 3. The trade/GDP ratio is a comparison between a net and a gross concept; trade is measured in gross terms (intermediate material inputs + value added) whereas GDP is essentially measured on a value-added basis (that is, net of intermediate material inputs). Thus, the measured change in trade orientation is sensitive to changes in import intensity of export production. As will be seen later, over the past decade there has been a palpable shift in the export composition away from primary products and toward labor-intensive light manufacturing and, more recently, the ongoing process of international production fragmentation within high-tech industries. The increase in measured trade orientation could partly reflect the fact that these new product lines are relatively

[5] Exports are generally regarded as preferable to total trade (or imports) as the numerator in calculating this ratio because restrictiveness of a given country's policy regime is presumably better captured by export performance.

more import-intensive compared to the former. Another limitation for cross-country comparisons is that the ratios need to be adjusted for size, in recognition of the fact that small countries by definition will trade more than larger ones. However, as already noted, the usefulness of this measure in its own right as an indicator of trade openness is limited because, by construct, it is driven by structural shifts in production and trade patterns. Of particular relevance in this connection is the ongoing process of international production fragmentation, which involves small value-added additions at various stages of the production process of a given final good in various countries, thus resulting in inflated trade values relative to GDP. Even in small countries, at least 60% of GDP is generated by nontradable sectors. Thus an export share of much more than 30%–40% can arise only when export production involves adding fairly small amounts of value to imported inputs (Krugman 1995, 335). These limitations notwithstanding, the intercountry differences and the time profile revealed by this measure are broadly consistent with those already observed.

Table 3: Trade Orientation of Selected Asian Economies,[1] 1969/70–2006/07 (percent)

	1969/70	1974/75	1979/80	1984/85	1989/90	1994/5	1999/00	2006/7
Korea, Rep. of	15	27	30	33	30	28	40	45
China, People's Rep. of	3	5	10	11	18	24	21	41
Hong Kong, China	92	85	90	108	131	138	138	206
Taipei,China	18	23	33	39	42	43	51	70
Indonesia	14	27	33	24	25	27	40	30
Malaysia	40	45	56	54	73	92	121	114
Philippines	21	23	23	24	28	35	53	45
Singapore		80	95	103	134	174	190	240
Thailand	16	20	24	23	35	41	64	73
Viet Nam	—	—	—	—	30	33	53	75
India	4	6	7	5	7	11	13	22
Pakistan	8	13	12	10	15	17	14	15
Developing Countries[2]	10	13	15	16	20	23	26	33

— means data not available.
[1] Exports of goods and services relative to GDP (at current prices), 2-year averages.
[2] Low- and middle-income countries per the World Bank country classification.
Sources: World Bank, World Development Indicators Database; Taipei,China: Council for Economic Planning and Development; Cambodia and Lao PDR: Asian Development Bank, Key Indicators Database.

Openness to trade is a necessary but not sufficient condition for successful global economic integration. Equally important is the conduciveness of the business environment. International competitiveness requires high quality infrastructure, both hard and soft, especially for successful participation in time-sensitive global production and purchasing networks. Labor markets need to reflect underlying supply and demand conditions, with wage growth and differentials driven by productivity. Prudent macroeconomic management is required to provide a stable and predictable commercial policy environment, and to ensure that exchange rate outcomes do not impair competitiveness. Above all, political stability and policy certainty figure prominently among prerequisites for profitable long-term investment, particularly for multinational enterprises (MNEs).

In recent years there have been various attempts to build databases on the business environment of a large number of countries based on investor surveys or other subjective assessments covering large number of countries. Tables 4 and 5 show the rankings of ADEs in two of these that have by far the widest country coverage among the alternative databases, namely, the *Doingbusiness* database and Logistic Performance Index (LPI) database of the World Bank. *Doingbusiness* ranks countries (85 countries in the latest update) in terms of ease of doing business using 10 criteria. The LPI specifically focuses on the quality of trade-related logistic provisions, based on a worldwide survey of global freight forwarders and express carriers, complemented by a number of qualitative and quantitative indicators of the domestic logistics environment, institutions, and performance of supply chains.

The ease of doing business data summarized in Table 4 confirm the superiority of East Asia over South Asia, with the four Asian newly industrialized economies (NIEs)—Hong Kong, China; the Republic of Korea; Singapore; and Taipei,China—along with Malaysia and Thailand ranking the highest. The PRC ranks ahead of India by a wide margin. The differences between Northeast and Southeast Asia are not significant. Nevertheless this ranking exercise is at best indicative and also presumably reflects the development paradigms of the institution preparing the data. The PRC and Viet Nam fare poorly, in spite of the sweeping reforms of the past 2 decades, and even when they are obviously commercially attractive to foreign investors. Naturally the country ranking in terms of the LPI (Table 5) is remarkably similar to that based on the *Doingbusiness* database. Singapore tops the overall logistics quality raking. The other major transshipment hub in the region, Hong Kong, China, is fourth on the global ranking and second among ADEs. The data also reveal significant differences among countries at similar levels of development. Countries in Northeast and Southeast Asia have higher rankings. Other East Asian contraries, including the PRC, also compare very favorably compared to developing countries in other parts of the world.

Table 4: Indicators of Ease of Doing Business Ranking of Selected Asian Developing Economies, 2009

Economy	Starting a Business	Dealing with Construction Permits	Employing Workers	Registering Property	Getting Credit	Protecting Investors	Paying Taxes	Trading across Borders	Enforcing Contracts	Closing a Business	Overall Rank
PRC	151	176	111	30	59	88	132	48	18	62	83
Hong Kong, China	15	20	20	74	2	3	3	2	1	13	4
Taipei,China	119	127	159	26	68	70	100	30	88	11	61
Korea, Rep. of	126	23	152	67	12	70	43	12	8	12	23
Indonesia	171	80	157	107	109	53	116	37	140	139	129
Malaysia	75	104	48	81	1	4	21	29	59	54	20
Philippines	155	105	126	97	123	126	129	58	114	151	140
Singapore	10	2	1	16	5	2	5	1	14	2	1
Thailand	44	12	56	5	68	11	82	10	25	46	13
Viet Nam	108	67	90	37	43	170	140	67	42	124	92
India	121	136	89	105	28	38	169	90	180	140	122
Pakistan	77	93	136	97	59	24	124	71	154	53	77

Note: The dataset covers 181 countries. Economies are ranked in ascending order (best practicing country = 1).
Source: *Doing Business 2009* (World Bank 2009).

Table 5: World Bank Logistic Performance Index and Its Composite Indices: Asian Developing Economies and Major Country Groups

	Subindices							LPI		
Economy	Customs	Infrastructure	International Shipments	Logistics Competence	Tracking and Tracing	Domestic Logistics Costs	Timeliness	Index	Rank: ADEs	Rank: Global
Korea, Rep. of	3.2	3.4	3.4	3.6	3.6	2.7	3.9	3.5	3	25
PRC	3.0	3.2	3.3	3.4	3.4	3.0	3.7	3.3	5	30
Hong Kong, China	3.8	4.1	3.8	4.0	4.1	2.7	4.3	4.0	2	8
Indonesia	2.7	2.8	3.1	2.9	3.3	2.8	3.3	3.0	8	43
Malaysia	3.4	3.3	3.4	3.4	3.5	3.1	4.0	3.5	4	27
Philippines	2.6	2.3	2.8	2.7	2.7	3.3	3.1	2.7	10	65
Singapore	3.9	4.3	4.0	4.2	4.3	2.7	4.5	4.2	1	1
Thailand	3.0	3.2	3.2	3.3	3.3	3.2	3.9	3.3	6	31
Viet Nam	2.9	2.5	3.0	2.8	2.9	3.3	3.2	2.9	9	53
India	2.7	2.9	3.1	3.3	3.0	3.1	3.5	3.1	7	39
Pakistan	2.4	2.4	2.7	2.7	2.6	2.9	2.9	2.6	11	68
Memorandum Items										
High income countries	3.45	3.66	3.52	3.64	3.71	2.58	4.05	3.67		
Upper middle income countries	2.64	2.7	2.84	2.8	2.83	2.94	3.31	2.85		
Lower middle income	2.31	2.27	2.48	2.4	2.45	3.01	2.93	2.47		
Low income	2.12	2.06	2.32	2.29	2.25	2.99	2.71	2.29		

LPI = logistic performance index.

Note: Logistic quality of the individual countries covered are assessed using a 5-point scale (1 for the worst performance and 5 for the best) focusing on seven areas of performance listed in the table. The composite LPI index has been constructed by combining the seven sub-indices using the principal component analysis.

Source: Arvis et al. (2007).

III. Trade Patterns

Rapid trade expansion has been the hallmark of Asia's rise in the global economy. The combined share of ADEs in total world merchandise exports increased continuously from less than 5% in 1970 to 22% by 2008 (Figure 1a).[6] The region accounted for over a third of total increment in world exports over this period. Focusing on world nonoil trade (trade net of oil and gas) to gain a better comparative picture,[7] the increase in ADEs' world export share turns out to be even sharper, from about 4% in the early 1970s to over nearly 25% in 2008 (Figure 1b).

The rise of the PRC has been a dominant factor behind the share increase in the ADEs' world market shares from about the early 1990s. But the upward trend in world market shares of the other countries that began in the early 1970s has continued unabated throughout the period. Thus, on first inspection, there is no indication of the PRC "crowding out" its neighbors—the PRC's market share gains has been at the expense of that of the rest of the world, not from the rest of Asia. This observation is consistent with the inferences coming from a number of recent studies that have systematically examined the impact of the PRC's rise in export performance on the other countries in the region (Athukorala 2009, Greenaway at al. 2008, Eichengreen et al. 2007).

At the individual country level, market share gains have varied notably over time (Table 1).[8] Among the nine largest ADEs, only Hong Kong, China; Indonesia; and the Philippines have smaller world trade shares than India, which is by far the dominant South Asian economy. Notwithstanding the notable export expansion in recent years, India still accounts for a mere 1.1% of total world trade, equivalent to less than 5% of ADEs' total trade. Pakistan is the only country among the 12 ADEs to record a decline in market share (other than Hong Kong, China, whose export production base has "migrated" to the PRC since about the early 1990s).

Rapid export growth in developing Asia has been underpinned by a pronounced shift in export structure away from primary commodities and toward manufactures (Table 6). From about the early 1990s, manufactures accounted for over four fifths of total merchandise exports from these economies, up from 84.3% in 1969/1970 some 4 decades ago. Given the nature of their resource endowments, the four Asian NIEs (Hong Kong, China; the Republic of Korea; Singapore; Taipei,China) relied very heavily on manufacturing for export expansion from the outset. However, beginning in the 1970s, a notable shift toward manufacturing is observable across all economies, at varying speeds and intensity. The combined shares of the ASEAN countries other than Singapore increased from a mere 11% to 71.0% between these two time points. Among individual

6 Trade data throughout the paper are measured in current US dollars unless otherwise indicated.
7 Oil and gas account for a significant (albeit declining) share in export only in Indonesia, Malaysia, and Singapore.
8 In this and other trade data tables, data are presented as 2-year averages to smooth out the impact of yearly fluctuations in trade.

countries, Indonesia and Viet Nam had a significantly lower share of manufactures in their exports, reflecting both their comparative advantage and their later adoption of export-oriented industrialization strategies.

Figure 1a: Share in Total World Merchandise Trade: Asian Developing Economies and the PRC, 1970–2008 (percent)

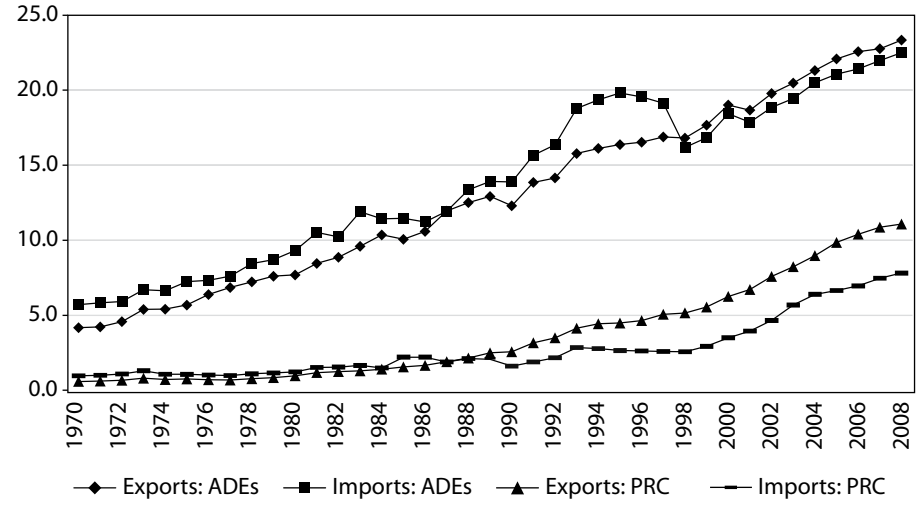
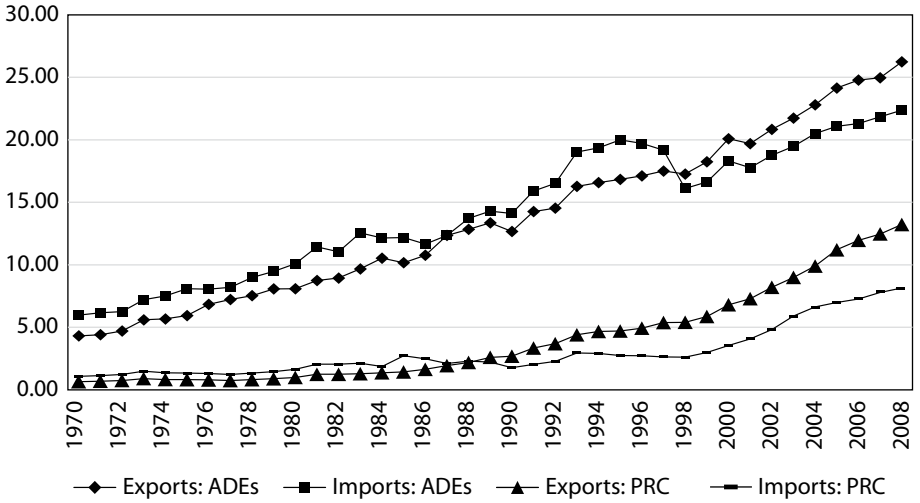


Figure 1b: Share in World Nonoil Trade: Asian Developing Economies and the PRC, 1970–2008 (percent)



Source: Based on data compiled from the UN Comtrade database.

Table 6: Developing Asia in World Trade (percent)

	Total (nonoil) Trade			Manufacturing Trade			Manufacturing Share in Total Exports		
	1969/70	1989/90	2007/8	1969/70	1989/90	2007/8	1969/70	1989/90	2007/8
(a) Exports									
Developing Asia	4.7	13.4	24.4	3.1	14	27.4	44.3	84.3	84.9
PRC	0.8	2.9	12.7	0.5	3	14.9	45.1	83.6	93.4
Hong Kong, China	0.9	1.7	0.6	1.3	2	0.6	95.1	96.5	89.3
Korea, Rep. of	0.3	2.2	3.0	0.3	2.6	3.5	75.4	93.6	87.6
Taipei,China	0.6	2.7	2.0	0.6	3.1	2.4	71.5	91.9	91.8
Indonesia	0.3	0.5	0.9	0	0.4	0.6	3.8	55.6	41.5
Malaysia	0.8	1.0	1.6	0.1	0.7	1.6	7.2	60.4	70.9
Philippines	0.5	0.3	0.6	0.1	0.3	0.6	10.3	62.8	83.8
Singapore	0.2	1.1	1.2	0.1	1.3	1.4	45.9	91.2	70.6
Thailand	0.3	0.8	1.3	0	0.6	1.3	7.7	59.6	76.5
Viet Nam			0.4	0	0	0.3		13.5	59.2
India	0.9	0.6	1.1	0.7	0.5	1.1		71.5	67.7
Pakistan	0.1	0.2	0.1	0.2	0.2	0.1		71.8	80.9
Memo items									
East Asia	11	23.8	30.7	12	26.7	34.8	72.5	90.3	86.6
Japan	6.3	10.4	4.6	8.9	12.7	7.4	93.4	98	93.2
NAFTA	25.5	17.5	13.8	24.1	16.2	13.6	62.8	74.5	71.1
EU15	46.3	41.1	34.3	53.4	42.2	34.9	76.6	82.7	77.4
Developing countries	14.7	20.9	44.4	5.9	19.3	44.0	26.8	74.2	61.2
Developed countries	85.3	79.1	55.6	94.1	80.7	56.0	73.3	82.2	75.2
World	100	100	100.0	100	100	0.0	66.5	80.6	68.3
US$ billion	205	2386	12056	137	1922	9766			
(b) Imports									
Developing East Asia	5.1	12.9	20.4	5.3	13.3	21.1	69.7	83	71.4
PRC	0	2.3	7.8	0	2.3	7.7		81	70.0
Hong Kong, China	1.3	3.1	3.4	1.3	3.4	3.9	69.5	87.5	90.2
Korea, Rep. of	0.9	2.3	2.2	0.8	2.2	2.2	59.9	74.8	59.2
Taipei,China	0.6	1.7	1.4	0.6	1.7	1.4	69.7	80.1	76.2
Indonesia	0.4	0.7	0.6	0.5	0.8	0.6	80.7	83	57.7
Malaysia	0.5	1	1.1	0.5	1	1.1	63.9	85.6	72.3
Philippines	0.5	0.4	0.4	0.6	0.3	0.4	77.3	76.4	65.3
Singapore	0.9	1.9	1.9	0.9	2.1	2.1	63.7	87.4	68.6
Thailand	0.5	1.1	1.1	0.7	1.1	1.1	85.9	84.1	68.5
Viet Nam	0	0	0.5	0	0	0.5		60.3	69.3
India	1.2	0.7	1.3	1.6	0.7	1.2	94.9	77.7	46.6
Pakistan	0.7	0.2	0.2	0	0.2	0.2	0	68.1	51.1
Memo items			0.0			0.0			0.0
East Asia	11.6	19.9	24.4	8.3	18.3	24.6	47.6	74.1	67.0
Japan	6.5	7	0.6	3	5	3.6	30.4	57.7	49.3
NAFTA	25	17.4	20.0	20.9	15.8	19.1	55.5	73.1	66.0
EU15	45.5	40.8	35.4	46.2	41.1	34.5	67.7	81.1	67.9
Developing countries	16.5	21.6	40.1	18.6	21.4	40.2	74.9	80	68.3
Developed countries	83.5	78.4	59.9	81.4	78.6	59.8	64.8	80.7	67.4
World	100	100	100.0	100	100	0.0	66.5	80.6	67.8
US$ billion	205	2386	12056	137	1922	9766			

EU = European Union, NAFTA = North American Free Trade Agreement, PRC = People's Republic of China.

[1] Excluding Asian developing economies.

[2] Excluding Japan.

[3] Based on the United Nations country classification.

Sources: Compiled from UN Comtrade database and Trade Data CD-ROM; for Taipei,China: Council for Economic Planning and Development.

Within manufacturing, machinery and transport equipment (SITC 7) played a pivotal role in the structural shift in the export composition of ADEs (Tables 7 and 8). The share of machinery and transport equipment in the export structures of some of the more industrialized economies of East Asia is particularly high. By contrast, that for Indonesia, Viet Nam, and all of South Asia is much smaller. Within the machinery and transport equipment category, information and communication techology (ICT) products have been the most dynamic component of Asian export expansion. By 2007/2008, over 58% of total world ICT exports originated from Asia, up from 30.8% in 1994/1995 (Table 8); the PRC accounted for 25.4% of total world ICT exports, up from 4.2% in 1994/1995. In electrical goods, the PRC's world market share increased from 3.1% to 20.6% between these 2 years.

Asia's share in the other main product categories has also increased over time, though at a slower rate. Of particular interest here is the notable increase in the region's share in miscellaneous manufacturing. This mostly consists of standardized labor-intensive manufactured goods, in particular clothing and footwear. The PRC has accounted for much of this increase but, in contrast to ICT exports, the geographic participation has been broader. Indonesia, India, and Viet Nam (and also a number of low-wage countries in Southeast and South Asia, including Bangladesh, Cambodia, India, Indonesia, Sri Lanka, and Viet Nam not covered in the table) have all recorded impressive gains in market share.

Table 7: Commodity Composition of Manufacturing Exports (percent)

	Chemicals (SITC 5)	Resource Based Products (SITC 6 - SITC 68)		Machinery and Transport Equipment (SITC 7)				Miscellaneous Manufacturing (SITC 8)		Total Manufacturing Exports, US$ billion
		Total	Textiles	Total	ICT Products [4]	Electrical Goods [5]	Road Vehicles (SITC 78)	Total	Apparel (SITC 84)	
Developing Asia										
1994-5	5.3	17	7.3	46	32.6	5.2	2.4	31.6	11.6	587
2007/8	6.3	11.2	2.4	47.1	33.6	5.3	2.9	20.4	5.5	3156
PRC										
1994-5	4.2	15.7	7.5	24.8	14.8	5.4	0.9	55.3	20.1	178
2007/8	4.4	13.7	3.1	46.6	32.5	6.9	1.6	28.8	8.4	1559
Hong Kong, China										
1994-5	3.1	15.8	9	35.7	24.9	5.1	0.4	45.4	23.1	46
2007/8	5.0	15.8	4.3	39.9	30.5	5.4	0.6	28.6	9.9	71
Taipei,China										
1994-5	6.8	23.7	11.5	50.9	30.5	6.1	4.7	18.6	3.5	96
2007/8	9.1	12.5	3.0	55.0	43.4	5.3	2.2	15.6	0.5	252
Korea, Rep. of										
1994-5	8.1	23.6	10.6	53.4	33.9	5.5	7	14.9	6.1	87
2007/8	10.4	11.2	2.2	57.2	33.3	3.9	10.2	8.9	0.5	390
Indonesia										
1994-5	5.9	41.8	11.5	13.2	9.2	1.7	0.9	39.1	16.7	20
2007/8	4.7	9.7	2.3	15.0	9.0	2.8	1.4	12.2	5.2	148
Malaysia										
1994-5	3.6	9.2	1.8	73.5	63.7	4.5	0.8	13.7	5.8	53
2007/8	4.8	5.2	0.6	53.0	47.5	2.7	0.6	7.8	1.7	226
Philippines										
1994-5	1.9	5.6	1.5	58.3	48.3	7.2	1.2	34.3	17.9	13
2007/8	1.5	3.0	0.5	70.9	62.3	5.6	1.3	8.3	3.3	74
Singapore										
1994-5	6.9	4.1	0.6	80.9	68	4.5	0.7	8.2	1.3	60
2007/8	15.8	2.9	0.2	45.6	36.3	1.9	0.5	6.4	0.1	191
Thailand										
1994-5	3.5	15.5	4.3	52.6	39.4	5.6	0.8	28.3	8.9	33
2007/8	7.4	9.6	1.5	48.1	30.4	3.8	7.9	11.5	3.1	168
Viet Nam										
1994-5	1.3	12.5	6.4	3.9	0.9	0.5	0.9	82.3	42.8	2

continued.

Table 7: *continued.*

	Chemicals (SITC 5)	Resource Based Products (SITC 6 - SITC 68)		Machinery and Transport Equipment (SITC 7)				Miscellaneous Manufacturing (SITC 8)		Total Manufacturing Exports, US$ billion
		Total	Textiles	Total	ICT Products [4]	Electrical Goods [5]	Road Vehicles (SITC 78)	Total	Apparel (SITC 84)	
2007/8	1.7	7.2	2.1	11.4	6.1	2.5	0.7	39.1	15.4	55
India										
1994-5	8.5	50.7	16.8	9.2	2	0.9	2.7	31.7	21.8	22
2007/8	12.5	27.8	6.2	12.3	2.6	1.8	2.5	15.1	8.1	155
Pakistan										
1994-5	0.6	65.4	59.6	0.6	0.1	0.1	0	33.4	26.7	6
2007/8	2.9	46.7	41.3	1.2	0.2	0.1	0.2	30.1	23.9	16
Memo items										
East Asia										
1994-5	5.8	14.3	5.1	57.3	31.3	5.2	9.5	22.7	7	981
2007/8	6.9	11.0	2.1	50.3	30.9	5.2	6.4	18.3	4.4	3933
Japan										
1994-5	6.4	10.1	1.7	74	29.4	5.1	20.2	9.4	0.2	394
2007/8	9.6	10.3	0.9	63.4	20.1	5.0	20.7	10.0	0.1	777
NAFTA										
1994-5	12.3	12.3	1.6	61.7	20.7	5.1	15.6	13.6	1.3	599
2007/8	12.2	8.3	0.8	41.5	11.4	3.3	10.4	9.1	0.5	1864
EU 15										
1994-5	17.2	21.3	3.7	47	10.4	4.2	14	14.4	2.9	1319
2007/8	17.2	13.6	1.4	37.1	7.2	2.9	11.9	9.6	1.4	4400
Developed countries[3]										
1994-5	14.8	22.2	7.4	54.3	15.7	4.4	14.9	13.6	1.9	2349
2007/8	15.4	11.6	1.2	38.8	8.8	2.9	11.5	9.4	0.9	7279
Developing countries[1, 3]										
1994-5	8.2	17.3	2.9	41.9	24.9	5.1	4.1	27.7	11.4	1009
2007/8	5.9	10.9	1.9	31.6	17.8	3.5	3.7	12.9	3.9	7045
World										
1994-5	12.8	18.8	4.2	50.6	18.5	4.6	11.6	17.8	4.8	3358
2007/8	10.7	11.3	1.6	35.2	14.0	3.2	7.7	11.1	2.4	14323

EU = European Union, ICT = information and communications technology, NAFTA = North American Free Trade Agreement, PRC = People's Republic of China.
--- means data not available.
[1] Excluding Asian developing economies.
[3] Based on the United Nations country classification.
[4] ICT Information and communication technology products (SITC 75+76+772+776)
[5] SITC 77 - 772 – 776.

Sources: Compiled from UN Comtrade database and Trade Data CD-ROM; for Taipei,China: Council for Economic Planning and Development.

Table 8: World Export Shares of Selected Manufactured Products (percent)

	ICT Products[4] (75+76+772+776)	Electrical Goods (77 - 772 - 776)	Road Vehicles (78)	Textiles (SITC 65)	Apparel (SITC 84)
Developing East Asia					
1994/5	30.8	19.9	3.5	30.3	42.6
2007/8	53.1	35.7	8.2	34.6	50.7
Taipei,China					
1994/5	4.7	3.8	1.2	7.8	2.1
2007/8	5.5	2.9	0.5	3.4	0.3
Korea, Rep. of					
1994/5	4.7	3.1	1.6	6.5	3.3
2007/8	6.5	3.3	3.6	3.8	0.6
PRC					
1994/5	4.2	6.2	0.4	9.4	22.2
2007/8	25.4	23.2	2.3	21.9	38.2
Hong Kong, China					
1994/5	1.9	1.5	0.0	2.9	6.7
2007/8	1.1	0.8	0.0	1.4	2.1
Indonesia					
1994/5	0.3	0.2	0.0	1.6	2.1
2007/8	0.7	0.9	0.2	1.5	2.3
Malaysia					
1994/5	5.4	1.5	0.1	0.7	1.9
2007/8	5.4	1.3	0.1	0.6	1.1
Philippines					
1994/5	1.0	0.6	0.0	0.1	1.4
2007/8	2.3	0.9	0.1	0.2	0.7
Singapore					
1994/5	6.5	1.7	0.1	0.2	0.5
2007/8	3.5	0.8	0.1	0.2	0.1
Thailand					
1994/5	2.1	1.2	0.1	1.0	1.8
2007/8	2.6	1.4	1.2	1.1	1.5
Viet Nam					
1994/5	0.0	0.0	0.0	0.1	0.5
2007/8	0.2	0.3	0.0	0.5	2.5
India					
1994/5	0.1	0.1	0.2	2.6	2.9
2007/8	0.2	0.6	0.4	4.2	3.6
Memo items					
East Asia					
1994/5	49.5	33.0	23.9	35.0	43.0
2007/8	60.9	44.2	22.9	37.8	50.9
Japan					
1994/5	18.6	13.0	20.4	4.6	0.5
2007/8	7.8	8.4	14.7	3.2	0.2
Developed countries					
1994/5	59.5	66.9	89.4	47.4	28.2
2007/8	32.1	46.3	76.2	38.9	19.7
Developing countries					
1994/5	40.5	33.1	10.6	52.6	71.8
2007/8	62.3	53.7	23.8	61.1	80.3

ICT = information and communications technology.
— means data not available.
[1] Excluding Asian developing economies.
[2] Excluding Japan.
[3] Based on the UN country classification.
[4] ICT Information and communication technology products.
Sources: Compiled from UN Comtrade database and Trade Data CD-ROM; for Taipei,China: Council for Economic Planning and Development.

A. Global Production Sharing

The fast growth of machinery trade in Asia has been driven by rapid growth of international fragmentation of production in world trade and the increasingly deep integration of East Asian countries into the global production networks (Athukorala 2005, Ng and Yeats 2003). Linking Southeast Asia to the global electronics production networks began in 1968 with the arrival of two US companies, National Semiconductors and Texas Instruments, which set up plants in Singapore to assemble semiconductor devices (Athukorala 2008). From about the late 1970s, the MNEs with production facilities in Singapore began to relocate some low-end assembly activities in neighboring countries (particularly in Malaysia, the Philippines, and Thailand) in response to the rapid growth of wages and land prices. Many newcomer MNEs to the region also set up production bases in these countries, bypassing Singapore. From about the early 1990s the emergence of the PRC as the global factory of electrical and electrical goods assembly based on parts and components imported from other countries contributed to rapid expansion of production networks in the region. More recently, regional production networks have begun to expand to Viet Nam. Over the past 3 decades, the process of global production sharing has created a new division of labor among countries in the region, based on skill differences involved in different stages of the production process and relative wages, and improved communication and transport infrastructure (Ando and Kimura 2010). As will be seen below, the formation of production networks has dramatically transformed the spatial patterns of international trade in the region, with a notable "magnification" effect on recorded trade flows operating through multiple border-crossing of parts and components on the expansion of intraregional trade.

The most ubiquitous indicator of the intensity of fragmentation-based specialization in world trade is the share of parts and components in total manufacturing trade (Table 9, Panel A).[9] Over the past 2 decades there has been a sharp increase in the share of parts and components (henceforth referred to as components for brevity) in world manufacturing trade from 19.3% in 1992/1993 to 27.1% in 2006/2007 (Table 9). This share has increased at much faster rate in ADEs, from 17.3% to 34.0%. Components share is particularly high among the countries in ASEAN, with all countries in East Asia recording shares well above the world average. The combined component share in manufacturing exports from the ASEAN countries in 2006/2007 amounted to 44.2%, up from 22.7% in 1992/93. In spite of its intrinsic comparative advantage, India still remains a minor player in this new form of international exchange (Krueger 2010).

[9] Henceforth, for the sake of brevity, the term "components" in place of parts and components and "machinery" in place of machinery and transport equipment are used.

Table 9: Share of Parts and Components in Manufacturing Trade, 1992/3 and 2006/7 (percent)

	Total Trade				Intraregional Trade			
	Exports		Imports		Exports		Imports	
	1992/3	2006/7	1992/3	2006/7	1992/3	2006/7	1992/3	2006/7
Developing Asia	17.3	34.0	29.0	44.2	21.6	53.9	32.9	59.5
PRC	7.4	25.6	20.4	44.0	9.4	40.6	23.7	59.2
Hong Kong, China	15.8	33.3	24.1	48.5	17.2	58.3	35.7	60.1
Taipei,China	24.7	44.2	29.5	38.9	25.3	50.5	39.4	58.3
Korea, Rep. of	18.1	47.3	30.1	31.9	21.0	63.5	38.8	38.1
ASEAN6	22.7	44.2	36.0	47.9	32.6	61.4	42.6	51.4
Indonesia	3.8	21.5	27.0	21.8	5.5	29.9	32.0	23.4
Malaysia	27.7	53.6	40.5	50.0	39.8	74.5	47.9	53.7
Philippines	32.9	71.7	32.6	61.3	47.2	99.6	38.6	65.8
Singapore	29.0	49.3	39.9	60.4	41.6	68.5	47.2	64.8
Thailand	14.1	29.9	30.6	36.1	20.2	41.5	36.2	38.7
Viet Nam	—	11.0	—	19.1	—	15.3	—	20.5
India	3.0	10.4	17.5	22.9	4.3	14.4	20.7	24.6
Memo items								
East Asia	20.2	34.1	27.2	42.1	24.9	50.1	30.3	52.8
Japan	23.9	34.4	19.3	29.9	28.9	42.0	19.3	34.2
NAFTA	28.4	31.2	37.4	28.8	20.9	28.8	47.6	36.3
EU15	18.3	22.4	21.2	23.2	18.4	22.0	20.5	22.1
World	19.3	27.1	19.6	27.3	NA	NA	NA	NA

ASEAN = Association of Southeast Asian Nations, EU = European Union, NA = not applicable, NAFTA = North American Free Trade Agreement, PRC = People's Republic of China.

— means data not available.

Sources: Compiled from UN Comtrade database and Trade Data CD-ROM; for Taipei,China: Council for Economic Planning and Development.

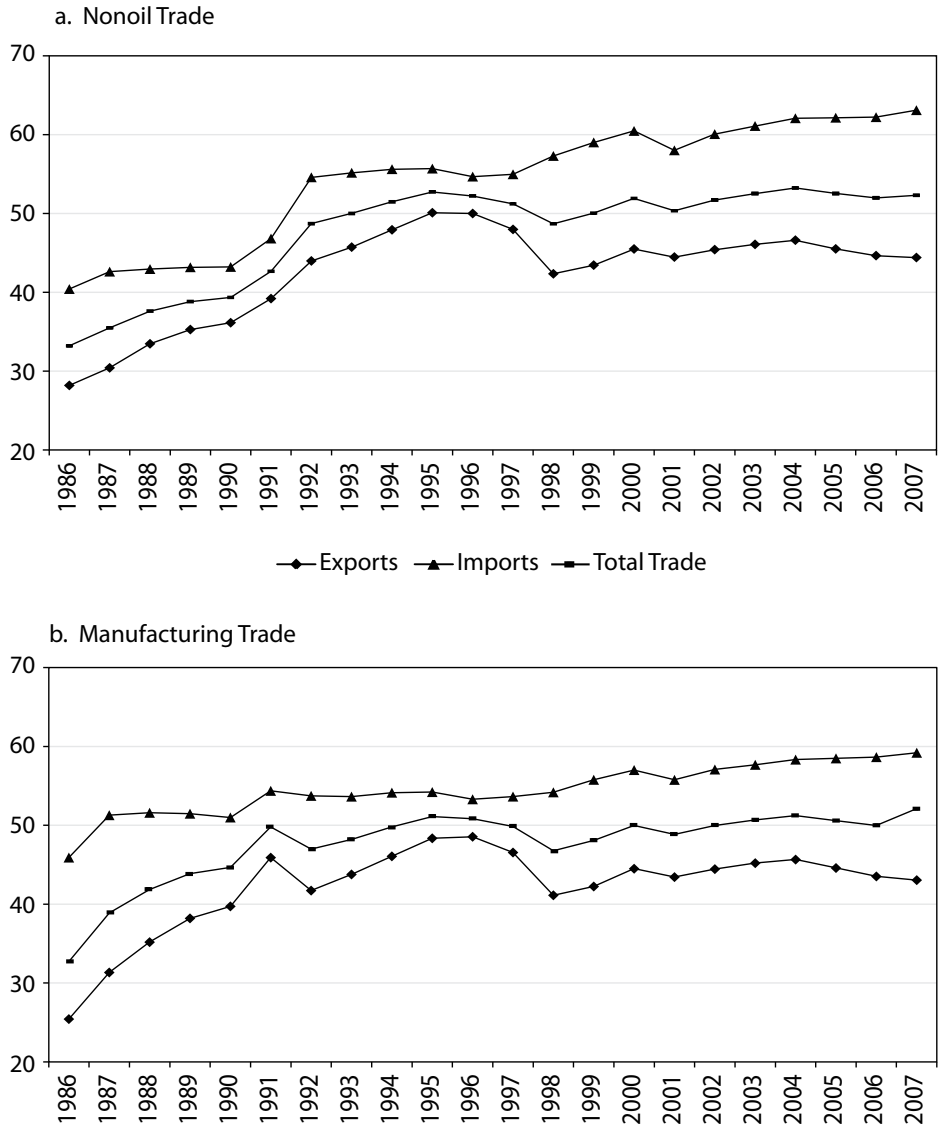
In an intercountry comparison, there is a remarkable similarity of component shares in manufacturing exports and imports across all East Asian countries other than the PRC, reflecting overlapping specialization patterns in component assembly and testing among countries in the region. The PRC's manufacturing trade patterns differ from its East Asian neighbors. In particular, the components share in the total manufacturing imports of the PRC (44% in 2006/2007) is much larger compared to the corresponding share in its manufacturing exports (25.6%). This difference between the PRC and the other countries in the region is consistent with the earlier observation that the PRC's rise in world trade has brought about a notable shift in the division of labor within regional production networks, with ASEAN countries playing an increasing role in producing parts and components for the rapidly growing final assembly activities in the PRC. The bulk of components used in final assembly in the PRC come from other countries in the region. At the same time, final goods (total exports minus components) account for an overwhelming share of the PRC's exports to the rest of the world, mostly to the EU and the US.

B. Intraregional Trade

A notable outcome of the rapid expansion of production networks has been been the rapid growth of cross-border trade in parts and components within the regions. For instance, in 2006/2007, components accounted for 53.9% of intra-ADE exports (59.5% of imports) compared to 34.0% in the regions total exports (44.2% of total imports). Interestingly component share in intra-ADE trade is much higher compared to that of intraregional trade in the North American Free Trade Agreement (NAFTA) and the EU-15.

Driven largely by component trade, the share of intraregional nonoil trade in total world trade of ADEs increased continuously from about 20% in 1985 to over 52% by 2008 (Figure 2). Until about the late 1990s, both intraregional trade shares of imports exports closely moved together. However, the time pattern has changed notably from then on. While the intraregional impost share has continued to increase at a faster rate, the intraregional export-to-GDP ratio virtually stagnated or recorded a mild decline in some years. Consequently, the rate of increase in total intraregional trade share has remarkably slowed. This notably asymmetry in the growth of intraregional exports and imports (and the consequent slow expansion in total intraregional trade) is a reflection of East Asia's unique role within global production networks, in particular the PRC's role as the premier assembly center within these networks based on parts and components procured from the rest of East Asia (Athukorala 2009).

Figure 2: Intraregional Trade Shares of ADEs, 1986–2007 (percent)



Source: Based on data compiled from the UN Comtrade database.

IV. Modelling Trade Flows

This section reports results of an econometric exercise undertaken to predict trade flows of the 12 countries to 2030 based on trade equations estimated at the country level using data for the period 1985 to 2008. The analytical tool used for this purpose is the gravity model, which has become the “workhorse” for modeling bilateral trade flows. The standard gravity model postulates that trade between two countries, like the gravitational

force between two masses, is a function of their economic size and the geographic distance between them.[10] This basic model is augmented by adding a number of explanatory variables found in previous studies[11] to improve the explanatory power of the estimated trade equations.

The specification of the gravity model is:

$$Ln(X_{i,j} \text{ or } M_{i,j}) = \alpha + \beta_1 ln(GDP_i \;\; GDP_j) + \beta_2 lnDST_{i,j} + \beta_3 LNG_{i,j} + \beta_4 ADJ_{i,j} + \beta_5 lnRWG_{i,j} + \beta_6 RTA_{ij,} + \beta_7 CLN_{ij} + \beta_8 \text{DAFC} + \beta_9 \text{DGFC} + \gamma T + \varepsilon_{ij}$$

Subscripts *i* and *j* refer to the reporter and the partner country in bilateral trade relation and the variables are listed and defined below, with the postulated sign of the regression coefficient for the explanatory variables in brackets.

X or *M*	Bilateral trade (export or import) between *i* and *j*
GDP	Real gross domestic product (GDP), a measure of the economic size (+)
DST	Distance between the economic centers of *i* and *j* (-)
LPI	Index of the quality of trade-related logistics (*LPI*)
LNG	Dummy variable that is unity if *i* and *j* have a common language and zero otherwise (+)
ADJ	Dummy variable that is unity if *i* and *j* share the same border (+)
RTA	Dummy that is unity if both *i* and *j* belong to the same referential trade agreement (*RTA*) (+)
CLN	Dummy variable that is unity if *i* and *j* have a common language (a measure of cultural affinity) (+)
DAFC	Binary dummy variable for the Asian financial crisis, 1997–1998
DGFC	Binary dummy variable for the global financial crisis, 2008
α	Constant term
T	Set of time dummy variables to capture year-specific “fixed” effects
ε	Stochastic error term representing the omitted other influences on bilateral trade

[10] For an introduction to the gravity model and recent methodological and theoretical advances in its applications to trade flow modeling, see Bergeijk and Brakman (2010).

[11] Bergeijk and Brakman (2010) provide a comprehensive survey of this literature.

Table 10: Share of Parts and Components in Trade Flows, 2006/7 (percent)

Reporting Economy/Region		Developing Asia	NAFTA	EU15	World
(a) Exports					
Developing East Asia	1992/3	21.6	17.0	14.7	17.3
	2006/7	53.9	22.7	21.6	34.0
PRC	1992/3	9.4	5.8	6.0	7.4
	2006/7	40.6	17.1	16.3	25.6
Korea, Rep. of	1992/3	21.0	20.6	16.3	18.1
	2006/7	63.5	36.6	26.8	44.2
Taipei,China	1992/3	25.3	23.9	31.9	24.7
	2006/7	50.5	35.0	37.6	44.2
ASEAN6	1992/3	32.6	21.1	17.3	22.7
	2006/7	61.4	32.1	33.9	44.2
Memo Items					
East Asia	1992/3	24.9	21.1	17.7	20.2
	2006/7	50.1	25.1	24.1	34.1
Japan	1992/3	28.9	25.5	20.9	23.9
	2006/7	42.0	31.5	30.4	34.4
NAFTA	1992/3	31.5	29.0	30.4	28.4
	2006/7	49.8	28.8	30.6	31.2
EU15	1992/3	20.5	23.1	18.4	18.3
	2006/7	34.8	22.1	22.0	22.4
(b) Imports					
Developing East Asia	1992/3	32.9	45.3	27.7	29.0
	2006/7	59.5	40.3	31.7	44.2
PRC	1992/3	23.7	19.7	23.5	20.4
	2006/7	59.2	40.1	31.6	44.0
Korea, Rep. of	1992/3	38.8	35.3	16.5	30.1
	2006/7	38.1	38.9	22.9	31.9
Taipei,China	1992/3	39.4	29.9	19.8	29.5
	2006/7	58.3	40.2	28.0	38.9
ASEAN6	1992/3	42.6	45.2	28.0	36.0
	2006/7	51.4	67.5	41.7	47.9
Memo Items					
East Asia	1992/3	30.3	42.8	23.3	27.2
	2006/7	52.8	54.7	33.1	42.1
Japan	1992/3	19.3	35.2	12.3	19.3
	2006/7	34.2	41.0	18.9	29.9
NAFTA	1992/3	29.5	47.6	35.5	37.4
	2006/7	26.0	36.3	25.1	28.8
EU15	1992/3	18.5	36.0	20.5	21.2
	2006/7	22.8	34.1	22.1	23.4

ASEAN = Association of Southeast Asian Nations, EU = European Union, NAFTA = North American Free Trade Agreement, PRC = People's Republic of China.

Source: Compiled from UN Comtrade database.

The model is estimated for each of the 12 Asian economies, separately for total exports and imports of merchandise trade (SITC 1 through 9), nonoil, and manufacturing trade (SITC 5 though 8 less 68). Trade data are from the Comtrade database. Data on GDP are extracted from the World Bank's World Development Indicators database. The nominal (US$) trade data extracted from the Comtrade database are converted into real terms using US trade price indices extracted from the US Bureau of Labor Statistics database.

Table 11: Intraregional Shares of Manufacturing Trade: Total, Parts and Components, and Final Trade, 1992/3 and 2006/7[1] (percent)

	Developing Asia	NAFTA	EU15
Total Manufacturing[2]			
Exports			
1996/7	44.2	44.4	60.1
2006/7	37.4	48.1	56.9
Imports			
1996/7	40.4	36.3	63.6
2006/7	50.4	32.0	57.9
Trade (exports + imports)			
1996/97	42.3	39.9	61.8
2006/7	43.9	38.4	57.5
Parts and Components			
Exports			
1996/7	38.8	43.5	65.1
2006/7	56.0	47.8	55.9
Imports			
1996/7	34.5	39.5	59.8
2006/7	55.6	40.1	55.0
Trade			
1996/7	36.6	41.4	62.4
2006/7	55.8	44.2	55.5
Final Goods[3]			
Exports			
1996/7	45.0	44.7	58.8
2006/7	28.7	48.8	57.1
Imports			
1996/7	41.4	35.3	64.7
2006/7	46.5	30.2	59.2
Trade			
1996/7	43.2	39.4	61.8
2006/7	37.6	37.3	58.1

[1] Intraregional trade shares have been calculated excluding bilateral flows between the PRC and Hong Kong, China.
[2] SITC 5 to 8 less SITC 68.
[3] Total (reported) trade – parts and components.
Sources: Compiled from UN Comtrade database and Trade Data CD-ROM; for Taipei,China: Council for Economic Planning and Development.

Data on *LPI* come from the newly developed Logistics Performance Index database of the World Bank (Arvis et al. 2007), which provides the first in-depth, cross-country assessment of trade-related logistic provisions. It covers 150 economies, including 28 in developing Asia. It is based on a worldwide survey of global freight forwarders and express carriers, complemented by a number of qualitative and quantitative indicators of the domestic logistics environment, institutions, and performance of supply chains. The data on bilateral distance come from the trade patterns database of the French Institute for Research on the International Economy (CEPII). The CEPII distance measure is a composite measure of the bilateral great-circle distance between major cities of each economy compiled by taking into account the trading significance of each city in each economy. Export shares for 2000 are used in compiling the distance measure for each economy. For a complete listing of variables and data sources see Appendix Table 1.

A. Trade Equations

Of the three standard panel data estimation methods (pooled ordinary least squares [OLS], random effects, and fixed effects estimators), the fixed effect estimator is not appropriate in this case because the model contains a number of time-invariant explanatory variables that are central to the analysis. In experimental runs, both pooled OLS and random-effects estimators are used. The Bruesch-Pagan Lagrange multiplier test failed to reject the null hypothesis of random effects, favoring the use of pooled OLS estimator. The preferred (pooled OLS) estimates are reported in Table 12. Note that $PGDP_I$ and $PGDP_J$ could not be retained in the final estimates because of their high correlation with the counterpart GDP variables. Common border dummy was deleted in the final estimates because of its high correlation with the distance variable.

The coefficients of the two standard gravity variables (GDP in pairs, and the distance) are statistically significant with the hypotheses signs in all cases. The coefficient of the distance variable is well within the range of 0.7–1.20 commonly found in various gravity model applications. The coefficient of GDP in pairs is consistently closer to unity. The LPI performs remarkably well in explaining both imports and exports, with statistically significant and positive coefficients in all cases. The other control variables are not uniformly significant across all countries, both on import and export sides. These variables have been retained in a given equation only if the coefficients carried the expected sign with a t-ratio of more than unity. In terms of the overall fit the export equations generally performs better (with R^2 s of closer to 0.80) than the import equations (R^2s of around 0.65). As one would expect, estimated equations (both exports and imports) for nonoil trade generally exhibit a better overall fit compared to those for total trade.

Table 12: Determinants of Trade Flows

Trade Category/ Country	Con	$GDP_I GDP_J$	DST	FTA	LPI	LLD	CLD	GFCD	AFCD	N	R2	RMSE
(a) Total merchandise trade												
Exports												
PRC	-24.43	1.02	-1.04				1.45			1919	0.77	1.20
	(25.33)	(70.64)	(18.98)				(8.72)					
Hong Kong, China	-13.94	0.55	-0.76		1.12		1.12			1812	0.74	1.11
	(5.22)	(29.52)	(15.41)		(18.53)		(6.87)					
Taipei,China	-4.05	0.59	-0.93		0.44	-0.85				682	0.76	0.88
	(3.12)	(23.77)	(19.84)		(5.14)	(5.46)						
Korea, Rep. of	-17.34	0.85	-0.87	0.86	0.11	-0.18				1676	0.79	0.94
	(18.63)	(50.54)	(19.54)	(3.91)	(2.22)	(2.26)						
Indonesia	-13.99	0.93	-1.69			-0.45		-0.21		1642	0.79	0.98
	(15.45)	(73.22)	(35.17)			(5.23)		(1.80)				
Malaysia	-20.48	0.97	-1.39		0.67			0.50		1520	0.75	1.20
	(18.60)	(41.57)	(28.64)		(9.77)			(3.05)				
Philippines	-20.82	0.92	-1.38	0.96	1.24			-0.39		1247	0.78	1.18
	(27.29)	(37.24)	(26.83)	(3.56)	(17.14)			(2.32)				
Singapore	-9.86	0.82	-1.63	0.11	0.68	-0.19	0.74			1459	0.84	0.95
	(11.80)	(45.15)	(43.16)	(1.00)	(12.71)	(2.19)	(5.09)					
Thailand	-7.76	0.67	-1.31	0.93	0.98	-0.20				1731	0.65	1.50
	(7.30)	(30.43)	(28.55)	(13.83)	(11.87)	(2.25)						
Viet Nam	-21.77	0.95	-0.96		0.46		-0.30			1558	0.78	1.14
	(14.86)	(34.17)	(12.86)		(4.96)		(1.46)					
India	-10.58	0.81	-1.45	0.94						1981	0.75	1.04
	(15.67)	(69.47)	(33.33)	(4.24)								
Pakistan	-8.28	0.66	-1.15	0.84	0.71	-0.28				1750	0.62	1.38
	(7.19)	(26.78)	(19.68)	(2.31)	(9.34)	(2.80)						
Imports												
PRC	-22.55	0.93	-0.90		0.32		0.93	0.50	-0.57	1787	0.62	1.80
	(14.76)	(32.66)	(10.88)		(3.33)		(3.59)	(2.31)	(3.77)			
Hong Kong, China	--23.96	1.01	-1.37		1.10		1.33	-0.05		1213	0.77	1.24
	(26.54)	(38.38)	(23.58)		(14.42)		(7.19)	(1.29)				
Taipei,China	-18.83	0.86	-1.32		0.88					645	0.74	1.14
	(10.99)	(26.79)	(17.55)		(8.40)							
Korea, Rep. of	-22.51	0.67	-0.83	1.26	0.66	-1.22		-0.18		1546	0.60	1.51
	(7.78)	(25.81)	(11.22)	(3.56)	(7.96)	(8.88)		(0.97)				
Indonesia	-15.25	0.79	-1.02	1.08	0.81						0.63	1.54
	(17.69)	(29.98)	(14.73)	(2.94)	(9.93)							

continued.

Table 12: *continued.*

Trade Category/ Country	Con	$GDP_I GDP_J$	DST	FTA	LPI	LLD	CLD	GFCD	AFCD	N	R2	RMSE
(a) Total merchandise trade *Continued.*												
Imports (*Continued*)												
Singapore	-9.19	0.75	-1.45		1.02	-0.39				1360	0.71	1.22
	(8.85)	(33.55)	(30.12)		(14.03)	(2.80)						
Thailand	-8.85	0.68	-0.98	0.78	0.98			1.12		1731	0.65	1.50
	(7.78)	(24.47)	(19.77)	(2.93)	(11.87)			(4.13)				
Viet Nam	-45.22	2.20	-1.34	0.58	0.36					736	0.67	1.33
	(6.17)	(7.30)	(18.82)	(1.81)	(3.08)							
India	-10.38	0.67	-0.85		0.51					1850	0.52	1.66
	(8.12)	(26.48)	(12.74)		(6.38)							
Pakistan	-12.55	-0.80	-1.47		0.78				-0.21	1593	0.56	1.69
	(9.16)	(26.47)	(18.80)		(5.58)				(1.36)			
(B) Nonoil trade												
Exports												
PRC	-24.70	1.02	-1.03				1.37			1907	0.76	1.22
	(24.58)	(68.52)	(18.25)				(8.09)					
Hong Kong, China	-7.02	0.56	-0.76		1.11		1.10			1799	0.74	1.12
	(8.27)	(29.58)	(15.49)		(18.15)		(6.80)					
Taipei,China	-4.23	0.59	-0.93		0.45	-0.85				681	0.77	0.88
	(3.26)	(23.91)	(19.82)		(5.19)	(5.40)						
Korea, Rep. of	-17.40	0.85	0.85	0.71	-0.16					1675	0.79	0.94
	(18.78)	(50.57)	(19.23)	(3.24)	(2.07)							
Indonesia	-14.14	0.93	-1.65			-0.30		-0.36	0.20	1644	0.78	1.03
	(17.96)	(70.63)	(34.01)			(3.36)		(2.63)	(1.60)			
Malaysia	-15.43	0.90	-1.37		0.38	-0.13				1557	0.79	1.03
	(16.85)	(48.08)	(29.78)		(6.65)	(1.58)						
Philippines	-26.76	1.04	-1.41	0.84	1.22			-0.44	-0.07	1722	0.83	1.24
	(24.15)	(46.29)	(27.29)	(3.00)	(18.00)			(2.88)	(1.01)			
Singapore	-11.06	0.81	-1.48		0.73	-0.12	0.64			1506	0.83	0.92
	(14.06)	(47.81)	(40.26)		(14.09)	(1.43)	(4.50)					
Thailand	-7.71	0.67	-1.30		0.92	-0.20			-1.13	1758	0.78	1.14
	(7.37)	(30.43)	(28.34)		(13.83)	(2.23)			(5.56			
Viet Nam	-22.15	0.93	0.83		0.58			-0.23		1516	0.68	1.51
	(15.62)	(38.16)	(11.17)		(6.27)			(1.14)				
India	-10.27	0.80	-1.45	0.77						1982	0.74	1.02
	(15.41)	(69.65)	(35.57)	(3.49)								
Pakistan	-8.09	0.65	-1.14	0.79	0.73	-0.28				1751	0.62	1.38
	(7.02)	(26.44)	(19.40)	(2.17)	(9.48)	(2.78)						

continued.

Table 12: *continued.*

Trade Category/ Country	Con	$GDP_I GDP_J$	DST	FTA	LPI	LLD	CLD	GFCD	AFCD	N	R2	RMSE
(b) Nonoil Trade *Continued.*												
Imports												
PRC	-23.54	0.92	-0.77		0.32		1.06	0.52	-0.57	1657	0.66	1.64
	(16.32)	(34.14)	(10.11)		(3.52)		(4.46)	(2.58)	(4.03)			
Hong Kong, China	-24.91	1.02	-1.37		1.09		1.25	-0.02		1187	0.77	1.24
	(18.06)	(37.33)	(23.51)		(4.12)		(6.78)	(1.14)				
Taipei,China	-22.72	0.92	-1.02		1.01					661	0.78	1.15
	(13.48)	(28.80)	(17.04)		(9.67)							
Korea, Rep. of	-13.91	0.72	-0.79	1.50	0.72	-0.40			-0.10	1127	0.71	1.25
	(11.56)	(33.34)	(13.02)	(5.26)	(9.90)	(3.34)			(0.90)			
Indonesia	-16.10	0.78	-0.97	0.92	0.90			-0.26		1629	0.67	1.46
	(13.47)	(31.10)	(14.79)	(2.61)	(11.25)			(1.25)				
Malaysia	-16.81	0.76	-0.77	1.34	1.13	-0.88				1313	0.70	1.43
	(13.68)	(29.40)	(12.20)	(4.49)	(13.45)	(6.81)						
Philippines	-11.45	0.78	-1.53	0.67	1.01	-0.74				1232	0.65	1.53
	(8.05)	(25.70)	(21.19)	(1.62)	(10.53)	(4.58)						
Singapore	-11.77	0.76	-1.25	0.31	1.18	-0.16	0.47			1204	0.79	0.97
	(13.38)	(38.82)	(30.23)	(2.53)	(19.39)	(1.46)	(3.11)					
Thailand	-12.04	0.67	-0.82	1.18	0.90			0.95		1733	0.67	1.42
	(11.00)	(27.07)	(17.29)	(4.16)	(11.13)			(3.74)				
Viet Nam	-119.50	4.90	-0.60		1.47			-0.58		1334	0.79	1.41
	(50.23)	(50.93)	(9.57)		(15.60)			(3.01)				
India	-13.91	0.70	-0.61	1.16	0.37				-0.16	1840	0.55	1.57
	(11.37)	(28.94)	(9.42)	(3.66)	(4.44)				(1.30)			
Pakistan	-20.78	0.90	-1.08		0.51	0.45			-0.36	1581	0.57	1.66
	(14.45)	(28.65)	(13.43)		(5.36)	(3.66)			(2.47)			

Note: Dependent variable: Exports/Imports. Explanatory variables are as follows: GDP_I: Log of GDP of reporting country; GDP_J: Log of GDP of partner country; DST: Log of bilateral distance; FTAD: dummy variable for FTA membership; LPI: Logistic performance index index (partner); LLD: Land-locked dummy (partner); CLD:Common language dummy; WTOD: WTO dummy (for the PRC); GFCD: Global financial crisis dummy; AFCD: Asian financial crisis dummy.
T-ratios are given in parentheses.

B. Trade Projections

The estimated equations are used for predicting trade flows for the period 2010–2030. The methodology involved estimating total trade for each country as the sum of bilateral trade flows estimated using the estimated import and export equations. In making these projections, GDP projections generated in this research project are used for the ADEs. GDP projections for the other trading partner countries of ADEs come from the USDA database.

Trade flow projections (US$ billion) for total merchandise trade and nonoil merchandise trade for the ADEs are reported in Appendix Table 2. It is important note that these perditions are based on the assumption that the past trade patterns will continue unchanged for the ensuing 2 decades. In reality, the nature of trade orientation of an economy changes with the passage of time reflecting both structural changes in the domestic economy and changes in global trade patterns. The following discussion focuses on predictions for nonoil trade because the degree of dependence on oil and gas trade varies significantly among the countries.

Annual growth rates of projected trade flows are reported in Table 12. Total nonoil exports from ADEs are projected to grow at an annual rate of 7.9% during 2010–2020 and 9.9% during 2020–2030 (Table 12, panel a). Predicted growth rates of imports for the two subperiods are 8.4% and 6.8%, respectively. A comparison of the estimates on export and import sides points to a mild tendency for narrowing of the overall trade deficit of the region over the years. The annual growth rate of exports from the PRC is projected to decline from 10.4% during 2010–2020 to 8.1% between the 2 decades. Predicted import and export growth rates varies notably among the 12 economies, with significant slowing down of trade expansion in three NIEs (the Republic of Korea; Singapore; Taipei,China) compared to the other countries. Overall the estimates point to a notable convergence in the rate of trade expansion among the countries over the years.

Intraregional nonoil trade in ADEs are projected to grow at a slightly faster rate compared to their overall (global) trade (compare figures reported in Panel A and B in Table 12). Exports from these countries to regional markets during 2010–2030 will grow at 9.2% compared to 8.5% growth in the region's total exports. The comparable figures on the import side are 8.4% and 7.1%, respectively. During these 2 decades the PRC's intraregional exports are protected to grow at 10.5% compared to an overall export growth rate of 9.2%. In all other countries intraregional trade would also grow at a faster rate compared to overall trade, driven by trade expansion associated with faster economic growth.

Reflecting these growth rate differentials between intraregional and total trade, intraregional share in total trade of ADEs will increase continuously during 2000–2030 (Table 13, Figure 3). Intraregional nonoil export share in ADEs would reach 64.9% in 2030 from 56.9% in 2010. The increase on the import side would be from 53.5% to 59.5%. Intraregional trade shares are predicted to increase in all countries in the region, with those of the second-tier ADEs increasing at a faster rate compared to the Republic of Korea; Singapore; and Taipei,China. The PRC's intraregional export and import shares are predicted to increase from 51.6% to 59.6%, and 41.7% to 81.9%, respectively, between 2010 and 2030.

Trade openness of the region, measured by the trade-to-GDP ratio, is projected to increase sharply from 39.4% in 2010 to 74.4% in 2030. Among the 12 economies, Hong Kong, China; Malaysia; Singapore; and the Philippines are notable for maintaining very high trade/GDP ratios for a long period of time (Krugman 1995). By the end of the projection period, Thailand and Viet Nam too are likely to join this group of "super trading economies". The PRC's degree of trade openness is projected to increase from 41.7% in 2010 to 81.9% in 2030. The degree of trade openness of India and Pakistan is projected to remain low compared to their East Asian counterparts. As already noted, these figures need to be treated with caution: they are based on the assumption that patterns of trade pertaining to the estimation period 1986–2008 will continue unchanged during the ensuing 2 decades. In particular, it is important to take into account the likely impact of the current policy emphasis in the PRC on rebalancing growth.

Table 13: Export Growth Predictions, 2010–2030 (at 2005 prices) (percent)

Year	PRC	Hong Kong, China	Korea, Rep. of	Taipei,China	Indonesia	Malaysia	Philippines	Singapore	Thailand	Viet Nam	India	Pakistan	Total ADEs
Total nonoil Trade: World													
Exports													
2010	15.3	5.3	8.5	5.1	7.9	9.9	11.6	10.9	5.7	11.8	9.8	6.8	13.1
2011	10.6	4.8	8.2	4.8	9.8	10.3	11.2	8.7	8.2	9.8	8.6	6.9	10.1
2012	10.4	5.5	8.0	5.0	9.6	10.2	11.4	8.2	7.9	10.3	8.5	7.7	10.0
2013	10.2	5.2	7.7	4.8	9.8	10.5	11.1	8.4	8.0	9.9	8.5	8.0	9.9
2014	10.0	4.9	8.7	5.0	10.1	9.4	11.5	8.5	8.0	10.2	8.6	7.4	9.8
2015	10.4	5.5	8.0	4.8	9.5	10.3	11.7	8.5	8.0	9.7	8.7	6.9	10.0
2016	10.0	4.4	7.4	4.5	9.6	10.2	11.1	7.5	7.7	9.3	8.4	7.9	9.6
2017	9.1	4.3	7.7	4.3	8.7	9.2	10.6	7.4	7.4	9.4	7.8	7.3	8.9
2018	9.3	4.1	7.9	4.5	8.8	9.7	11.1	7.3	7.5	9.4	8.4	7.5	9.1
2019	9.4	4.6	7.3	4.3	9.4	9.5	10.9	7.3	7.5	9.3	8.6	6.9	9.2
2020	9.4	4.4	8.0	4.5	8.6	9.2	10.6	7.2	7.2	9.5	7.9	7.6	9.2
2021	8.2	3.6	6.3	3.7	8.5	8.9	10.3	6.3	7.5	8.4	8.1	7.0	8.2
2022	8.3	3.5	7.0	3.8	8.3	8.6	10.0	6.0	6.1	8.0	7.5	6.6	8.2
2023	8.3	3.4	6.5	3.7	8.7	8.8	10.0	5.7	7.4	8.2	7.6	7.0	8.2
2024	8.3	3.8	6.6	3.8	8.4	8.5	9.9	6.3	6.2	8.0	7.6	7.0	8.2
2025	8.2	3.1	6.6	3.4	8.2	8.9	10.1	5.9	7.2	8.1	8.2	6.9	8.2
2026	8.1	3.5	6.2	3.6	7.9	8.1	9.6	5.6	6.8	7.9	7.1	6.5	7.9
2027	7.9	2.9	6.3	3.2	8.0	8.4	9.8	5.3	6.3	7.5	7.5	6.8	7.9
2028	8.0	3.3	5.9	3.3	8.1	8.3	9.5	5.0	6.5	7.7	7.5	6.3	7.9
2029	7.8	3.7	5.9	3.2	7.8	8.2	9.7	4.8	6.1	7.8	7.3	6.5	7.7
2030	8.0	3.1	6.2	3.3	8.1	8.3	9.6	5.2	6.3	7.7	7.6	6.7	7.9
2010-20	10.4	4.8	8.0	4.7	9.2	9.9	11.2	8.2	7.6	9.9	8.5	7.4	9.9
2021-30	8.1	3.4	6.4	3.5	8.2	8.5	9.9	5.6	6.7	7.9	7.6	6.7	8.0

continued.

Table 13: *continued.*

Year	PRC	Hong Kong, China	Korea, Rep. of	Taipei,China	Indonesia	Malaysia	Philippines	Singapore	Thailand	Viet Nam	India	Pakistan	Total ADEs
Total nonoil Trade: World													
Imports													
2010	13.9	12.8	6.2	8.9	5.2	8.1	8.1	9.9	5.3	9.8	7.5	10.8	10.7
2011	9.1	10.9	6.5	8.0	7.2	8.1	8.2	7.5	7.1	8.7	6.6	10.4	8.5
2012	8.9	10.2	6.7	7.8	7.4	8.3	8.6	7.5	7.1	8.5	7.0	11.2	8.4
2013	9.1	10.7	6.5	7.8	7.2	8.2	8.2	7.5	7.3	8.6	6.5	10.6	8.5
2014	9.1	10.6	6.6	7.7	7.7	8.3	8.5	7.5	7.2	8.6	6.9	11.0	8.6
2015	9.1	10.4	6.5	7.9	7.4	8.3	8.3	7.4	7.1	8.5	7.1	10.8	8.5
2016	8.6	9.4	6.3	7.2	6.9	7.9	8.2	6.7	6.8	8.2	6.6	10.9	8.1
2017	8.3	8.8	6.1	7.0	6.9	7.6	8.0	6.5	6.7	7.8	6.5	10.5	7.8
2018	8.1	9.0	6.4	7.0	6.7	7.7	8.0	6.5	6.6	8.0	6.4	10.5	7.7
2019	8.3	9.0	6.2	6.9	6.7	7.6	8.0	6.6	6.6	7.9	6.5	10.3	7.8
2020	8.2	8.8	6.2	7.0	6.9	8.1	8.1	6.4	6.8	7.9	6.4	10.7	7.8
2021	7.4	7.4	5.5	6.4	6.5	6.9	7.5	5.7	6.2	7.0	6.2	10.4	7.1
2022	7.3	7.2	5.4	5.7	6.3	6.5	7.3	5.4	6.0	6.8	6.1	10.0	6.9
2023	7.4	7.0	5.5	6.3	6.2	7.8	7.3	5.4	6.1	6.7	6.1	9.9	7.0
2024	7.3	7.1	5.4	5.9	6.3	6.5	7.5	5.4	6.0	6.7	6.2	10.1	6.9
2025	7.4	7.1	5.5	5.6	6.4	7.6	7.3	5.4	6.3	7.2	6.2	9.9	7.1
2026	7.2	6.9	5.1	5.3	5.9	6.3	7.2	4.7	5.8	5.6	5.8	9.5	6.6
2027	6.9	6.8	5.0	5.0	6.0	6.6	7.4	4.6	5.5	7.1	6.0	9.5	6.6
2028	7.4	6.4	5.0	5.4	5.9	6.8	6.9	4.5	6.0	5.8	5.9	9.5	6.8
2029	6.9	6.7	5.0	5.8	5.9	7.0	7.4	4.7	5.7	7.0	5.9	9.6	6.7
2030	6.5	7.2	4.8	4.9	5.9	6.5	6.9	4.0	5.4	5.8	6.0	9.5	6.3
2010-20	9.2	10.1	6.4	7.6	6.9	8.0	8.2	7.3	6.8	8.4	6.7	10.7	8.4
2021-30	7.2	7.0	5.2	5.6	6.1	6.9	7.3	5.0	5.9	6.6	6.0	9.8	6.8

continued.

Table 13: *continued.*

Year	PRC	Hong Kong, China	Korea, Rep. of	Taipei,China	Indonesia	Malaysia	Philippines	Singapore	Thailand	Viet Nam	India	Pakistan	Total ADEs
Intraregional Nonoil Trade													
Exports													
2010	17.2	6.7	11.7	7.0	9.8	11.6	14.8	11.9	7.4	14.5	12.0	9.2	14.8
2011	12.0	5.4	9.5	5.8	10.7	11.2	12.7	9.3	9.0	10.9	9.8	8.0	11.3
2012	11.6	6.0	9.2	5.9	10.3	11.0	12.6	8.7	8.6	11.3	9.5	8.7	11.0
2013	11.4	5.7	8.9	5.6	10.5	11.3	12.3	8.9	8.7	10.9	9.6	9.0	10.9
2014	11.1	5.4	9.9	5.8	10.8	10.2	12.7	8.9	8.7	11.2	9.7	8.4	10.8
2015	11.5	6.0	9.2	5.6	10.3	11.1	12.9	9.0	8.7	10.7	9.7	7.9	11.0
2016	11.0	4.9	8.4	5.3	10.2	10.9	12.1	7.9	8.3	10.2	9.4	8.9	10.5
2017	10.0	4.7	8.6	5.0	9.3	9.9	11.5	7.8	8.0	10.2	8.7	8.2	9.7
2018	10.2	4.5	8.7	5.2	9.4	10.4	11.9	7.7	8.0	10.2	9.3	8.3	10.0
2019	10.3	5.0	8.2	5.0	10.0	10.1	11.7	7.7	8.1	10.1	9.5	7.8	10.0
2020	10.3	4.8	8.9	5.1	9.2	9.8	11.5	7.6	7.7	10.2	8.8	8.4	9.9
2021	8.9	3.9	7.0	4.2	8.9	9.4	11.0	6.6	8.0	9.0	8.9	7.8	8.8
2022	8.9	3.8	7.6	4.3	8.8	9.1	10.7	6.3	6.5	8.6	8.2	7.3	8.8
2023	8.9	3.6	7.2	4.2	9.1	9.3	10.7	6.0	7.8	8.7	8.3	7.8	8.8
2024	8.9	4.1	7.2	4.3	8.8	8.9	10.6	6.6	6.6	8.6	8.4	7.7	8.7
2025	8.8	3.4	7.3	3.9	8.6	9.3	10.7	6.2	7.6	8.6	8.9	7.6	8.7
2026	8.5	3.8	6.8	4.0	8.3	8.6	10.1	5.9	7.1	8.4	7.7	7.1	8.4
2027	8.3	3.2	6.8	3.6	8.4	8.8	10.3	5.6	6.7	8.0	8.2	7.4	8.3
2028	8.4	3.6	6.4	3.8	8.4	8.7	10.0	5.3	6.9	8.1	8.1	7.0	8.3
2029	8.2	3.9	6.4	3.6	8.1	8.6	10.2	5.0	6.5	8.2	8.0	7.2	8.2
2030	8.4	3.3	6.8	3.8	8.4	8.7	10.1	5.5	6.6	8.1	8.2	7.3	8.3
2010-20	11.5	5.4	9.2	5.6	10.0	10.7	12.4	8.7	8.3	10.9	9.6	8.4	10.9
2021-30	8.6	3.7	7.0	4.0	8.6	8.9	10.4	5.9	7.0	8.4	8.3	7.4	8.5

continued.

Table 13: *continued.*

Year	PRC	Hong Kong, China	Korea, Rep. of	Taipei,China	Indonesia	Malaysia	Philippines	Singapore	Thailand	Viet Nam	India	Pakistan	Total ADEs
Intraregional Nonoil Trade													
Imports													
2010	15.9	14.0	9.0	12.5	7.3	10.4	10.3	11.4	7.3	10.9	10.5	14.1	12.4
2011	10.6	11.4	7.9	9.5	8.5	9.4	9.3	8.4	8.0	9.3	8.1	11.8	9.7
2012	10.2	10.6	7.9	9.1	8.5	9.4	9.5	8.3	7.9	9.0	8.3	12.4	9.5
2013	10.4	11.0	7.7	9.1	8.3	9.3	9.1	8.3	8.1	9.0	7.8	11.8	9.5
2014	10.4	10.9	7.8	9.0	8.7	9.3	9.3	8.3	8.0	9.0	8.2	12.2	9.6
2015	10.4	10.8	7.7	9.2	8.5	9.3	9.2	8.2	7.9	9.0	8.4	12.0	9.5
2016	9.7	9.7	7.4	8.3	7.8	8.9	8.9	7.4	7.5	8.6	7.9	12.1	8.9
2017	9.4	9.1	7.1	8.0	7.8	8.5	8.7	7.1	7.3	8.1	7.6	11.6	8.6
2018	9.1	9.2	7.4	8.0	7.6	8.5	8.7	7.1	7.2	8.4	7.5	11.5	8.5
2019	9.4	9.3	7.2	7.9	7.6	8.4	8.7	7.2	7.3	8.3	7.7	11.4	8.6
2020	9.2	9.1	7.2	8.0	7.7	9.0	8.8	7.0	7.4	8.2	7.5	11.7	8.6
2021	8.2	7.6	6.3	7.2	7.1	7.6	8.0	6.2	6.7	7.3	7.2	11.2	7.7
2022	8.0	7.4	6.1	6.4	6.9	7.1	7.8	5.9	6.4	7.1	7.0	10.9	7.4
2023	8.1	7.2	6.3	7.0	6.8	8.5	7.9	5.9	6.5	7.0	7.0	10.7	7.6
2024	8.0	7.3	6.1	6.6	6.9	7.1	8.0	5.9	6.4	7.0	7.1	10.9	7.4
2025	8.1	7.3	6.3	6.3	7.0	8.2	7.8	5.8	6.8	7.5	7.1	10.7	7.6
2026	7.8	7.1	5.8	5.9	6.4	6.9	7.6	5.1	6.2	5.8	6.6	10.2	7.0
2027	7.4	6.9	5.6	5.6	6.4	7.2	7.9	5.0	5.8	7.3	6.7	10.2	7.0
2028	7.9	6.6	5.6	6.0	6.3	7.4	7.4	4.9	6.4	6.0	6.7	10.2	7.1
2029	7.4	6.9	5.6	6.4	6.4	7.5	7.8	5.1	6.1	7.2	6.7	10.2	7.1
2030	7.0	7.4	5.5	5.5	6.4	7.0	7.3	4.4	5.8	6.0	6.7	10.2	6.7
2010-20	10.4	10.5	7.7	9.0	8.0	9.1	9.1	8.1	7.6	8.9	8.1	12.1	9.4
2021-30	7.8	7.2	5.9	6.3	6.7	7.4	7.8	5.4	6.3	6.8	6.9	10.5	7.3

Source: Appendix Table 2

V. Concluding Remarks

Developing Asian economies have become increasingly open to foreign trade and investment over the past 4 decades, but still there are notable contrasts patterns between East and South Asia, particularly between the PRC and India, notwithstanding converging growth rates. India and other South Asian countries have continued to remain underperformers.

Global production sharing has become an integral part of the economic landscape of East Asia. The degree of dependence on this new form of international specialization is proportionately larger in East Asia, in particular in the Association of Southeast Asian Nations (ASEAN), than in North America and Europe. A highly important recent development in international fragmentation of production has been the rapid integration of the PRC into the regional production networks. This development is an important counterpoint to the popular belief that the PRC's global integration would crowd out other countries' opportunities for international specialization. The PRC's imports of components from countries in ASEAN and other developing East Asia countries have grown rapidly, in line with the equally rapid expansion of manufacturing exports from the PRC to extraregional markets, mostly North America and Europe.

The PRC's emergence as a major trading power and an investment location is not a zero sum proposition from the perspective of the region. The PRC's rapid integration into regional production networks is an important counterpoint to the popular belief that its global integration would crowd out other countries' opportunities for international specialization. The PRC's imports of components from countries in ASEAN and other developing East Asian countries have grown rapidly, in line with the equally rapid expansion of manufacturing exports from the PRC to extraregional markets, mostly North America and Europe. The PRC's pivotal role with regional production networks also seems to have added further dynamism to regionwide MNE operations. The migration of some production processes within vertically integrated high-tech industries to the PRC opens up opportunities for producing original-equipment-manufactured goods and back-office service operations in other countries. Even if the PRC continues to remain relatively attractive as an assembly center, not all stages of production within vertically integrated global industries are going to move there; supply chain managers are reluctant to source all of their inputs from just one nation, preferring instead to diversify the risk of exchange rate instability or supply disruptions. There is also evidence that rapid growth in wages has already begun to erode some of the PRC's cost advantages, encouraging firms in the PRC to relocate labor-intensive manufacturing activities to low-wage countries in the region.

A notable outcome of the rapid expansion of production networks has been the rapid growth of cross-border trade in parts and components within the regions; component share in intra-ADE trade is much higher compared to that of intraregional trade in NAFTA

and EU-15. Driven largely by cross-border component trade, the share of intraregional nonoil trade in total world trade of ADEs increased continuously from about 20% in 1985 to over 52% by 2008. The intraregional share of imports has increased at a much faster rate compared to the intraregional share of exports, reflecting ADEs' unique role within global production networks, in particular the PRC's role as the premier assembly center within these networks based on components procured from the other countries in the region.

According to projections based on the standard gravity modelling framework, total nonoil exports and imports from ADEs would increase at an annual rate of 8.5% and 7.8% during 2010–2030, exhibiting a mild slowdown in the rate of growth over time. The growth of intraregional trade would be about 1.2 percentage points faster, resulting in an increase in intraregional share in total exports and imports of countries in the region from 53.5% to 9.5%, and 56.9% to 63.3%, respectively. Trade openness of the region, measured by the trade-to-GDP ratio, is projected to increase from 39.4% in 2010 to 74.4% in 2030. These predictions need to be treated with caution as they are based on the assumption that patterns of trade pertaining to the estimation period 1986–2008 will continue unchanged during the ensuing 2 decades.

Table 14: Predicted Intraregional Share of Nonoil trade, 2010–2030 (percent)

Year	PRC	Hong Kong, China	Taipei,China	Korea, Rep. of	Indonesia	Malaysia	Philippines	Singapore	Thailand	Viet Nam	India	Pakistan	Total
(a) Exports													
2010	51.6	66.7	57.9	59.5	73.4	70.3	68.1	80.5	71.5	64.1	58.2	43.7	56.9
2011	52.3	67.1	58.4	60.3	74.0	70.9	69.0	80.9	72.1	64.8	58.8	44.2	57.5
2012	52.8	67.5	58.9	60.9	74.6	71.5	69.8	81.3	72.5	65.4	59.4	44.6	58.0
2013	53.4	67.8	59.3	61.5	75.1	72.0	70.5	81.7	73.0	66.0	59.9	45.0	58.6
2014	53.9	68.1	59.8	62.2	75.5	72.5	71.3	82.0	73.5	66.6	60.5	45.4	59.1
2015	54.5	68.5	60.2	62.8	76.1	73.0	72.0	82.4	74.0	67.2	61.1	45.8	59.6
2016	55.0	68.7	60.7	63.4	76.5	73.5	72.7	82.8	74.4	67.8	61.6	46.2	60.1
2017	55.4	69.0	61.0	63.9	76.9	73.9	73.3	83.1	74.8	68.2	62.1	46.6	60.6
2018	55.9	69.3	61.4	64.5	77.4	74.3	73.9	83.4	75.2	68.7	62.7	47.0	61.0
2019	56.3	69.6	61.8	65.0	77.8	74.7	74.4	83.7	75.5	69.2	63.2	47.3	61.5
2020	56.8	69.8	62.2	65.5	78.2	75.1	75.0	84.0	75.9	69.7	63.7	47.7	61.9
2021	57.2	70.0	62.5	65.9	78.5	75.5	75.5	84.2	76.2	70.1	64.2	48.1	62.3
2022	57.5	70.2	62.8	66.3	78.8	75.8	75.9	84.5	76.5	70.5	64.6	48.4	62.6
2023	57.8	70.4	63.1	66.7	79.2	76.1	76.3	84.7	76.8	70.9	65.1	48.7	62.9
2024	58.1	70.6	63.4	67.1	79.5	76.5	76.7	84.9	77.1	71.2	65.5	49.0	63.3
2025	58.4	70.8	63.7	67.5	79.8	76.8	77.2	85.2	77.4	71.6	66.0	49.3	63.6
2026	58.7	71.0	63.9	67.9	80.0	77.1	77.6	85.4	77.6	71.9	66.4	49.6	63.9
2027	58.9	71.2	64.2	68.3	80.3	77.4	77.9	85.6	77.9	72.3	66.7	49.9	64.1
2028	59.1	71.3	64.5	68.6	80.6	77.6	78.3	85.8	78.1	72.6	67.1	50.2	64.4
2029	59.3	71.5	64.7	69.0	80.9	77.9	78.7	86.0	78.4	72.9	67.5	50.5	64.6
2030	59.6	71.6	65.0	69.3	81.1	78.2	79.0	86.2	78.6	73.2	67.9	50.8	64.9
2010-2020	54.3	68.4	60.1	62.7	75.7	72.9	71.8	82.3	73.9	67.1	61.0	45.8	59.5
2020-2030	58.5	70.7	63.4	67.2	87.7	76.5	76.8	85.0	77.1	71.3	65.6	49.1	63.3

continued.

Table 14: *continued.*

Year	PRC	Hong Kong, China	Taipei,China	Korea, Rep. of	Indonesia	Malaysia	Philippines	Singapore	Thailand	Viet Nam	India	Pakistan	Total
(b) Imports													
2010	42.0	89.2	59.4	49.6	56.1	59.3	67.1	68.0	66.2	80.0	39.7	54.0	53.5
2011	42.6	89.6	60.2	50.2	56.5	59.9	67.7	68.6	66.8	80.4	40.2	54.7	54.1
2012	43.1	89.9	61.0	50.8	57.2	60.5	68.3	69.1	67.3	80.8	40.7	55.4	54.6
2013	43.6	90.2	61.7	51.4	57.7	61.1	68.9	69.6	67.8	81.1	41.2	56.0	55.1
2014	44.1	90.5	62.5	52.0	58.4	61.7	69.4	70.1	68.3	81.4	41.7	56.6	55.7
2015	44.7	90.8	63.2	52.6	58.9	62.2	70.0	70.6	68.8	81.8	42.2	57.2	56.2
2016	45.1	91.0	63.9	53.1	59.3	62.8	70.5	71.0	69.3	82.1	42.7	57.8	56.6
2017	45.6	91.3	64.5	53.6	59.9	63.3	71.0	71.5	69.7	82.4	43.2	58.4	57.0
2018	46.0	91.5	65.1	54.1	60.2	63.8	71.4	71.9	70.1	82.6	43.6	58.9	57.5
2019	46.4	91.7	65.7	54.6	60.7	64.3	71.9	72.3	70.5	82.9	44.1	59.5	57.9
2020	46.9	91.9	66.3	55.1	61.1	64.7	72.3	72.7	70.9	83.2	44.6	60.0	58.3
2021	47.2	92.1	66.8	55.6	61.5	65.1	72.7	73.1	71.3	83.4	45.0	60.5	58.7
2022	47.5	92.3	67.2	56.0	62.0	65.5	73.0	73.4	71.6	83.6	45.3	61.0	58.9
2023	47.8	92.4	67.7	56.4	62.3	65.9	73.4	73.8	71.9	83.8	45.7	61.4	59.3
2024	48.1	92.6	68.1	56.8	62.6	66.3	73.7	74.1	72.2	84.0	46.1	61.9	59.5
2025	48.5	92.7	68.6	57.2	63.0	66.7	74.1	74.4	72.5	84.2	46.5	62.3	59.8
2026	48.7	92.9	69.0	57.6	63.2	67.0	74.4	74.7	72.8	84.4	46.8	62.8	60.1
2027	48.9	93.0	69.4	57.9	63.5	67.4	74.7	75.0	73.0	84.5	47.2	63.2	60.3
2028	49.2	93.1	69.8	58.3	63.8	67.7	75.0	75.3	73.3	84.7	47.5	63.6	60.5
2029	49.4	93.2	70.2	58.7	64.1	68.0	75.3	75.6	73.5	84.9	47.9	64.0	60.8
2030	49.6	93.4	70.6	59.0	64.4	68.4	75.6	75.9	73.8	85.0	48.2	64.4	61.0
2010-2020	44.6	90.7	63.0	52.5	58.5	62.1	69.9	70.5	68.7	81.7	42.2	57.2	56.1
2020-2030	48.5	92.6	68.2	56.9	69.2	66.4	73.8	74.2	72.2	84.0	46.2	62.0	59.5

Source: Appendix Table 2.

Table 15 : Predicted Trade Openness[1] (Nonoil Trade) 2010–2030 (%)

	PRC	Hong Kong, China	Taipei,China	Korea, Rep. of	Indonesia	Malaysia	Philippines	Singapore	Thailand	Viet Nam	India	Pakistan	ADEs
2010	41.7	152.0	49.5	44.6	37.6	113.6	124.3	154.7	65.0	60.5	7.7	17.0	39.4
2011	43.5	154.0	50.9	45.9	39.0	116.7	129.5	158.9	66.8	62.0	7.9	17.3	40.9
2012	45.3	156.2	52.4	47.0	40.4	120.1	135.4	163.3	68.6	63.9	8.1	17.7	42.4
2013	46.9	158.7	53.9	48.0	42.1	123.8	141.2	168.3	70.6	66.0	8.3	18.1	43.9
2014	48.4	161.1	55.4	49.6	43.8	127.0	147.7	172.7	72.6	67.9	8.5	18.5	45.3
2015	50.3	163.8	57.0	51.1	45.4	130.9	154.8	177.7	74.7	69.8	8.7	18.9	47.0
2016	52.2	166.4	58.7	52.1	47.0	134.9	161.5	182.9	76.7	72.0	8.9	19.2	48.7
2017	54.0	168.9	60.3	53.4	48.7	138.5	168.0	188.2	78.7	73.9	9.1	19.7	50.3
2018	55.9	171.8	62.0	54.9	50.3	142.6	175.4	193.4	80.7	76.0	9.4	20.0	51.9
2019	58.0	174.7	63.7	56.4	52.2	146.7	182.9	198.5	83.2	78.2	9.7	20.3	53.7
2020	59.9	177.8	65.5	57.9	53.9	150.0	190.4	203.9	84.9	80.2	9.9	20.8	55.4
2021	61.8	180.7	67.3	59.1	55.8	154.7	197.9	209.7	87.5	82.4	10.1	21.2	57.2
2022	63.8	183.6	68.8	60.7	57.6	158.0	205.7	215.2	88.9	84.6	10.3	21.6	58.8
2023	65.9	186.7	70.7	62.0	59.5	162.7	212.6	220.2	91.1	86.8	10.6	22.0	60.6
2024	68.1	189.9	73.2	63.6	61.7	166.9	222.1	226.8	92.8	89.1	10.8	22.4	62.5
2025	70.2	193.3	74.9	65.2	63.5	171.4	230.6	232.7	95.5	91.7	11.2	23.0	64.4
2026	72.4	196.7	76.6	66.6	65.5	175.0	239.2	240.1	97.8	93.6	11.3	23.4	66.2
2027	74.7	100.2	78.8	68.4	67.8	179.7	249.2	246.8	100.0	96.3	11.7	23.9	68.3
2028	77.2	203.5	80.7	69.9	70.0	184.9	257.5	253.3	102.7	98.4	11.9	24.3	70.3
2029	79.3	207.4	82.9	71.8	72.1	189.4	267.5	259.8	104.6	101.8	12.2	24.9	72.3
2030	81.9	211.7	85.3	73.6	74.5	194.3	278.2	266.7	106.6	103.2	12.4	25.4	74.4

[1] (Exports + Imports)/2 as a percentage of GDP.
Source: Appendix Table 2.

Appendix: Trade Data Compilation

The data used in the analysis of trends and patterns trade flows for all economies other than Taipei,China are compiled from the UN Comtrade database, based on Revision 3 of the Standard International Trade Classification (SITC, Rev. 3). Data for Taipei,China are obtained from the trade database (based on the same classification system) of the Council for Economic Planning and Development.

To analyze the growing importance of regional production networks in determining trade patterns, detailed (5-digit) data for the period 1992–2008 are used. Although the SITC Rev. 3 was introduced in the mid-1980s, a close examination of country-level data shows that data recording systems in many countries had considerable gaps in the coverage parts and components trade until the early 1990s. Therefore 1992 is used as the starting year for data disaggregation.

In previous studies of international production fragmentation and trade patterns (e.g., Ng and Yeats 2003, Athukorala 2005, Athukorala and Yamashita 2008) commodity coverage was limited to parts and components, which can be directly identifiable based on the commodity nomenclature of the US Standard International Trade Classification (SITC). These items are confined to the product classes of machinery and transport equipment (SITC 7) and SITC 8. However, there is evidence that global production sharing has been spreading beyond SITC 7 and 8 to other product categories, such as pharmaceutical and chemical products (SITC 5) and machine tools and various metal products (SITC 6). This study uses a list of parts and components encompassing the entire spectrum of manufacturing trade. The list was compiled by mapping parts and components in the UN Broad Economic Classification (BEC) Registry (available at http:/www. unstats.un.org/unsd/cr/registry) in the product list of the WTO Information Technology Agreement with the Harmonized System (HS) of trade classification at the 6-digit level. Information gathered from firm-level surveys conducted in Malaysia and Thailand as part of this author's ongoing research in this field was used to fill gaps in the list. Data compiled at the HS 6-digit level were converted to SITC for the final analysis using the UN HS-SITC concordance.

There is no hard and fast rule applicable to distinguishing between parts and components and assembled products in international trade data. The only practical way of doing this is to focus on the specific industries in which network trade is heavily concentrated. Once these industries are identified, assembly trade can be tentatively estimated as the difference between parts and components, directly identified based on the list here, and recorded trade in these product categories (Krugman 2008). This is the procedure followed here. Guided by the available literature on production sharing, seven product categories are identified: office machines and automatic data processing machines (SITC 75), telecommunication and sound recording equipment (SITC 76), semiconductors and semiconductor devices (SITC 772 and 776), electrical goods (SITC 77-772-776), road vehicles (SITC 78), professional and scientific equipment (SITC 87), and photographic apparatus (SITC 88). It is quite reasonable to assume that these product categories contain virtually no products produced from start to finish in a given country. Admittedly however, the estimates based on this list do not provide a full coverage of final assembly in world trade. For instance, outsourcing of final assembly does takes place in various miscellaneous product categories such as clothing, furniture, sport goods, and leather products. However, it is not possible to meaningfully delineate parts and components and assembled goods in reported trade in these product categories because they contain a significant (though unknown) share of "horizontal" trade. Likewise, assembly activities in software trade have recorded impressive expansion in recent years, but these are lumped together in the UN data system with "special transactions" under SITC 9. However, the magnitude of the bias resulting from the failure to

cover these items is unlikely to be substantial because network trade in final assembly is heavily concentrated in the product categories covered in the decomposition.

The data are tabulated using importer records, which are considered to be more appropriate for analyzing trade patterns than the corresponding exporter records. It is generally believed that data compiled from importer records are less susceptible to recording errors, and reveal the origins and composition of trade more accurately than other records, because there are normally important legal penalties for incorrectly specifying this information on customs declarations. Importer records are also presumably less susceptible to double-counting and erroneous identification of the source/destination country in the presence of entrepot trade, for example, the PRC's trade through Hong Kong, China; and Indonesia's trade through Singapore (Ng and Yeats 2003, Feenstra et al. 2005).

Appendix Table 1: Variables Construction and Data Sources for Gravity Model Estimation

Label	Definition	Data Source/Variable Construction
X, M	Value of bilateral trade (imports and exports) in US$ measured at constant (2000) prices.	Exports (at CIF price, US$): compiled from importer records of UN-COMTRADE online database. Exports and import values are deflated by US import and export price indices extracted from the US Bureau of Labor Statistics database.
GDP, GDPP	Real GDP and real per capita GDP (at 1995 price)	World Development Indicators, The World Bank
DIST	Weighted distance measure of the French Institute for Research on the International Economy (CEPII), which measures the bilateral great-circle distance between major cities of each country	CEPII database
LPI	World Bank logistic performance index Arvis et al. (2007)	LPI database, World Bank
LNG	A dummy variable which is unity if *i* and *j* have a common language and is zero	CEPII database
ADJ	A binary dummy variables that takes the value 1 for countries sharing a common land border, and 0 otherwise	CEPII database

Appendix Table 2: Trade Projections: Asian Developing Economies (US$ billion)

(a) Total Merchandise Trade: World Exports

Year	PRC	Hong Kong, China	India	Indonesia	Korea, Rep. of	Malaysia	Pakistan	Philippines	Singapore	Taipei,China	Thailand	Viet Nam	Total ADEs
2005	4250	63	348	550	521	455	34	210	355	0	442	89	7316
2006	5140	68	472	615	583	515	47	278	404	0	500	102	8723
2007	7300	88	533	685	680	601	57	363	468	181	576	119	11651
2008	8410	93	586	752	730	664	61	487	517	192	634	134	13260
2009	9420	96	633	822	778	724	65	527	565	199	688	149	14666
2010	10900	100	695	889	846	805	70	578	630	209	737	167	16626
2011	12000	105	756	976	915	895	76	635	686	219	805	185	18253
2012	13200	111	822	1070	989	993	82	697	744	230	878	204	20020
2013	14600	116	894	1180	1070	1100	88	766	808	241	958	225	22046
2014	16100	122	972	1290	1160	1220	95	842	879	253	1050	248	24231
2015	17800	128	1060	1420	1250	1360	103	926	955	265	1140	274	26681
2016	19500	134	1150	1550	1350	1500	111	1020	1030	277	1240	301	29163
2017	21300	139	1240	1690	1450	1650	119	1110	1110	289	1350	330	31777
2018	23300	145	1350	1850	1570	1820	129	1220	1190	302	1460	361	34697
2019	25400	152	1460	2020	1690	2010	139	1330	1280	315	1580	396	37772
2020	27800	158	1580	2200	1820	2210	149	1460	1370	329	1720	434	41230
2021	30100	164	1710	2390	1940	2420	161	1580	1460	341	1850	471	44587
2022	32600	169	1850	2590	2070	2640	172	1720	1550	354	2000	510	48225
2023	35300	175	1990	2810	2210	2880	185	1870	1650	367	2150	553	52140
2024	38200	181	2150	3040	2360	3140	198	2040	1750	380	2320	598	56357
2025	41300	187	2320	3300	2510	3430	213	2210	1860	394	2490	648	60862
2026	44600	193	2500	3570	2670	3730	227	2400	1960	407	2680	699	65636
2027	48100	199	2690	3850	2840	4050	243	2600	2060	421	2880	754	70687
2028	51900	205	2890	4160	3010	4410	260	2820	2170	435	3090	814	76164
2029	56000	212	3110	4490	3200	4790	278	3050	2290	449	3310	878	82057
2030	60500	218	3350	4850	3390	5210	297	3310	2410	463.0	3550	947	88495

continued.

Appendix Table 2: *continued.*

(a) Total Merchandise Trade: World Imports

Year	PRC	Hong Kong, China	India	Indonesia	Korea, Rep. of	Malaysia	Pakistan	Philippines	Singapore	Taipei,China	Thailand	Viet Nam	Total ADEs
2005	1630	102	142	215	255	307	85.2	160	307		203	163	3569
2006	1930	123	155	234	280	411	93.8	184	343		242	252	4248
2007	2530	175	169	271	337	470	105	212	389	349	304	300	5611
2008	2870	197	181	336	354	511	113	232	423	384	325	361	6287
2009	3160	220	189	354	367	544	121	249	454	405	342	402	6807
2010	3600	247	202	372	388	591	132	270	497	439	359	446	7543
2011	3920	273	215	400	412	642	144	294	535	472	383	488	8178
2012	4280	302	228	430	436	698	158	320	576	506	409	533	8876
2013	4670	333	243	462	463	760	173	348	620	543	436	583	9634
2014	5100	367	258	497	491	826	189	379	668	583	465	638	10461
2015	5570	405	274	534	521	899	207	413	719	626	497	697	11362
2016	6060	442	291	572	551	975	227	448	768	668	529	759	12290
2017	6560	481	309	612	583	1050	247	486	819	712	562	824	13245
2018	7100	523	327	654	616	1140	270	527	874	759	597	895	14282
2019	7690	569	346	700	652	1230	295	571	933	809	634	973	15402
2020	8330	618	367	748	689	1330	323	619	995	861	674	1060	16614
2021	8960	664	388	797	724	1430	352	668	1050	911	713	1140	17797
2022	9620	710	410	848	760	1540	382	719	1110	961	754	1220	19034
2023	10300	760	433	902	798	1660	416	775	1170	1010	797	1310	20331
2024	11100	813	458	959	838	1780	452	835	1240	1070	842	1410	21797
2025	11900	869	484	1020	880	1910	492	900	1310	1130	890	1510	23295
2026	12800	928	510	1080	922	2050	533	968	1370	1190	939	1620	24910
2027	13700	990	538	1150	964	2200	577	1040	1430	1240	990	1730	26549
2028	14700	1060	567	1220	1010	2360	625	1120	1500	1310	1040	1850	28362
2029	15700	1130	598	1290	1050	2530	677	1200	1570	1370	1100	1980	30195
2030	16800	1200	631	1360	1100	2710	733	1290	1650	1440	1160	2120	32194

continued.

Appendix Table 2: *continued.*

(b) Total Merchandise Trade: Intraregion Exports

Year	PRC	Hong Kong, China	India	Indonesia	Korea, Rep. of	Malaysia	Pakistan	Philippines	Singapore	Taipei,China	Thailand	Viet Nam	Total ADEs
2005	1592	33	163	366	240	296	13	134	289	0	314	52	3493
2006	1965	37	259	418	278	342	24	192	331	0	361	62	4270
2007	3532	55	298	475	358	413	32	267	386	98	427	74	6415
2008	4170	59	333	531	398	465	36	303	430	106	477	86	7394
2009	4883	63	373	599	447	524	39	344	477	113	532	99	8493
2010	5740	66	417	659	501	592	43	386	536	121	577	114	9754
2011	6400	70	459	729	549	664	47	430	586	128	635	127	10824
2012	7112	74	503	805	600	742	51	476	638	136	696	142	11974
2013	7946	78	552	894	656	827	55	528	695	143	763	157	13296
2014	8849	83	606	984	719	924	60	586	759	151	841	175	14736
2015	9882	87	667	1090	783	1037	66	651	827	160	917	195	16362
2016	10917	92	730	1197	854	1150	71	723	895	168	1002	216	18016
2017	12021	95	794	1312	925	1272	77	793	967	177	1096	238	19767
2018	13256	100	871	1444	1011	1410	83	878	1040	186	1190	262	21730
2019	14565	105	950	1585	1097	1566	90	964	1121	195	1293	289	23820
2020	16066	110	1037	1735	1191	1730	97	1066	1204	205	1413	319	26172
2021	17496	114	1130	1893	1278	1902	106	1160	1286	213	1524	348	28451
2022	19050	118	1231	2059	1373	2083	113	1269	1368	223	1653	378	30918
2023	20736	123	1333	2243	1475	2280	123	1387	1459	232	1782	412	33585
2024	22555	127	1450	2436	1585	2495	132	1521	1551	241	1929	448	36470
2025	24510	132	1575	2654	1696	2735	142	1657	1652	251	2076	488	39568
2026	26572	136	1707	2881	1815	2984	152	1808	1744	261	2240	528	42828
2027	28762	141	1847	3117	1941	3249	164	1967	1836	271	2413	572	46280
2028	31145	145	1996	3379	2068	3547	176	2143	1938	281	2595	620	50034
2029	33725	151	2160	3659	2211	3864	189	2328	2049	291	2786	671	54083
2030	36563	155	2340	3965	2354	4214	203	2537	2160	301	2995	727	58514

continued.

Appendix Table 2: *continued.*

(b) Total Merchandise Trade: Intraregion Imports

Year	PRC	Hong Kong, China	India	Indonesia	Korea, Rep. of	Malaysia	Pakistan	Philippines	Singapore	Taipei,China	Thailand	Viet Nam	Total ADEs
2005	517	82	44	127	91	190	42	100	213	0	124	129	1658
2006	625	101	49	141	102	216	48	118	240	0	155	211	2004
2007	1006	151	55	172	149	261	55	138	274	191	187	255	2895
2008	1170	173	61	188	162	293	60	155	302	217	204	289	3272
2009	1352	196	67	205	176	326	67	172	331	240	221	328	3682
2010	1568	222	73	220	190	362	75	190	366	268	236	368	4138
2011	1732	246	79	239	205	398	83	208	397	292	254	404	4537
2012	1913	273	85	259	219	437	91	228	430	316	273	443	4969
2013	2112	302	91	281	235	480	101	250	465	343	293	487	5441
2014	2333	334	98	305	252	526	111	274	504	372	315	535	5960
2015	2578	370	106	331	270	578	123	301	546	404	339	586	6532
2016	2833	405	113	357	288	633	136	329	586	435	363	641	7119
2017	3096	442	122	385	308	686	149	359	628	468	387	697	7727
2018	3383	481	130	414	328	751	164	391	674	503	414	760	8393
2019	3699	525	139	446	350	816	181	426	723	541	442	828	9116
2020	4045	571	149	480	373	889	199	465	774	580	472	905	9904
2021	4382	615	159	515	395	962	219	504	820	618	502	975	10665
2022	4736	658	169	551	417	1042	239	545	870	656	533	1046	11462
2023	5104	706	180	589	441	1130	262	589	921	694	566	1126	12306
2024	5536	756	192	629	466	1219	286	638	980	739	600	1214	13255
2025	5974	809	204	673	493	1315	313	690	1039	785	637	1303	14235
2026	6459	866	217	715	520	1419	341	745	1090	832	674	1400	15277
2027	6946	925	230	765	546	1530	371	803	1142	871	713	1498	16341
2028	7489	991	244	815	576	1649	404	868	1201	925	751	1605	17519
2029	8037	1058	259	865	602	1777	440	933	1261	973	797	1720	18723
2030	8640	1125	276	915	635	1912	479	1006	1330	1027	844	1845	20035

continued.

Appendix Table 2: *continued.*

(C) Nonoil Trade: World Exports

Year	PRC	Hong Kong, China	India	Indonesia	Korea, Rep. of	Malaysia	Pakistan	Philippines	Singapore	Taipei,China	Thailand	Viet Nam	Total ADEs
2005	4110	64.9	321	450	498	483	70.1	333	249	0	324	71.9	6975
2006	4980	70.4	415	501	559	541	75.6	436	283	0	360	82.6	8304
2007	6990	91.2	468	558	659	606	82.3	576	327	180	410	95.6	11043
2008	8050	96.1	514	612	708	663	87.2	771	361	191	445	108	12606
2009	9020	99.7	553	669	754	718	91.1	846	393	198	476	119	13937
2010	10400	105	607	722	818	789	97.3	944	436	208	503	133	15762
2011	11500	110	659	793	885	870	104	1050	474	218	544	146	17353
2012	12700	116	715	869	956	959	112	1170	513	229	587	161	19087
2013	14000	122	776	954	1030	1060	121	1300	556	240	634	177	20970
2014	15400	128	843	1050	1120	1160	130	1450	603	252	685	195	23016
2015	17000	135	916	1150	1210	1280	139	1620	654	264	740	214	25322
2016	18700	141	993	1260	1300	1410	150	1800	703	276	797	234	27764
2017	20400	147	1070	1370	1400	1540	161	1990	755	288	856	256	30233
2018	22300	153	1160	1490	1510	1690	173	2210	810	301	920	280	32997
2019	24400	160	1260	1630	1620	1850	185	2450	869	314	989	306	36033
2020	26700	167	1360	1770	1750	2020	199	2710	932	328	1060	335	39331
2021	28900	173	1470	1920	1860	2200	213	2990	991	340	1140	363	42560
2022	31300	179	1580	2080	1990	2390	227	3290	1050	353	1210	392	46041
2023	33900	185	1700	2260	2120	2600	243	3620	1110	366	1300	424	49828
2024	36700	192	1830	2450	2260	2820	260	3980	1180	380	1380	458	53890
2025	39700	198	1980	2650	2410	3070	278	4380	1250	393	1480	495	58284
2026	42900	205	2120	2860	2560	3320	296	4800	1320	407	1580	534	62902
2027	46300	211	2280	3090	2720	3600	316	5270	1390	420	1680	574	67851
2028	50000	218	2450	3340	2880	3900	336	5770	1460	434	1790	618	73196
2029	53900	226	2630	3600	3050	4220	358	6330	1530	448	1900	666	78858
2030	58200	233	2830	3890	3240	4570	382	6940	1610	463	2020	717	85095

continued.

Appendix Table 2: *continued.*

(c) Nonoil Trade: World Imports

Year	PRC	Hong Kong, China	India	Indonesia	Korea, Rep. of	Malaysia	Pakistan	Philippines	Singapore	Taipei,China	Thailand	Viet Nam	Total ADEs
2005	1310	99	144	158	200	241	94.1	129	197	0	207	123	2902
2006	1550	119	170	171	225	330	105	162	221	0	250	198	3501
2007	2020	167	187	197	278	377	119	194	252	383	331	235	4740
2008	2290	189	202	239	293	408	129	242	274	423	355	287	5331
2009	2520	211	212	251	305	432	139	258	293	447	376	315	5759
2010	2870	238	228	264	324	467	154	279	322	487	396	346	6375
2011	3130	264	243	283	345	505	170	302	346	526	424	376	6914
2012	3410	291	260	304	368	547	189	328	372	567	454	408	7498
2013	3720	322	277	326	392	592	209	355	400	611	487	443	8134
2014	4060	356	296	351	418	641	232	385	430	658	522	481	8830
2015	4430	393	317	377	445	694	257	417	462	710	559	522	9583
2016	4810	430	338	403	473	749	285	451	493	761	597	565	10355
2017	5210	468	360	431	502	806	315	487	525	814	637	609	11164
2018	5630	510	383	460	534	868	348	526	559	871	679	658	12026
2019	6100	556	408	491	567	934	384	568	596	931	724	710	12969
2020	6600	605	434	525	602	1010	425	614	634	996	773	766	13984
2021	7090	650	461	559	635	1080	469	660	670	1060	821	820	14975
2022	7610	697	489	594	669	1150	516	708	706	1120	870	876	16005
2023	8170	746	519	631	706	1240	567	760	744	1190	923	935	17131
2024	8770	799	551	671	744	1320	624	817	784	1260	978	998	18316
2025	9420	856	585	714	785	1420	686	877	826	1330	1040	1070	19609
2026	10100	915	619	756	825	1510	751	940	865	1400	1100	1130	20911
2027	10800	977	656	801	866	1610	822	1010	905	1470	1160	1210	22287
2028	11600	1040	695	848	909	1720	900	1080	946	1550	1230	1280	23798
2029	12400	1110	736	898	954	1840	986	1160	990	1640	1300	1370	25384
2030	13200	1190	780	951	1000	1960	1080	1240	1030	1720	1370	1450	26971

continued.

Appendix Table 2: *continued.*

(c) Nonoil Trade: Intraregional Exports

Year	PRC	Hong Kong, China	India	Indonesia	Korea, Rep. of	Malaysia	Pakistan	Philippines	Singapore	Taipei,China	Thailand	Viet Nam	Total ADEs
2005	1514	35	149	296	228	305	27	211	189	0	205	40	3199
2006	1873	39	220	336	266	348	30	297	217	0	232	47	3905
2007	3304	58	252	382	349	398	33	417	253	97	275	56	5875
2008	3902	62	282	428	388	444	36	484	283	105	304	65	6781
2009	4577	66	315	483	436	497	39	560	314	113	335	75	7808
2010	5364	70	353	530	487	555	43	643	351	120	360	85	8961
2011	6010	74	388	587	533	617	46	725	384	127	392	95	9977
2012	6707	78	424	648	582	685	50	817	417	135	426	105	11074
2013	7471	83	465	716	634	763	54	917	454	142	463	117	12278
2014	8302	87	510	793	696	841	59	1034	495	151	503	130	13601
2015	9261	92	559	875	760	934	64	1167	539	159	547	144	15101
2016	10277	97	612	964	824	1036	69	1308	582	167	593	159	16687
2017	11305	101	665	1054	895	1138	75	1458	627	176	640	175	18309
2018	12462	106	727	1153	973	1256	81	1632	675	185	691	192	20133
2019	13748	111	796	1268	1053	1382	88	1823	727	194	747	212	22149
2020	15167	117	867	1384	1146	1518	95	2032	783	204	805	234	24351
2021	16517	121	944	1507	1226	1661	102	2256	835	212	869	255	26505
2022	17989	126	1021	1640	1320	1812	110	2497	887	222	926	276	28825
2023	19591	130	1106	1789	1415	1980	118	2763	940	231	999	300	31362
2024	21325	136	1199	1947	1517	2156	127	3055	1002	241	1064	326	34095
2025	23193	140	1306	2114	1628	2357	137	3380	1065	250	1145	354	37070
2026	25167	146	1407	2289	1738	2559	147	3723	1127	260	1227	384	40174
2027	27268	150	1522	2482	1857	2785	158	4107	1190	270	1308	415	43510
2028	29560	155	1645	2692	1976	3028	169	4518	1252	280	1398	449	47121
2029	31987	162	1776	2911	2103	3287	181	4979	1316	290	1489	486	50966
2030	34669	167	1922	3155	2245	3572	194	5483	1388	301	1588	525	55210

continued.

Appendix Table 2: *continued.*

(c) Nonoil Trade: Intra-regional *Continued.*
Imports

Year	PRC	Hong Kong, China	India	Indonesia	Korea, Rep. of	Malaysia	Pakistan	Philippines	Singapore	Taipei,China	Thailand	Viet Nam	Total ADEs
2005	396	79	44	85	70	147	43	83	123	0	131	94	1294
2006	478	97	59	94	79	166	49	111	140	0	167	165	1604
2007	774	143	67	116	124	203	57	138	162	200	203	198	2385
2008	900	164	74	126	135	227	64	153	179	230	223	223	2697
2009	1040	186	82	138	147	251	73	170	197	257	244	249	3034
2010	1206	212	90	148	161	277	83	187	219	289	262	277	3411
2011	1334	236	98	160	173	303	93	205	237	317	283	302	3742
2012	1471	262	106	174	187	331	105	224	257	346	306	330	4096
2013	1623	290	114	188	202	362	117	244	278	377	330	359	4486
2014	1792	322	123	205	217	395	131	267	301	411	357	392	4914
2015	1979	357	134	222	234	432	147	292	326	449	385	427	5383
2016	2170	391	144	239	251	470	165	318	350	486	414	464	5863
2017	2373	427	155	258	269	510	184	346	375	525	444	502	6368
2018	2589	467	167	277	289	553	205	376	402	567	476	544	6912
2019	2832	510	180	298	310	600	228	408	431	612	511	589	7509
2020	3093	556	193	321	332	654	255	444	461	660	548	637	8156
2021	3347	599	207	344	353	704	284	480	490	708	585	684	8783
2022	3616	643	222	368	374	754	315	517	518	753	623	732	9435
2023	3908	689	237	393	398	817	348	558	549	805	663	783	10150
2024	4222	740	254	420	422	875	386	602	581	859	706	838	10906
2025	4565	794	272	450	449	947	428	649	615	912	754	901	11735
2026	4919	850	290	478	475	1012	471	699	646	966	800	953	12561
2027	5286	908	309	509	502	1085	519	754	679	1020	847	1023	13442
2028	5704	968	330	541	530	1165	572	810	712	1082	901	1084	14401
2029	6127	1035	352	576	560	1252	631	873	748	1151	956	1163	15424
2030	6553	1111	376	612	590	1340	695	937	782	1214	1011	1233	16455

continued.

Appendix Table 3: GDP Projections (at 2005 prices)

Year	PRC	Hong Kong, China	India	Indonesia	Korea, Rep. of	Malaysia	Pakistan	Philippines	Singapore	Taipei,China	Thailand	Viet Nam	ADEs
2005	8510	263	3800	1070	1050	422	542	347	164	348	572	274	17362
2006	9840	281	4110	1120	1100	447	574	382	180	359	603	296	19292
2007	11300	300	4460	1170	1140	475	621	425	200	618	630	322	21661
2008	12600	311	4770	1220	1180	499	652	448	214	657	658	347	23556
2009	14100	320	5090	1280	1230	524	693	472	227	677	684	373	25670
2010	15900	330	5440	1310	1280	553	738	492	245	702	692	396	28078
2011	16800	346	5730	1380	1340	589	793	522	258	731	725	421	29635
2012	17800	362	6040	1450	1410	627	851	553	271	760	759	445	31328
2013	18900	378	6370	1520	1480	667	913	586	284	790	794	470	33152
2014	20100	396	6710	1600	1550	709	980	621	299	821	831	498	35115
2015	21300	414	7080	1680	1620	754	1050	658	314	854	870	527	37121
2016	22500	430	7450	1770	1700	800	1130	697	327	883	909	555	39151
2017	23700	446	7830	1850	1780	847	1210	737	340	914	949	585	41188
2018	25000	462	8220	1940	1860	897	1300	780	354	945	991	617	43366
2019	26300	479	8640	2030	1940	949	1400	825	369	977	1030	650	45589
2020	27800	496	9080	2130	2030	1010	1500	873	384	1010	1080	686	48079
2021	29100	510	9530	2220	2110	1060	1610	922	396	1040	1120	718	50336
2022	30500	524	10000	2320	2190	1120	1720	972	408	1070	1170	749	52743
2023	31900	537	10500	2430	2280	1180	1840	1030	421	1100	1220	783	55221
2024	33400	551	11000	2530	2360	1240	1970	1080	433	1120	1270	817	57771
2025	35000	565	11500	2650	2450	1310	2100	1140	446	1150	1320	853	60484
2026	36600	579	12100	2760	2540	1380	2240	1200	455	1180	1370	889	63293
2027	38200	593	12600	2870	2620	1450	2380	1260	465	1200	1420	926	65984
2028	39900	608	13200	2990	2710	1520	2540	1330	475	1230	1470	964	68937
2029	41800	622	13800	3120	2790	1600	2700	1400	485	1260	1530	1000	72107
2030	43600	637	14500	3250	2880	1680	2880	1470	495	1280	1590	1050	75312

Source: *Long-Term Projections of Asian GDP and Trade* (ADB 2010).

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About the Paper

Prema-chandra Athukorala provides trade flow projections for major Asian developing economies (ADEs) for the next 2 decades against the backdrop of an in-depth analysis of policy shifts and trade patterns over the past 4 decades. Total real nonoil trade of ADEs is predicted to increase at an average annual rate of 8.2 % during the next two decades, with a notable convergence of individual countries' rates to the regional average. The share of intraregional trade in total nonoil trade would increase steadily from 53% in 2010 to 58% in 2030.

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