Deepening Trade and Production Linkages in East Asia and Implications on National Policies and Regional Cooperation[1]

Ponciano S. Intal, Jr.[2]

I. INTRODUCTION

Despite the Asian financial and currency crisis of 1997-1998, the period from the latter part of the 1980s to the early 2000s is characterized by a deepening of trade and production linkages in East Asia. Intra-regional trade in East Asia grew the fastest in the world, just as East Asia's trade with the rest of the world also grew robustly. The growth of regional markets, best exemplified by China's explosive economic growth, is obviously a factor behind the growth of intra-regional trade in the region. However, a key factor behind the remarkable growth of intra-regional trade in East Asia has been the surge in cross-national production sharing embodied in production networks in the region that are connected to or parts and parcel of global production networks. The wide heterogeneity of East Asia's economies and the deepening and widening of production networks in the region is reflected in the complementarity of trade profiles of East Asian countries. Frumm and Kharas (2003) estimate that the degree of complementarity is comparable to those of the European Union and the NAFTA, the two most successful regional economic arrangements in the world. This augurs well for even deeper trade and investment linkages and economic arrangements in the region in the future. Indeed, East Asia's competitiveness in both the East Asian market and the global markets may hinge on deeper regional integration and stronger regional cooperation.

A small group of us are involved in an Asia Development Research Forum (ADRF) project on regional production networks and their implications on domestic policies and regional cooperation. The studies involved primarily selected country studies on China, Malaysia, Philippines, Thailand and Vietnam. Based on studies, it is apparent that East Asian economies would need to sharpen further their domestic policies and strengthen further regional cooperation in order to husband more effectively industrial restructuring and upgrading in the region that is consistent with changing comparative advantage and the dynamics of global and regional production networks.

This paper elaborates on deepening trade and production linkages in the East Asian region and then draws implications for domestic policies and regional cooperation.

II. DEEPENING INTRAREGIONAL TRADE AND PRODUCTION LINKAGES

Trade linkages. International trade and investment have been at the core of East Asia's economic expansion. The centrality of international trade in East Asia's development process is well reflected in the more than tripling of the share of Emerging East Asia's[3] share in world exports from the mid-1970s to the early 2000s (Frumm and Kharas, 2003). East Asia (with Japan) now accounts for a quarter of global exports, which is second only to the European Union (E.U.) at 34.3 percent and in fact, it is almost 6 percentage points higher than the global share of the NAFTA (Ng & Yeats, 2003). Intra-regional trade within East Asia (including Japan) accounted for 8.8 percent of global trade in 2001, which is higher than the 7.7 percent share of

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[2] Professor, Department of Economics, De La Salle University, and Executive Director, DLSU-Angelo King Institute for Economic and Business Studies, Manila, the Philippines. The author would like to thank Mr. Jitendra S. Mojica for his excellent research assistance.

[3] Emerging East Asia is defined by Frumm and Kharas as consisting of NIEs, ASEAN, China and Mongolia.

the NAFTA countries at the start of the NAFTA in 1995. At the same time, it may be pointed out that the global share of intra-regional trade in East Asia in 2001 was lower than NAFTA's share of 10.1 percent in 2001 and the E.U.'s 20.2 percent share in the same year. This suggests that East Asia is, on the one hand, more globally oriented than the NAFTA and the E.U. It also reflects an element of triangulation in East Asia's trade wherein a significant portion of East Asia's intra-regional trade is meant to attain cost efficiencies for products that are eventually exported outside the region, mainly the U.S. and the E.U.

Table 1 shows the expansion of international trade in the region since the latter 1980s. The growth of exports and imports was particularly spectacular during the 19851995 period, which highlights the so-called "East Asian Miracle". Among others, the "miracle years" were characterized by: (1) sharp rise in foreign investment into Southeast Asia and China, much of it coming from Northeast Asia; (2) sharp expansion in exports especially from China and Southeast Asia, and; (3) fast economic growth and growing regional markets. The currency and financial crisis of 1997-1998 and the global electronics slump significantly dampened trade in the region except for China, which provided the growth and trade dynamo for the region and the world in recent years. The ongoing recovery of the world electronics market together with the robust growth of China, among others, can be expected to significantly boost East Asia's trade performance in the near term.

Intra-regional trade grew in tandem with the growth of overall trade in East Asia since the latter 1980s. Table 2 is indicative of the growth of intra-regional trade during the period. The table shows that the ratio to the total trade of Emerging Northeast Asia (China, Korea, Hong Kong) of imports from and exports to emerging Northeast Asia and Southeast Asia rose from 9 percent in 1985 to 22 percent in 2002. Together with Japan, the ratio to the total trade of Northeast Asia of trade within Northeast Asia and with Southeast Asia rose from 30 percent in 1985 to 41 percent in 2002. Similarly, the ratio to the total trade of Southeast Asia of exports to and imports from both Northeast Asia and Southeast Asia increased from 49 percent in 1985 to 54 percent in 2002. Table 2 indicates that the growth of intra-regional trade in East Asia includes the rise in the share of trade between Northeast Asia and Southeast Asia for the most part during the 1985-2002 period.

The China factor is also brought out in Table 2. The table seems to suggest that China is in fact becoming less integrated with the rest of East Asia. This is indicated by the reduction in the share of East Asia in China's total trade. Notice however that China's reliance on East Asia appears to be inordinately high in the mid-1980s because at that time China's access to the world market was primarily through Hong Kong. The improvement of direct trade links in the 1990s means that China's trade need not mainly go through Hong Kong. Notice also, that the share of East Asia in the total trade of China remains very high, comparable to the average for the whole of Northeast Asia. Thus, China is very much a factor in East Asia's intra-regional trade. In fact, recent papers and the paper of Kueh (2004) in the ADRF Project indicate that China is increasingly a key cog in the regional production networks in East Asia.

The growing intra-regional trade links in East Asia are well summarized by Ng and Yeats (1999, 2002). The share of intra-regional trade in total East Asian exports rose significantly across virtually all major commodity groups during the East Asian miracle years. For example, the share of intra-regional trade for food and feeds rose from 42.5 percent in 1984 to 59.8 percent in 1996; for ores and metals from 58.4 percent to 76.1 percent; and for all manufactures from 24.7 percent to 45.4 percent during the same period (Ng and Yeats, 1999). The trade intensity indices in the region, adjusted for distance between trading partners, are particularly high and mostly rising. Ng and Yeats (2003) report that 61 percent of all bilateral flows among

the East Asian member economies in 2001 surpass the critical value of trade intensity, up from 40 percent in 1985 (Ng & Yeats, 2003).

Similarly, intra-regional intra-industry trade also rose significantly in many countries in East Asia since 1985 (Ng & Yeats, 2002). Ng and Yeats estimated intra-industry trade (IIT) indices for East Asian countries for the years 1985, 1995 and 2001. Most of the East Asian countries experienced rising IIT indices during the period (except notably for Laos and Cambodia). In 2001, the degree of intra-industry trade within East Asia was comparable to the cross-Pacific trade between the United States and East Asia.

Behind the rising trade intensity and intra-industry trade in the region is the sharp rise in components production and trade in the region. This sharp rise in the international trade of parts, components and partially assembled manufactured goods is the best manifestation of the deepening and widening of production sharing and networks in the region.

III. INTRA-INDUSTRY TRADE IN PARTS AND COMPONENTS IN EAST ASIA

A popular measure of the growth of international production sharing is the growth of trade in parts and components (Ng & Yeats, 1999, 2003). From this measure, international production sharing increased substantially during the latter 1980s and the 1990s.

East Asia's total exports of parts and components grew by an average of 15.1 percent per year during 1984-1996; in contrast, East Asia's exports of all items increased by 10.6 percent per year during the same period. Similarly, East Asia's exports of parts and components to the region grew by 20.9 percent per annum during 1984-1996; in contrast, East Asia's total exports of all items to the region increased by 14.4 percent per annum (Ng & Yeats, 1999). By 2001, trade in parts and components already accounted for one-fifth of all intra-regional trade in manufactures excluding chemicals in East Asia (Ng & Yeats, 2003).

Thus, East Asia's exports of parts and components were the most dynamic among all export items. Moreover, intra-regional trade in parts and components grew the fastest among all items during the same period. Finally, East Asia's growth rates in overall exports and in parts and components were higher than the major production areas like the NAFTA and the E.U. In short, East Asia's trade in parts and components was the most dynamic in the world during the latter 1980s and the early 1990s.

International trade in parts and components is highly concentrated commodity-wise globally and in East Asia. The top 5 product groups (i.e., office machines, telecommunications, switchgear, motor vehicles, and electronic components) accounted for 78.6 percent and 74 percent of East Asia's exports and imports respectively of parts and components in 1996 (Ng & Yeats, 1999). By 2001, the top four product groups accounted for 85 percent of total East Asia component trade, with parts of office machinery and telecommunication equipment accounting for two-thirds of total trade (Ng & Yeats, 2003). This reflects the fast growth in global trade in electrical, office machinery and telecommunications equipment and related products as well as motor vehicles during the period and the important role of East Asia in global production and trade in these products. On the other hand, this also reflects the fact that the electronics and related industries and the motor vehicle industry have been in the forefront of innovations in global production sharing and networks in the past decade.

Table 1: Levels and Rates of Change in Northeast and Southeast Asian Trade, 1986-2002, (in billion US dollars)

Year	Level and Annualized growth rate (%)	NEA[a]			SEA[b]			NEA + SEA		
		Exports	Imports	Total	Exports	Imports	Total	Exports	Imports	Total
1985[c]	Level	55.3	54.9	110.2	12.4	10.5	22.9	67.7	65.4	133.1
	Annualized growth rate	12.3	12.1	12.2	2.7	5.1	3.8	10.2	10.8	10.5
1990	Level	116.9	114.8	231.7	25.6	22.6	48.2	142.5	137.5	280.0
	Annualized growth rate	15.0	14.8	14.9	14.5	15.3	14.9	14.9	14.9	14.9
1995	Level	260.4	252.5	512.9	70.3	57.3	127.7	330.7	309.8	640.5
	Annualized growth rate	16.0	15.8	15.9	20.2	18.6	19.5	16.8	16.3	16.6
1997	Level	278.7	264.9	543.6	79.4	66.9	146.3	358.1	331.8	689.9
	Annualized growth rate	3.4	2.4	2.9	6.1	7.7	6.8	4.0	3.4	3.7
2000	Level	320.1	313.0	633.1	93.1	77.7	170.8	413.2	390.7	803.9
	Annualized growth rate	4.6	5.6	5.1	5.3	5.0	5.2	4.8	5.4	5.1
2002	Level	358.9	290.2	649.1	85.8	74.7	160.5	444.7	364.9	809.6
	Annualized growth rate	5.7	-3.8	1.2	-4.1	-2.0	-3.1	3.7	-3.4	0.4

Notes:
[a] NEA - Northeast Asia = China, Hong Kong, Japan, Korea
[b] SEA - Southeast Asia = Indonesia, Malaysia, Philippines, Singapore, Thailand, Viet Nam
[c] Annualized growth rate is computed for the five year period, 1980 to 1985
Source: IMF Direction of Trade Statistics

Table 2: Growing Intra-Regional Trade, 1980-2002

Ratio to total imports of Northeast Asia

Year	MNEA/ TMNEA (1)	MNEA from SEA/TMNEA (2)	(1) + (2)
1980	0.15	0.09	0.23
1985	0.23	0.08	0.32
1990	0.26	0.12	0.38
1995	0.32	0.16	0.47
1997	0.32	0.14	0.45
2000	0.32	0.12	0.44
2002	0.29	0.11	0.40

Ratio to total exports of Northeast Asia

Year	XNEA/ TXNEA (1)	XNEA to SEA/TXNEA (2)	(1) + (2)
1980	0.16	0.12	0.28
1985	0.21	0.08	0.29
1990	0.23	0.08	0.31
1995	0.29	0.09	0.39
1997	0.30	0.10	0.40
2000	0.29	0.10	0.39
2002	0.33	0.10	0.42

Notes: XNEA - Exports of Northeast Asia with Northeast Asia
MNEA - Imports of Northeast Asia with Northeast Asia
TNEA - Total trade (imports plus exports) of Northeast Asia with the world
TMNEA - Total imports of Northeast Asia
SEA - Southeast Asia

Ratio to total imports of Northeast Asia sans Japan

Year	MNEAJ/ TMNEAJ (1)	MNEAJ from SEA/TMNEAJ (2)	(1) + (2)
1980	0.12	0.08	0.19
1985	0.27	0.13	0.40
1990	0.40	0.11	0.51
1995	0.40	0.14	0.53
1997	0.41	0.13	0.55
2000	0.51	0.15	0.66
2002	0.64	0.21	0.85

Ratio to total exports of Northeast Asia sans Japan

Year	XNEAJ/ TXNEAJ (1)	XNEAJ to SEA/TXNEAJ (2)	(1) + (2)
1980	0.16	0.12	0.28
1985	0.21	0.08	0.29
1990	0.23	0.08	0.31
1995	0.29	0.09	0.39
1997	0.30	0.10	0.40
2000	0.29	0.10	0.39
2002	0.33	0.10	0.42

Notes: XNEA - Exports of Northeast Asia with Northeast Asia excluding Japan
MNEA - Imports of Northeast Asia with Northeast Asia excluding Japan
TNEA - Total trade (imports plus exports) of Northeast Asia with the world excluding Japan
TMNEA - Total imports of Northeast Asia excluding Japan

Table 2: Growing Intra-Regional Trade, 1980-2002

Ratio to total trade of Northeast Asia			
Year	**(XNEA+ MNEA) /TNEA**	**(XNEA to SEA+MNEA from SEA)/TNEA**	**[(XNEA+MNEA)+ (XNEA to SEA)+(MNEA from SEA)]/TNEA**
1980	0.15	0.10	0.26
1985	0.22	0.08	0.30
1990	0.25	0.10	0.34
1995	0.30	0.12	0.43
1997	0.31	0.12	0.42
2000	0.30	0.11	0.41
2002	0.31	0.10	0.41

Notes: XNEA - Exports of Northeast Asia with Northeast Asia
MNEA - Imports of Northeast Asia with Northeast Asia
TNEA - Total trade (imports plus exports) of Northeast Asia with the world
TMNEA - Total imports of Northeast Asia
SEA - Southeast Asia

Ratio to total trade of Northeast Asia sans Japan			
Year	**(XNEAJ+MNEAJ)/ TNEAJ**	**(XNEAJ to SEA+MNEAJ from SEA)/TNEAJ**	**[(XNEAJ+MNEAJ)+(XNEAJ to SEA)+(MNEAJ from SEA)]/TNEAJ**
1980	0.13	0.08	0.21
1985	0.30	0.12	0.42
1990	0.43	0.11	0.54
1995	0.47	0.15	0.62
1997	0.45	0.14	0.59
2000	0.47	0.15	0.62
2002	0.59	0.19	0.78

Notes: XNEA - Exports of Northeast Asia with Northeast Asia excluding Japan
MNEA - Imports of Northeast Asia with Northeast Asia excluding Japan
TNEA - Total trade (imports plus exports) of Northeast Asia with the world excluding Japan
TMNEA - Total imports of Northeast Asia excluding Japan

Table 2: Growing Intra-Regional Trade, 1980-2002

Ratio to total imports of Southeast Asia

Year	MSEA/ TMSEA (1)	MSEA from NEA/TMSEA (2)	(1) + (2)
1980	0.13	0.19	0.31
1985	0.16	0.38	0.55
1990	0.14	0.27	0.4
1995	0.15	0.24	0.39
1997	0.17	0.26	0.43
2000	0.20	0.33	0.54
2002	0.23	0.39	0.62

Ratio to total exports of Northeast Asia

Year	XSEA/ TXSEA (1)	XSEA to NEA/TXSEA (2)	(1) + (2)
1980	0.16	0.2	0.36
1985	0.18	0.26	0.44
1990	0.18	0.34	0.52
1995	0.26	0.44	0.71
1997	0.22	0.33	0.55
2000	0.22	0.28	0.49
2002	0.21	0.27	0.49

Ratio to total trade of Northeast Asia

Year	(XSEA+ MSEA) /TSEA	(XSEA to NEA+MSEA from NEA)/TSEA	[(XSEA+MSEA)+ (XSEA to NEA)+(MSEA from NEA)]/TSEA
1980	0.14	0.19	0.34
1985	0.17	0.32	0.49
1990	0.16	0.30	0.46
1995	0.20	0.33	0.53
1997	0.20	0.29	0.49
2000	0.21	0.30	0.51
2002	0.22	0.32	0.54

Notes: XSEA - Exports of Southeast Asia with Southeast Asia
MNEA - Imports of Southeast Asia with Southeast Asia
TSEA - Total trade (imports plus exports) of Southeast Asia with the world
TXSEA - Total exports of Southeast Asia
NEA - Northeast Asia

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Table 2: Growing Intra-Regional Trade, 1980-2002 - *Continued*

Ratio to total imports of China

Year	MC from NEA/TMC (1)	MC from SEA/TMC (2)	(1) + (2)
1990	0.42	0.06	0.47
1995	0.36	0.07	0.44
1997	0.36	0.09	0.44
2000	0.33	0.10	0.43
2002	0.31	0.10	0.42

Ratio to total exports of China

Year	XC to NEA/TXC (1)	XC from SEA/TXC (2)	(1) + (2)
1990	0.42	0.06	0.47
1995	0.36	0.07	0.44
1997	0.36	0.09	0.44
2000	0.33	0.10	0.43
2002	0.31	0.10	0.42

Notes: MC - Imports of China
XC - Exports of China
TMC - Total imports of China from world
TXC - Total exports of China to the world
TCNEA - Total trade of China with Northeast Asia
NEA - Northeast Asia

Ratio to total imports of China sans Japan

Year	MC from NEAJ/TMCJ (1)	MC from SEA/TMCJ (2)	(1) + (2)
1990	0.42	0.06	0.47
1995	0.36	0.07	0.44
1997	0.36	0.09	0.44
2000	0.33	0.10	0.43
2002	0.31	0.10	0.42

Ratio to total exports of China

Year	XC to NEAJ/TXCJ (1)	XC to SEA/TXCJ (2)	(1) + (2)
1990	0.42	0.06	0.47
1995	0.36	0.07	0.44
1997	0.36	0.09	0.44
2000	0.33	0.10	0.43
2002	0.31	0.10	0.42

Notes: TXCJ - Total exports of China excluding Japan
TCNEAJ - Total trade of Northeast Asia to Northeast Asia (sans Japan)
SEA - Southeast Asia

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Table 2: Growing Intra-Regional Trade, 1980-2002 - *Continued*

Year	Ratio to total trade of China		
	TCNEA/TC	TCSEA/TC	(TCNEA+ TCSEA)/TC
1990	0.51	0.06	0.57
1995	0.42	0.07	0.49
1997	0.42	0.07	0.49
2000	0.36	0.08	0.44
2002	0.35	0.09	0.43

Notes: MC - Imports of China
XC - Exports of China
TMC - Total imports of China from world
TXC - Total exports of China to the world
TCNEA - Total trade of China with Northeast Asia
NEA - Northeast Asia

Year	Ratio to total trade of China		
	TCNEAJ/ TCJ	TCSEA/TCJ	(TCNEA+ TCSEA)/TCJ
1990	0.42	0.07	0.49
1995	0.28	0.09	0.36
1997	0.28	0.09	0.37
2000	0.23	0.10	0.32
2002	0.22	0.10	0.32

Notes: TXCJ - Total exports of China excluding Japan
TCNEAJ - Total trade of Northeast Asia to Northeast Asia (sans Japan)
SEA - Southeast Asia

A simple and generally valid framework for understanding the pattern of international trade in parts and components is that high wage (developed) countries have the comparative advantage in the *production* of parts and components while the low wage (developing) countries have the comparative advantage in *using* the parts and components and a*ssembling* them into other components and products. Table 3, based from Ng and Yeats (2003) brings this out neatly. The table shows the ratio of the revealed comparative measures for countries as producers of parts and components and as assemblers of parts and components and that developed countries like Japan and U.S. have the highest ratio of the percentage of products where the country has revealed comparative advantage in the production of parts and components to the percentage of products where they have comparative advantage in assembly operations. On the other hand, it also shows that the other developing countries have ratios less than unity, which suggests that they have comparative advantage in assembly. It needs to be pointed out though that in higher income newly industrialized countries with large manufacturing sectors (e.g., Taiwan, Korea, Poland and Hungary), the ratios are substantially higher than the other developing countries.

Table 2: Indicator of Comparative Advantage in Production versus Assembly of Parts and Components, 1985-2001

Countries	1985	1995	2001
China	0.16	0.21	0.37
Hong Kong	0.50	1.00	0.74
Indonesia	0.00	0.09	0.16
Japan	13.10	7.00	2.60
Korea	0.27	0.32	0.45
Malaysia	0.16	0.33	0.42
Mongolia	0.00	0.00	0.00
Philippines	0.18	0.20	0.32
Singapore	0.54	0.58	0.52
Taiwan, China	1.50	0.91	0.89
Thailand	0.25	0.21	0.26
Viet Nam	—	0.28	0.13
Ave. excluding Japan	0.27	0.36	0.42
Mexico	—	0.43	0.62
Hungary	0.14	0.59	0.54
Poland	—	0.62	0.67
United States	2.10	1.90	2.10

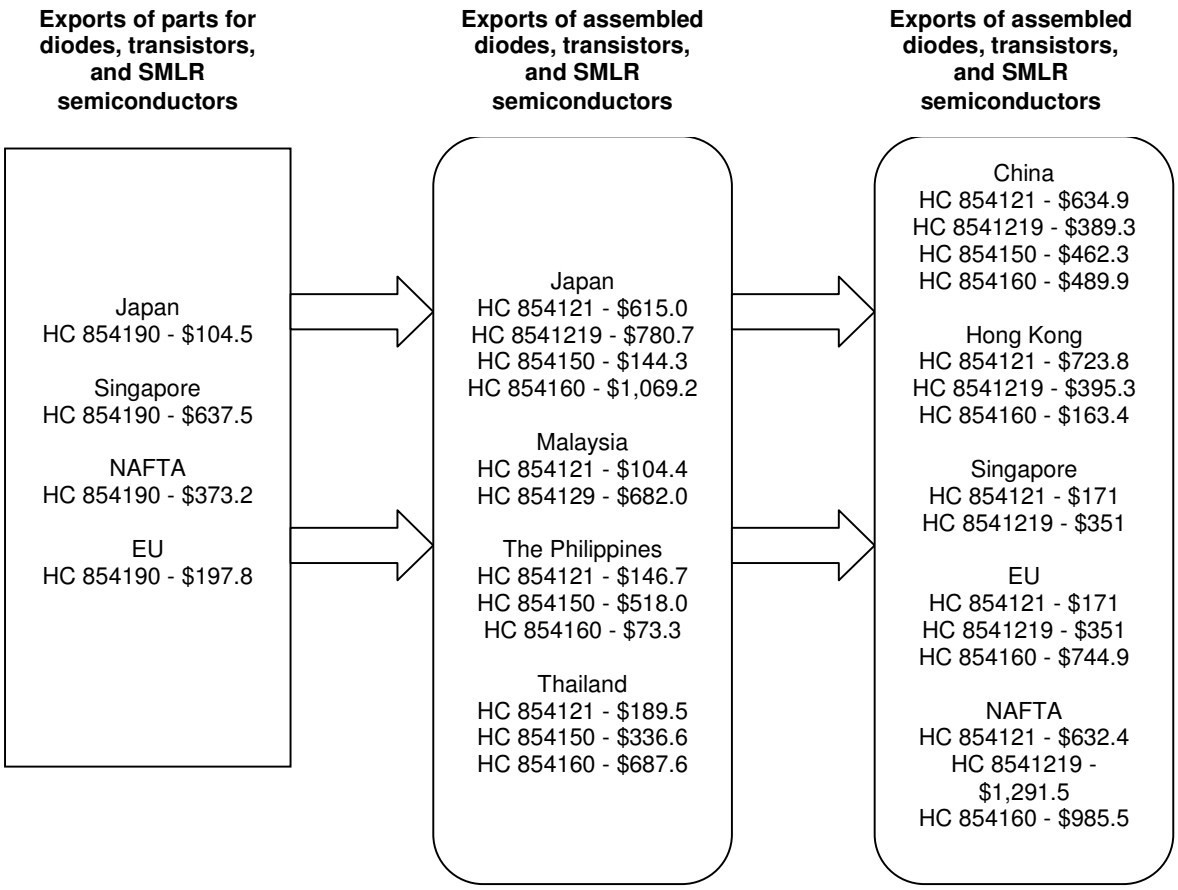
Source of basic data: Ng and Yeats (2003), Table 19.1, p. 63.

Trade flow data on parts and components in East Asia for 2001 is largely consistent with the general framework with Japan having the largest trade surplus and a number of developing countries being net importers of parts and components. On the other hand, China's large trade surplus, which can be attributed to Hong Kong as part of the Pearl River Delta cluster, seems to indicate that there are factors other than pure wage differential that influence investment location and the concomitant trade flows. Indeed, the emergence of China as a trade surplus country in parts and components reflects in part the emerging role of China as a key hub in the global and regional production networks in electronics and automotive industries.

Figures 1a and 1b illustrate further, in terms of the semi-conductor-integrated circuits-machinery segment, the growing intra-industry trade in the region. The disaggregation of the 4-digit Harmonized System (HS) classification into 6-digit classification reveals the role of production sharing. Notice that the semiconductor-integrated circuits segment is one of the most

R&D- and skill-intensive segments of the electronics industry. It is to a large extent the core of the electronics industry. Thus, it can be expected that leading countries like Japan, the United States, and the European Union should be net exporters of semiconductor devices, integrated circuits and electronics machinery.

Figure 1a: Trade Flows of Semiconductor Devices; Light-Emit Diodes etc., Parts, 2001
(in million US dollars)



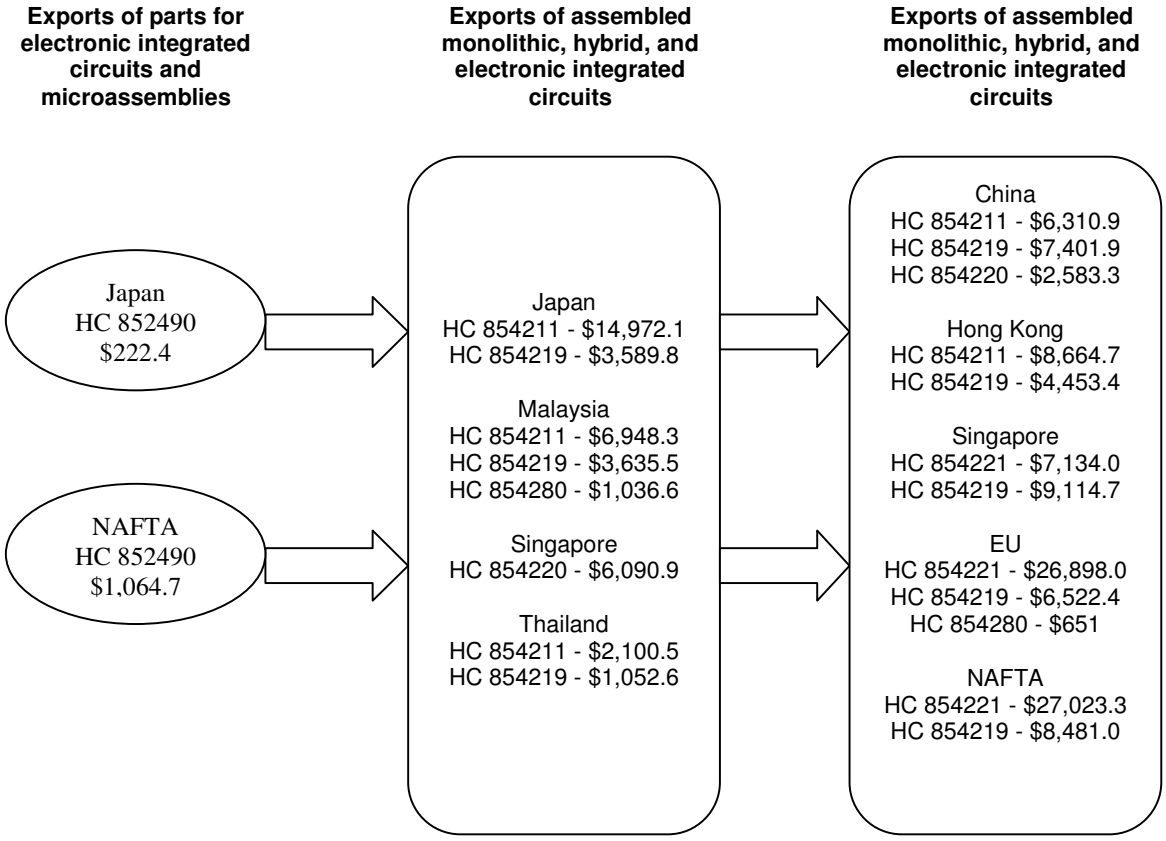
Memo: Korea, NAFTA, and EU are net importers at the four-digit aggregation of the Harmonized system Classification (HC 8541).

However, Figure 1a reveals that Malaysia and the Philippines are major exporters of semiconductor devices and integrated circuits (at the 4-digit HS level) while NAFTA and the E.U. are major net importers. A disaggregation at the 6-digit HS level presents a slightly different picture. For example, while Malaysia is a net exporter and the NAFTA a net importer of transistors (HC 854129), Malaysia is a net importer and the NAFTA a net exporter of HC 854190 (parts for diodes, transistors, and SMLR semiconductors). Among East Asian countries, Malaysia is the largest importer of parts for diodes, transistors, etc. from the NAFTA countries. This suggests that Malaysia imports the parts to be assembled into transistors that are exported to the NAFTA and other parts of the world.

Similarly, the Philippines and Malaysia are major exporters of electronic integrated circuits and microassemblies (HC 854280) with the value of their exports far greater than those of Japan and the NAFTA. The operations of the Philippines and Malaysia are largely assembly

work. This is revealed by the fact that both countries are major net importers of parts of electronic integrated circuits and microassemblies (HC 854290). Both Japan and the NAFTA, however, are net exporters of HC 854290. The same can be said of Thailand with respect to monolithic integrated circuits, digital (HC 854211), where it is also a significant exporter and importer of parts for integrated circuits.

Figure 1b: Trade Flows of Electronic Integrated and Microassembly Parts, 2001
(in million US dollars)



Notice from Figure 1b that the product electric machinery (HC 8543), etc. is mainly exported by Japan, the NAFTA, the E.U. and Singapore, reflecting the R&D and skill intensity needed for the production of the specialized machinery. Here, the Philippines, Malaysia, and Thailand are net importers. Notice also from Figure 1a that China and Hong Kong are major markets. This reflects the tremendous growth of electrical and telecommunication equipment and other related industries, where semiconductor devices and integrated circuits are needed. Finally, it is to be noted that at the 6-digit HC level, there appears some commodity specialization by country. For example, Singapore is a net importer of monolithic integrated circuits, digital but a major exporter of hybrid integrated circuits (HC 854220). Nonetheless, in many cases there is substantial intra-industry trade at even the 6-digit HC level.

Driving the pace and extent of the intra-industry trade even at the more detailed 6-digit HC level is the web of production sharing and networks in the region, which is primarily shaped by transnational corporations especially for electronics and automotive industries.

IV. PRODUCTION SHARING AND NETWORKS IN EAST ASIA

Production sharing is neither new nor is concentrated only in the capital-intensive electronics, motor vehicle and related industries. In fact, international production sharing has been the dominant international sourcing arrangement in apparel, perhaps since the mid-1960s (Yeats, 1998). Other labor-intensive industries that have relied on international production sharing include footwear, leather goods and furniture.

International production sharing and networks stem from the efficiency, cost saving and productivity-enhancing benefits of fragmenting the production process. This is according to the dictates of changing comparative advantage of economies and to the agglomeration and spillover effects of knowledge and innovation clusters. For largely labor-intensive industries like apparel, labor cost reduction is a key impetus for the growth of international production sharing to maintain or improve competitiveness in the consumer market, considering the comparatively high and rising wages in developed countries. The labor cost consideration is tempered by the increasing need for geographical proximity to reduce transport cost and lead time for deliveries (Gereffi, 2002). In addition, tariff biases in developed countries (net importing countries) also favored offshore assembly operations, whereby the tariff is imposed only on the value added of the exporting country as long as the materials for the assembled product are sourced from the importing country (e.g., U.S. under HTS Provision 9802.00.60 and 9802.00.80 the and E.U.'s outward processing relief arrangements).

It is probably not at all surprising that labor-intensive consumer products like apparel are among the early and extensive users of international production sharing and networks. This is because of the intense competition at the consumer end. The competition has intensified in recent decades among retailers, marketers and manufacturers with the consolidation among retailers and the rise of giant discount firms. Moreover, real wages in developed countries have increased secularly and substantially, thereby making apparel production in developed countries less competitive vis-à-vis imports from developing countries which have far lower wages. The previous two factors, together with the tariff biases in developed countries favoring imports assembled abroad from intermediate inputs from the developed country, have led to the extensive use of international subcontracting or production sharing arrangements. A substantial portion of international trade in textile and apparel is attributable to this production arrangement; as a result, developed countries export fabric, other accessories and import apparel to developing countries.

The top three East Asian apparel exporters in the 1970s (i.e., Korea, Hong Kong, and Taiwan) were not just foreign assemblers for the U.S. and E.U. markets, they were full-package suppliers under Original Equipment Manufacturer (OEM) production that made them formidable competitors to the developed country apparel firms. However, as wages in these economies also increased substantially and their currencies appreciated, firms in Northeast Asia expanded their operations to lower labor cost countries for the final assembly while supplying the assemblers with the intermediate inputs. Thus, the Northeast Asian exporters also moved towards international subcontracting of the more labor-intensive segments of the textile-garment sector. As Gereffi (2002) shows, exports from Korea, Hong Kong, Taiwan, and Japan of textiles and fibers and (for Japan) textile machinery rose substantially while exports of apparel dropped during the 1980s and 1990s. This reflects the changing comparative advantage in apparel production in East Asia; the NIEs and Japan shifted their production towards the more capital intensive phases of the textile-garments chain (i.e., textiles, fibers and machinery), where they have comparative advantage. To a large extent, the shifting of apparel production from the NIEs to the lower income countries in the region (as well as countries in Central and Latin America)

completes what is sometimes called “triangle manufacturing.” That is, the buyers of apparel (primarily in the U.S.) place orders from the NIEs suppliers which then shift all or some of the requested production to their affiliated offshore factories in the low income countries (Gereffi, 2002). Thus, in many ways the low-income countries become export platforms of the NIEs for the world markets, especially the U.S. market.

It must be pointed out, however, that just like the case of the NIEs, a few of the lower income apparel exporting countries have gone beyond mere assembly and have been moving towards full-service providers similar to the NIEs. These countries, such as China, India and Mexico, are expected to be dominant next-tier leaders in the world textile-garment trade as they strengthen their foundations in both industries. Indeed, if the Japanese import sourcing is an indication of what could happen in a quota-less apparel world trade, then China would be the dominant player in the region in the textile-garment sector.

Like textile and garments, the impetus for international production sharing in electronics and automotive is stiffening competition and shorter product cycles. This process is facilitated by declining transport costs, improvements in information technology and growing supplier capabilities. In contrast to textile and garments however, the pace of organizational changes and the growth of production networks were faster because of the sharp rise in world demand for electronics products; this has accelerated product innovation in the industry. In the electronics industry, the international organization of production has grown from reliance on off-site assembly plants (which are either subsidiaries or international subcontracts) to turn-key production by contractors. Eventually there was a growing reliance by global lead firms on a few large, technologically-sophisticated global contractors, which may have a global network of plants geared to different product requirements. The location of such plants tends to follow the following pattern (Sturgeon & Lester, 2003):

i) Low product mix, high volume production: Asia, Mexico and East Europe
ii) High product mix, medium to high volume production: US, Europe, Canada, Western Europe and Japan
iii) Engineering-heavy: “new product introduction centers” near important customers’ design activities

In Asia, there is some differentiation in the product mixes for the various countries in the region. Thus, low-end assembly goes to low labor cost countries like Indonesia, Vietnam and, to some extent, China. Medium-end assembly is done in Malaysia, Thailand, the Philippines and, to a less extent, China. Original equipment manufactures are done in Taiwan and Korea. This product variation by location ensures considerable intra-industry trade in the region and regional production networks remain alive.

At the same time, the pattern of intra-industry intra-regional trade is likely to change further in East Asia because of China. As Kueh’s (2004) paper amply demonstrates, China has dramatically improved its presence in the regional production, trade and consumption of electronics and automotive products in the region. All the major world players in electronics have made major investments in China, including the large Taiwanese investments that have made Dongguan in Guangdong province a key regional production site in electronics.
Similarly, most of the major world automotive makers have invested billions of U.S. dollars to build plants in China. Although virtually all of them are for the domestic market (except for the Honda plant in Guanzhou), the economies of scales and the large investments in the support automotive parts have led to declining costs of automotive parts with China now exporting more than USD2 billion of automotive parts. The strong support and ambitious targets of China in

exports of automotive parts and even completely built up units (CBUs) could lead to more liberal rules in foreign equity for export-oriented automotive projects (such as the Honda project) and therefore eventually to large increases in the exports of automotive products. Thus, in the medium run, there may be substantial changes in the trade flows within the region. For countries that are more vulnerable to China (e.g., the Philippines, Malaysia and Thailand), the challenge is in adjusting to the China factor by finding appropriate niches and or looking into possible partnerships for a third market.

The de-verticalization of the automotive industry has also moved the same pace as that of the electronics. The increasing shift towards modular approach to automotive assembly by the American and European car manufacturers has led to the recent rise of "mega-suppliers" (Sturgeon & Lester, 2003) because of supply-base consolidation, global sourcing, and co-location of the suppliers with the assembly plants abroad in order to effect "just in time" parts delivery. The Japanese automotive production system comes closest to the meaning of production networks[4]. In Japan, the car manufacturers links up mainly with the Tier 1 suppliers, which in turn can produce globally or source part of the requirements from Tier 2 suppliers, and so on. This system demands tight coordination to meet "just- in-time" parts assembly. The Tier 1 firms also tend to work closely with the manufacturer in R&D, product and process innovation. The integral nature of automotive industry encourages the co-location of parts suppliers with the manufacturers-assemblers. Since it would be uneconomical for parts to be done in the same manner for all countries where the automotive company has an assembly plant, it is likely that only certain countries with large domestic markets or with industries near world standards could draw in and develop an export competitive automotive industry. There is, therefore, a likelihood that when the high tariffs imposed on vehicles are reduced, only few countries would end up being major exporters. In the case of NAFTA, there would be a network of plants in the region that would be involved in the manufacture and/or assembly and export of the relevant parts, components and whole vehicles produced in the region, perhaps primarily for the regional markets. In this case, intra-industry and intra-regional trade would even be deepened as what happened in NAFTA, where in fact automotive parts and vehicles are major intraregional trade items. This is feasible in the industry because of the large number, size and weight of components and materials for the industry (Sturgeon & Lester, 2003).

V. IMPLICATIONS ON NATIONAL POLICIES AND REGIONAL COOPERATION

An important consideration with respect to global and regional production networks is that they have played a big role in the industrial upgrading and economic development of the successful East Asian economies. The participation of local firms in the networks as suppliers of parts and products and as buyers of specialized process equipment enabled the local firms to gain access to important product and process know-how (Sturgeon & Lester, 2003). As participants, the local firms learned, and over time a number of them gained enough expertise and capability to become OEM and ODM (original design manufacturer) firms. In so doing, the firms gained important footholds in the foreign markets that are trail blazed by the buyers and/or lead firms in the production networks, which are headed by the lead firm in a developed country. The transition from assembler to OEM firm and eventually ODM is, however, not easy. It demands not only forward looking and demanding firms but also robust support industries and facilitative policy environments.

[4] There is a slightly different nuance to production networks compared to production sharing; that is, networks tend be shaped by "lead firms," where suppliers can be involved early in the design process and the demand for rapid response and build-to-order performance demand tightly coordinated operations dispersed across national boundaries.

At the same time, it is important to note that there is an economy-wide backdrop to the developments at the firm level in the evolution of production networks. Specifically, base regional production networks highlight the differing comparative advantages of countries in the region. Indeed, the de-verticalization of production is merely an attempt at maximizing the cost efficiency benefits of tapping the differing comparative advantages of countries. Under the standard factor proportions theory of international trade, given production technology and demand patterns, a country has comparative advantage in commodities that use more intensively the country's relatively abundant factor resources. For example, with other things being equal, a comparatively labor abundant country has comparative advantage in the production and export of labor intensive commodities. Similarly, countries with large stock of R&D resources can be expected to have comparative advantage in R&D-intensive products.

Differences in growth rates of population, human capital formation, physical capital formation, natural resource extraction/resource regeneration, technological adaptation and development among countries over time will lead to significantly different factor intensity of abundance. This will therefore change the comparative advantage among countries which is the corollary of industrial restructuring in the countries in the region. The process of industrial restructuring and shifts in comparative advantage in East Asia has accelerated in the past two decades because of accelerated flows of foreign direct investment and technology transfer to the developing countries in the region, in many cases linked to the growing production networks regionally and globally.

Estimates of revealed comparative advantage (RCAs) indicate the changing comparative advantage in the region since the 1970s. For example, Japan had revealed comparative advantage in industries like textile, clothing, leather and footwear, furniture and fixture, rubber and plastic products, metal products, and transport equipment other than motor vehicles in 1970. By 1990, Japan lost its comparative advantage in all of the aforementioned industries and were limited to electrical machinery, motor vehicles, precision instruments, industrial materials, iron and steel (See Table 4a). Similarly, Singapore's industrial restructuring was dramatic during 1970-1990 as the country shifted from exporting/re-exporting agricultural materials, clothing, crude foodstuff, and furniture and fixture to electric machinery, precision instruments, industrial materials and petroleum products. The shifts in comparative advantage in Korea and Taiwan were less dramatic compared to Japan or Singapore but nonetheless saw their competitiveness in unskilled labor-intensive industries substantially erode. Consequently, Korea and Taiwan shifted to skilled labor-intensive and capital-intensive industries like electric machinery, metal products, and miscellaneous manufactures. For the ASEAN countries and China, there is also a perceptible reduction in the degree of revealed comparative advantage in agriculture and mineral primary products towards labor-intensive industries like clothing, textile, leather and footwear, furniture and assembly of electric machinery products. The shift towards machinery (and transport equipment) became more pronounced for the ASEAN countries and China in the 1990s (See Table 4b). Considering that virtually all the major countries in East Asia saw substantial increase in revealed comparative advantage in electrical machinery, this reflects the deepening production linkages within the region which was dominated by regional intra-industry trade in electronics and to a less extent automotive parts.

Table 4a: Revealed Comparative Advantage Indices for Exports of Japan and Asian NIEs, 1970 and 1990

Commodity Groups	Japan		South Korea		Taiwan		Singapore	
	1970	1990	1970	1990	1970	1990	1970	1990
Crude foodstuff	0.23	0.04	0.10	0.40	2.13	0.59	1.12	0.34

Agricultural materials	0.30	0.18	1.25	0.39	0.51	0.46	5.62	1.05
Mineral materials	0.03	0.06	1.61	0.18	0.21	0.15	0.45	0.29
Mineral fuels	0.01	0.05	0.08	0.00	0.01	0.07	0.02	0.66
Processed food	0.49	0.12	0.23	0.43	0.76	0.37	0.96	0.46
Beverage and tobacco	0.07	0.05	1.39	0.16	0.14	0.03	1.22	1.23
Textiles	2.48	0.66	2.79	3.00	3.79	2.92	0.95	0.55
Clothing	1.43	0.06	15.30	3.85	8.92	1.86	1.19	0.96
Leather and footwear	0.99	0.10	2.46	6.01	2.78	4.83	0.41	0.17
Furniture and wood products	1.00	0.12	13.94	0.34	8.70	2.39	1.60	0.62
Pulp, paper and paper products	0.39	0.29	0.04	0.27	0.29	0.30	0.34	0.41
Chemicals	0.80	0.65	0.22	0.41	0.34	0.39	0.47	0.73
Petroleum products	0.08	0.02	0.23	0.40	0.23	0.00	9.34	5.04
Rubber and plastic products	1.80	0.84	0.36	0.98	0.52	0.91	0.37	0.67
Glass and non-metal products	1.03	0.50	0.42	0.46	0.84	0.76	0.50	0.28
Iron and steel	3.16	1.33	0.34	1.69	0.75	0.40	0.18	0.25
Non-ferrous metals	0.35	0.34	0.19	0.25	0.19	0.41	0.07	0.48
Metal products	1.90	0.84	0.75	1.45	0.94	2.73	0.69	0.66
Industrial materials	0.95	1.62	0.09	0.57	0.31	1.24	0.37	1.71
Electric machinery	2.37	2.22	1.01	2.23	2.38	1.74	0.77	2.40
Motor vehicles	1.46	2.49	0.03	0.37	0.08	0.17	0.38	0.09
Other transport equipment	2.78	0.77	0.32	2.06	0.12	0.92	0.15	0.53
Precision instruments	2.00	2.61	0.24	0.51	0.25	0.90	0.37	1.03
Miscellaneous manufactures	0.49	0.86	0.96	1.30	0.75	2.09	0.32	0.76

Table 4b: Revealed Comparative Advantage Indices for Exports of ASEAN-4 Countries and China, 1970 and 1990.

Commodity Groups	Philippines		Thailand		Indonesia		Malaysia		China	
	1970	1990	1970	1990	1970	1990	1970	1990	1970	1990
Crude foodstuff	2.96	1.68	5.03	3.75	1.42	1.53	0.53	0.50	4.00	1.73
Agricultural materials	7.53	2.02	4.51	1.60	7.47	1.97	10.05	6.51	3.21	1.47
Mineral materials	6.82	3.20	1.04	0.37	3.48	1.79	0.99	0.37	0.84	0.71
Mineral fuels	0.00	0.09	0.00	0.06	5.03	4.84	0.68	2.12	0.09	0.82
Processed food	1.14	1.91	3.11	3.58	0.34	0.34	0.49	0.74	1.01	0.71
Beverage and tobacco	1.18	0.60	1.14	0.33	0.40	0.44	0.34	0.10	0.93	0.46
Textiles	0.14	0.36	8.34	1.29	0.05	1.55	0.10	0.37	3.84	3.74
Clothing	0.03	2.68	0.08	3.88	0.00	2.04	0.19	1.42	1.82	4.92
Leather and footwear	0.12	0.89	0.09	3.63	0.05	2.08	0.11	0.31	1.40	2.91
Furniture and wood products	5.15	3.34	0.32	1.43	0.01	9.29	2.17	1.60	0.82	0.70
Pulp, paper and paper products	0.03	0.15	0.03	0.09	0.00	0.30	0.10	0.21	0.50	0.18
Chemicals	0.10	0.41	0.07	0.25	0.10	0.32	0.13	0.22	1.15	0.85
Petroleum products	0.65	0.62	0.28	0.15	1.45	1.86	1.37	0.45	0.11	0.63
Rubber and plastic products	0.01	0.20	0.04	0.43	0.00	0.19	0.20	0.29	0.15	0.28
Glass and non-metal products	0.17	0.32	0.90	2.12	0.00	0.43	0.21	0.44	1.46	0.96
Iron and steel	0.23	0.29	0.06	0.18	0.00	0.28	0.05	0.23	0.15	0.63
Non-ferrous metals	0.04	1.52	3.01	0.22	0.21	0.76	5.36	0.66	0.25	0.41
Metal products	0.01	0.12	0.11	0.65	0.02	0.23	0.11	0.37	0.78	1.22
Industrial materials	0.01	0.09	0.02	0.69	0.03	0.01	0.07	0.33	0.17	0.32
Electric machinery	0.00	1.09	0.02	1.10	0.00	0.08	0.05	2.86	0.13	0.68
Motor vehicles	0.00	0.03	0.03	0.05	0.00	0.01	0.07	0.04	0.00	0.62
Other transport equipment	0.00	0.12	0.01	0.18	0.00	0.11	0.05	0.65	0.19	0.28
Precision instruments	0.00	0.09	0.09	0.55	0.00	0.08	0.04	0.51	0.18	0.87
Miscellaneous manufactures	0.05	5.15	0.39	1.46	0.02	0.25	0.07	0.79	0.57	1.30

The massive flow of foreign direct investment into China has transformed the country into an emerging major hub in the region and the world for electronics and apparel. Automotive parts increasingly poses a major challenge to the region's other developing countries because of the possibility of substitution and transfer of operations to China. At the same time, China's fast paced economic growth and the deepening trade and investment linkages within the region suggest that there are significant returns to successful adjustment to the changing pattern of comparative advantage and stiffening market competition in the region. There is a constant pressure for the countries in the region to continuously undertake industrial upgrading because the lead firms in the regional and global production networks face stiffening competition and continuous innovation. In addition, competitor firms within the region and the rest of the world also continue to improve and upgrade. As Sturgeon and Lester (2004) pointed out, "…the process of upgrading is unending; there is no threshold for adequacy".

Sturgeon and Lester (2004) emphasized that there is more than one upgrading path; and it may differ from one industry to another or from one firm to another in the same industry. This is because firms have differing internal capabilities, regional or national environments, and markets being served. Thus, imposing a one-size-fits-all industrial upgrading strategy is not viable in the long run and would likely fail.

Clearly, there is a need for industrial upgrading and a national strategy on it is advisable. Here, Malaysia provides an important example. Ariff and Chow's (2004) paper shows the contrasting picture of the electrical and electronics industry and the automobile industry. The latter has fundamental competitiveness problems arising from a history of protection. Thus, there is serious doubt that the industry could be export competitive unless there is a drastic restructuring of incentives and operations of the two homegrown firms. As a success story, it is Malaysia who has emerged as one of the world's top exporters of semiconductors as well as a major export platform of Japanese consumer electronics products. Malaysia's electrical and electronics industry has a wide range of competitive product portfolio, even if most of them remain import dependent with respect to the major inputs. As the paper points out, both China and India pose as threats to the continued robust growth of the electrical and electronics industry.

Malaysia actually has a strategy of industrial upgrading that, if successful, can be expected to help shield the country from the onslaught of Chinese export products. The strategy involves backward integration (primarily into wafer fabrication) and forward (especially into advanced IC design and manufacturing). The country, however, remains deficient on some key foundations for industrial upgrading and technological advancement. The deficiencies include the breadth and depth of human capital especially in the advanced technical fields, weak capabilities as well as relative lack of funding for research institutes and centers, and venture capital. The Multimedia Super Corridor is a manifestation of the government's forward looking projects towards the country's technological upgrading. The project has a long-term horizon and has already gained a bit of success, although perhaps not as initially expected. Note that industrial and technological upgrading is a long-term process but it can be accelerated by encouraging the private sector to innovate and invest more, provide more funds for research and human capital formation, and to encourage more venture capital. Finally, Ariff and Chow (2004) propose the forging and strengthening of partnership among ASEAN countries, China and India through what they call as "reciprocal technological upgrading" such as the formation of strategic alliances among private sector science parks, joint research on technical and scientific matters, and forgery of joint ventures among Chinese, Indian and ASEAN companies especially in emerging industries.

Malaysia has had a generally open and undistorted industrial economy (except for the automotive industry most especially) for decades, that is why it has succeeded very well in drawing export-oriented foreign direct investments since the 1970s. For countries like the Philippines and Vietnam, foreign direct investments and higher overall investment rate is important for their industrial upgrading in order to meet the challenges of China and at the same time make full use of the opportunities offered by the opening of China. Vietnam has been liberalizing and it has succeeded in attracting large foreign investments (Thanh, Long & Minh, 2004); in fact, at levels better than the Philippines'. Nonetheless, in order for the country to improve its investment attractiveness and ensure better growth performance from the increased investments, Thanh, Long and Minh (2004) propose further reforms in policies as well as change in mindsets away from a heavy government–programmed industrial development like Korea and Japan in the 1950s and 1960s. A specific concern of the authors is the inefficiency of support industries which are controlled by state enterprises, thereby deterring the country from robust industrial development.

Thailand's automotive industry is another example of industrial upgrading path (i.e., the deepening of the local production network, led by MNCs, in the context of global sourcing and imposed price competition from abroad) (Chiasakul, 2004). That is, domestic suppliers are required to meet standards and match the price of imports. It is worth noting that the growth of Thailand as a regional automotive hub came after the liberalization of rules, including the elimination of the local content requirement that allowed for global sourcing strategies and its establishment as a viable export platform for automotive parts and vehicles. Note also that the pressure for cost effectiveness and quality comes from the lead firms – the MNC automotive giants—of the production network. In short, the deepening of the local production network is primarily the by-product of private sector efforts in the context of intense market competition and facilitative government policies.

The Philippines has been the least successful in attracting foreign direct investments among the ASEAN 6 during the past two decades. Considering the great importance of investment as a facilitator of industrial adjustment, the failure of the country to raise substantially more investments at a sustained rate is one major reason for the relatively difficult industrial adjustment process the country undertook since the mid-1980s. The Philippines must have higher investments especially because the country is the most vulnerable among ASEAN countries to China's export juggernaut in the two largest and dominant export industries in the country (i.e., semiconductors and garments). Thus, it is very important for the country to substantially improve the investment climate, including a greater measure of political stability. In addition, the country may as well emulate Malaysia in that the latter has a clear and specific strategy of industrial adjustment. The Philippines sorely lacks such clear and specific strategy for industrial upgrading, perhaps industry by industry for the most important ones. Castillo (2004) also presses for the Philippines to sustain the integration of Philippine firms within global production networks through "… the implementation of networking strategies between local institutions, support agencies, and enterprises." The proposal of Ariff and Chow (2004) for strategic partnership between Malaysian, Chinese and Indian institutions provide one example of networking suggested by Castillo (2004). Castillo (2004) further recommends a greater focus on improving the skills and motivation of Filipino workers as another means by which the country can meet the challenges as well as reap the benefits of China and globalization.

Finally, it may be noted that the Philippines would need to substantially improve logistics services and facilities in the country. Bad infrastructure has been the bane of Philippine investment drives. The country would need to cultivate the market–driven formation and growth of local production networks or area industrial districts because of the inadequate infrastructure,

to capture agglomeration economies and externalities from a pool of skilled workers and related support institutions.

At the regional level, making the region more whole through trade and investment is one way of maximizing the benefits from global production networks. This is because the larger the market is, the greater the potentials are for higher growth in the globally networked industries. The larger market may convince foreign firms to set up shops in the region out of the sheer volume of sales. However, the more urgent measures are the trade facilitation measures that speed up customs clearance, trade documentation and product certification, for example. Inter-country cooperation in trade facilitation can be done at a sub-regional level like East ASEAN Growth Area (EAGA) where, for example, there could be a waiver of the cabotage law in order to allow for intra-EAGA movement of goods. There could also be joint promotion of sub-regional production networks such as a resource-based production network in the EAGA. In addition, regional cooperation in advanced research, training, and education can be important tools for strengthening that long run viability and international competitiveness of East Asia's industries vis-à-vis those in the Americas or Europe. Finally, venture capital is an important means to encourage the commencement of innovative ideas. Hence, the improvement of the financial markets is important in the region.

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