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**Recent Developments in the Electronics
Production Networks in Southeast Asia**

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Abstract

This paper examined the role of Southeast Asia in the electronics industry and where it is now in the global production chain. It analyzed the pattern of trade and FDI in the electronics industry in Southeast Asia, and the implications of the changing pattern of trade and FDI in Southeast Asia on Canada-ASEAN trade and investment flows. Finally, this paper examined the emerging issues affecting the electronics industry in the region.

Recent Developments in the Electronics Production Networks in Southeast Asia¹

The participation of Southeast Asian economies in the electronics global production networks is a significant factor behind the changing pattern and increasing participation of the region in international trade since the 1980s. In particular, the ASEAN-5 (Indonesia, Malaysia, Philippines, Singapore and Thailand) are hosts to a critical mass of global players in the industry like Intel, Texas Instruments, Dell and Hewlett Packard from the United States; Siemens and Philips from Europe; Sony, Toshiba, Hitachi and Fujitsu from Japan; and in the 1990s, Samsung and Goldstar from South Korea; and Acer from Taiwan. The region has become the production base of multinational companies (MNCs) for their markets to the rest of East Asia, North America and Europe. The outcome was the rapid expansion of trade and foreign direct investment (FDI), and the increasing economic integration of the region.

The objectives of this short paper are as follows: (1) to examine the role of Southeast Asia in the electronics industry and where it is now in the global production chain; (2) to analyze the pattern of trade and FDI in the electronics industry in Southeast Asia; (3) to analyze the implications of the changing pattern of trade and FDI in Southeast Asia on Canada-ASEAN trade and investment flows; and (4) to examine the emerging issues affecting the electronics industry in the region.

¹ This study is part of the project “Canada-ASEAN Trade and Investment Analytical Study” funded by the Asia-Pacific Foundation of Canada. Copies can be downloaded from <http://www.dlsu.edu.ph/cberd/publication>; and http://www.asiapacificresearch.ca/caprn/as_project/index.ctm

The Role of Southeast Asia in the Electronics Global Production Network

The global production network (GPN) is a production scheme where various stages of a manufacturing process are undertaken at different geographic locations where they can be carried out most efficiently (UNCTAD, 2002). For the electronics industry, the capital- and skill-intensive parts and components are designed and manufactured in developed economies and exported to developing economies for the labor-intensive assembly and testing. The production system is FDI-driven and multi-layered involving thousands of firms, from the parent companies (also the lead firms in the production chain), to subsidiaries and sub-contractors. Each layer in the system involves a specific production process located in a particular country. The lead firms concentrate on their “core competencies” such as research, product design and development, sales and marketing, and supply chain management considered essential to their competitive advantage and rely on specialized suppliers to provide the non-core functions (Sturgeon & Lester, 2004). The primary purpose of the production network is to provide the lead firms with quick and low-cost access to resources, capabilities, and knowledge that complement its core competencies (Ernst, 2004). The outsourcing of non-core functions opened the opportunity for developing economies to participate in the complex production chain, following a supplier-oriented industrial upgrading path.

This industrial upgrading path is best exemplified by the experience of the newly industrializing economies (NIEs) – Singapore, South Korea, Taiwan and Hong Kong- and the ASEAN-5 over the last three decades. In the 1970s and 1980s, the rise in wage cost, shortage of labor and the appreciation of the Japanese yen following the Plaza Accord in 1985 forced Japanese multinational companies to undergo industrial restructuring and upgrading by establishing their affiliates in the NIEs whose wages were then relatively cheap. Soon, the multinational companies from the USA and Europe followed as part of their global strategy to remain competitive.

At the initial stage, the NIEs were involved in the assembly and testing of parts and components supplied by the lead firms, involving cheap labor. Over time, they were involved in original equipment manufacturing (OEM), where they produced a product according to the design and specification of the lead firms but the product is sold under the lead firms’ brand name. This is followed by original design manufacturing (ODM) where local suppliers make the design and produce the product but the product is sold under lead firms’ brand the name. As the NIEs learned about the upstream and downstream segments of the production chain, they pushed for original brand manufacturing (OBM), producing and exporting their own brands and product.

The production shifts in the NIEs from assembly to OEM/ODM and OBM changed the geographical landscape of international trade in electronics. As the wage rates in the NIEs began to rise in the 1990s, these economies lost their comparative advantage in the labor-intensive segment of the production chain, causing them also to move their production offshore - this time to the ASEAN-4 (Indonesia, Malaysia, Philippines and Thailand), and then recently to China, India and a number of other developing countries in South Asia. The NIEs thus became the first–

tier suppliers to the lead firms while the ASEAN-4, China and India are second-tier suppliers, performing the assembly and testing requirements of the NIEs.

The ASEAN-5 has strengths in different parts of the value chain (McKinsey & Co., 2003). Each member has its own competitive niche products which are different from the other member economies, indicating product specialization (Austria, 2005a). Malaysia and Thailand are considered to have the broadest and most mature assembly capacity for components (Ng & Yeats 2002). On the other hand, the Philippines is considered to be promising in the semiconductor industry.

Factors Crucial to the Growth of Global Production Networks

Several factors increased the attractiveness of the ASEAN-5 to the global production network. In general, the unilateral, regional and multilateral reduction of barriers to trade and investment in the region resulted to domestic efficiency and increased competitiveness. In particular, the ASEAN Free Trade Area (AFTA) where intra-regional tariffs were reduced to 0-5 percent was just the right policy for attracting the FDI-driven production networks. With the emergence of other competing locations for this type of FDI, AFTA increased the attractiveness of the region. That is, by lowering, if not eliminating, barriers to trade and investment among the members, and hence reducing the costs of producing a product across the region, AFTA makes the entire set of economies that participates in the integrated production sharing more attractive as export markets and investment destinations, i.e. a win-win arrangement for all participants. In other words, AFTA facilitates the division of sophisticated production processes of the MNCs, with locations in the region. AFTA created an environment in which the MNCs are freer to choose their cross-border bases and conduct their economic activities; thus allowing them to exploit factor price differences within the region (Austria, 2003).

Since the MNCs are concerned about systemic efficiencies in their global production chain, where a given location is judged by how cost-efficient it performs a given function in coordination with other functions located elsewhere (UNCTAD, 2002), the ASEAN-5 invested in world class infrastructures and logistics oriented to the worldwide management of the production chain. New ports and container terminals were developed across the region (for example, Laem Chabang in Thailand, Tanjung Pelepas in Malaysia, and Tanjung Priok in Indonesia) (Heaver, 2004). Airport services also improved and expanded, cutting travel time and offering travel and shipment options. Singapore's Changi Airport best exemplified efficient airport services where the airport's computer-linked system of customs clearance simplified customs procedures and facilitated the smooth flow of goods. Such efficient air transport services are important for the time-sensitive products and intermediate inputs traded between countries in the production chain (Ernst, 2004).

The efficient ports and airport services, together with information technology, resulted to improved logistics. The advances in information technology enabled lead firms to coordinate dispersed activities and synchronize production and marketing (UNCTAD, 2002; Heaver, 2004). With good logistics, firms are able to outsource in low-cost locations not only production tasks but also back-office functions. Efficient logistics also allow just-in-time delivery where

deliveries are timed to respond to the immediate needs of users thus, minimizing inventories and consequently, costs (Heaver, 2004).

The region also boasts of its skilled manpower resources. The compensation package is also relatively low compared to other countries in East Asia, except China.

Impact on Economic Growth and Economic Integration

The participation of the ASEAN in the production network provided them with access to the main growth markets of the electronics industry, i.e. developed economies (Ernst, 2004; Yusuf, 2004). To enhance their overall competitive position in the international markets, lead firms provide their local affiliates and local suppliers with newer technology, more rapid technological upgrading, and greater attention to quality control, cost control as well as human resource development. They also attract other foreign investors, including their competitors and foreign suppliers to cluster in the same area. The combination of these factors (cutting-edge technology, exporting into competitive world markets and clustering of foreign investor activity) generates substantial spillovers and externalities that far exceed the standard positive effects of foreign direct investment (Moran, 1998).

The outcome was the rapid expansion of intra-industry trade in such products as computers and office equipment, telecommunications, video and audio equipment, and semiconductors, and the rising market shares of the ASEAN economies for such products (UNCTAD, 2002). In general, the global production network contributed to the significant improvement in the economic performance of the region and the intensification of economic linkages and integration of the region with Northeast Asia and North America. The latter is measured by the intra-industry trade index, which has been observed to be increasing in the 1990s, indicating increasing economic integration (see for example studies by Bora (1996), Austria (2003), and Austria (2004)). The increasing integration of the region is a reflection of the trilateral nature of trade and investment linkages between the ASEAN, the NIEs and North America.

At the individual economy level, however, the impact of the global production network on economic development depends to a large extent on how much of the activities of the lead firms are linked to domestic economic activity. In general, the lower the level an economy is in the production chain, the smaller is the impact of the production network to its economic development. As second-tier suppliers to the value-chain, the ASEAN-5 is highly dependent on imported inputs. Thus, the rapid expansion of their high-technology and skills-intensive exports was not accompanied by concomitant increases in value added and hence, income. Much of the skills and technology in these exports are embodied in parts and components produced in the technologically more advanced members of the production chain. Thus, much of the value added in these kinds of exports accrues to those involved in the higher levels of the production chain.

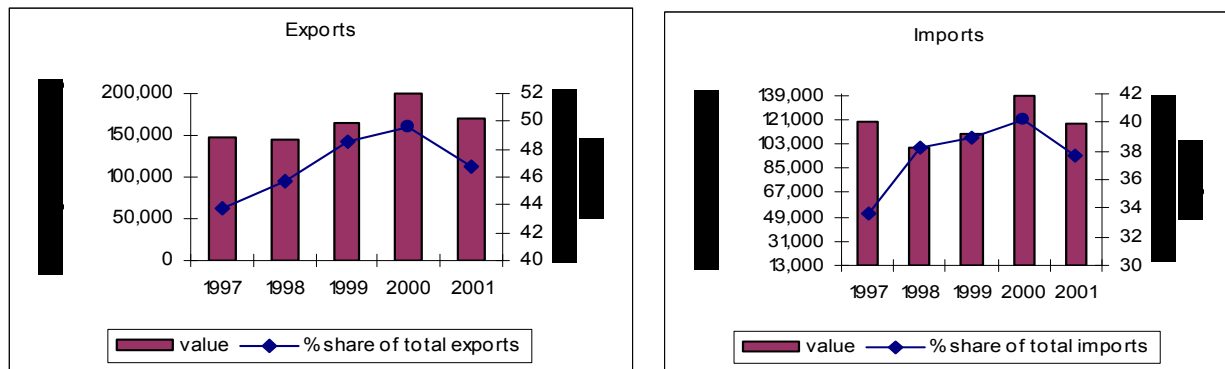
Structure and Pattern of Southeast Asian Trade in Electronics

Exports

The electronics industry is the largest foreign exchange earner for the ASEAN-5 member economies. Exports increased from USD148.7 billion in 1997 to USD200.8 billion in 2000. This represents 43.7 percent and almost 50 percent of the region's total exports, respectively (Figure 1). However, exports decreased to USD170 billion in 2001, or 46.7 percent of total exports, as result of the global downturn in the industry.

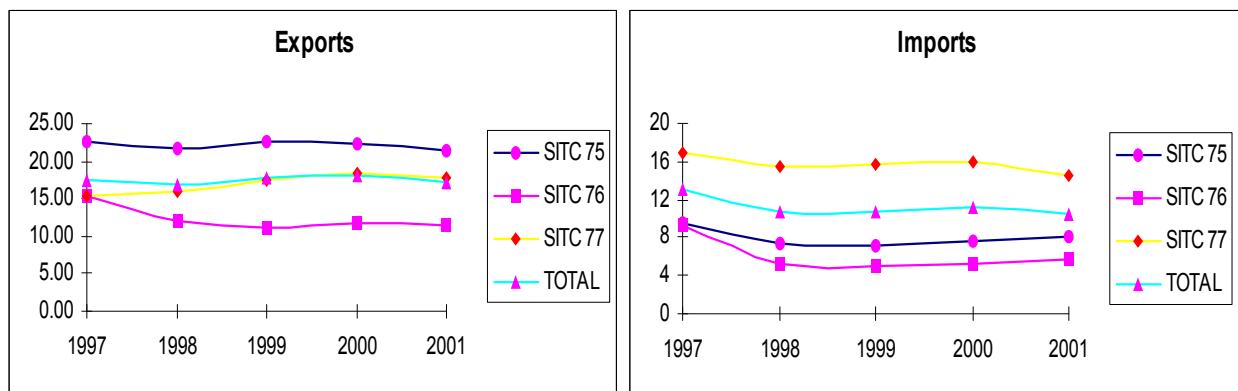
The region's market share in world exports of electronics is about 17.5 percent per year, on the average, during the period 1997-2001 (Figure 2). However, in terms of major products, the region accounted for about one-fifth of the world's exports of office machines and automatic data processing (SITC 75).

Figure 1. Exports and imports of electronics, ASEAN-5, 1997-2001.



Source of basic data: PC-TAS Database

Figure 2. Market share of ASEAN-5 in world exports and imports of electronics, 1997-2001.



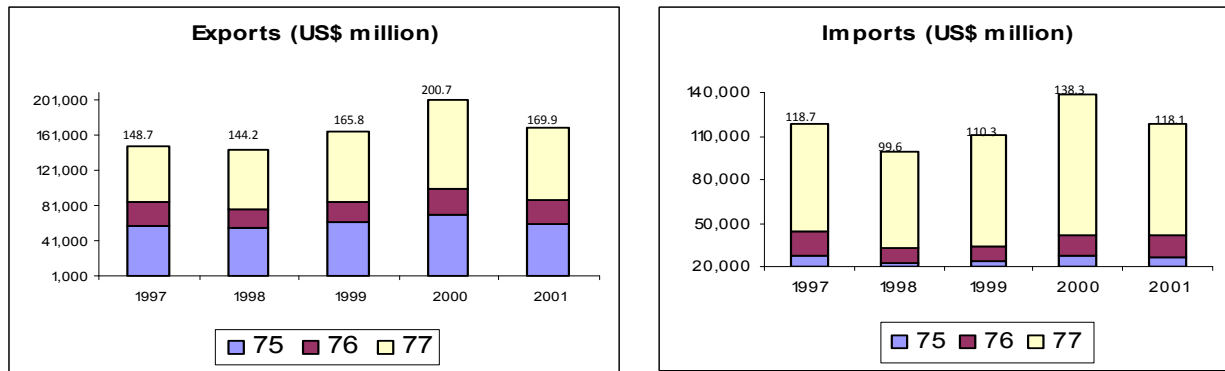
Source of basic data: PC-TAS Database

The bulk of the region's exports are electrical machinery, apparatus & appliances, n.e.s and electrical parts (SITC 77). These products accounted for about 47 percent of the region's total exports during the period 1997-2001 (Figure 3). It also registered the largest increase of 27

percent between 1997 and 2001. On the other hand, office machines & automatic data processing machines (SITC 75) contributed 37 percent per year of the industry’s exports. Telecommunications and sound recording & reproducing apparatus & equipment (SITC 76) contributed the smallest share of 16 percent.

Singapore contributed the largest share (43%) to the region’s exports of electronics during the period 1997-2001 (Figure 4). Indonesia contributed the least (3%). The importance of electronics is also reflected in the share of the industry in each member economy’s total exports. The industry accounted for the largest portion of the total exports of individual member economies, except for Indonesia (Figure 5). The largest was registered by the Philippines, with electronics contributing an average of 69.6 percent per year to the country’s total exports during the period 1997-2001.

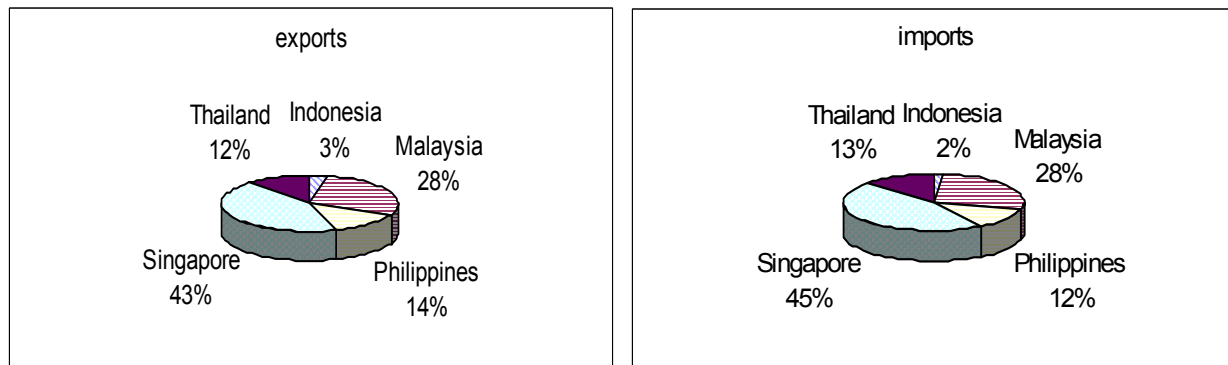
Figure 3. Exports and imports of electronics, by sector, ASEAN-5, 1997-2001.



Note: SITC 75 – Office machines & automatic data processing machines
 SITC 76 – Telecommunications & sound recording & reproducing apparatus & equipment
 SITC 77 – Electrical machinery, apparatus & appliances, n.e.s, and electrical parts

Source of basic data: PC-TAS Database

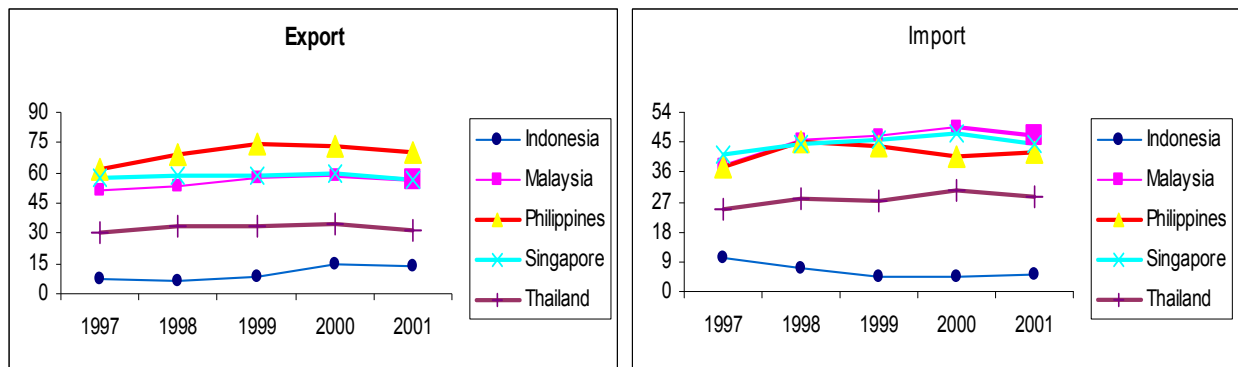
Figure 4. Distribution of exports and imports of electronics across the ASEAN-5, 1997-2001 (%).



Source of basic data: PC-TAS Database

The structure of exports of individual economies shows, however, that exports are highly concentrated to only a few products, as shown by the large percentage shares of the top three export products (Table 1). The high concentration implies specialization in production. But this is not surprising as product specialization is the true spirit of the production chain. The bulk of exports of Malaysia, Philippines and Singapore are electronic microcircuits (SITC 7764) while that of Thailand are parts, data processing machineries (SITC 7599). The high concentration of exports to a few products has been an issue for the case of the Philippines. Since the country relies on electronics for its major foreign exchange earnings, as discussed above, the high concentration to a few products is very risky as this makes the country highly vulnerable to the cyclical downturns of the industry (Austria, 2005b).

Figure 5. Percentage share of electronics in total exports and imports of member economies, ASEAN, 1997-2001 (%).



Source of basic data: PC-TAS Database

Imports

Imports of the ASEAN accounted for 11.3 percent of world imports of electronics (Figure 2). The region's imports suffered a decline during the financial crisis in 1998 and 1999 (Figure 1). From USD118.7 billion in 1997, it went down to USD110.3 billion in 1999. Given that the member economies are highly dependent on imported parts and components for their inputs, the substantial depreciation of their currencies caused by the crisis made it difficult for them to increase imports. Nonetheless, despite the crisis, the share of electronics in the region's total imports increased from 33.6 percent in 1997 to 40 percent in 2000 (Figure 1).

Singapore accounted for the largest share in the region's total imports, contributing an average of 45 percent per year, followed by Thailand at 28 percent (Figure 4).

The electronics industry also contributed the largest share in the total imports of member economies, except for Indonesia (Figure 5). This has some negative implications on individual economy's terms of trade. That is, while imports consist of high-value added parts and components, the industry's exports consist of low-value added final assemblies.

The structure of imports follows the same pattern as that of exports. Electrical machinery, apparatus & appliances, and electrical parts (SITC 77) accounted for two-thirds of the industry's

total imports (Figure 3). For individual member economies, the industry's imports are also highly concentrated on a few products. The top three import products of Malaysia and the Philippines accounted for an average annual share of 61 percent and 70 percent, respectively, for the period 1997-2001 (Table 2). Thailand's top three imports contributed 47 percent; and 25 percent for Singapore and Indonesia during the same period.

Table 1

Percentage Share of Top Three Export Products, Electronics, ASEAN-5, 1997-2001 (%)

SITC	Product Description	1997	1998	1999	2000	2001	Ave. Annual Share, 1997-2001
INDONESIA							
7599	Parts,data proc. etc.mch	16.45	21.38	21.46	10.98	11.72	16.40
7638	Sound,video recordng etc	21.06	14.00	10.19	8.69	10.46	12.88
7649	Parts,telecommun. equipt	7.32	9.64	13.41	14.56	15.20	12.03
	Total	44.83	45.01	45.06	34.24	37.37	41.30
MALAYSIA							
7599	Parts,data proc. etc.mch	13.24	16.10	21.62	22.95	17.56	18.30
7649	Parts,telecommun. equipt	5.79	4.66	3.32	3.30	3.18	4.05
7764	Electronic microcircuits	26.50	26.94	27.39	24.29	24.72	25.97
	Total	45.54	47.70	52.33	50.54	45.47	48.31
PHILIPPINES							
7526	Input or output units	13.96	11.74	11.92	14.31	2.05	10.79
7599	Parts,data proc. etc.mch	12.74	10.20	8.97	9.05	12.27	10.64
7764	Electronic microcircuits	48.57	57.58	59.46	53.88	49.03	53.70
	Total	75.26	79.52	80.35	77.23	63.35	75.14
SINGAPORE							
7527	Storage units,data proc.	20.35	20.87	18.83	15.31	16.24	18.32
7599	Parts,data proc. etc.mch	14.15	15.22	14.83	13.38	14.59	14.43
7764	Electronic microcircuits	21.82	23.44	25.91	32.45	31.75	27.07
	Total	56.32	59.53	59.57	61.14	62.59	59.83
THAILAND							
7526	Input or output units	7.66	8.16	5.63	5.96	7.48	6.98
7599	Parts,data proc. etc.mch	24.27	33.00	31.02	27.37	28.83	28.90
7764	Electronic microcircuits	11.24	9.92	12.45	16.54	15.54	13.14
	Total	43.18	51.08	49.10	49.87	51.85	49.01

Source of basic data: PC-TAS Database

Major Trading Partners

Given the trilateral nature of trade and investment linkages in the region, the major trading partners of the ASEAN are USA, EU, Japan, China, South Korea, and the individual economies themselves. Intra-ASEAN exports expanded from USD35.2 billion in 1997 to USD39.8 billion in 2001, representing almost 24 percent of the region's total exports for both

years (Table 3). On the other hand, intra-ASEAN imports increased from USD31.9 billion in 1997 to USD32.5 billion in 2001, representing 26.9 percent and 27.6 percent, respectively of the region's total imports during the same period.

While the USA remains the region's primary market for its exports, the share of the country has gone down (Table 3). The country's market share decreased from 27.3 percent in 1997 and 23 percent in 2001. Likewise, imports originating from the USA also decreased relative to the region's other trading partners.

Table 2

Percentage Share of Top Three Import Products, Electronics, ASEAN-5, 1997-2001

Product Description	1997	1998	1999	2000	2001	Average Annual Share, 1997-2001
INDONESIA						
7641 Line telephone etc.equip	17.27	9.23	2.88	8.17	7.52	9.01
7649 Parts,telecommun. equipt	13.59	9.27	7.91	5.87	8.89	9.10
7731 Insultd wire,etc.condctr	7.18	7.30	7.77	4.96	6.06	6.65
Total	38.04	25.80	18.56	18.99	22.47	24.77
MALAYSIA						
7599 Parts,data proc. etc.mch	11.72	9.44	8.25	8.60	8.43	9.29
7764 Electronic microcircuits	20.79	25.50	27.12	26.86	24.58	24.97
7768 Electr comp pts,crystals	24.76	28.05	28.85	26.85	26.43	26.99
Total	57.27	62.98	64.22	62.31	59.44	61.25
PHILIPPINES						
7599 Parts,data proc. etc.mch	15.60	19.10	15.33	15.86	21.92	17.56
7764 Electronic microcircuits	10.84	12.88	14.35	11.68	7.92	11.53
7768 Electr comp pts,crystals	37.95	41.09	46.33	41.95	38.74	41.21
Total	64.39	73.07	76.01	69.49	68.58	70.31
SINGAPORE						
7527 Storage units,data proc.	8.59	8.11	6.43	5.84	5.84	6.96
7599 Parts,data proc. etc.mch	16.13	16.88	17.10	15.22	16.73	16.41
7611 Colour televisn receiver	1.17	0.92	0.82	0.96	1.02	0.98
Total	25.89	25.90	24.35	22.02	23.58	24.35
THAILAND						
7599 Parts,data proc. etc.mch	16.74	15.03	15.39	16.38	15.51	15.81
7764 Electronic microcircuits	11.33	13.13	14.55	14.87	14.36	13.65
7768 Electr comp pts,crystals	14.83	17.53	18.76	20.15	16.64	17.58
Total	42.90	45.69	48.70	51.39	46.51	47.04

Source of basic data: PC-TAS Database

Three factors could help explain the declining role of the USA in the region's trade (Austria 2005b). *First*, most American electronic MNCs have established their subsidiaries in Southeast Asia and have made the region and the rest of East Asia as their production base and export platform. Thus, instead of shipping their products to the U.S. and then re-exports these to other countries, these MNCs now export directly from the region to their markets to the rest of

the world. *Second*, as second-tier suppliers in the production chain, the ASEAN economies are increasingly sourcing their parts and components from the NIEs, (first-tier suppliers). *Third*, Mexico and China have become significant trading partners of the USA. NAFTA, in which Mexico is a member, and the cheap export products from China could have displaced the ASEAN exports in the U.S. market. These two countries accounted for the bulk of U.S. imports of electronic products, with market shares reaching as high as 50 percent for certain products (Austria 2005b). This is in contrast to the meager share of individual ASEAN member economies in U.S. imports.

Table 3
Market Share in ASEAN-5 Exports and Imports of Electronics, By Major Trading Partners, 1997-2001 (%)

Year	Intra-ASEAN	China	Japan	South Korea	USA	Canada
Exports						
1997	23.65	1.17	9.59	1.85	27.31	0.59
1998	21.04	1.76	9.20	1.56	28.88	0.56
1999	22.13	1.99	9.35	2.57	26.91	0.61
2000	24.03	2.56	10.16	3.03	24.57	0.65
2001	23.42	3.46	10.82	3.26	22.98	0.52
Imports						
1997	26.91	3.11	21.51	5.14	19.65	0.45
1998	26.81	4.10	20.94	5.04	20.03	0.28
1999	27.62	4.52	20.51	6.07	18.96	0.23
2000	28.43	4.92	20.28	5.34	17.57	0.22
2001	27.55	6.67	18.81	5.14	16.96	0.19

Source of basic data: PC-TAS Database

Japan accounted for almost 10 percent of the region's total exports of electronics (Table 3). It went up from USD14.3 billion in 1997 to USD18,390 million in 2001, representing 9.6 percent and 10.8 percent of the industry's exports. Japan is also a major source of the region's imports, accounting for an average share of 20 percent per year for the period 1997-2001. The study by Ng and Yeats (2003) also shows that Japan supplies more than 50 percent of the member economies' imports of parts and component from East Asia.

China and South Korea are the region's emerging markets. The shares of these two countries have been increasing (Table 3). Exports to China increased more than three times, from USD1.7 billion in 1997 to USD5.9 billion in 2001 or 1.2 percent and 3.5 percent of the industry's exports, respectively. Imports from China also went up from USD3.7 billion in 1997 to USD7.9 billion in 2001, representing 3.1 percent and 6.7 percent of the industry's total imports. On the other hand, exports to South Korea increased from USD2.7 billion in 1997 to USD5.5 billion in 2001, representing 1.9 percent and 3.3 percent of the industry's exports,

respectively. Imports from South Korea, however, remained at 5 percent of the industry's total imports for the period 1997-2001.

In general, the analysis of the market shares of the region's major trading partners indicates an emerging trading pattern in which China, Japan and South Korea are more important as sources of imports than as market for exports of ASEAN member economies. This is shown by the shares of these three countries in ASEAN imports which are larger than their shares in ASEAN exports. The same can be said with intra-ASEAN trade. In contrast, the shares of the USA indicate that the country is more important as a market for the region's exports than as a source of the region's imports. This pattern also reflects the behavior of multinational companies (MNCs) in the region. That is, with the region as their production base, MNCs import parts and components from within the region and export their products to markets outside of the region.

Finally, the structure of ASEAN's trade with its major trading partners also shows the increasing importance of the electronics industry. The bulk of the region's exports to and imports from the EU and the USA are electronic products (Table 4). Intra-ASEAN trade is also dominated by electronic products. On the other hand, the share of the industry in the total exports to China, Japan and South Korea are increasing since 1993. From less than 4 percent in 1993, electronics products accounted for 37 percent of the region's exports to China. For Japan, it increased from 12 percent in 1993 to 37 percent in 2001; and for South Korea, it increased from 14 percent in 1993 to 42 percent in 2001. The same pattern of large increases since 1993 can be seen in the imports of the ASEAN from these three countries. This trading pattern in the region is a strong indication of the extent to which the global production networks are making an impact in the region's trade.

Balance of Trade

The electronics industry registered a trade surplus during the period 1997-2001 (Figure 6). From USD30 billion in 1997, the surplus steadily increased to USD62.5 billion in 2000; but suffered a setback in 2001, reaching only USD51.8 billion.

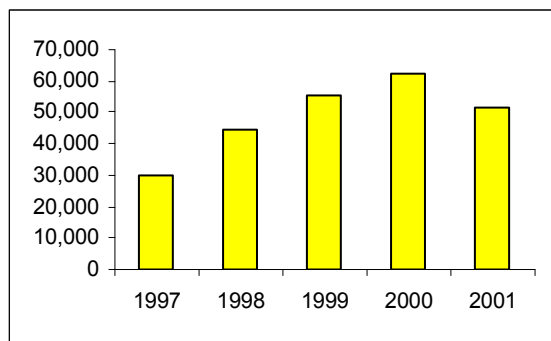
Table 4

Exports and Imports of Electronics, By Products and Major Trading Partner, ASEAN-5, 1993-2001

SITC	Commodities	ASEAN			EU			USA			China			Japan			South Korea			
		1993	1996	2001	1993	1996	2001	1993	1996	2001	1993	1996	2001	1993	1996	2001	1993	1996	2001	
EXPORTS																				
% Share in Total Exports																				
752	Automatic data processing	2.12	4.02	2.01	11.89	13.56	15.03	14.83	21.55	16.80			1.38	2.76	7.42	6.27	4.45	7.84	5.52	
759	Parts & accessories for office machines & automatic data processing	6.05	7.52	10.04	4.51	7.12	6.57	7.40	8.39	8.20			4.66	12.15	1.64	3.75	4.82	1.28	1.95	2.84
761	Tv receivers	1.27		1.39	2.78	1.56		1.43					1.04			1.85	1.06			
762	Radio broadcast receivers	0.96	0.85		4.10	2.71	1.91	3.29	2.30	1.50						0.89	1.06			
763	Sound & TV image records & reproducers	1.14	0.84		2.86	2.24	2.07	3.62	2.96	2.08						1.73	1.83			
764	Telecommunications equipment, NES & parts	5.38	5.46	5.98	3.05	3.19	3.43	4.76	4.83	5.42	3.58	1.43	4.22	1.78	2.67	3.20	1.80	1.69	3.68	
771	Electrical power machines & parts	1.17	1.22	1.12												0.96			1.20	
772	Electrical switcher relays, circuits, NES	2.52	3.10	3.83		1.51	2.06		1.37	2.89		1.16	3.58	0.90	0.90	1.81			1.10	
773	Eqpmnt for distributing elctrcity			0.94											1.12	1.08				
775	Household type electrical & non-electrical equipment NES															0.91			0.84	
776	Transistors, semiconductors devices, valves, etc.																			
778	Electrical machinery & apparatus, NES	9.54	16.55	16.13	8.52	12.24	23.15	12.98	14.99	15.14		2.89	11.68	5.27	9.45	13.19	6.04	10.65	25.10	
	Total Share	31.98	42.19	44.49	37.71	44.14	55.15	48.31	56.38	52.03	3.58	10.14	37.40	12.35	29.78	37.17	13.57	23.12	42.11	
	Value of Electronics Exports (US\$ Million)	13,967	34,163	37,137	11,838	20,714	30,960	20,294	33,557	32,088	162	758	9,450	3,824	12,848	17,920	838	2,185	6,194	
	Value of Exports of All Commodities (US Million)	43,680	80,974	83,464	31,390	46,926	56,139	42,008	59,516	61,676	4,530	7,474	25,267	30,952	43,149	48,216	6,176	9,450	14,709	
IMPORTS																				
751	Office machines												1.76							
752	Automatic data processing	3.05	5.02	5.75		1.23	3.63	3.34	3.36	2.68		1.90	4.24	1.93	1.44	1.63			1.12	
759	Parts & accessories for office machines & automatic data processing	5.83	7.71	8.22		1.37	2.65	3.49	5.76	5.34		3.74	10.41	2.42	2.10	4.98	2.04	1.50	2.02	
761	Tv receivers	1.63	0.95	0.82																
762	Radio broadcast receivers	1.99	0.83	1.01								1.29	1.64	2.25						
763	Sound & TV image records & reproducers	2.85		0.79									1.60							
764	Telecommunications equipment, NES & parts	6.18	4.40	3.81	3.87	5.67	7.17	3.09	3.26	1.99	2.58	5.69	9.46	5.53	4.06	3.45	3.88	2.97	10.46	
771	Electrical power machines & parts	1.28	1.42	1.38								1.81	2.49						1.45	
772	Electrical switcher relays, circuits, NES	3.32	3.20	3.34	3.0543	2.45	2.37	1.74	1.58	2.35		2.67	4.22	3.50	3.44	4.24	1.73	1.96	1.85	
773	Eqpmnt for distributing elctrcity	1.06		0.95		1.19							1.65							
775	Household type electrical & non-electrical equipment NES																			
776	Transistors, semiconductors devices, valves, etc.																			
778	Electrical machinery & apparatus, NES	11.47	16.26	19.10	4.64	7.64	15.73	17.20	20.34	26.6335		3.08	2.86	10.91	15.81	16.48	19.42	26.20	22.58	
	Total Electronics	40.65	42.25	47.64	13.19	21.14	33.27	30.21	35.83	40.7151	3.87	22.05	43.34	27.48	29.94	34.72	28.19	33.78	41.15	
	Value of Electronics Imports (US\$ Million)	15,756	27,131	31,076	4,198	12,130	13,159	10,186	18,996	18,551	168	2,032	8,578	15,308	21,949	18,376	2,015	4,491	5,373	
	Value of Imports of All Commodities (US Million)	38,763	64,212	65,231	31,824	57,378	39,558	33,713	53,014	45,563	4,336	9,217	19,793	55,704	73,309	52,931	7,148	13,295	13,058	

Source: ASEAN Statistical Yearbook 2003

Figure 6. Balance of trade in electronics, ASEAN-5, 1997-2001 (USD million).



Source of basic data: PC-TAS Database

Pattern of FDI in Electronics in Southeast Asia

The accumulated foreign direct investment in electronics reached USD35,722 million for the period 1995-2001 (Table 5). The share of the industry in total FDI in the region increased from 7.3 percent in 1995 to 27.3 percent in 2001, although there was a big drop in shares during the financial crisis period of 1997-1998. FDI in the region has not recovered yet from the 1996 pre-crisis level. Total FDI in 2001 was only 54 percent of the FDI in 1996. Except for the Philippines where the country's FDI in 2001 was 40 percent higher than the 1996 level, the other ASEAN-5 experienced a decline in FDI between 1996 and 2001. On the other hand, Vietnam registered a 132 percent growth in FDI between 2000 and 2001. Given the FDI-driven nature of the global production network, the high growth of FDI in Vietnam is facilitating the integration of the country in the region (Austria, 2004).

The attractiveness of electronics to FDI is manifested in the shares of the industry to the total FDI of individual members (Table 5). Electronics was the largest recipient of FDI in the Philippines, Malaysia and Thailand. This supports the FDI-driven nature of the industry and the role that these economies play in the production network. The FDI inflows are consistent with the increasing extent to which MNCs have located parts of their operations in these economies.

There was strong dependence on FDI from outside of the region, as shown by the less than 12 percent average share of intra-ASEAN FDI to the total FDI in the industry (Table 5). This was expected given that multinational companies from developed economies dominate the region's electronics industry. Among the member economies, intra-ASEAN FDI was most important to Indonesia. The country recorded the highest share of intra-ASEAN FDI to an economy's total FDI, i.e. average of 20 percent per year during the period 1995-2001. On the other hand, Laos, Myanmar and Brunei are relying for a greater part of their FDI from within the region, i.e. large share of intra-FDI.

Implications on Canada-ASEAN Trade and Investment

ASEAN exports of electronics to Canada increased from USD882 million in 1997 to USD1.305 billion in 2000; but decreased to USD882 million 2001 (Figure 7). The region's imports from Canada also continuously declined from USD539 million in 1997 to USD226 million in 2001. While the industry accounted for about 39 percent and 15 percent of the region's exports to and imports from Canada, respectively, during the period 1997-2001, Canada has remained an insignificant trading partner of the ASEAN. This is reflected in the less than 1 percent share of Canada in ASEAN's total exports and imports of electronics (Table 3).

Furthermore, Canada's share in total FDI (i.e. all sectors) inflows to the region is only 2 percent of the total during the period 1997-2001. Given the FDI-driven nature of the production chain, unless Canada will increase its FDI into the region, trade between the country and the ASEAN will remain small. A Canada-ASEAN Free Trade Area may provide the opportunity for trade and FDI between the two economies to increase.

Table 5

Foreign Direct Investment in Electronics, By Sector, By Country, 1995-2001

Year	Brunei	Cambodia	Indonesia	Laos	Malaysia	Myanmar	Philippines	Thailand	Viet Nam	ASEAN
Value (US\$Million)										
1995	0.00	0.73	1,080.73	0.00	1,109.11	0.00	60.54	1,436.14	0.00	3,687.24
1996	0.00	1.00	976.79	1.00	4,751.67	0.00	338.53	2,684.60	0.00	8,753.60
1997	0.23	0.00	778.88	0.99	1,958.88	8.66	1,682.33	949.05	0.00	5,379.01
1998	7.17	0.00	371.97	0.00	541.64	16.13	56.14	1,379.95	0.00	2,373.00
1999	1.00	0.00	454.19	0.00	1,801.36	1.45	866.91	1,455.65	0.00	4,580.54
2000	0.00	0.00	89.13	0.00	3,056.97	2.11	1,276.71	1,726.10	59.34	6,210.36
2001	0.00	50.00	425.78	0.50	2,555.15	0.00	474.11	1,095.71	137.73	4,738.97
Total	8.40	51.73	4,177.47	2.49	15,774.77	28.35	4,755.28	10,727.19	197.07	35,722.73
% Share in Total FDI (All Sectors)										
1995	-	0.81	4.03	-	18.52	-	1.55	10.39	-	7.28
1996	-	0.27	6.11	0.30	42.58	-	19.82	23.18	-	20.80
1997	0.91	-	3.40	11.31	25.39	4.83	55.83	13.91	-	13.09
1998	61.96	-	4.44	-	10.31	8.23	2.21	41.31	-	11.82
1999	5.09	-	6.58	-	43.51	5.37	35.97	42.02	-	26.70
2000	-	-	1.05	-	38.34	3.15	72.94	33.68	8.77	25.73
2001	-	61.94	8.28	3.04	41.92	-	69.83	27.63	10.38	27.32
% Share of Intra-ASEAN to Total FDI in Electronics										
1995	-	-	23.51	-	11.32	-	23.22	9.01	-	14.29
1996	-	-	17.57	-	26.66	-	14.96	1.09	-	17.35
1997	100.00	-	13.34	-	5.40	100.00	11.07	2.65	-	7.99
1998	0.83	-	22.13	-	8.89	39.55	-	5.30	-	8.85
1999	-	-	28.25	-	13.61	-	-	0.16	-	8.20
2000	-	-	28.89	-	15.60	-	15.44	9.00	4.48	13.81
2001	-	-	6.01	100.00	15.23	-	6.74	5.15	2.69	10.70
Average	50.42	-	19.95	100.00	13.82	69.78	14.28	4.62	3.58	11.60

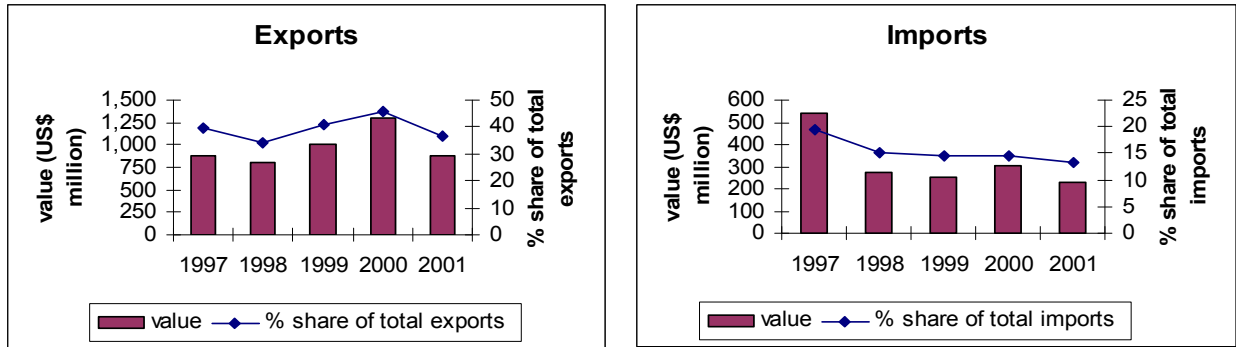
Note: Data for 2000 exclude Cambodia.

Singapore does not collect data on approval basis. Thus, its figures for FDI are not reflected.

Vietnam's data submission commenced from 2000.

Source: Statistics of Foreign Direct Investment in ASEAN, 2002 Edition.

Figure 7. Trade between Canada and ASEAN on electronics, 1997-2001.



Source of basic data: PC-TAS Database

Emerging Issues Affecting the Electronics Industry in Southeast Asia

There are three major issues currently affecting the electronics industry in Southeast Asia and the rest of East Asia namely, (i) the emergence of global contract manufacturers based in North America; (ii) the emergence of China as a priority investment target for electronics global production networks; and (iii) growing bilateral free trade areas (FTAs) and regional trading arrangements (RTAs).

On the first issue, since the mid-1990s, outsourcing through subcontracting gained a new dimension following the divestment strategies of OBM firms. Wanting to get rid of their low-margin manufacturing, lead firms sold a number of their overseas affiliates. Likewise, by way of streamlining the management of their outsourcing relationships, lead firms consolidated their contract manufacturing activities by giving a larger share of their activities to a smaller group of large and technologically sophisticated contract manufacturers that have global presence (Ernst 2004; Sturgeon and Lester 2004). In other words, lead firms now prefer to outsource some of the functions that are previously carried out in-house.

This strategy was first adopted by North American brand leaders (like Compaq, Dell, Hewlett-Packard, IBM, Motorola) but European (Ericsson, Philips, Siemens) and Japanese (NEC, Sony, Fujitsu) companies eventually followed (Ernst 2004). Large contract manufacturers seized the opportunity through acquisitions, capacity expansions and establishing their international operations, first in America and Europe and recently, in East Asia. The top five contract manufacturers or global suppliers are all based on North America – Celestica (Toronto, Canada), Flextronics (San Jose, California), Jabil Circuit (St. Petersburg, Florida), Sanmina/SCI (San Jose, California), and Solectron (Milpitas, California) (Sturgeon & Lester, 2004).

These global suppliers were chosen based on their capability to provide the new global sourcing requirements of lead firms in order to trim down costs. These include global support for product and component design, component sourcing, inventory management, testing, packaging, and logistics functions. Likewise, global suppliers are also considered by lead firms as less of a competitive threat compared to East Asian suppliers who are focused on eventually becoming a competitor in the product markets, as the experience during the past decade shows (Sturgeon & Lester, 2004). This is the reason why in recent years the lead firms have become less willing to outsource their inputs from the classic OEM/ODM firms.

The global suppliers therefore provide stiff competition to Southeast and Northeast Asian suppliers. Likewise, the shift in strategy of lead firms of becoming more dependent on global suppliers presents an important challenge to the ASEAN, China and India who would like to follow the supplier-industrial upgrading development path of the NIEs.

On the second issue, there is no doubt that China has emerged as the priority investment site of global production networks. Since the late 1990s, there has been a shift in network location away from the traditional export platform in Southeast Asia and toward China. Because

the electronics industry is highly sensitive to assembly costs, China has emerged to be the principal gainer in the export market for electronic products, particularly in telecommunication equipment, computers and disk drives (Wilson et al., 2003), while the ASEAN is slowly losing its comparative advantage in this segment of the production chain.

China is not only a provider of cheap labor but its recent attraction to global production network is attributed to other factors: (i) a booming market for information technology products and services; (ii) an unlimited supply of low-cost information technology skills who are involved in R&D; (iii) abundant land and a rapidly improving infrastructure; (iv) a massive rush of capital flows into China; (v) support policies by the government to rely on FDI for industrial upgrading (Ernst 2004).

It is also argued that the increase of investment in China is a consolidation of production in response to the increasing popularity of global suppliers (Sturgeon and Lester 2004). All these developments in China pose a serious challenge to the ASEAN and other developing economies wanting to participate in the global production networks as part of their development strategy. The less developed members of the ASEAN - Cambodia, Laos, Myanmar and Vietnam – (CLMV) appear to be at most risk in the immediate future since they are in danger of being ‘leapfrogged’ in the value chain (Wilson et al., 2003).

On the third issue, the growing regional trading arrangements (RTAs) and bilateral free trade areas (FTAs) in recent years have been affecting the location of FDI, not only in electronics but in other industries as well (Austria, 2005a). Lower barriers to trade and investment, reduced transaction costs, harmonized standards and legal norms, etc. characterize FTAs and RTAs. These factors increase the attractiveness of lead firms from the U.S., Japan and European economies to locate their subsidiaries or outsource their production in economies in which their own economies are linked through free trade agreements (Stein & Daude, 2001). Also, the rules of origin (ROO) in FTAs and RTAs encourage MNCs to locate in economies that belong to the same RTA/FTA as their source economies in order to overcome the ROO. The ROO determines how much domestic content a product must have to qualify as an internal product in a preferential trade agreement. In short, RTAs/FTAs in which the ASEAN are not members may displace ASEAN products.

Thus, economies in Southeast and Northeast Asia are now competing, as hosts to production network-related foreign investment, with other developing economies that belong to the same RTAs/FTAs as the U.S., Japan and European economies. A very good example of this is the North-American FTA (NAFTA) that gives Mexico an advantage for U.S. investment over other developing economies. Likewise, given the growing bilateral FTAs between individual economies in East Asia and the U.S. or Japan, these economies will find themselves competing with each other as location of GPN.

Conclusion and Future Directions

There is no doubt that the global production network of electronics multinational companies has made a significant impact on the growth and development of the ASEAN-5, particularly in international trade. The challenge facing Southeast Asia now is how to strengthen the region's position and remain competitive in the international production chain, given that multinational companies are constantly on the look-out for new markets, low cost assembly points, as well as parts and component suppliers that would strengthen their competitive position in the world market. Since MNCs are particularly concerned about systemic efficiencies in their entire global production chain, the challenge is how to make the entire set of ASEAN-10 membership cost efficient and more attractive as investment destinations and export markets (Austria, 2004). In other words, there must be no weak link in the entire chain if the region were to function as a production base for the MNCs. The CLMV and Brunei are the weakest link in the chain and this lessens the attractiveness of the region to the FDI-driven production networks.

While electronics are high-technology products, the role of region in the production network is highly concentrated to the labor-intensive assembly and testing segment of the production chain. This has given rise to exports that are highly import-dependent and hence, domestic value added is minimal. There are risks with continuing the existing pattern of production and trade. It involves the type of FDI that is highly mobile, i.e. footloose. Hence, cost advantages can be easily eroded and lost due to wage increases and the emergence of more attractive locations. Thus, unless the ASEAN undergo industrial upgrading, their prospects of staying in the value chain become weak.

Industrial upgrading will require moving up the ladder of the value chain from the low value-added, labor-intensive manufactures to high value-added original equipment manufacturing (OEM) and eventually, to original brand manufacturing (OBM). Industrial upgrading will accomplish two things (Austria, 2004). *First*, it will open opportunities for the CLMV and Brunei to join and be integrated in the production chain, first by undertaking the low value added, labor intensive stages and then learning how to move up the value chain. Unless the ASEAN-5 achieved the required shift in production, there will be no room for the CLMV and Brunei, given that their current comparative advantage lies in labor-intensive industries.

Second, it will increase the competitiveness of the ASEAN-5 vis-à-vis China. The latter has already overtaken ASEAN as a low cost production base and attractor to FDI; and hence, has become a competitor, both in their domestic and export markets (Wilson et al., 2003). Furthermore, given the low cost structure of China, its increasingly skilled workforce and the influx of technology and management skills associated with the large FDI inflows in the country in the 1990s, the country is better placed than the ASEAN-5 in finding complementarities in the value chain with the NIEs. China is integrating more successfully with the NIEs, as can be shown by the presence of companies from the NIEs in China.

Hence, the key strategy for the ASEAN-5 is not to compete with China but to find niches which are complementary to China in the value chain (Austria, 2004). With industrial upgrading, MNCs can locate their labor-intensive activities in China while maintaining their high-value production segment in the ASEAN.

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