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Assessing the Competitiveness of the Philippine IT Industry

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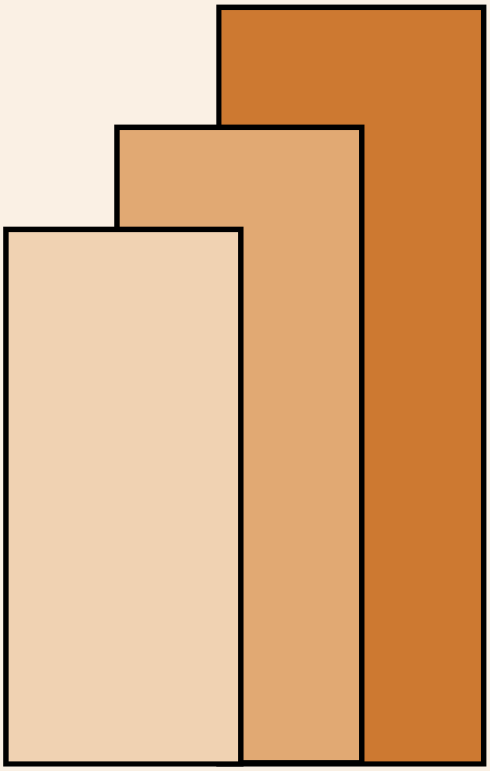

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Assessing the Competitiveness of the Philippine IT Industry

Abstract

This paper examines the competitiveness of the Philippine information technology (IT) industry vis-à-vis its emerging competitors and neighboring countries in the region. While the industry boasts of being the largest foreign exchange earner for the country, it suffers from structural weaknesses that unless addressed, its long-term competitiveness is at risk; more so that the country's competitors are increasing their stake in the world IT market much faster than the country. Infrastructural and institutional bottlenecks and the inadequacy of the educational system to meet the human resource requirements of the industry have remained a severe constraint to its long-term growth. With the accelerating global technology race, opportunities for the country to upgrade its competitive position have become much more difficult. Some cross-cutting strategies are identified to lessen or overcome such difficulties and keep the industry's present edge.

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Myrna S. Austria*

1. Introduction

The development experience of the past three decades has demonstrated the strategic role information technology (IT) has on the global economy. As an industry, IT has dominated world trade growth in the 1990s contributing to the rapid growth of exports. As a generic technology, it has also revolutionized production process by cutting costs and enhancing product quality and performance. The IT industry, particularly its semiconductors segment, has become essential in the development of virtually all other high tech industries, from toys to wrist watches, computers, cars, appliances, machines, and missiles, etc. Likewise, IT has also become an indispensable infrastructure in the 1990s having modernized traditional infrastructures such as transportation and communication. This gave birth to new competencies in meeting a wide array of specific service needs of consumers, industries, business and the government in response to and as demanded by the fast integration of the world economy.

The electronics[1] industry has catapulted Singapore, Hong Kong, South Korea and Taiwan to their status as the newly industrializing economies (NIEs). The electronics industry has steered the NIEs along the course of their export-led growth. The unprecedented growth experienced by these economies in the late 1980s to the 1990s became the envy of other developing economies. The exposure of these economies to IT started in the late 1970s to early 1980s when they became an integral part of the global production network of American and Japanese multinational companies that feed the global market with IT products, particularly semiconductors. Within a decade or so, they have developed their indigenous IT industry with their own brands and products. Soon each one became one of the largest global producers of key segments of the IT industry.

The Philippines, since the mid-1980s, also became an integral part of that global electronic production network. The semiconductor industry has topped the country's exports and has weathered the adverse effects of the recent financial crisis. Nonetheless, the country's participation in the global network is threatened by its limited local activity on assembly and testing level, part of the production chain that only adds low value to production.

The main objective of the paper is to assess the competitiveness of the Philippine IT industry and examine the factors affecting both its current and future development. The paper has five major sections. Section 2 presents an overview of

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[1] By definition, the only segment of the electronics industry that is not included in the IT industry is consumer electronics.

the international environment for the IT industry with a special focus on the experience of the NIEs and the lessons that other developing economies, like the Philippines, can learn from their success. Section 3 is a discussion of the development of the Philippine IT industry including the policies that helped shaped the industry and continues to affect the industry today. Section 4 is an assessment of the competitiveness of the Philippine IT industry vis-à-vis its major competitors. Section 5 presents an analysis of the issues confronting the Philippine IT industry and its future development. The paper concludes with a conclusion and recommendations for the Philippine IT industry for the 21st century.

2. The International Environment for the IT Industry

The IT industry covers both the manufacturing of IT products (computer hardware, telecommunication equipment, semiconductors) and the provision of IT services (computer software and services). Computer software refers to packaged software that have been designed and developed for certain applications that can be marketed as products. Computer services on the other hand refer to the provision of contract services rendered locally for offshore clients, or the assignment of manpower to the client's facilities.

Computer software and services became more in demand in the 1990s with the advent of networked computing and servers. The IT environment used to be dominated by mainframes in the 1970s and by desktops in the 1980s. However, in the 1990s, there was a major shift to a network architecture which is characterized by client-server computing and open networks, like the Internet (OECD, 1997). This new architecture gave birth to computer software and services as networking requires not only hardware but also software and firms that provide computing services.

The Information Technology Agreement

One significant agreement that greatly affects the IT industry is the *Information Technology Agreement (ITA)* forged during the Ministerial Conference of the WTO in Singapore in December 1996. Under the agreement, tariffs on information technology products would be reduced to zero through equal rate of reduction in a series of four steps: July 1997, January 1988, January 1999 and January 2000. However, extended staging of reduction until 2005 is also allowed under certain circumstances.

The ITA covers a wide range of product categories that include computer hardware and software, semiconductors, telecommunications equipment, electronic office equipment and manufacturing equipment particularly for use in semi-conductors production. Excluded from the agreement, however, are consumer electronics and about 5 percent of IT product lines (5-digit SITC). The latter is about 6 percent of IT exports (Table 1).

Significance of the agreement. The direct effect of the ITA would be an increase in trade in IT products, especially in high tariff countries, as the elimination of tariffs would make them cheaper. But cheaper IT products have profound and far-

reaching impacts on the economy. It reduces production cost as virtually all industries use IT products. It would also encourage the development of the information industry especially in less developing countries where information exchange has always been a problem. This would enable the information industry to provide cheaper products and services thereby making it more competitive. Above all, cheaper IT products and services would further increase diffusion of information technology in all sectors (business, industries, households and government) and considering the speed, accuracy and flexibility that this would bring to production process and information exchange, it would enhance productivity and efficiency leading to increased welfare.

Table 1. Share of products covered by ITA to total IT exports, 1991-1997 (percent)

Product	1991	1992	1993	1994	1995	1996	1997	Average
Computer hardware	32.2	31.7	31.4	30.2	30.3	30.3	32.3	31.2
Semiconductors	17.2	17.1	18.8	21.1	23.7	22.3	19.5	20.0
Telecommunications	12.3	12.9	13.5	13.6	12.2	13.5	14.4	13.2
Other IT products	32.3	32.1	30.1	29.0	28.0	28.4	28.6	29.8
Total	94.0	93.8	93.8	93.8	94.2	94.5	94.8	94.1

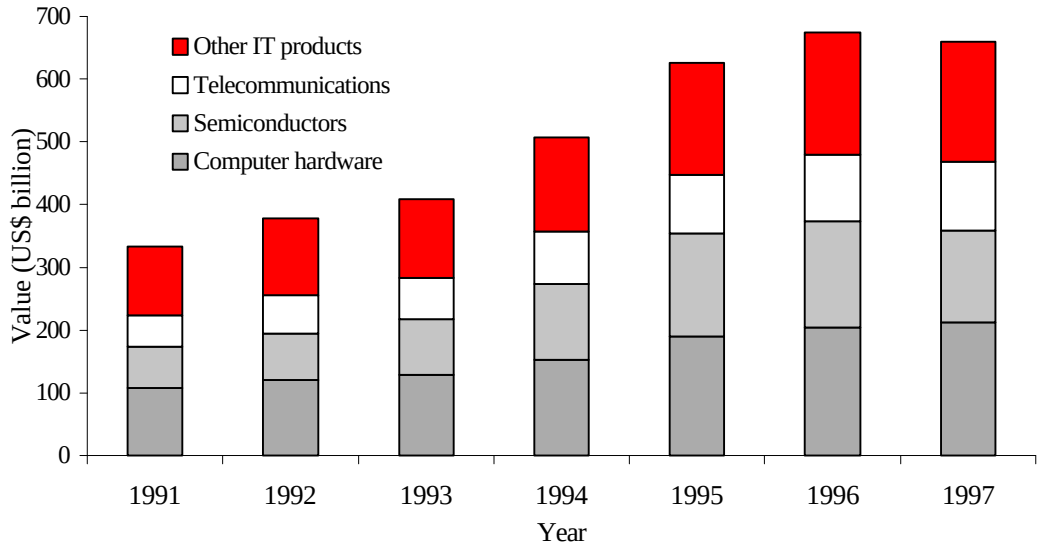
Source: PCTAS.

World Trade in IT

Exports. The value of world exports of IT went up from US$332.7 billion in 1991 to US$660.1 billion in 1997 (Figure 1), increasing its share to total world exports from 11.5 percent in 1991 to 15.5 percent in 1997 (Table 2). Exports of the industry are dominated by computer hardware (Table 3). The bulk of semiconductor exports are integrated circuits and micro-assemblies (SITC 7764) with an average share of 16 percent per year of total IT exports during the period 1991-1997 (Appendix Table 1). On the other hand, majority of exports of computer hardware is digital automatic data processing machines (SITC 7523 and 7526) with an average annual share of 10.8 percent of total IT exports during the same period. For telecommunication, the major export is telecommunication parts and accessories (SITC 7649) with an average share of 7.4 percent.

The industry registered an average real growth rate of 9.4 percent per year during the period 1991-1997 although high growth rates of more than 20 percent were registered in 1993-1994 and 1994-1995 (Table 4). The fastest growing exports are semiconductors and telecommunications with an average real growth of 11.3 percent and 11 percent, respectively, during the period 1991-1997. Despite the ITA, however, the industry's exports suffered a set back in 1997 as shown by the negative growth rates registered by all products, except computer hardware. The hardest hit was semiconductors due to the industry's regional restructuring attributable to technological innovations and changing market patterns (OECD, 1997). Because of this, the share of semiconductor to total IT exports has declined since 1996 (Table 3).

Figure 1. World exports of IT, by product, 1991-1997 (US$ billion)



Source: PCTAS

Table 2. Share of IT to total world exports, 1991-1997 (percent)

Code	1991	1992	1993	1994	1995	1996	1997	Average
Computer hardware	3.7	3.7	4.0	4.1	4.5	4.5	5.0	4.2
Semiconductors	2.3	2.3	2.7	3.2	3.9	3.7	3.4	3.1
Telecommunications	1.7	1.8	2.1	2.3	2.2	2.4	2.6	2.1
Other IT products	3.8	3.8	3.9	4.0	4.3	4.3	4.5	4.1
Total	11.5	11.5	12.6	13.7	15.0	14.9	15.5	13.5

Source: PCTAS.

Table 3. Structure of world IT exports, 1991-1997 (percent)

Year	Computer hardware	Semiconductors	Telecommunications	Other IT products	Total
1991	32.2	19.9	15.1	32.7	100.0
1992	31.7	19.9	15.8	32.6	100.0
1993	31.4	21.6	16.3	30.6	100.0
1994	30.2	23.7	16.6	29.5	100.0
1995	30.3	26.3	14.9	28.5	100.0
1996	30.3	24.9	15.8	28.9	100.0
1997	32.3	22.1	16.5	29.2	100.0
Average, 1991-1997	31.2	22.6	15.9	30.3	

Source: PCTAS

Table 4. Real growth rate of world IT exports, by product, 1991-1997 (percent)

Product	1991-92	1992-93	1993-94	1994-95	1995-96	1996-97	Average 1991-97
Computer hardware	9.1	4.4	16.1	20.9	5.4	2.2	9.5
Semiconductors	10.4	14.8	32.5	33.6	(0.0)	(15.0)	11.3
Telecommunications	15.7	8.4	23.6	7.6	12.1	(0.2)	11.0
Other IT products	10.4	(1.3)	16.8	16.0	7.1	(3.3)	7.3
Total	10.8	5.2	21.1	20.3	5.5	(4.0)	9.4

Source: PCTAS.

The OECD countries dominate the export market with an average share of 82 percent per year during the period 1991-1997 (Table 5). About 23 percent of total exports came from NAFTA and 62 percent from APEC. In terms of individual countries, Japan and the USA have remained the market leaders for IT although the share of Japan has been declining since 1994 due to the overall economic recession the country has been going through in recent years. There is some degree of product specialization by region, with the OECD accounting for 83 percent of the world's export of telecommunication; APEC, 77 percent of semiconductors; and NAFTA, 24 percent of computer hardware.

The market share of the ASEAN increased between 1991 and 1995 (Table 5) due largely to the increased investment and relocation of Japanese and American firms in the region as a result of the increase in wage rate in the NIEs. Since semiconductor is a major export of the ASEAN, the worldwide slowdown in semiconductor in 1996 and 1997 affected the share of the region in total IT exports. As shown in Table 4, the share of the region declined after 1995.

The ASEAN also has a relatively large share in semiconductors and computer hardware. In fact, the region has exceeded the market share of the US and Japan in semiconductors and of Japan in computer hardware. Although the share of the ASEAN in total IT exports went down in 1997, its share in these two products increased, albeit small.

The ASEAN also registered the highest average real growth rate of IT exports of 16.2 percent per year during the period 1991-1997 (Table 5). Except for telecommunications, the region also registered the highest growth rate in all the industry's major segments. All this signifies the expanding role of the ASEAN in the global IT industry.

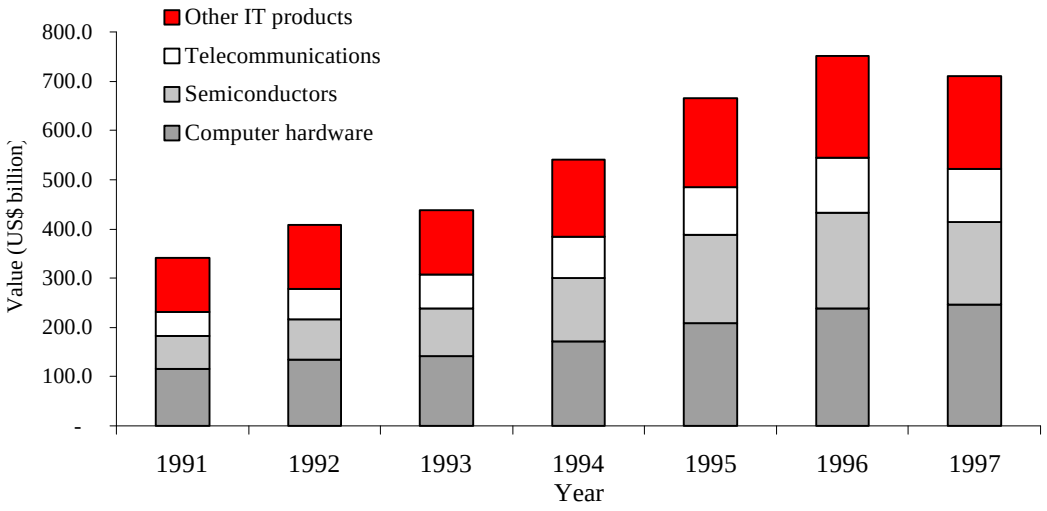
Imports. The total world IT imports increased from US$341.6 billion in 1991 to US$711 billion in 1997 (Figure 2), the bulk of which are computer hardware with an average share of 33 percent during the period (Table 6). The share of IT to total world imports in 1997 reached 16 percent from 11.2 percent in 1991 (Table 7). All the sub-sectors registered increasing share in world imports during the period, except for semiconductor which showed a declining trend in 1996 and 1997.

Table 5. Market share in and real growth rate of IT exports, by regional grouping, 1991-97 (percent)

Grouping	1991	1992	1993	1994	1995	1996	1997	Average share 1991-97	Average real growth rate (%) 1991-97
Japan									
Computer hardware	19.2	19.9	20.4	18.1	15.5	13.7	14.3	17.3	4.2
Semiconductors	20.6	21.3	23.2	23.4	23.5	20.2	22.1	22.0	12.7
Telecommunication	26.2	23.7	22.1	18.6	15.7	11.2	11.5	18.4	(3.3)
Other IT products	19.1	17.7	19.8	19.4	20.3	18.1	18.8	19.0	7.1
Total	20.5	20.1	21.1	19.8	19.0	16.2	16.9	19.1	5.9
USA									
Computer hardware	22.4	20.8	19.7	19.0	18.2	18.3	19.3	19.7	6.8
Semiconductors	19.8	18.1	18.1	17.4	16.0	16.2	22.4	18.3	13.7
Telecommunications	16.4	15.6	16.5	15.9	17.7	16.0	19.1	16.7	13.9
Other IT products	17.0	16.2	17.7	17.0	16.8	17.4	19.8	17.4	10.1
Total	19.2	18.0	18.2	17.5	17.1	17.2	20.1	18.2	10.3
NAFTA									
Computer hardware	25.6	24.2	23.2	23.1	22.5	22.6	24.2	23.6	8.4
Semiconductors	25.1	23.7	22.6	21.2	18.0	20.1	27.3	22.6	12.9
Telecommunication	19.5	20.9	22.2	21.7	24.1	22.4	27.0	22.5	17.2
Other IT products	19.3	20.9	22.7	22.5	22.3	23.0	26.4	22.4	13.1
Total	22.5	22.5	22.8	22.2	21.5	22.1	26.0	22.8	12.1
ASEAN									
Computer hardware	12.3	14.3	16.9	20.0	21.6	20.8	20.9	18.1	19.6
Semiconductors	19.9	19.3	20.7	22.6	24.3	24.5	24.7	22.3	15.4
Telecommunications	11.1	10.5	12.1	14.2	14.6	11.1	8.4	11.7	5.9
Other IT products	2.7	3.0	3.9	5.1	6.3	4.2	5.1	4.3	19.0
Total	10.5	11.0	13.0	15.2	16.9	15.4	15.1	13.9	16.2
APEC									
Computer hardware	59.9	63.6	65.8	66.3	65.3	64.1	63.5	64.1	10.6
Semiconductors	74.4	75.9	77.2	78.7	80.9	76.7	78.0	77.4	12.2
Telecommunications	60.7	63.9	65.9	64.2	64.7	54.5	53.5	61.1	8.7
Other IT products	43.5	46.5	51.5	52.5	54.9	50.6	54.3	50.6	11.4
Total	57.6	60.5	63.9	64.8	66.4	61.8	62.4	62.5	10.9
OECD									
Computer hardware			80.1	77.1	76.5	74.6	75.5	76.8	9.3
Semiconductors			78.3	76.7	77.0	73.5	77.0	76.5	10.3
Telecommunications			81.6	79.3	87.4	81.6	83.8	82.7	11.2
Other IT products			92.2	90.5	93.4	91.2	91.1	91.7	8.5
Total			83.7	81.3	83.1	80.2	81.8	82.0	9.5

Source: PCTAS.

Figure 2. World imports of IT, 1991-1997 (US$ billion)



Source: PCTAS.

Table 6. Structure of world IT imports, 1991-1997 (percent)

Year	Computer hardware	Semiconductors	Telecommunications	Other IT
1991	33.9	19.7	13.8	32.6
1992	33.0	20.2	14.7	32.1
1993	32.5	22.0	15.6	29.9
1994	31.6	23.9	15.7	28.9
1995	31.5	26.8	14.5	27.2
1996	31.9	25.7	14.8	27.6
1997	34.6	23.5	15.3	26.6
Average	32.7	23.1	14.9	29.3

Source: PCTAS.

The industry registered an average real growth rate of 10.3 percent per year during the period 1991-1997. Just like exports, the total imports of the industry registered a decline between 1996 and 1997, with semiconductors recording the highest fall (Table 8).

The main importers of IT are the OECD countries accounting for three-fourths of world IT imports (Table 9).

Table 7. Share of IT to total world imports, 1991-1997 (percent)

Product	1991	1992	1993	1994	1995	1996	1997	Average share (1991-97)
Computer hardware	3.8	3.8	4.2	4.4	4.8	4.9	5.5	4.5
Semiconductors	2.2	2.3	2.8	3.3	4.1	4.0	3.7	3.2
Telecommunications	1.5	1.7	2.0	2.2	2.2	2.3	2.4	2.1
Other IT products	3.7	3.7	3.8	4.0	4.2	4.2	4.2	4.0
Total	11.2	11.6	12.8	13.8	15.3	15.4	15.9	13.7

Source: PCTAS.

Table 8. Real growth rate of world IT imports, 1991-1997 (1990 prices)(percent)

Code	1991-92	1992-93	1993-94	1994-95	1995-96	1996-97	Average 1991-1997
Computer hardware	13.0	3.0	17.3	19.6	11.8	0.8	10.7
Semiconductors	18.9	14.1	30.8	34.7	5.9	(15.1)	13.6
Telecommunications	24.2	10.3	21.3	11.0	12.8	(3.9)	12.2
Other IT products	14.6	(2.6)	16.4	12.9	12.0	(10.5)	6.6
Total	16.3	4.5	20.6	19.9	10.4	(7.1)	10.3

Source: PCTAS.

Global Production Network: the Key to IT Industry's Success

The introduction of developing economies to the IT global production network is best explained by the *flying geese phenomenon*. It started in the early 1980s when multinational companies from Japan established their affiliates in developing countries in response to shortage in labor, surge in wage rates and the appreciation of the yen following the Plaza Accord in 1985. These factors lowered the price competitiveness in the world market of products produced from Japan. This forced Japan to go global in its production strategy by relocating its labor intensive industries to Asia to defend its export markets (DFAT, 1998; Austria, 1996). Soon, multinational companies from the US and Europe followed as part of their global strategy to remain competitive.

Table 9.Market share in IT imports, by regional grouping, 1991-97 (percent)

Grouping	1991	1992	1993	1994	1995	1996	1997	Average
Japan								
Computer hardware	4.6	4.3	4.6	5.1	7.3	7.7	7.4	5.9
Semiconductors	5.7	4.7	5.3	5.5	6.8	6.8	7.7	6.1
Telecommunications	4.5	3.4	3.8	4.5	5.8	6.1	5.7	4.8
Other It products	5.6	4.5	4.9	5.3	6.2	6.4	7.3	5.7
Total	5.1	4.3	4.7	5.2	6.7	6.9	7.2	5.7
USA								
Computer hardware	22.9	24.0	27.2	27.5	27.4	25.5	28.1	26.1
Semiconductors	24.9	22.8	24.0	23.4	24.5	21.4	25.0	23.7
Telecommunications	23.9	20.9	19.6	18.9	18.0	16.1	17.9	19.3
Other It products	15.7	14.6	16.7	17.0	16.9	16.0	19.5	16.6
Total	21.1	20.3	22.2	22.1	22.4	20.4	23.5	21.7
NAFTA								
Computer hardware	28.1	28.8	32.2	32.7	31.9	29.8	32.9	30.9
Semiconductors	31.9	30.6	31.2	30.4	31.3	28.1	33.4	31.0
Telecommunications	29.4	27.3	25.7	24.8	23.2	21.5	24.8	25.2
Other It products	21.3	21.4	24.2	24.5	23.9	22.8	28.3	23.8
Total	26.8	26.6	28.6	28.6	28.3	26.2	30.6	27.9
ASEAN								
Computer hardware	5.9	6.1	7.1	7.9	8.7	9.2	8.6	7.7
Semiconductors	21.0	18.9	21.9	20.3	26.2	25.3	21.3	22.1
Telecommunications	13.2	11.3	13.6	13.2	13.7	11.9	9.9	12.4
Other It products	8.0	7.7	9.1	9.9	12.9	11.8	9.7	9.9
Total	10.6	10.0	12.0	12.3	15.3	14.5	12.1	12.4
APEC								
Computer hardware	42.6	46.1	51.2	53.5	56.4	55.2	57.0	51.7
Semiconductors	66.1	69.7	73.5	68.6	78.9	75.1	74.8	72.4
Telecommunications	52.3	58.2	63.5	62.7	65.0	58.5	59.4	60.0
Other It products	40.2	45.2	52.4	54.1	58.1	55.5	56.2	51.7
Total	47.8	52.4	58.4	58.7	64.1	60.9	61.3	57.7
OECD								
Computer hardware			86.6	85.5	88.3	83.0	83.9	85.5
Semiconductors			68.6	66.2	68.1	64.7	68.8	67.3
Telecommunications			64.9	65.2	69.4	67.6	67.4	66.9
Other It products			77.2	76.6	80.1	75.4	77.7	77.4
Total			76.5	75.1	77.9	73.9	76.2	75.9

Source: PCTAS

One of the industries that benefited from the flying geese phenomenon was the electronics industry where part of the production process involves assembly and testing, both of which are labor intensive. To maintain their cost competitiveness, Japanese and US firms relocated their lower end processes and products to offshore production locations in Asia where labor is relatively cheap. Since an electronic product involves a thousand parts and components, production sites were developed around Asia where each site would specialize in the production of a particular part and component or sub-process. The selection of the location would depend on where each sub-process could be performed most efficiently or with the least cost.

The strategy resulted in the horizontal division of labor networks that links production sites, i.e. integrated production process in one or more production sites. The trend shows that more sophisticated electronic products are produced in the NIEs where they are provided with the technology to become original equipment manufacturer (OEM) suppliers. On the other hand, the relatively advanced ASEAN economies (Thailand and Malaysia) became the hosts of the production of standardized products and the labor abundant countries (Philippines, China and India) specialized in the assembly and testing of these products (Chia, 1995).

Although the availability of cheap labor in Asia was the initial force that triggered the creation of the global chain of production, what ultimately made it possible was the availability of fully equipped infrastructures for international transport and distribution and telecommunications (Mikami, 1998). The availability of such infrastructures has reduced the cost of producing in multiple locations. The continuing development in telecommunications, for example, has allowed firms to exchange information with overseas suppliers. Likewise, the delivery of parts and components which have short life cycle and hence, requires short time delivery between production sites, is made possible by the completely electronic system for simplified and rapid completion of customs procedures, such as the ports of Singapore and Hong Kong.

All this made possible the new organizational imperatives of just-in-time, total quality control, and continuous process improvement as pioneered by Japan and adopted by MNCs from the US and Europe as they are driven by global competition (Hanna, et.al., 1996). Under the new imperatives, the delivery of parts is coordinated to meet the immediate demands of production. This shortens the production life cycle and increase speed of response to changing market conditions thereby, enhancing further the competitiveness of multinational companies.

Lessons from the NIEs

The development experience of the NIEs during the past two decades has become the envy of most, if not all, developing countries. For these countries, the IT industry was the outgrowth of the local consumer electronics industry that flourished in the 1980s. Their private firms' experience in consumer electronics influenced the building of their IT capabilities.

In the 1990s, the NIEs have moved away from being sites for production of low cost OEM[2] supplies for developed countries/transnational corporations to being primary producers selling their own brand names (Sung Gul Hong, 1997; Hanna, et. al., 1996). Taiwan, for example, had no indigenous semiconductor manufacturing capability until the mid-1970s but it became a major supplier of computers and semiconductor devices in the world market by the mid-1990s. South Korea also did not have any semiconductor manufacturing capability up until the early 1980s; but the country is now the world's third largest producer of dynamic random access memories (DRAMs), an advanced semiconductor product. Singapore was into consumer electronic products in the mid-1960s. By mid-1980s, the country had become a major producer of computer equipment.

What lessons can be learned from the success of the NIEs? The NIEs have used diverse strategies to build their IT industries. Taiwan, for example, relied more on the government to initiate the development of IT as an industry while South Korea relied more on its conglomerates[3] (Sung Gul Hong, 1997). Singapore, on the other hand, concentrated more on providing the right environment, particularly in building world class infrastructures, to attract IT multinational companies. But they all have used similar frameworks, processes and institutions to implement their strategies. It should be emphasized that their success did not come overnight. It was the result of the cross cutting policies and strategies they adopted in the 1970s and 1980s.

- *Investment in select technical manpower training in the US and Japan* - Acknowledging that it has no technology nor the manpower to start its semiconductor industry, Taiwan invested heavily in sending people to technical training in US semiconductor firms, not just for any technology but for the particular technology it wants to acquire and develop. These people later became the core group in the developmental process of its semiconductor industry. They occupied key positions in research institutes and later also set up their own semiconductor companies.

  South Korea also adopted the same strategy by giving incentives to encourage people for training abroad. It sent scientists and engineers to industrial establishments, research institutes and universities in advanced countries to learn advanced technologies.

- *Investment in secondary and tertiary training* - Taiwan, South Korea and Singapore also invested and developed their secondary and tertiary educational institutions in such a way that the education of the graduates matches the needs of industries. This was made possible by involving industrialists in the design of science and technology education curriculum.

- *Vocational training institutes established* – Korea had the Vocational Training Law in 1966 and established public vocational training institutes. Korea provides incentives by requiring firms with more than 500 employees to provide six months

[2] Under OEM, a local firm makes a complete product according to the specification supplied by a foreign manufacturer which then sells under its own brand name.

[3] This is somewhat an exceptional case since Taiwan has practiced laissez-faire in most of its developmental period.

of training in approved schemes. Large firms also established their own training centers where they trained at least 10 percent of their workforce.

- *Incentives for "brain re-drain"* - Taiwan gave incentives to draw back the Chinese-Taiwanese who studied in the US in the 1960s and 1970s and later were employed in the Silicon Valley (Goh, 1996). This overseas resource of technical skills not only had scientific and engineering knowledge but also had production and management experience in US corporations. The Taiwanese government used the alumni networks to track these people and those who were selected were given incentives which include tax holidays and seed money to start ventures, or were offered well-paid jobs. Between 1950 and 1988, more than 19,000 skilled workers returned. Korea also gave incentives to encourage its overseas scientists to return from overseas. Between 1968 and 1989, about 1,000 scientists returned (Hanna, et. al., 1996).

- *Less reliance on foreign investment for technology transfer* - Foreign investment was essential during the initial stage as the NIEs became the assembly and packaging sites of overseas production strategy. Realizing that this left them with little technology transfer, they embarked on a different strategy that changed the nature of interaction between local and foreign companies (Ernst and O'Connor, 1992). Taiwan sent out invitation of bids for technology imports. For the successful bidders, Taiwan entered into technology transfer contract that often includes design and production capability transfer including information about product applications.

  Korea also relied on original equipment manufacturers (OEM) and technology licensing for technology acquisition. This would include agreements on outright production technology transfer or patent rights.

- *Establishment of specialized R&D institutes* - Research became imperative for the NIEs to developing new technology and products in order to upgrade their products and maintain their competitiveness without being dependent on foreign technology. Developing their technological capability, especially on product design, was their priority. This compelled them to establish research institutes that specialize on IT.

  Taiwan has the Industrial Technology Research Institute (ITRI) and the Electronic Research Service Organization (ERSO). ITRI undertakes applied research for the development of industrial technologies. On the other hand, ERSO, as the main research organization for the electronics industry, developed various semiconductor technologies and transfer them to the private sector for commercial production. All the research of these two organizations were funded by the government.

  Korea has several research institutes responsible for electronics research and promotion namely, the Korea Institute of Science and Technology, the National Industrial Research Institute and the Fine Instrument Center, the Korea Institute of Electronics Technology (KIET). The primary goal of the latter is to support R&D in high-tech areas.

Singapore has the Information Technology Institute, under the National Computer Board, responsible for its R&D. The research of the institute has led to advanced products sold internationally.

- *IT diffusion in the public sector* - The government played a major role in IT diffusion in the NIEs. They have used IT to modernize public administration. The strategy reduced transaction costs between government and business and improved the delivery of public services but at the same time, it created demand for IT products and services and hence, the growth and expansion of the IT industry.

  All the NIEs promoted public sector computerization. But Singapore is the most coherent and ambitious in its approach. In 1981, Singapore launched its civil service computerization program to facilitate business transactions with government. It developed strategic IT application system to promote "one-stop" service; and established information "utilities" for user communities such as health, education, law and commerce. Today, Singapore has *SingaporeOne* system which is a cyber network that interconnects every home, business, school, government agency and institution through an information network that provides a range of services to users without the need for them to leave their house or offices. Such services include on-line shopping and other e-commerce transactions, distance learning and other on-line courseware, videoconferencing, network gaming and other entertainment-on-demand services, Internet, and public sector services round the clock.

- *IT diffusion through the private sector* - The governments of the NIEs have also promoted IT diffusion in the private sector particularly the SMEs. This was accomplished by encouraging greater automation in factories. The government provided technical assistance for the computerization and technology systems for the SMEs. IT adoption has been recognized as essential to the success of the garment industry of Singapore and Hong Kong (Hanna, et. al., 1996).

- *Investment in infrastructure* – The NIEs also invested in world class key infrastructures, particularly in telecommunications and transportation, which became the target of IT-based modernization. The best example here is the port of Singapore. The availability of electronic system for simplified customs is a key factor for the efficiency and stability of international transport and distribution which is critical in the global production network strategy of multinational companies.

- *Support industries* – The availability of support industries was also a key factor that enabled the NIEs to establish a foothold in the global production network of multinational companies (Nagasaka, 1998). The availability of support industries reduced production cost and hence, increases price competitiveness. Local procurement of parts and components in the NIEs has reached 80 percent and 90-100 percent on some products.

3. The Development of the Philippine IT Industry

Compared to the NIEs, the IT industry of the Philippines is relatively young. Nevertheless, there is no doubt that the industry has developed into one of the fast growing and important industries of the country given its contribution to the economy particularly in maintaining a healthy balance of payments made possible by the dollar earnings generated from exports of the industry. Since the 1980s, electronics has been identified as one of the country's export winners. Today, the IT industry has become more than just an industry that produces output. It has become an enabling technology for the development of the country penetrating and linking businesses, industries, households, individuals and government as the country is taken by the information revolution.

There are approximately 518 IT firms in the country registered with the Board of Investment and the Philippine Export Processing Zone Authority, most of which are located in Metro Manila and in the export processing zones and industrial parks located in various part of the country (BETP, 1998)

The semiconductor industry is made up of two distinct groups of companies. The first group includes the Filipino-owned independent subcontractors led by the Conception Industries and Integrated Microelectronics. The second group includes the wholly-owned subsidiaries of foreign companies carrying out operations as part of their world wide production chain, like Intel and Texas Instruments.

The computer industry, on the other hand, is made up mostly of foreign-owned subsidiaries, local distributors, dealers, importers and traders of computer hardware and peripherals. Although there are over a hundred companies in the computer industry, less than 10 had a semblance of computer hardware manufacturing and/or computer component assembly work (BETP, 1998).

Domestic Policy Environment

A number of factors have changed the overall domestic policy environment in the country in the 1990s. There was a general policy of openness as shown by the lowering of tariffs and other trade barriers, expansion of areas (particularly services and infrastructure) opened for foreign investment; and foreign exchange deregulation. The country has strong macroeconomic fundamentals (low inflation rate and interest rate) which enabled the country to weather the financial crisis that hit the Asian region in 1997. Below are the policies that directly affect the country's IT industry.

Trade liberalization through the ITA. Under the ITA, the Philippines has committed to bind tariff rates to zero on 188 IT product lines by 2000, and 47 product lines by 2005. Most of the products committed to zero tariff rate by 2000 belong to the 10 percent tariff level in 1998. On the other hand, those committed to an extended staging of reduction until 2005 have tariff rates between 20 and 40 percent in 1998.

With tariff rates declining to zero, imports of IT products is expected to become cheaper and hence, exposes the domestic industry to greater competition and

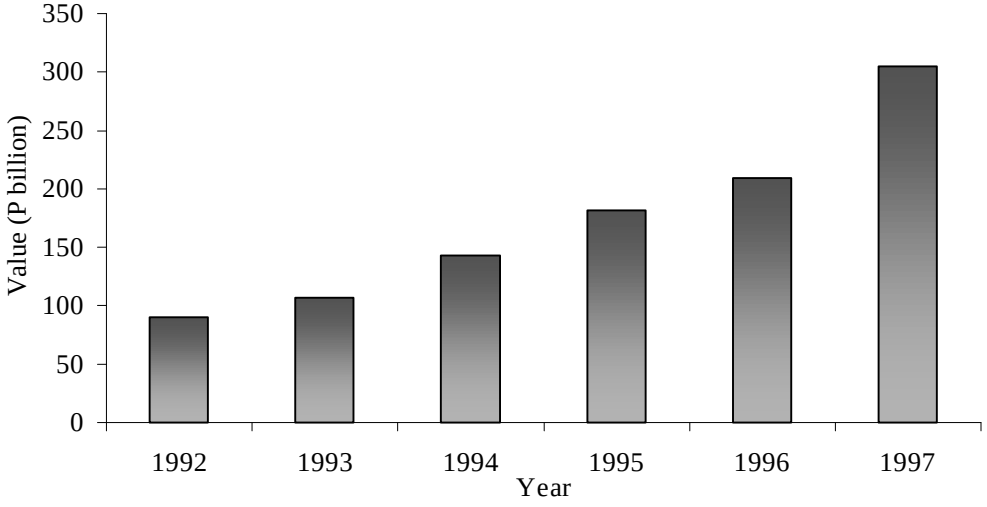
provides wide variety of product choices for the consumers. Nonetheless, greater competition promotes efficiency in the economy. Furthermore, while the country's exports will also be exposed to greater competition abroad, tariff reduction in other countries would mean greater market access for the country's IT products.

Deregulation of the telecommunication industry. Deregulation of the industry started with the issuance of Executive Order No. 59 in February 1993. The Executive Order called for the compulsory interconnection of all authorized telecommunication facilities, effectively abolishing the monopoly held by the Philippine Long Distance Company (PLDT) since 1928. In July of the same year, Executive Order 109 was also issued requiring all cellular mobiline telephone system and international gateway facility operators to install at least 400,000 and 300,000 new phone lines, respectively, within five years. As of the end of 1998, 78.7 percent of the total required telephone lines have been installed (NTC, 1998).

Non-trade barriers such as those related to standards and testing are expected to become easier with the Mutual Recognition Agreement (MRA) in telecommunication initiated by APEC. The initiative calls for the development of a framework and mechanism for testing and certification of telecommunications equipment in the APEC region. Since the country has no telecommunication equipment industry, it stands to benefit from the initiative if this materializes (Chua, 1998).

The deregulation of the industry created an environment conducive to growth and investments. New players entered promoting greater competition in the industry. Firms expanded their networks and introduced new technologies and services. All these resulted to a sharp increase in investment in the industry (Figure 3), the number of service providers (Table 10) and users (Figure 4). In short, this meant an increase in the demand for telecommunication equipment and products.

Figure 3. Investments in telecommunications, 1992-1997.



Source: 1998 NTC Annual Report.

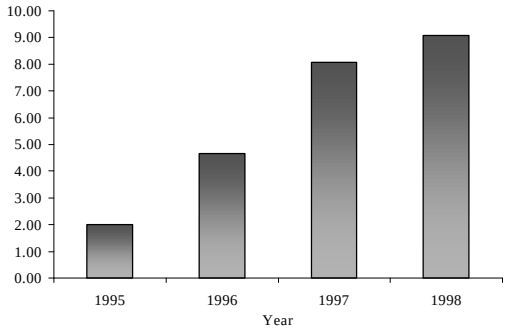
Table 10. Telecommunications industry structure, 1996-1998.

Telecom Service	1996	1997	1998
Local Exchange Carrier Service	74	76	76
Cellular Mobile Telephone Service	5	5	5
Paging Service	14	15	15
Public Trunk Repeater Service	10	10	10
International Gateway Facility	9	11	11
Satellite Service	3	3	3
International Record Carrier	5	5	5
Domestic Record Carrier	6	6	6
Very Small Aperture Terminal	3	4	4
Public Coastal Station	12	12	12
Radiotelephone	5	5	5
Value-added Service	27	47	70

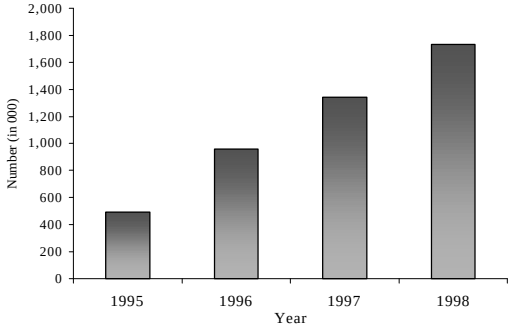
Source: 1998 NTC Annual Report.

Figure 4. IT users, 1995-1998

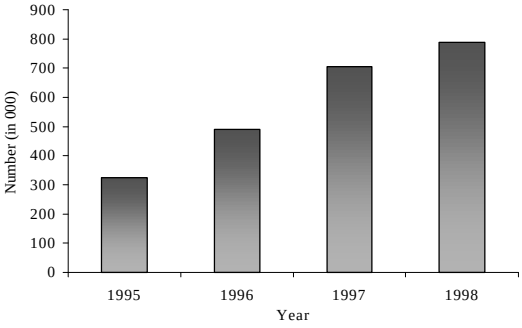
Telephone density, 1995-1998



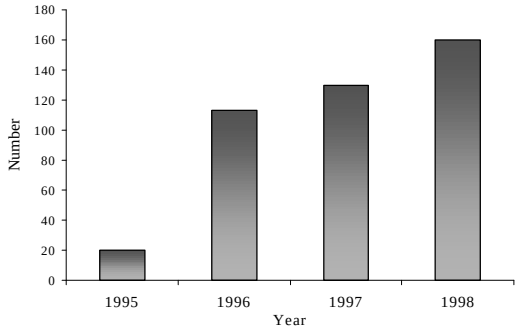
Cellular subscribers, 1995-1998



Radio paging subscibers, 1995-1998



Internet service provider, 1995-1998



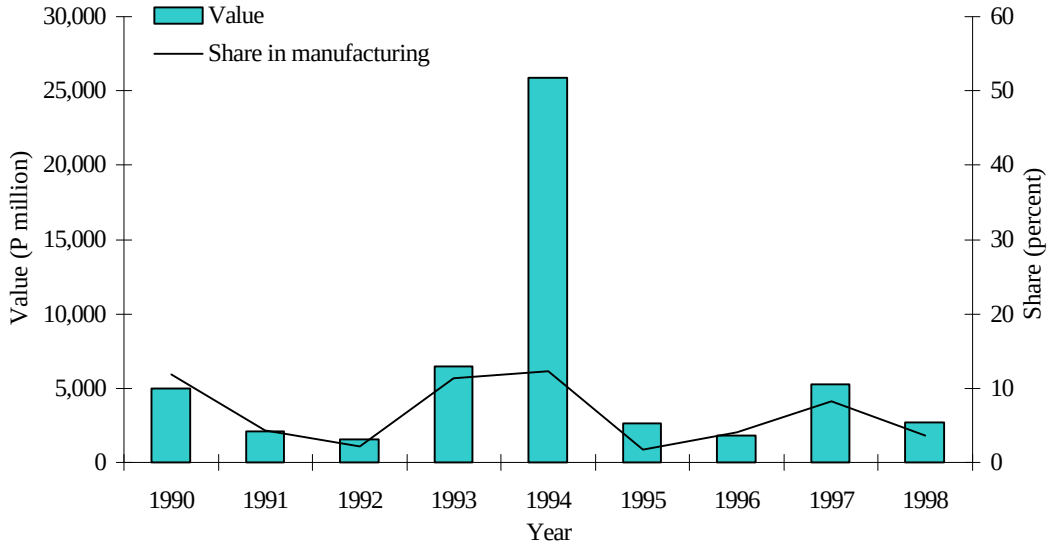
Source: 1998 NTC Annual Report.

Investment incentives. A comprehensive system of incentives exists for both domestic and foreign investment in the Philippines. The electronics industry, identified as an export winner, has always been included in the list of areas included in the country's Investment Priorities Plan (IPP). As such, enterprises in the industry are qualified for the incentive package under the 1987 Omnibus Investment Code (OIC) administered by the Board of Investment.

Incentives under the 1987 OIC include income tax holiday, tax and duty exemptions on imported capital equipment, tax credits on domestic capital equipment, and some non-fiscal incentives like simplified custom procedures, access to bonded warehouses and employment of foreign nationals in supervisory, technical or advisory positions.

The value of project costs approved by BOI for electrical and electronic products was highest in 1994 (Figure 5). The share of the sector to total BOI-approved project cost seems to follow a cyclical path. But overall, there has been a decline both in value and share. The value of investment in 1998 is only 52 percent of its level in 1997 and 54 percent in 1990.

Figure 5. BOI-approved project costs in electrical and electronic products, 1990-1998

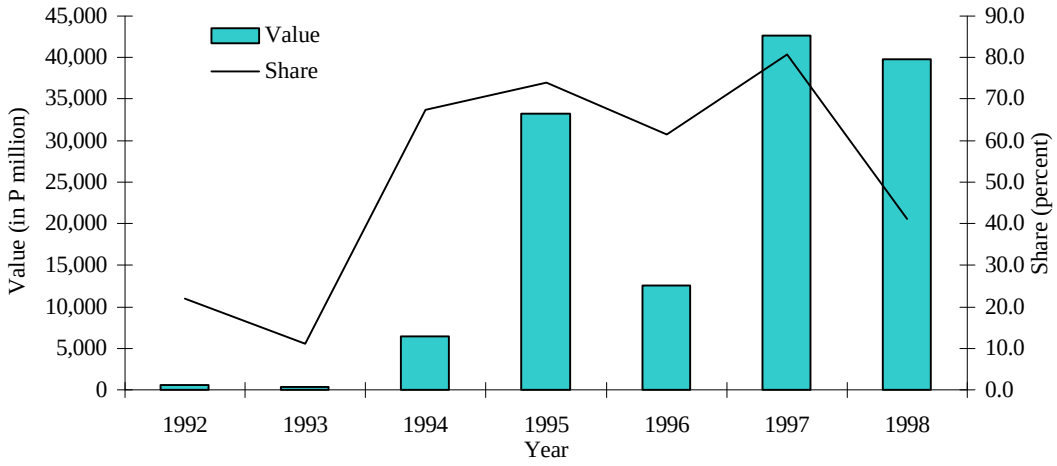


Source: BOI, DTI.

Establishment of export processing zones and technology parks. To promote industrialization in regions outside Metro Manila, the government promotes the establishment of export processing zones, industrial estates and free port zones. Firms operating in the zones and industrial estates enjoy an integrated package of incentives, streamlined government procedures, infrastructure services, good transport links to ports and airports, all of which are not available outside the zones. The incentives include duty-free import privileges and generous local taxation arrangements.

The zones played a key role in attracting foreign investment in the country, particularly for the electronics sector. About 51 percent of the investment in the zones during the period 1992-1998 went to electrical machinery, much of which are electronics (Figure 6). Nonetheless, the share of the industry declined in 1996 and 1998.

Figure 6. Investment in electrical machinery at the EPZ, 1992-1998



Source: EPZA.

Industry Performance

(1) IT Services

The Philippines is now known as the second largest producer of computer services in Asia, the first being India. Exports of the industry increased from only US$60 million in 1993 to US$250 million in 1997 or an average annual growth rate of 43 percent during the period (DTI, 1998). As will be shown later on, the growth is much higher than the growth of the country's exports of IT products. The US accounts for about 80 percent of the industry's exports. Recently, however, the industry is expanding its services to Japan, Middle East and the ASEAN.

The Y2K problem has opened a huge opportunity for the industry as more and more US and Japanese companies have used Manila as their major outsourcing center for software development, conversion, maintenance and other Y2K-related work. Most of these services are provided offshore.

One great comparative advantage of the industry is the capability of the country's IT professionals to provide high quality service at a lower price than their counterparts in the US or Europe.

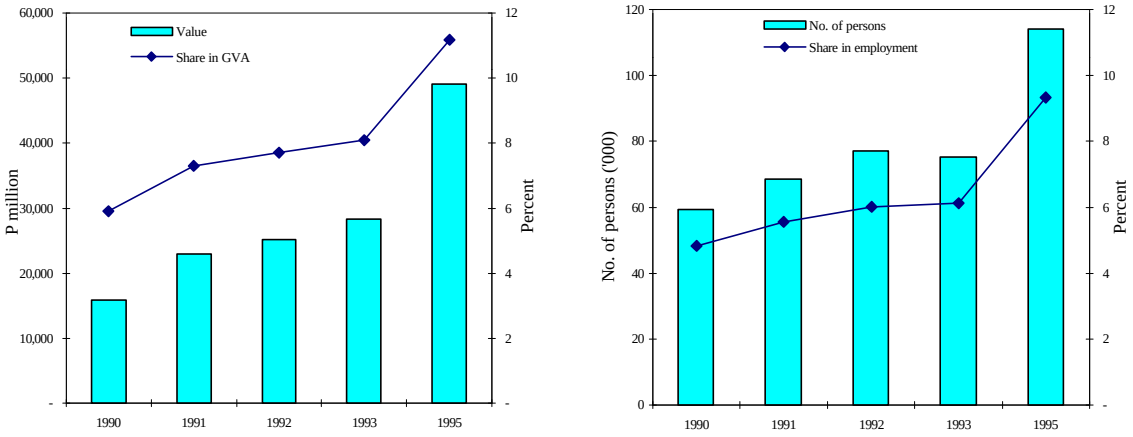
(2) IT products

Value added and employment. From only 6 percent in 1990, the share of the IT industry in manufacturing value added reached 11 percent in 1995 (Figure 7). The small contribution of the industry to value added is due to its dependence on imported

raw materials as will be discussed later. The industry is also an important source of employment, increasing its share from 59.4 thousand persons in 1990 to 114.1 thousand persons in 1995 or 5 percent and 9 percent, respectively, of manufacturing employment (Figure 7).

Productivity and factor intensity. While labor productivity in the industry at constant 1990 prices increased from P266.3 thousand in 1990 to P270.6 thousand in 1995, capital productivity deteriorated from P4.7 thousand to P2.2 thousand (Table 11). The declining capital productivity is a concern not only because capital is a scarce resource in the country but more so because the industry is becoming more and more capital intensive. The capital-labor ratio has been increasing from only P57.2 thousand in 1991 to P124.73 thousand in 1995. There is nothing wrong with becoming more capital-intensive so long as the increase in capital is accompanied by a much greater increase in output but this is not the case in the country's IT industry. During the period 1990-1995, output grew by 25.4 percent while capital expenditures grew by 33.2 percent.

Figure 7. Gross value added and employment of IT products, 1990-1995



Source: ASE, NSO; Philippine Statistical Yearbook, NSCB.

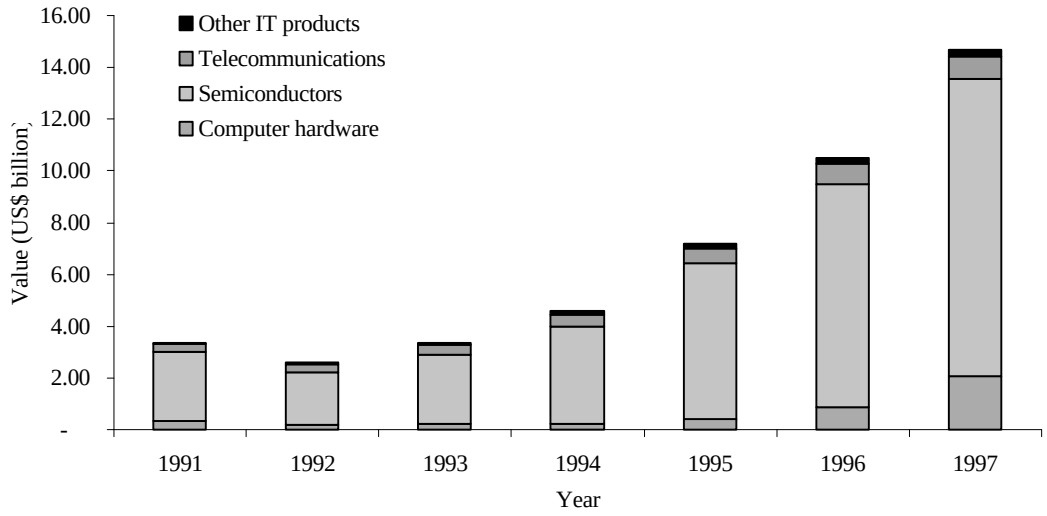
Table 11. Productivity and factor intensity of the Philippine IT industry, 1990-1997.

Year	Labor productivity (P'000, 1990 prices)	Capital productivity (P'000, 1990 prices)	Capital-labor Ratio (P'000)
1990	266.3	4.7	57.2
1991	288.5	5.0	57.3
1992	258.8	4.8	53.7
1993	280.8	3.3	84.4
1995	270.6	2.2	124.7

Source: ASE, NSO.

Exports. The IT industry boasts of being the largest foreign exchange earner for the country in the 1990s with the value of exports reaching US$14.7 billion in 1997 from US$3.4 billion in 1991 (Figure 8). Its share to total Philippine exports went up from 38 percent in 1991 to 58 percent in 1997 (Table 12). Exports of the industry is highly concentrated on semiconductors which accounted for an average share of 81 percent per year of total IT exports during the period 1991-1997 (Table 13). The global decline in semiconductor in 1996 and 1997 is also manifested in the decline in the share of semiconductor in the country's total IT exports. The industry also registered an average real growth rate of 25 percent per year during the same period and the growth is largely driven by the growth of computer hardware and other IT products (Table 14).

Figure 8. Philippine exports of IT products, 1991-1997 (US$ billion).



Source: PCTAS.

Table 12. Share of IT to total Philippine exports, 1991-1997 (percent)

Code	1991	1992	1993	1994	1995	1996	1997	Average
Computer hardware	3.7	2.0	1.9	1.8	2.5	4.2	8.2	3.5
Semiconductors	30.3	20.7	23.5	28.1	35.0	42.0	45.6	32.2
Telecommunications	3.5	3.1	3.4	3.7	3.3	3.9	3.3	3.5
Other IT products	0.5	0.4	0.6	1.0	1.1	1.0	1.2	0.8
Total	38.0	26.3	29.4	34.5	41.8	51.1	58.3	39.9

Source: PCTAS.

Table 13. Structure of Philippine IT export, 1991-1997 (percent)

Year	Computer hardware	Semiconductors	Telecommunications	Other IT products	Total
1991	9.8	79.8	9.2	1.2	100.0
1992	7.5	78.9	12.0	1.6	100.0
1993	6.4	80.0	11.6	2.0	100.0
1994	5.1	81.5	10.6	2.9	100.0
1995	6.0	83.6	7.9	2.5	100.0
1996	8.2	82.2	7.6	2.0	100.0
1997	14.1	78.2	5.7	2.0	100.0
Average share	8.2	80.6	9.2	2.0	100.0

Source: PCTAS

Table 14. Annual growth rate of Philippine IT exports, by product, 1991-1997 (1990 prices) (percent).

Year	Computer hardware	Semiconductors	Telecommunications	Other IT	Total
1991-92	(42.8)	(25.9)	(2.4)	(2.1)	(25.1)
1992-93	8.0	27.9	22.0	57.9	26.2
1993-94	5.9	36.7	22.8	92.8	34.2
1994-95	80.4	56.3	13.5	35.1	52.4
1995-96	95.3	40.6	37.6	14.1	43.0
1996-97	136.2	30.6	3.3	34.0	37.3
Average 1991-97	32.6	24.5	15.4	35.4	24.9

Source: PCTAS

A detailed analysis of the 5-digit SITC commodity composition of the industry's exports reveals the structural weaknesses of the industry. Exports are concentrated to only 11 products out of the 81 IT products exported by the country. Together, these products accounted for an average of 93 percent of total IT exports (Table 15). Of the 11 products, semiconductor products manufactured from materials imported on consignment basis (SITC 931-02.22)[4] accounted for the largest share of 54 percent of total IT exports.

The above finding confirms what is often said about the industry's high import content and its capability that is limited to the assembly and testing of imported parts and components. A World Bank study (1997) in fact shows that the average local content is only 20 percent in semiconductors, 25 percent in simple circuit products and even lower at 15 percent in more complex products. With the high import

[4] This includes SITC 931-02.21, 931-02.22, 931-02.23, 931-02.24 and 931-02.29

content, the growth of exports contributes much lesser to foreign exchange earnings than the numbers suggest, i.e. net foreign exchange earnings are far less than gross. The high import content also implies that the industry does not create direct forward and backward linkages to the economy.

Considering that assembly and testing belong to the lower segment of the IT production chain, the upper segment being product design and fabrication, the value added of the industry is very low, if not limited to mere labor. Furthermore, since assembly and testing do not require any sophisticated manufacturing technologies (Sung Gul Hong, 1997), technology transfer, which is often cited as one of the reasons for encouraging foreign companies to operate in the country, is minimal. This is a big contrast to the experience of the NIEs where, as discussed earlier, the local content was high and which added to the competitiveness of the IT industry of these countries.

The high concentration of IT exports to a few low value added products is very risky, especially more so that the country relies on the industry for its major dollar earnings. For one, it makes the country vulnerable to cyclical demand downturns. Second, there will always be competing locations for these types of products as the labor cost in the country becomes relatively more expensive as is already evident with its emerging competitors like China, Vietnam, India and even Mexico. But more importantly, the low level assembly characteristic of the IT industry is in itself a constraint for the industry to absorb new and more advanced technologies which is nowadays a critical factor to remaining competitive considering the rapid change of technology in the industry. Unless this is addressed, this would pose a severe constraint to the long-term growth of the industry.

The above concern has become more critical as the industry has yet to create its niche market. This is very evident in the country's average market share of only 1 percent per year during the period 1991-1997 (Table 16). But it should be highlighted, however, that despite the weaknesses of the industry, it has managed to capture an increasing share of the market, albeit in smaller proportion. The country's market share in computer hardware and telecommunications equipment has remained below 1 percent although this too is also on an increasing trend. Semiconductors, on the other hand, have increased its market share from 2.7 percent in 1992 to 8 percent in 1997.

Table 15.Major IT export products, Philippines, 1991-1997 (Share to total IT exports)

Code	Description	1991	1992	1993	1994	1995	1996	1997	Average
Computer hardware									
75260	Input or output units	4.9	6.8	5.6	3.9	2.7	4.5	11.4	5.7
75997	Parts and accessories of data processing machines	4.9	0.7	0.8	1.2	2.3	3.1	2.6	2.2
Semiconductors									
77632	Transistors with less 1W dissipation rate	1.2	1.3	1.0	1.6	1.7	1.8	1.5	1.5
77639	Other semiconductor devices	3.1	4.9	4.2	3.2	3.0	3.6	2.2	3.4
77641	Integrated circuits	1.3		0.0	0.0	5.3	11.0	10.1	4.0
77649	Electronic microassemblies	31.6	14.5	17.2	17.3	10.4	2.9	4.0	14.0
78433	Brakes and servo-brakes		0.9	1.0	1.6	1.2	1.2	1.2	1.0
93102	Materials imported on consignment basis for the manufacture of semiconductors and electrical equipment	37.7	54.0	54.3	56.0	60.6	59.7	56.9	54.2
Telecommunications									
76411	Telephone sets and videophones	0.8	1.9	1.8	2.1	1.9	3.6	3.3	2.2
76432	Transmission apparatus	3.4	5.5	5.2	4.2	2.7	1.2	1.0	3.3
76493	Aerial and antennae and parts used for radio telephony and radio telegraphy	2.6	1.8	1.8	2.0	1.8	1.5	0.7	1.7
	Total share	91.5	92.3	92.9	93.1	93.5	94.1	94.9	93.2

Source: PCTAS.

Table 16. Market share in IT exports, Philippines, by product, 1991-1997 (percent)

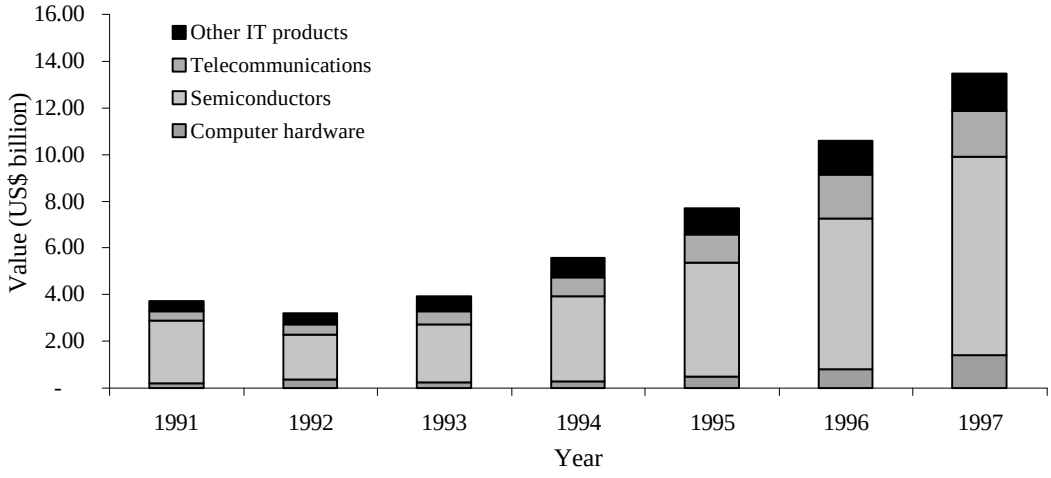
Product	1991	1992	1993	1994	1995	1996	1997	Average share 1991-1997
Computer hardware	0.3	0.2	0.2	0.2	0.2	0.4	1.0	0.3
Semiconductors	4.0	2.7	3.0	3.1	3.6	5.1	7.9	4.2
Telecommunications	0.6	0.5	0.6	0.6	0.6	0.7	0.8	0.6
Other IT products	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.1
Total	1.0	0.7	0.8	0.9	1.1	1.6	2.2	1.2

Source: PCTAS.

Imports. From US$3.7 billion in 1991, the country's imports of IT products reached US$13.5 billion in 1997 or an average real growth rate of 21 percent per year during the period (Figure 9). The share of IT to the country's total imports has been consistently increasing since 1991 reaching 35 percent in 1997 (Table 17). Majority of imports is accounted for by semiconductor (Table 18).

Like exports, import is highly concentrated to a few products. Semiconductor products imported on consignment basis (SITC 93102) formed the bulk of the country's imports accounting for an average share of 44 percent per year during 1991-1997 (Table 19). This is consistent with the finding above that IT exports is dominated by products manufactured from materials imported on consignment basis. The other products that accounted for more than 1 percent of imports are shown in Table 19 which, together with the products imported on consignment basis, accounted for about 82 percent of total imports.

Figure 9. Philippine imports of IT products, 1991-1997 (US$ billion)



Source: PCTAS.

Table 17. Share of IT to total Philippine imports, 1991-1997 (percent)

Code	1991	1992	1993	1994	1995	1996	1997	Average
Computer hardware	1.7	2.3	1.3	1.3	1.6	2.3	3.6	2.0
Semiconductors	20.9	12.6	13.2	16.0	17.2	18.7	22.1	17.2
Telecommunications	3.0	2.7	3.0	3.6	4.2	5.5	5.0	3.9
Other IT products	3.4	3.1	3.4	3.6	4.0	4.1	4.1	3.7
Total	29.0	20.7	20.9	24.4	27.0	30.6	34.9	26.8

Source: PCTAS.

Table 18. Structure of Philippine IT imports, 1991-1997 (percent)

Year	Computer hardware	Semiconductors	Telecommunications	Other IT products	Total
1991	5.8	72.2	10.2	11.8	100.0
1992	10.9	61.0	13.1	15.0	100.0
1993	6.1	63.2	14.6	16.1	100.0
1994	5.2	65.4	14.7	14.7	100.0
1995	6.1	63.7	15.5	14.7	100.0
1996	7.4	61.1	17.9	13.5	100.0
1997	10.4	63.3	14.4	11.9	100.0
Average share (1991-97)	7.4	64.3	14.4	14.0	100.0

Source: PCTAS.

The growth of IT imports is driven by computer hardware and telecommunications equipment (Table 20). In contrast to the declining growth of semiconductor, the growth of these two products has been increasing, except in 1996-1997 where imports of telecommunication equipment hardly grew. The sharp increase in the imports of telecommunication equipment is due to the deregulation of the telecommunication industry in 1993. Since the country does not have a telecommunication equipment manufacturing industry, it has to rely solely on imports. The effect of the deregulation in 1993 could be seen from the sharp increase in the growth rate of imports of telecommunications equipment of 32.6 percent in 1992-1993 as against 7.6 percent in 1991-1992 (Table 20). Imports of computer hardware are also rapidly increasing due to the increasing number of population using computers.

Table 19. Major IT import products, Philippines, 1991-1997 (percent) (Share to total IT imports)

Code	Description	1991	1992	1993	1994	1995	1996	1997	Average
Computer hardware									
75260	Input or output units	0.8	4.7	1.6	1.3	1.2	1.3	0.8	1.7
75997	Parts and accessories of data processing machines	4.2	5.5	3.6	3.2	3.9	5.2	8.8	4.9
Semiconductors									
77641	Integrated circuits	1.5	0.7	1.0	0.9	1.2	0.8	2.1	1.2
77649	Electronic microassemblies	2.0	2.3	1.5	1.1	1.0	1.0	2.7	1.7
77689	Parts of electronic integrated circuits and microassemblies	28.9	11.4	12.3	12.3	9.5	8.1	14.0	13.8
93102	Materials imported on consignment basis for the manufacture of semiconductors and electrical equipment	32.4	43.8	46.2	48.8	49.1	48.4	40.2	44.1
Telecommunications									
76415	Telephonic or telegraphic switching apparatus	1.7	1.6	2.3	3.7	3.0	2.9	2.3	2.5
76431	Transmission apparatus other than for radio-broadcasting or television	0.9	1.5	1.9	1.8	3.0	2.5	2.3	2.0
76491	Parts of electrical apparatus for line telephony or telegraphy	2.0	3.6	2.5	2.4	2.4	4.4	4.7	3.2
76493	Aerials or antennae and parts used for radio telephony and radio telegraphy	3.5	4.4	5.5	4.3	4.3	5.4	3.3	4.4
Other IT products									
77259	Connection and contact elements for wires and cables	1.9	1.8	1.5	1.5	1.3	0.9	0.8	1.4
77314	Electronic conductors	0.6	1.4	1.3	1.3	1.1	0.9	0.7	1.0
	Total share	80.3	82.8	81.2	82.7	81.0	81.8	82.8	81.8

Source: PCTAS.

Table 20. Annual growth rate of Philippine IT imports, 1991-1997 (percent)

Year	Computer hardware	Semiconductors	Telecommunications	Other IT products	Total IT
1991-92	56.9	(29.5)	7.6	5.5	(16.5)
1992-93	(33.1)	23.7	32.6	28.5	19.4
1993-94	19.0	43.5	39.4	26.7	38.7
1994-95	57.1	31.4	42.6	34.3	34.9
1995-96	65.1	29.2	55.3	24.5	34.7
1996-97	72.6	29.2	0.6	9.0	24.6
1991-97	33.2	18.3	28.2	21.0	20.9

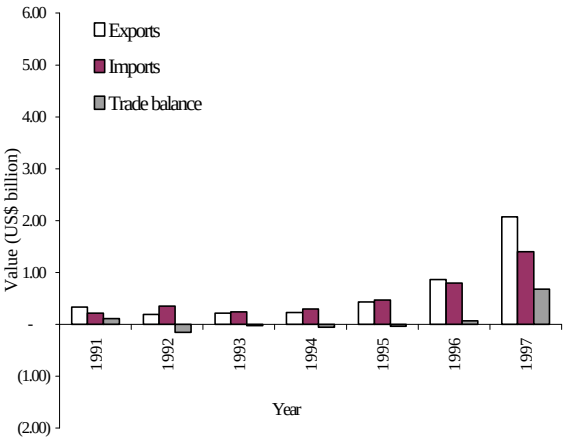
Source: PCTAS.

Trade Balance. Only in 1997 did the IT industry registered a trade surplus (US$1.2 billion) (Figure 10). In terms of major IT segments, computer hardware registered a trade surplus in 1991, 1996 and 1997. Semiconductors has been a consistent *net* foreign exchange earner since 1992. Since the country has no telecommunication manufacturing industry, the industry is always on a trade deficit, as expected.

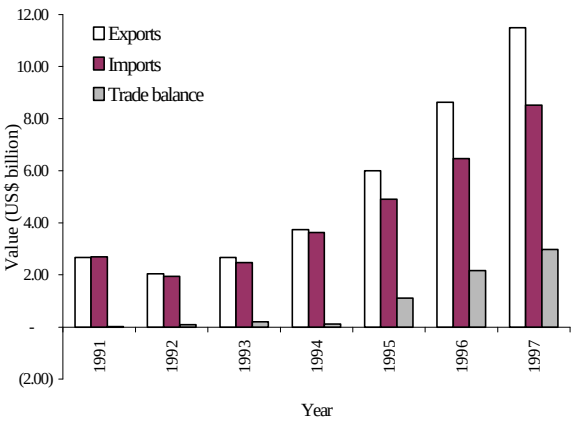
A more detailed analysis of 5-digit SITC products reveals that there are a few IT products which are net foreign exchange earners since 1991. These include input or output units whether or not containing units in the same housing (SITC 75260), diodes, other than photosensitive or light emitting (SITC 77631), transistors with dissipation rate of less than 1 W (SITC 77632), other semiconductor devices (SITC 77639), digital monolithic integrated circuits (SITC 77641), electronic micro-assemblies (SITC 77649), brakes and servo-brakes (SITC 78433), materials imported on consignment basis for the manufacture of semiconductors (SITC 91302), line telephone sets with cordless handsets (SITC 76411), transmission apparatus (SITC 76432), radar and remote control apparatus (SITC 76483), line telephone handsets (SITC 76424), other inductors for power supplies for automatic data processing machines (SITC 77125) and other fixed resistors for power handling capacity (SITC 77232) (Appendix Table 2). The reasons for the favorable trade performance of these products will be discussed in Section 5 of the paper.

Figure 10. Trade balance, Philippine IT, 1991-1997 (US$ billion)

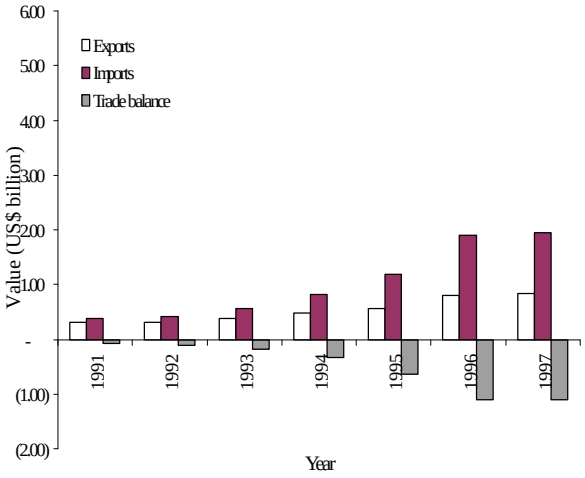
Computer hardware



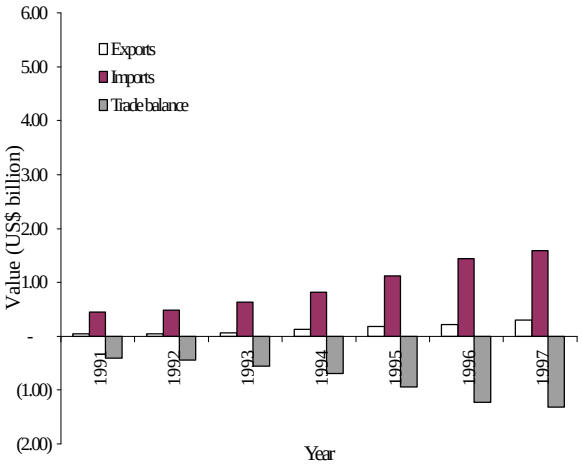
Semiconductors



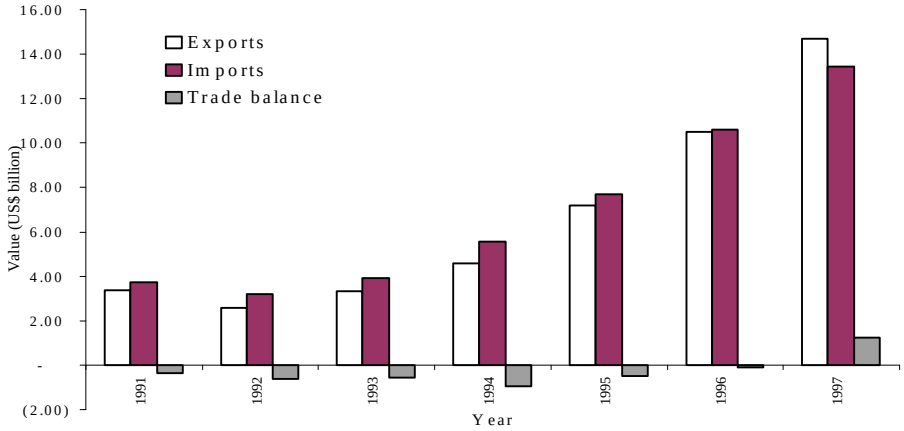
Telecommunications Equipment



Other IT products



Total IT



Source: PCTAS.

4. Assessment of the Competitiveness of the Philippine IT Industry

The competitiveness of the Philippine IT industry in the world market is the key to its sustained growth in the next millenium. This section of the paper discusses how the country's IT industry compares with those of its competitors in the region.

Among its neighboring countries in the region, the Philippines is the *only* country where the IT industry is highly concentrated to just *one* major IT segment, i.e. in semiconductors (Table 21). The other countries have two or three: Malaysia has semiconductors and computer hardware and so are Thailand and Singapore. Indonesia has telecommunication equipment, computer hardware and other IT products and so is China; Mexico has computer hardware and other IT products. Hong Kong has the best structure where its exports are fairly distributed among the four major IT segments.

Table 21. Structure of IT exports, selected countries, 1991-1997 (percent)

Country	Computer hardware	Semiconductors	Telecommunications	Other IT products	Total IT
Philippines	8.2	80.6	9.2	2.0	100.0
Indonesia	25.2	12.1	39.0	23.7	100.0
Malaysia	24.5	54.4	18.5	2.7	100.0
Thailand	44.0	29.0	14.2	12.9	100.0
Singapore	49.1	29.6	12.2	9.1	100.0
South Korea	19.2	52.0	14.6	14.3	100.0
Hongkong	23.8	34.4	20.7	21.2	100.0
China	25.5	9.7	29.8	35.0	100.0
Mexico	23.5	13.4	19.5	43.6	100.0

Note: Data are not available for the following:
Malaysia and Korea - 1997;China and Hongkong - 1991; Thailand -1996

Source: PCTAS.

The disadvantages with a high level of concentration of exports on a few products have been pointed out earlier in Section 2 of the paper. The high level of concentration on one product would not be a problem for exporting so long as the demand for that product is growing (WB, 1997). However, as will be discussed later in the section, this is not so for the case of the Philippines. A detailed analysis of the 5-digit SITC composition of IT exports shows that much of the exports of the country are generated by products which are experiencing a decline in world demand relative to other commodities/goods in the world market. From Table 21, one may argue that the structure of exports of the country is quite similar to South Korea and Malaysia, i.e. semiconductors accounted for the highest share of IT export in these countries. Nonetheless, semiconductors from these countries are dominated by domestic firms and have high domestic value added in contrast to the Philippines.

The implications of this weakness of the country's IT industry becomes more serious because of the country's high dependence on IT for its export earnings, again

in contrast to its neighbors, except for Singapore (Table 22). This implies that exports of the country as a whole is highly vulnerable to the global situation of the IT industry, unlike the other countries where they have other products aside from IT to rely on for their exports when the global market for IT products becomes unfavorable to them.

Table 22. Share of IT to country's total exports, selected countries, 1991-1997 (percent)

Country	1991	1992	1993	1994	1995	1996	1997	Average
Philippines	38.0	26.3	29.4	34.5	41.8	51.1	58.3	39.9
Indonesia	0.7	1.4	1.5	2.7	3.0	4.2	3.9	2.5
Malaysia	22.8	24.2	27.4	30.1	33.3	37.2		29.2
Thailand	14.9	16.2	16.8	19.1	20.7		22.1	18.3
Singapore	31.5	43.6	39.2	51.6	50.3	52.7	53.0	46.0
South Korea	17.4	18.4	18.7	21.1	24.1	23.3		20.5
Hongkong		21.5	22.1	22.3	23.6	22.6	22.1	22.4
China		5.6	6.5	8.0	9.6	10.9	11.7	8.7
Mexico	4.8	14.9	15.1	16.8	16.3	16.3	18.3	14.6

Note: Data are not available for the following:
Malaysia and Korea - 1997;China and Hongkong - 1991; Thailand -1996

Source: PCTAS.

Measures of Competitiveness

Two measures of competitiveness are used here: (i) success in expanding world market shares and (ii) revealed comparative advantage (RCA). The latter is measured as the ratio of a product's share in a country's exports and the product's share in world trade[5]. A ratio of greater than 1 indicates that a country has a comparative advantage in that product while a ratio of less than 1 indicates the opposite.

Market Share. While the share of the country in the world exports of IT is increasing, it remains a small player in the world market. Nevertheless, the country managed to increase its market share better than Thailand and Indonesia (Table 23). Among the major IT segments, the country's improvement in its market share was highest in semiconductors.

There are a few 5-digit SITC products for which the country's share improved markedly between 1991 and 1997. This includes other electronic integrated circuits and microassemblies (SITC 77649-16%), transistors (SITC 77632-6%), digital monolithic integrated units (SITC 77641-2%), brakes and servo-brakes (SITC 78433-2%), input or output units, whether or not containing storage units in the same housing (SITC 7526-4%), telephone sets (SITC 76411-8%), line telephone handset

[5] $RCA_{ij} = (x_{ij}/X_{ij}) / (X_{iw}/X_{ww})$ where x_{ij} refers to product i exported by country j; and X_{ij} the country's total exports while *w* subscripts refer to world totals.

(SITC 76424-3%), other fixed resistors (SITC 77232-4%), and other fixed capacitors (SITC 77867-2%) (See Appendix Table 3 for details).

What is more notable from Table 23, however, is the way China and Mexico are capturing the world market for IT. These two countries are increasing their stake in the IT market much faster than any of the ASEAN-Four. This is further shown by the much rapid growth of exports of these two countries than the Philippines (Table 24). Indonesia's exports growth is also almost twice that of the Philippines.

Furthermore, the country had the least percentage of products that succeeded in increasing their market shares (Table 25). Again, very significant here are Indonesia, China and Mexico. Although the market share of Indonesia is a lot smaller than the Philippines as shown in Table 23, 87 percent of its products are increasing their export share, in contrast to the Philippines' of 41 percent. Also, China's and Mexico's market shares are not only higher and growing much faster than the Philippines (Table 23), but 83 percent of China's and 73 percent of Mexico's products have improved their market shares (Table 25).

The above finding is not surprising, however. Given that these countries are also low-wage countries and given the increasing wage in the Philippines, they serve as alternative locations for the labor-intensive segment of the IT production chain. This finding, however, serves as a clear signal that unless the country moves away from labor-intensive assembly type of IT products and towards technology-intensive products, it would loss its share in the IT market. Competition from low-wage countries would eventually erode the country's comparative advantage unless the shift to a technology-intensive IT industry is achieved. The rising wage rate is not the problem. The experiences of Malaysia, Thailand and the NIEs have shown that high economic growth could be attained with rising wage rate. The solution is to produce the right products. But is the Philippines ready to embark on the expected shift? This will be discussed in Section 5 of the paper.

Revealed Comparative Advantage. The country's indicator of revealed comparative advantage shows that the country is competitive in IT, i.e. RCA is greater than 1 (Table 26). There was a sharp decline in the country's competitiveness in 1992 and although this has been increasing since 1993, the country's level of competitiveness in 1997 was below its level in 1991. China and Indonesia are not competitive yet but their competitiveness improved during the period. This explains their increasing market shares as discussed earlier. Likewise, Mexico is already competitive and its competitiveness is increasing much faster than the Philippines. Even in semiconductors where the Philippines excels, the competitiveness of this segment declined between 1991 and 1995. It succeeded to improve since 1996 but its level of competitiveness in 1997 was barely half of what it was in 1991.

At the 5-digit SITC level, only 16 products out of 81 are competitive as enumerated in Table 27. Of the 16 that are *already* competitive, 6 are consistently improving on their competitiveness (Figure 11), while 10 are in danger of losing their competitiveness as shown by their deteriorating RCAs (Figure 12).

Table 23. Market share in IT exports, selected countries, 1991-1997 (percent)

Country	1991	1992	1993	1994	1995	1996	1997	Average share 1991-1997	Change 1997-1991
Total IT									
Philippines	1.0	0.7	0.8	0.9	1.1	1.6	2.2	1.2	1.2
Indonesia	0.1	0.1	0.1	0.2	0.2	0.3	0.3	0.2	0.3
Malaysia	2.4	2.6	3.1	3.5	3.9	4.3		3.3	2.0
Thailand	1.3	1.4	1.5	1.7	1.8		2.1	1.6	0.8
Singapore	5.6	7.3	7.1	9.9	9.5	9.5	10.4	8.5	4.8
South Korea	3.8	3.7	3.8	4.0	4.8	4.3		4.1	(3.8)
Hongkong		1.7	1.6	1.3	1.1	0.9	0.9	1.2	(0.8)
China		1.3	1.5	1.9	2.3	2.4	3.2	2.1	2.0
Mexico	0.4	1.8	1.9	2.0	2.1	2.3	3.1	1.9	2.7
Computer hardware									
Philippines	0.3	0.2	0.2	0.2	0.2	0.4	1.0	0.3	0.7
Indonesia	0.0	0.1	0.1	0.1	0.2	0.3	0.4	0.2	0.4
Malaysia	1.2	1.8	2.4	3.1	3.6	4.3		2.7	3.1
Thailand	1.7	1.8	1.9	2.4	2.7		3.3	2.3	1.6
Singapore	9.1	10.4	12.3	14.3	14.8	15.8	16.2	13.3	7.1
South Korea	2.5	2.4	2.6	2.2	2.5	2.7		2.5	0.1
Hongkong		1.9	1.4	1.1	0.9	0.5	0.4	1.0	(1.5)
China		0.7	1.0	1.3	2.0	2.6	3.5	1.8	2.8
Mexico	0.6	0.8	0.9	1.2	1.3	1.8	2.6	1.3	2.1
Semiconductors									
Philippines	4.0	2.7	3.0	3.1	3.6	5.1	7.9	4.2	3.8
Indonesia	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Malaysia	7.3	7.5	8.2	7.6	7.7	8.0		7.7	0.7
Thailand	1.7	2.0	2.1	2.1	2.0		2.7	2.1	0.9
Singapore	6.7	12.9	7.3	15.4	10.8	11.2	14.0	11.2	7.3
South Korea	8.8	9.3	8.2	9.2	11.0	9.3		9.3	0.6
Hongkong		1.7	1.8	1.6	1.6	1.5	2.1	1.7	0.4
China		0.5	0.6	0.7	0.9	1.0	1.7	0.9	1.2
Mexico	0.1	1.4	1.3	1.3	1.2	1.4	1.6	1.2	1.5
Telecommunications									
Philippines	0.6	0.5	0.6	0.6	0.6	0.7	0.8	0.6	0.2
Indonesia	0.2	0.4	0.3	0.5	0.5	0.7	0.6	0.5	0.4
Malaysia	3.3	3.1	3.6	4.2	4.4	4.0		3.8	0.8
Thailand	1.4	1.4	1.4	1.4	1.6		1.4	1.4	(0.1)
Singapore	5.6	6.0	6.2	7.6	7.5	5.8	5.7	6.3	0.1
South Korea	3.5	3.4	3.8	3.8	4.0	3.7		3.7	0.2
Hongkong		2.4	2.4	1.7	1.4	1.0	1.1	1.7	(1.3)

Country	1991	1992	1993	1994	1995	1996	1997	Average share 1991-1997	Change 1997-1991
China		2.5	2.8	3.7	4.5	4.4	5.1	3.8	2.6
Mexico	0.2	2.4	2.6	2.8	3.2	2.8	3.8	2.5	3.6
Other IT products									
Philippines	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.1	0.1
Indonesia	0.0	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2
Malaysia	0.1	0.1	0.1	0.2	0.3	1.3		0.4	1.3
Thailand	0.5	0.5	0.7	0.8	0.9		0.7	0.7	0.3
Singapore	1.4	1.6	2.0	2.2	3.7	3.5	4.0	2.6	2.6
South Korea	2.0	1.7	1.8	1.8	2.0	1.9		1.9	(0.1)
Hongkong		1.2	1.1	0.9	0.8	0.7	0.5	0.9	(0.7)
China		1.7	1.9	2.5	2.7	2.4	3.1	2.4	3.1
Mexico	0.5	2.8	3.0	3.0	3.1	3.4	4.2	2.8	3.7

Note: Data are not available for the following:

Malaysia and Korea - 1997; Thailand - 1996; Hongkong and China - 1991

Source: Estimates of author using PCTAS.

Table 24. Average real growth rate of IT exports, selected countries, 1991-1997 (1990 prices) (percent)

Country	Computer hardware	Semiconductors	Telecommunications	Other IT products	Total IT
Philippines	32.6	24.5	15.4	35.4	24.9
Indonesia	79.5	26.3	33.8	41.1	44.2
Malaysia*	44.1	19.7	18.1	102.5	26.9
Thailand	22.3	19.3	9.9	15.8	19.0
Singapore	20.5	25.9	11.4	27.2	21.4
South Korea	11.9	19.1	14.6	8.8	15.3
Hongkong	(20.4)	16.3	(6.4)	(9.9)	(3.8)
China**	52.1	41.0	27.0	20.5	31.9
Mexico	41.5	70.6	81.2	54.9	54.3

Note: Compounded growth rate were computed as follows:
* - 1991-96
** - 1992-97

Source: PCTAS.

Table 25. Percentage of products with improved competitiveness, 1991-1997 (5-digit SITC)

Country	Total No. of Export Products	Market Share		Revealed Comparative Advantage	
		No. of Products with Increased Market Share	% to Total	No. of Products with Increased RCA	% to Total
Philippines	81	33	40.7	29	35.8
Indonesia	100	87	87.0	87	87.0
Malaysia	131	109	83.2	101	77.1
Thailand	121	94	78.0	78	64.5
Singapore	131	104	79.4	95	72.5
South Korea	127	64	50.4	62	48.8
Hongkong	114	31	27.2	48	42.0
China	132	109	82.6	85	64.4
Mexico	129	94	72.9	109	84.5

Source: Appendix Tables 3 to 10.

Table 26.Revealed comparative advantage of IT exports, selected countries, 1991-1997

Country	1991	1992	1993	1994	1995	1996	1997	Change 1997-1991
Total IT								
Philippines	2.1	1.0	1.1	1.1	1.1	1.4	1.6	(0.4)
Indonesia	0.1	0.1	0.1	0.2	0.2	0.3	0.2	0.2
Malaysia	2.0	2.1	2.2	2.2	2.2	2.5		0.5
Thailand	1.3	1.4	1.3	1.4	1.4	-	1.4	0.1
Singapore	2.7	3.8	3.1	3.8	3.4	3.5	3.4	0.7
South Korea	1.5	1.6	1.5	1.5	1.6	1.6		0.1
Hongkong		1.9	1.8	1.6	1.6	1.5	1.4	(0.4)
China		0.5	0.5	0.6	0.6	0.7	0.8	0.3
Mexico	0.4	1.3	1.2	1.2	1.1	1.1	1.2	0.8
Computer hardware								
Philippines	1.0	0.5	0.5	0.4	0.6	0.9	1.6	0.6
Indonesia	0.0	0.1	0.1	0.1	0.2	0.3	0.3	0.3
Malaysia	1.0	1.5	1.6	1.9	2.1	2.5		1.5
Thailand	1.7	1.9	1.7	2.0	2.0	-	2.2	0.5
Singapore	4.5	5.4	5.4	5.5	5.2	5.9	5.3	0.8
South Korea	1.0	1.0	1.0	0.9	0.8	1.0		(0.1)
Hongkong	-	2.0	1.6	1.4	1.2	0.9	0.6	(1.4)
China		0.3	0.3	0.4	0.6	0.8	0.8	0.6
Mexico	0.6	0.6	0.6	0.7	0.7	0.9	1.0	0.4
Semiconductors								
Philippines	7.0	2.9	2.8	2.7	2.4	3.1	3.6	(3.3)
Indonesia	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0
Malaysia	6.2	6.1	5.6	4.8	4.4	4.7		(1.5)
Thailand	1.8	2.1	1.9	1.7	1.5	-	1.8	0.0
Singapore	3.3	6.7	3.2	5.9	3.8	4.2	4.6	1.3
South Korea	3.5	4.0	3.2	3.5	3.7	3.4		(0.1)
Hongkong	-	1.8	2.0	2.1	2.3	2.6	3.2	1.4
China		0.2	0.2	0.2	0.3	0.3	0.4	0.2
Mexico	0.1	1.0	0.8	0.8	0.6	0.6	0.6	0.5

Country	1991	1992	1993	1994	1995	1996	1997	Change 1997-1991
Telecommunications								
Philippines	2.0	1.7	1.7	1.6	1.5	1.6	1.3	(0.7)
Indonesia	0.2	0.3	0.3	0.5	0.5	0.7	0.4	0.3
Malaysia	2.8	2.5	2.5	2.6	2.5	2.3		(0.4)
Thailand	1.5	1.4	1.2	1.1	1.2	-	0.9	(0.5)
Singapore	2.7	3.1	2.7	2.9	2.6	2.2	1.9	(0.9)
South Korea	1.4	1.5	1.5	1.5	1.3	1.4		(0.1)
Hongkong	-	2.6	2.6	2.1	1.9	1.7	1.7	(1.0)
China		1.0	1.0	1.1	1.3	1.3	1.2	0.2
Mexico	0.2	1.7	1.6	1.7	1.7	1.3	1.5	1.3
Other IT products								
Philippines	0.1	0.1	0.2	0.2	0.2	0.2	0.3	0.1
Indonesia	0.0	0.1	0.1	0.2	0.2	0.2	0.2	0.1
Malaysia	0.1	0.1	0.1	0.1	0.2	0.8		0.7
Thailand	0.5	0.6	0.6	0.7	0.6	-	0.5	0.0
Singapore	0.7	0.8	0.9	0.8	1.3	1.3	1.3	0.6
South Korea	0.8	0.7	0.7	0.7	0.7	0.7		(0.1)
Hongkong	-	1.4	1.3	1.2	1.1	1.2	0.8	(0.5)
China		0.6	0.7	0.8	0.8	0.7	0.7	0.1
Mexico	0.5	2.0	1.9	1.8	1.6	1.6	1.6	1.1

Note: There are no reported data for the following:
Malaysia - 1997, Thailand - 1996, Korea - 1997, Hongkong - 1991and China - 1991

Source: Estimates of the author using PCTAS.

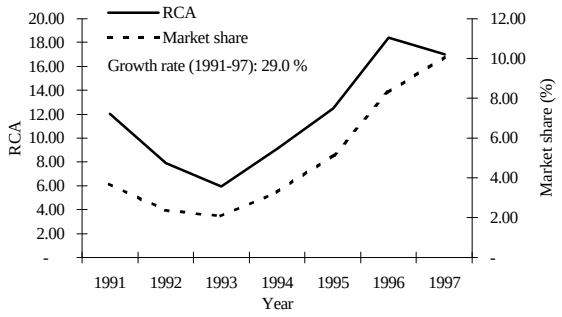
Table 27. List of competitive and non-competitive IT products, Philippines, 1991-1997

Competitive		Non-competitive	
Code	Description	Code	Description
75260	Input or output units	75220	Other digital automatic data processing unit
77631	Diodes, other than photosensitive or light emitting	75230	Digital automatic data processing unit other than those of sub-heading 7522
77632	Transistors with a dissipation rate of less than 1W	75290	Other units of automatic data processing machines
77639	Other semiconductor devices	75997	Part and accessories of heading 752
77641	Digital monolithic integrated circuits	77220	Printed circuits
77649	Electronic microassemblies	77633	Transistors with a dissipation rate of 1W or more
77681	Mounted piezo-electric crystals	77635	Thyristors, diacs and triacs
78433	Brakes and servo-brakes	77637	Photosensitive semiconductor devices
76411	Line telephone sets with cordless handsets	77643	Other monolithic integrated circuits
76424	Line telephone handsets	77645	Hybrid integrated circuits
76432	Transmission apparatus incorporating reception apparatus	77688	Parts of mounted piezo-electric crystals
76492	Parts of amplifiers, microphones and loudspeakers	77689	Parts of electronic integrated circuits and microassemblies
77125	Other inductors for power supplies for data processing machines	76382	Transcribing machines
76483	Radar and remote control apparatus other than for toys	76383	Sound reproducing apparatus, cassette type
76493	Aerials and antennae and parts used for radio telephony and radio telegraphy	76384	Magnetic tape recorders, cassette type
77232	Other fixed resistors for power handling capacity	76415	Telephonic or telegraphic switching apparatus
		76419	Other apparatus including entry-phone systems
		76431	Transmission apparatus
		76481	Portable receivers for calling, alerting and paging
		76491	Parts of electrical apparatus for line telephony and telegraphy
		76499	Magnetic type sound heads and parts for recording
		59850	Chemical elements doped for use in electronics
		72819	Parts of machines used for semiconductors wafers
		72842	Encapsulation equipment for assembly of semiconductors
		72852	Parts of encapsulation equipment
		72855	Parts of apparatus for the assembly of semiconductors
		73111	Machines for the removal of material by laser in the production of semiconductor waves
		73591	Parts of focused iron beam milling machines
		74131	Furnices and ovens for the production of semiconductor devices
		74133	Apparatus and parts of the manufacture of semiconductor devices
		74135	Parts of apparatus for rapid heating of wafers
		74189	Chemical vapor deposition apparatus for semiconductor production
		74190	Parts of chemical vapor deposition apparatus for semiconductor production
		74359	Spin dryer for semiconductor wafer processing
		74391	Parts of spin dyrer for semiconductor wafer processing
		74565	Cleaning machines for semiconductor packages
		74918	Parts of automated machines for transport of the manufacture of semiconductor devices
		75113	Word processing machines
		75131	Electrostatic photocopying apparatus
		75133	Other photocopying apparatus
		75910	Parts and accessories of photocopying apparatus
		75995	Parts and accessories of machines of sub-heading 751.2
		76421	Microphones having a frequency range of 300 Hz to 3.4 KHz
		76423	Loudspeakers, without housing
		77121	Static converters for automatic data processing machines and telecommunications
		77231	Fixed carbon resistors, composition or film types
		77233	Wirewound variable resistors, including rheostats and potentiometers
		77235	Other variable resistors
		77238	Parts of variable resistors
		77255	Electronic switches
		77258	Plugs and sockets for co-axial cables and printed circuits
		77259	Connection and contact elements for wires and cables
		77314	Electronic conductors
		77315	Other electronic conductors
		77863	Aluminum alectrolytic fixed capacitors
		77865	Ceramic dielectric, multilayer fixed capacitors

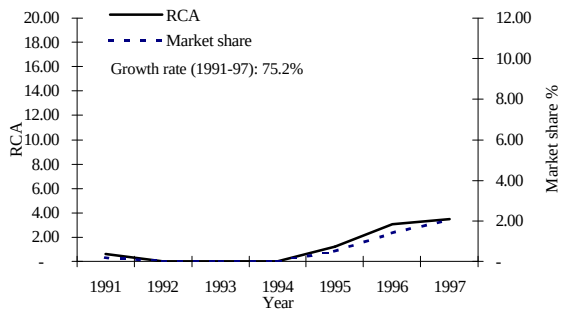
Competitive		Non-competitive	
Code	Description	Code	Description
		77866	Dielectric fixed capacitors of papers and plastics
		77867	Other fixed capacitors
		77868	Variable or adjustable (pre-set) apparatus
		77869	Parts of capacitors
		77878	Proximity cards and tags
		77879	Parts of 77878
		77884	Indicator panels incorporating LCD or LED
		77885	Parts of apparatus of sub-heading 77884
		87131	Electron beam microscopes
		87425	Optical instruments and appliances
		87426	Parts and accessories of optical instruments
		87431	Instruments for measuring or checking the flow of liquids
		87435	Instruments for measuring or checking pressure
		87437	Other instruments for measuring and checking of heading 759.1
		87439	Parts and accessories of instruments of heading 759.1
		87443	Spectrometers, spectrophotometers and spectographs using optical radiations
		87445	Other instruments and apparatus using optical radiations
		87446	Other instruments and apparatus under heading 8744
		87449	Parts and accessories of products of heading 8744
		87477	Instruments and apparatus designed for telecommunications
		87478	Instruments and apparatus for semiconductor wafers
		87479	Parts and accessories of instruments for semiconductor devices
		88135	Apparatus for making circuit patterns for semiconductor wafers
		88136	Parts and accessories of the apparatus of heading 88135
		89845	Magnetic tapes of of a width exceeding 6.5mm
		89859	Other magnetic tapes and discs
		89867	Magnetic tapes for reproducing phenomena other than sound
		89879	Other media for reproducing phenomena

Figure 11. Export products with increasing competitiveness, Philippines, 1991-97

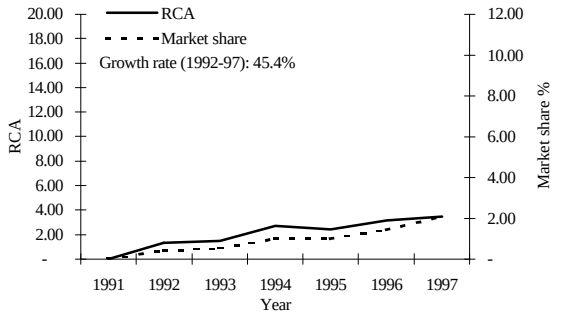
SITC 77632 - Transistors with 1 W dissipation rate



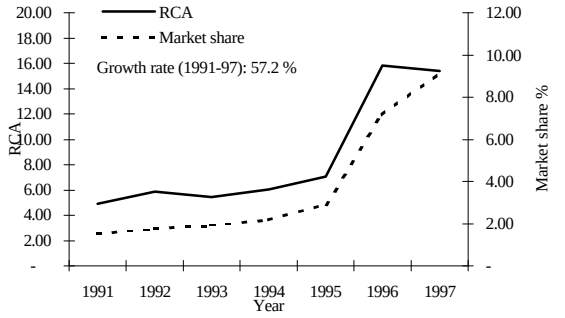
SITC 77641 - Digital monolithic integrated circuits



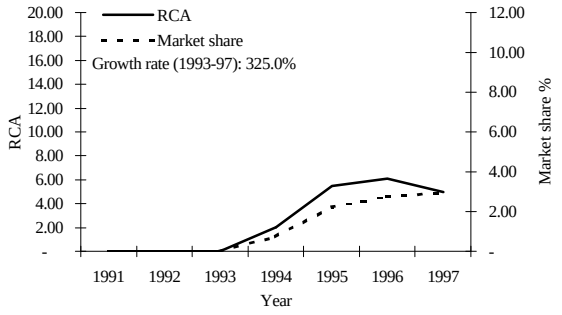
SITC 78433 - Brakes, servo-brakes and parts



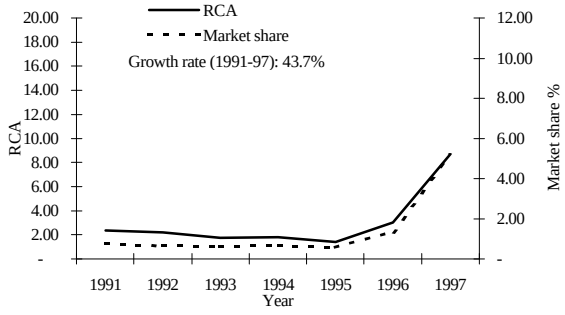
SITC 76411 - Telephone sets and videophones



SITC 76424 - Line telephone handsets



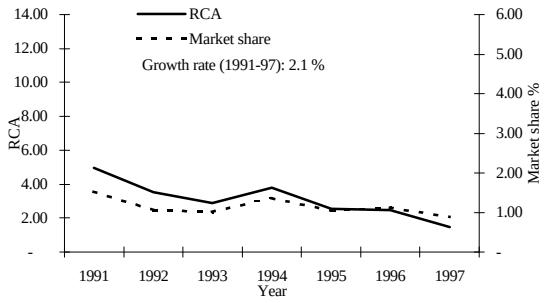
SITC 75260 - Input or output units



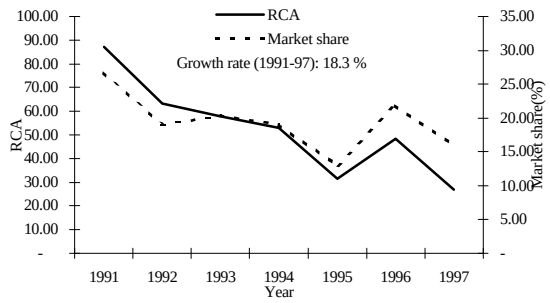
Source: Estimates by the author using PCTAS.

Figure 12. Export products with decreasing competitiveness, 1991-1997

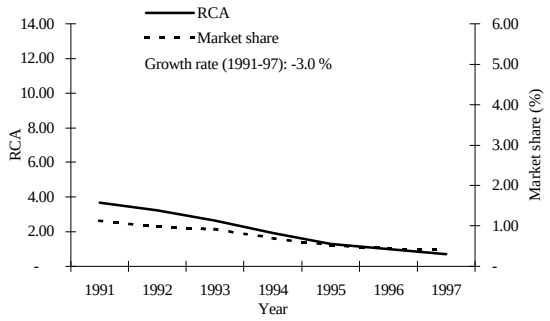
SITC 77631 - Diodes, nor photosensitive nor light emitting



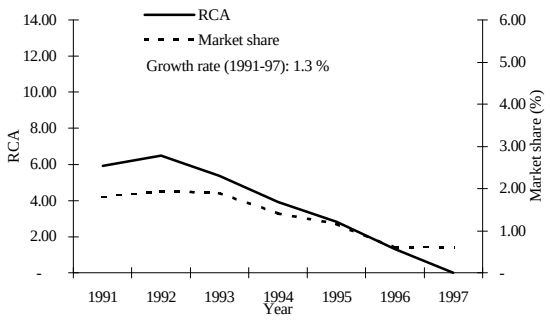
SITC 77639 - Other semiconductor devices



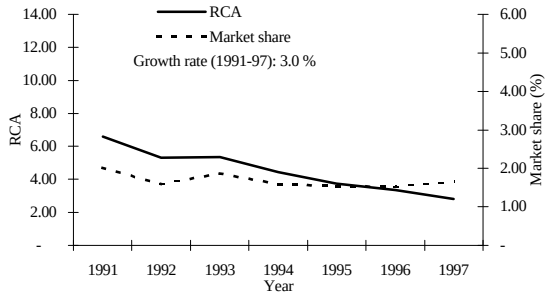
SITC 77681 -Piezo-electrical crystals, mounted



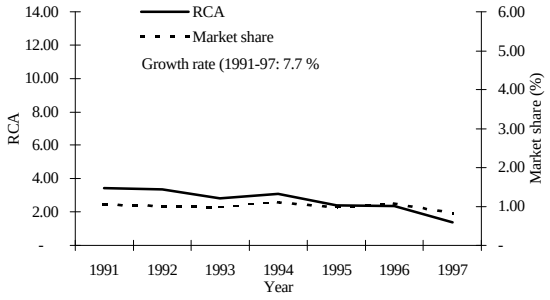
SITC 76432 - Transmission apparatus



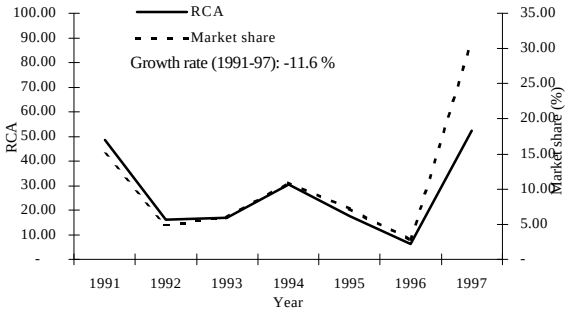
SITC 76492 - Parts of microphones and speakers



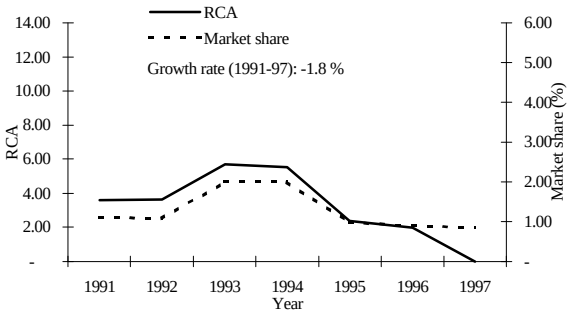
SITC 77125 - Inductors for power supplies of data processing machines and telecom apparatus



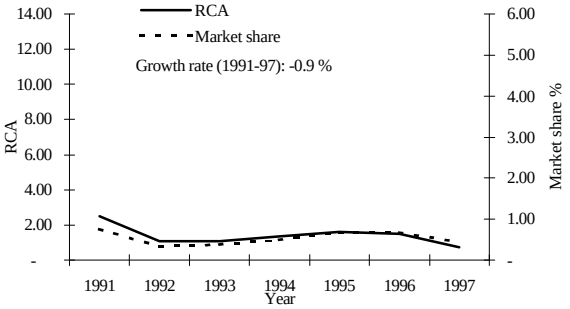
SITC 77649 - Electronic microassemblies



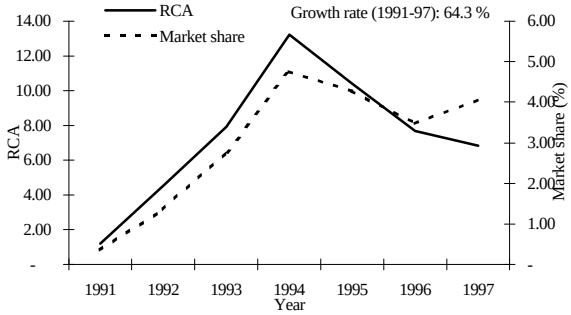
SITC 76483 - Radar and remote control apparatus other than for toys



SITC 76493 - Transmission apparatus and parts



SITC 77232 - Fixed resistors for power handling



Source: Estimates by the author using PCTAS.

The Philippines also had the least percentage of products that registered improvements in competitiveness between 1991 and 1997 (Table 25). These include products that became competitive only after 1991 and those that are already competitive since 1991. Improving and sustaining the competitiveness of the country's products are critical to increasing the market share of the country. As shown in Figure 11 and Figure 12, the competitiveness of a product moves in the same direction as its market share. Furthermore, the products that are competitive are also the ones that are consistently registering trade surplus (Appendix Table 2). Likewise, as indicated further in the figures, those that are increasing their competitiveness registered very high export growth rates while those experiencing a decline in their competitiveness registered very low, if not negative, growth rates.

Market Positioning

To understand better why the Philippines is not increasing its competitiveness and market share as fast as the other countries covered by the study, an analysis of the country's market positioning of its exports is next examined. This is done by analyzing whether the country is increasing its market share in products that are experiencing growth and hence, are dynamic in the overall world trade.

Following the World Bank study (1997), a country is considered competitive in a product if its world market share is growing, and a product is considered dynamic if its trade is growing faster than the average for all products. As shown in Table 28,

this results to four types of commodity classification. Quadrant I is the optimal position since a country is increasing its market share in dynamic products; Quadrant II is the worst position since a country is losing market shares in dynamic products; Quadrant III is a vulnerable position since a country is increasing its share in a stagnant product; and Quadrant IV is a position where a country needs some restructuring away from the stagnant products.

Table 28. Market positioning classification.

Share of Country's Exports in World Trade	Share of Products in World Trade	
	Rising (Dynamic)	Falling (Stagnant)
Rising (Competitive)	I Optimal	III Vulnerable
Falling (Non-competitive)	II Lost Opportunity	IV Restructuring

Source: World Bank, 1997.

Table 29 shows the products under each category for the Philippines. Herein lies another danger signal for the country. Much of the country's exports (44 %) are accounted for by IT products that are deteriorating in world trade relative to other products. This means that the country is increasing its share in products whose shares in world trade are falling. This makes the country's exports vulnerable. Only 42 percent of exports are generated from products that are growing and dynamic in world trade; 12 percent are generated by products whose share in world trade are increasing but which the country is losing its market share; and 1.5 percent are generated by products that needs some restructuring. The latter looks small in percentage but the amount of resources involved could be large. Efficiency in the economy could be improved by doing away from the production of these products and the resources reallocated to where they could be used most efficiently.

A comparison with the other countries shows that the country is not positioning its markets as best as the other countries (Table 30). Majority of the exports of the other ASEAN, the NIEs, China and Mexico are accounted for by products that are growing in world trade. In short, they are exporting the right products. The country needs to do a lot of catching up if it wants to increase its competitiveness in dynamic products.

Table 29. Market positioning of IT products, Philippines, 1991-1997

Optimal		Lost Opportunity		Vulnerable		Retreat	
Code	Description	Code	Description	Code	Description	Code	Description
75290	Other units of automatic data processing machines	75220	Printed circuits	75260	Input or output units	77635	Thyristors, diacs and triacs
75997	Parts and accessories of heading 752	77631	Diodes, other than photosensitive or light emitting	77220	Printed circuits	77688	Parts of mounted piezo-electric crystals
77632	Transistors with a dissipation rate of less than 1W	77633	Transistors with a dissipation rate of 1W or more	77649	Electronic microassemblies	76383	Sound reproducing apparatus, cassette type
77641	Cards incorporating an electronic integrated circuits	77637	Photosensitive semiconductor devices	73591	Parts of focused iron beam milling machines	76384	Magnetic tape recorders, cassette typr
77689	Parts of electronic integrated circuits and microassemblies	77639	Other semiconductor devices	74190	Parts of chemical vapor deposition apparatus for semiconductor production	76419	Other apparatus including entry-phone systems
78433	Brakes and servo-brakes	77643	Other monolithic integrated circuits			76483	Radar and remote control apparatus
76411	Line telephone sets with cordless handsets	77645	Hybrid integrated circuits	74391	Parts of spin dyrer for semiconductor wafer processing	72819	Parts of machines used for semiconductors wafers
76491	Parts of electrical apparatus for line telephony and telegraphy	77681	Mounted piezo-electric crystals	75131	Electrostatic photocopying apparatus	72842	Encapsulation equipment for assembly of semiconductors
75995	Parts and accessories of machines of sub-heading 751.2	76415	Telephonic or telegraphic switching apparatus	77231	Fixed carbon resistors, composition or film types	72852	Parts of encapsulation equipment
76421	Microphones having a frequency range of 300 Hz to 3.4 KHz	76432	Transmission apparatus incorporating reception apparatus	87131	Electron beam microscopes	74133	Apparatus and parts of the manufacture of semiconductor devices
76423	Loudspeakers, without housing	76493	Aerials and antannae and parts used for radio telephony and radio telegraphy	87449	Parts and accessories of products of heading 8744		
77121	Static converters for automatic data processing machines and telecommunications			88136	Parts and accessories of the apparatus of heading 88135	74189	Chemical vapor deposition apparatus for semiconductor production
		76499	Magnetic type sound heads and parts for recording	75910	Parts and accessories of photocopying apparatus		
77232	Other fixed resistors for power handling capacity	72855	Parts of apparatus for the assembly of semiconductors	76424	Line telephone handsets	74359	Spin dryer for semiconductor wafer processing
77255	Electronic switches	74918	Parts of automated machines for transport of the manufacture of semiconductor devices	77885	Parts of apparatus of sub-heading 77884	77868	Variable or adjustable (pre-set) apparatus
77258	Plugs and sockets for co-axial cables and printed circuits					87426	Parts and accessories of optical instruments
77259	Connection and contact elements for wires and cables	77125	Other inductors for power supplies for data processing machines			87439	Parts and accessories of instruments of heading 759.1
77865	Ceramic dielectric, multilayer fixed capacitors	77314	Electronic conductors			87443	Spectrometers, spectrophotometers and spectographs using optical radiations
77867	Other fixed capacitors	77315	Other electronic conductors				
77869	Parts of capacitors	77863	Aluminum alectrolytic fixed capacitors			87446	Other instruments and apparatus under heading 8744
87435	Instruments for measuring or checking pressure	77878	Proximity cards and tags			88135	Apparatus for making circuit patterns for semiconductor wafers
89879	Other media for reproducing phenomena	77884	Indicator panels incorporating LCD or LED			89845	Magnetic tapes of of a width exceeding 6.5mm
		87425	Optical instruments and appliances			76492	Parts of amplifiers, microphones and loudspeakers
		87478	Instruments and apparatus for semiconductor wafers			77235	Other variable resistors
		89859	Other magnetic tapes and discs			77238	Parts of variable resistors
						89867	Media for reproducing phenomena other than sound or image
Average annual value of exports (US$ million)	1,788.60		521.2		1,833.20		81.5
% Share	41.7		12.2		44.2		1.9

A further analysis of the products where the Philippines is losing market opportunities shows that these are the same products where the country's competitors are gaining market shares (compare Table 29 for the Philippines with Appendix Table 11 for Indonesia; Appendix Table 12 for Thailand; Appendix 13 for China; and Appendix Table 14 for Mexico). Unless the Philippines regains or improves on its competitiveness on these products, these countries will eventually eat up whatever small market there is remaining for the country.

Table 30. Market positioning of the IT products, selected countries, 1991-1997 (percent)

Country	Optimal	Vulnerable	Lost Opportunity	Retreat	Total
Philippines	41.7	44.2	12.2	1.9	100
Indonesia	72.0	22.0	4.3	1.7	100
Malaysia	54.8	33.7	11.2	0.2	100
Thailand	57.5	17.8	22.7	2.0	100
Singapore	74.4	4.7	7.2	13.7	100
South Korea	51.5	21.8	24.9	1.8	100
Hongkong	26.8	23.0	42.4	7.8	100
China	64.9	31.1	3.2	0.8	100
Mexico	82.1	15.8	1.9	0.2	100

5. Analysis of Issues Confronting the Philippine IT Industry and Its Future Development

While the NIEs and more recently Malaysia and Thailand are shifting away from final assembly type of IT industry, the Philippine IT industry has remained essentially a labor-intensive assembly manufacturing industry. Such a state of the industry is caused by a host of factors that hamper its development and competitiveness, some of which are systemic in nature.

- *Lack of political will to implement a comprehensive policy to promote IT as an industry* – IT can be looked at in three perspectives. One, as a strategic industry producing products for exports and domestic use, either for consumers or downstream user industries. Two, as a generic technology using IT in the production process to improve productivity and performance. Three, as an advanced infrastructure, like in telecommunications and transportation, to improve the delivery of services (Hanna, et. al. 1996).

  As an industry, semiconductor has been identified as an export winner in the country. But apart from the BOI incentives for semiconductor firms, there is no comprehensive and clear policy to promote IT as an industry. This is very evident under Section 1 of EO 125 where it has been

  > "declared the policy of government in furtherance of national development, to create the appropriate policy and institutional environment to rationalize and

accelerate the use, application and exploitation of IT as a productivity tool and as a development strategy for modernization and economic development".

It is clear from the above policy declaration that IT is being promoted as a generic technology (to improve productivity) and as an infrastructure (for modernization and economic development) but not as an industry. This is in contrast to the experience of the NIEs where there are explicit policies to promote IT as an industry.

The lack of political will to implement IT as an industry is made more evident by the following:

- *IT21 not realistic* – IT21, launched in early 1998, outlines the country's vision and goal of transforming the country into "Asia's Knowledge Center" under a three-phase strategy. Phase I is providing the impetus, targeting the year 2000 when the infrastructure for every sector of the economy to have access to IT should have been laid. Phase II, by the 2005, the use of IT will be pervasive in daily life and the country will be producing competitive IT products for world market. Phase 3, the vision should be realized within the first decade of the 21st century.

  The plan lacks focus. The vision, while ambitious by itself, is not realistic considering the current state of the industry. It is just a few months to 2000 and yet much remains to materialize on Phase I. For example, the government has been identified as the lead user of IT but the whole bureaucracy is not even interconnected to this day. Likewise, the plan did not specify the budget it requires for achieving what it has been set to achieve. It could also well be that there is no budget to implement the plan.

- *Fragmented government efforts in promoting IT* – There are several offices in-charge of policy-making and promoting IT in the country. During the Ramos administration, the National IT Council (NITC) was established as the highest planning and policy advisory body on IT for the government with the National Computer Council (NCC) as its technical arm. Under the Estrada administration, in addition to NITC/NCC, the Y2K Commission and the Presidential Consultant on IT and Communication were also established as additional policy-making bodies. The Y2K Commission was in charge of monitoring the government and industry's preparedness on the millenium bug. In addition, Executive Orders 34, 35 and 37, issued in October 1998, expanded the powers and functions of the NCC, one of which is the authority to conduct and manage all government IT-related projects. The three EOs required all government agencies to seek approval of their IT projects from NCC.

  The several IT offices has made the functions of NITC redundant and hence, made the coordination of government efforts on IT difficult. Likewise, centralizing the approval of *all* government agencies' IT plans on NCC caused delays in the implementation of IT plans and hence, the procurement of computers and computer softwares. This hampered IT diffusion within the bureaucracy.

Nonetheless, a new executive order, EO 125, has been issued last July 19, 1999 limiting the approval of IT plans within one month. It is hoped that the new EO would improve, if not make it faster, the diffusion of IT in the public sector.

- *Investments in R&D: too little* - There is a general consensus that for high tech industries, investment in R&D are of at least equal if not greater importance than those related to production (Ernst and O'Connor, 1992). Investment in R&D has become a source of competition for IT firms considering the fast speed of technological obsolescence in recent years, which is one year for some IT products. Product development has therefore become an essential factor to remaining competitive and a source of temporary technological monopoly rents until the new technology becomes obsolete or better technologies are developed.

  The NIEs have invested so much on R&D to develop their technological capability. South Korea had an average ratio of investment to GNP of 2.3 percent per year during the period 1990-1995; Singapore had 1.1 percent and Taiwan had 1.7 percent (NAPES database). In contrast, the Philippines has invested too little on R&D. A study by Cororaton (1998) using the UNESCO data, shows that out of 91 countries, the Philippines ranked 60th in terms of R&D expenditure to GNP ratio. Its ratio of 0.2 percent in 1992 is far below the maximum of 3 percent. Too little an investment in R&D hampers the development of the country's technological capability.

  In addition to underinvestment, the government's effort in R&D prioritization remains unfocused and not well-coordinated with the different government agencies and departments having different priorities and at times, conflicting interests (Cororaton, 1998).

- *Lack of specialized skills for high-value added IT products.* A well-trained and motivated labor force is an essential factor for competing in the IT industry. Beyond final assembly, skill requirements have become greater. For example, skilled process engineers are needed for the fabrication of sophisticated integrated circuits, trained circuit designers for integrated circuit design, and system design engineer for the computer industry.

  Again, the study of Cororaton (1998) has shown that out of 91 countries, the country ranked 73rd in terms of the number of scientists and engineers per million population. Its number of scientists and engineers of 152 per million population is far below the maximum of 6,736 scientists and engineers per million population.

  An interview made by this author in one of the country's export processing zones showed that the country's engineers do not have the specialized skills for high value added IT products. Companies have to spend hundreds of thousands of dollars for sending their manpower to the US for training. Such a high cost erodes their price competitiveness. Worse is, the average years of stay of this kind of manpower is only 2 years as they are being pirated in the US, Japan or the NIEs.

- *Infrastructure and institutional bottlenecks* - Inadequate infrastructures particularly in transportation and telecommunication, and congestion in the

metropolis have always been the perennial problems of the country. Furthermore, there is the high cost of doing business arising from delays in the processing of papers and graft and corruption. High infrastructure costs and delays erode profitability and competitiveness.

One clear institutional bottleneck affecting the industry is the apparent absence of a complete and accurate database for IT services and software. Exports and imports of IT services are recorded under the "services" classification of the BSP which includes all other types of services exported and imported by the country. The other official statistical gathering bodies like the NSO, NSCB and DTI also do not distinguish IT services and software under their existing classification of accounts or industries. The absence of such database makes industry analysis difficult, if not impossible.

- *Inadequate support industries including those providing support services* - The high import content of the country's IT industry is also caused partly by the inadequate support industries and services in the country that are supposed to allow the primary production activities to take place without interruptions and to adapt and expand.

- *Demand for IT applications: is there a solid domestic market base?*- The rising income in the country in recent years and the deregulation of the telecommunication industry resulted no doubt to the increasing demand in IT products. Likewise, the services sector, especially the banking sector, have also been making extensive use of advanced IT products and services to improve their delivery of services.

  Despite the growth in demand, however, the current domestic market has remained small. But it has great potential for expansion. One such sector that can be expected to give the IT industry a boost only if it would increase its demand for IT is the public service sector. The experience of the NIEs has shown that the public sector is the number one user of IT. The computerization of the public service has not only improved the delivery of public service and lowered transaction costs between government and business or households, but it has also created a huge domestic demand for IT. This has helped led to the industry's growth and expansion. Seeing this in the Philippines remains to be a wish and dream. While there is a marked increase in the computerization of government projects, the state of technological advancement in the public sector remains low.

6. The Philippine IT Industry for the 21st Century: Conclusion and Recommendations

The study has highlighted the structural weaknesses of the Philippine IT industry. The industry is still on a substantially lower level than the NIEs, both in terms of sophistication of the products and the technological complexity of the production process involved as production consists mostly of labor-intensive assembly operations. This was shown by the high concentration of exports of the industry on a few low value added products. Localization of inputs is still at an embryonic stage as the industry relies on parts imported on a consignment basis. Infrastructural and

institutional bottlenecks and the inadequacy of the educational system to meet the technical human resource requirements of the industry have remained critical constraints to the industry's further growth.

Technology advancement in the IT industry is very fast. However, the limited capability of the industry in terms of skills and facilities has constrained the continued transfer of process technologies from multinational companies. Unless the industry improves on its local capability that would enable it to absorb and cope with new and advanced technologies, the long term competitiveness of the industry will be at risk; more so that the country's competitors are increasing their stake in the world IT market much faster than the country.

The main agenda at the turn of the century should be to transform the Philippine IT industry from a labor-intensive low-skill industry to a knowledge- and technology-intensive industry. However, with the accelerating global technology race, opportunities for the country to upgrade its competitive position in the industry have become much more difficult. Some cross-cutting strategies are suggested here to lessen or overcome such difficulties.

a) Implementation of a Comprehensive IT Policy

- *Private sector to identify IT products and services for promotion and development* – The industry itself should identify its niche products and services. These products and services will then be the focus of efforts on R&D, manpower development and investment.

  The industry needs to capitalize on IT services as this appears to be its greatest strength. With the fast development of telecommunications, demand for IT services offshore is expected to increase given that the cost of providing IT services through this modality is much cheaper than providing it onsite at the client's site. For example, the cost of an Indian IT service provided offshore is only 58 percent of the cost of providing the same service onsite (Internet article).

  Likewise, while the country is traditionally known as a computer service provider, the industry also needs to strengthen its capability in software package development. This could be done by encouraging consumers to use local brands and hence, increase the demand for local software. Along the process, this strategy will provide the software industry with experience and a base for relevant skills and ultimately become the launching pad for exports.

- *Review of policy gaps in IT* – IT21 should be reviewed and strengthen the areas where it is weak. Considering that IT policies are currently being implemented by various agencies, there is a need to review these policies and identify policy gaps. Also, there should be greater coordination among the agencies implementing IT policies to avoid duplication of functions.

- *Fast track e-commerce bill and other technology-related bills* – The use of e-commerce will no doubt dominate marketing strategy in the next millennium. And this applies not only to the ordering and payment of goods but also to the ordering, payment and supply of computer services and software. For example,

more and more US software companies have been using electronic distribution to deliver their products since 1995 (WTO, 1998).

As e-commerce become a common marketplace, issues on legal contracts, licensing enforcement, authentication, protection of consumers and other e-commerce-related concerns increasingly become critical to making e-commerce feasible. Hence, the Congress and the House of Senate should fast track the passage of the e-commerce bill to properly guide consumers and businessmen in using this facility for commerce and for the government to properly regulate the use of e-commerce.

In addition to the e-commerce bill, technology-related bills should be given priority in the legislative agenda of the government.

- *Strengthening of NITC as government agency to promote IT industry* - Currently, the NITC has no budget and hence, it relies on its members to finance its meetings. An agency without a budget is like a car without a gasoline; it cannot function. Hence, it is critical that NITC should be given a regular annual budget for it to carry out its functions.

  Also, considering the critical role of CHED and DECS in developing the technical human resource requirements of the IT industry, these two agencies should have greater involvement in the NITC particularly in IT policy formulation.

b) Investments in R&D

- *Private sector to invest more in R&D* - Given the constraints in the government's budget, the private sector should take greater role in R&D for the industry. The government can encourage the private sector to increase their investments in R&D by giving them some incentives.

- *Focus R&D on high value-added IT products, product design and process* - Accessing to the newest technology through licensing is getting harder. It is now more difficult to have creative imitation because there is much greater emphasis now on intellectual property rights (IPR). Hence, the country's limited resources should be directed to the development of select technologies required by the select IT products it wants to promote and specialize on.

- *Enforcement of IPR* – To encourage the development of new products and process, the country should observe strict enforcement of intellectual property rights.

c) Development of specialized skills for high-value added IT products

- *Incorporate IT in all levels of education: primary, secondary and tertiary* – While this would mean an increase in the cost of education and/or additional years in schooling, this would undoubtedly create an "IT culture" in the mindset of the future workforce and prepare them for the greater skills requirements of globalization.

  But for DECS and CHED to implement this, these agencies should by themselves be technology advocates. Investment in computers and access to

internet for students should be given greater importance in the budget of DECS.

- *Re-design engineering and other natural sciences curriculum* – Emphasis should be made on developing the capability, creativity and attitude of students to design and develop new products and processes. The industry should be made part in designing the curriculum to ensure that graduates have the kind of education the industry needs.

- *Investment in specialized technical training schools to elevate the technical competencies of Filipinos* – Skills are essential for moving up the technological ladder. An engineering course is not enough since the development in information technology is growing very fast. Again, the industry should be involved in the design of the training programs.

d) Developing a National Information Infrastructure

- *Investment in telecommunication infrastructure* – Government should invest in building public telecommunication and specialized networks that could make IT accessible to everyone. In doing this, government-business partnership is important to guide the broad directions for standards, regulations and network-based applications. For specialized networks (for example in customs, health services, government database, etc), standardization and coordination among the various agencies concerned is essential.

- *Need to harmonize classification of IT services* – The government should recognize computer services as a separate industry and hence, needs to be classified separately from other types of services. Statistical gathering agencies should therefore use a common classification for computer services following the GATS Services Sectoral Classification. The classification includes five sub-categories as follows: (i) consultancy services related to the installation of computer hardware; (ii) software implementation services; (iii) data processing services; (iv) data base services; and (v) others (WTO, 1998).

- *Build database for IT services*– There is a need to build and develop a comprehensive statistical database for IT services for use in formulating plans and strategies for the development of this segment of the industry. The database should follow international classification of the industry as discussed above. Also, such database should form part of the existing government statistical system which is accessible to the public.

e) Role of Government in IT Diffusion

- *Create an enabling environment for IT diffusion* – This could be achieved through cheaper access to information and technology. This would encourage potential IT users to invest in their information and communication facilities thereby creating more demand for IT products.

- *Government to utilize local IT consultants* – Instead of hiring foreign consultants to provide IT services in government projects (including foreign funded projects), the government should utilize local consultants. It is ironical

that the demand for services of Filipino IT professionals abroad is increasing while they are not being utilized or recognized here.

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Appendix Table 1. Percent distribution of world IT exports, 1991-97 (%)

Code	1991	1992	1993	1994	1995	1996	1997	Average
Computer hardware								
7521	0.2	0.1	0.2	0.1	0.1	0.2	0.3	0.2
7522	2.6	2.5	2.6	1.9	2.1	2.2	2.3	2.3
7523	5.3	4.9	4.7	4.5	4.5	4.6	5.0	4.8
7526	6.9	7.1	7.4	5.5	5.3	5.1	5.0	6.0
7527	3.4	3.3	3.4	5.0	5.3	5.0	6.2	4.5
7529	1.4	1.3	1.4	1.3	1.5	2.0	2.0	1.6
75997	12.5	12.4	11.7	11.7	11.5	11.1	11.6	11.8
Total	32.2	31.7	31.4	30.2	30.3	30.3	32.3	31.2
Semiconductors								
7722	1.9	1.6	1.4	1.5	1.5	1.4	1.4	1.5
77629	0.4	0.4	0.5	0.4	0.5	0.4	0.4	0.4
77631	0.5	0.5	0.5	0.6	0.7	0.6	0.6	0.6
77632	0.3	0.4	0.4	0.4	0.4	0.3	0.3	0.4
77633	0.4	0.5	0.5	0.5	0.6	0.6	0.5	0.5
77635	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
77637	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.5
77639	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.2
77641	7.3	7.8	8.8	11.9	12.4	12.4	11.0	10.2
77643	2.9	2.6	2.9	2.8	4.1	3.1	3.3	3.1
77645	0.6	0.6	0.7	0.6	0.9	0.8	0.8	0.7
77649	2.1	2.0	2.4	1.4	1.6	1.6	0.3	1.6
77681	0.3	0.3	0.3	0.4	0.4	0.3	0.3	0.3
77688	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.2
77689	0.8	0.7	0.8	0.7	0.8	0.8	0.9	0.8
78433	1.5	1.6	1.6	1.5	1.4	1.3	1.3	1.5
Total	19.9	19.9	21.6	23.7	26.3	24.9	22.1	22.6
Telecommunications								
76382	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0
76383	0.8	0.8	0.7	0.7	0.7	0.6	0.5	0.7
76384	0.7	0.7	0.7	0.5	0.4	0.3	0.3	0.5
76411	0.6	0.7	0.8	0.9	0.7	0.8	0.8	0.8
76413	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0
76415	0.8	0.8	0.9	0.9	0.7	0.8	0.8	0.8
76417	0.6	0.6	0.6	0.7	0.8	1.0	1.3	0.8
76419	1.2	1.2	1.1	1.0	1.0	0.9	0.8	1.0
76431	0.5	0.4	0.3	0.3	0.3	0.3	0.4	0.4
76432	1.9	1.9	2.2	2.7	2.6	3.1	3.5	2.6
76481	0.3	0.3	0.5	0.4	0.4	0.4	0.4	0.4
76483	0.7	0.6	0.6	0.5	0.4	0.4	0.5	0.5
76491	2.2	2.3	2.6	2.6	2.1	2.5	2.7	2.4
76492	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1
76493	3.5	3.7	3.8	3.6	3.2	3.4	3.3	3.5
76499	1.3	1.3	1.4	1.6	1.4	1.2	1.0	1.3
Total	15.1	15.8	16.3	16.6	14.9	15.8	16.5	15.9
Other IT products								
5985	0.2	0.2	0.3	0.3	0.4	0.5	0.5	0.4
66591	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
72811	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.3
72819	0.2	0.2	0.2	0.2	0.1	0.2	0.1	0.2
72842	1.7	1.7	1.6	1.4	1.3	1.4	1.2	1.5

72852	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.4
72855	1.4	1.3	1.1	1.1	1.1	1.2	1.2	1.2
73111	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
73114	0.1	0.1	0.1	0.1	0.2	0.3	0.2	0.2
73591	0.6	0.5	0.4	0.4	0.4	0.4	0.4	0.5
74131	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
74132	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
74133	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
74135	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
74189	0.7	0.6	0.5	0.5	0.5	0.5	0.5	0.5
7419	0.5	0.5	0.4	0.4	0.4	0.4	0.3	0.4
74359	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.2
74391	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
74565	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2
74918	0.7	0.8	0.8	0.9	0.7	0.7	0.6	0.7
75113	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1
75121	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2
75122	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1
75123	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
75124	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1
75128	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
75131	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.1
75133	0.4	0.3	0.2	0.1	0.2	0.1	0.1	0.2
7591	1.4	1.4	1.3	1.1	1.0	0.9	0.9	1.1
75995	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
76421	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
76423	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.3
76424	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
77121	1.0	1.1	1.1	1.1	1.1	1.2	1.4	1.1
77125	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
77231	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1
77232	0.2	0.2	0.3	0.3	0.3	0.2	0.2	0.2
77233	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0
77235	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
77238	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1
77255	1.0	1.1	1.1	1.1	1.1	1.0	0.9	1.0
77258	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5
77259	1.3	1.4	1.3	1.4	1.4	1.4	1.5	1.4
77314	0.7	0.9	0.9	0.8	0.8	0.9	0.9	0.8
77315	0.9	1.1	1.0	0.8	0.8	0.9	0.9	0.9
77318	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
77861	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1
77862	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.2
77863	0.3	0.2	0.3	0.3	0.3	0.3	0.3	0.3
77864	0.1	0.1	0.1	0.1	0.2	0.1	0.2	0.1
77865	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.2
77866	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1
77867	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.1
77868	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1
77869	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
77871	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1
77878	1.5	1.4	1.3	1.2	1.2	1.2	1.3	1.3
77879	0.3	0.3	0.2	0.2	0.3	0.3	0.3	0.3
77884	0.4	0.5	0.5	0.6	0.5	0.6	0.6	0.5
77885	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
87131	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1
87139	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
87141	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
87143	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
87149	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
87422	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1

87424	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
87425	1.5	1.4	1.2	1.1	1.0	1.1	1.2	1.2
87426	0.3	0.3	0.3	0.2	0.2	0.3	0.3	0.3
87431	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2
87435	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
87437	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
87439	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2
87442	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
87443	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2
87445	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
87446	0.6	0.5	0.4	0.4	0.4	0.4	0.4	0.4
87449	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
87477	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
87478	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.5
87479	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
88135	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6
88136	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
89841	0.5	0.5	0.4	0.4	0.3	0.2	0.2	0.3
89843	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
89845	1.2	1.1	0.9	0.8	0.7	0.7	0.5	0.8
89851	0.5	0.7	0.7	0.5	0.5	0.6	0.6	0.6
89859	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2
89861	0.2	0.2	0.2	0.2	0.1	0.0	0.0	0.1
89865	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.1
89867	0.2	0.2	0.2	0.2	0.1	0.2	0.1	0.2
89871	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.1
89879	1.7	2.0	2.0	2.0	1.8	1.9	1.9	1.9
Total	32.7	32.6	30.6	29.5	28.5	28.9	29.2	30.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	

Source: PCTAS

Appendix Table 2.Trade balance, major IT products, Philippines, 1991-1997 (US$ '000)

Code	1991	1992	1993	1994	1995	1996	1997
SITC 75260 - Input or output units , whether or not containing storage units in the same housing							
Exports	165,334	174,795	187,378	177,865	195,364	468,996	1,682,723
Imports	30,008	148,735	62,660	72,411	95,217	136,684	109,439
Trade balance	135,326	26,060	124,718	105,454	100,147	332,312	1,573,284
SITC 77631 -Diodes, other than photosensitive or light emitting							
Exports	25,529	20,337	22,244	39,583	42,368	47,525	33,450
Imports	8,272	7,633	13,666	18,389	23,562	28,153	38,756
Trade balance	17,257	12,704	8,578	21,194	18,806	19,372	(5,306)
SITC 77632 - Transistors with a dissipation rate of less than 1W							
Exports	41,836	33,861	33,013	73,966	124,880	186,283	222,482
Imports	2,827	845	2,273	3,972	4,628	5,625	8,517
Trade balance	39,009	33,016	30,740	69,994	120,252	180,658	213,965
SITC 77639 - Other semiconductor devices							
Exports	102,557	126,698	141,320	147,237	212,143	375,010	325,244
Imports	72,229	9,459	12,436	12,748	19,334	43,089	79,533
Trade balance	30,328	117,239	128,884	134,489	192,809	331,921	245,711
SITC 77641 - Digital monolithic integrated circuits							
Exports	44,546	-	113	10	381,082	1,159,581	1,485,939
Imports	54,619	22,818	38,734	51,655	90,329	80,144	289,188
Trade balance	(10,073)	(22,818)	(38,621)	(51,645)	290,753	1,079,437	1,196,751
SITC 77649 - Electronic microassemblies							
Exports	1,059,102	374,112	574,169	793,148	743,837	304,374	584,279
Imports	74,001	73,033	59,895	61,549	77,762	106,266	359,872
Trade balance	985,101	301,079	514,274	731,599	666,075	198,108	224,407
SITC 78433 - Brakes and servo-brakes							
Exports	14	24,381	33,925	74,092	85,360	129,009	178,007
Imports	2,749	2,399	3,422	4,492	5,229	6,570	7,212
Trade balance	(2,735)	21,982	30,503	69,600	80,131	122,439	170,795
SITC 93102 - Materials imported on consignment basis for the manufacture of semiconductors and electrical equipment							
Exports	1,263,903	1,394,662	1,815,184	2,573,242	4,354,580	6,275,291	8,358,823
Imports	1,207,696	1,400,730	1,807,868	2,710,735	3,772,391	5,129,563	5,410,680
Trade balance	56,207	(6,068)	7,316	(137,493)	582,189	1,145,728	2,948,143
SITC 76411 - Line telephone sets with cordless handsets							
Exports	27,933	48,411	61,462	95,993	133,902	376,728	487,312
Imports	3,058	3,527	6,969	29,005	32,928	25,160	26,427
Trade balance	24,875	44,884	54,493	66,988	100,974	351,568	460,885
SITC 76432 - Transmission apparatus incorporating reception apparatus							
Exports	113,508	142,255	173,258	193,407	190,970	127,153	141,468
Imports	4,541	2,348	4,951	9,539	65,195	61,926	22,283
Trade balance	108,967	139,907	168,307	183,868	125,775	65,227	119,185
SITC 76483 - Radar and remote control apparatus							
Exports	25,078	24,570	45,733	50,274	25,895	24,604	25,996
Imports	490	485	930	1,786	2,461	5,893	2,789
Trade balance	24,588	24,085	44,803	48,488	23,434	18,711	23,207
SITC 76424 - Line telephone handsets							
Exports	2	-	45	4,336	15,940	19,227	16,085
Imports	806	738	2,016	1,197	853	888	1,113
Trade balance	(804)	(738)	(1,971)	3,139	15,087	18,339	14,972
SITC 77125 - Other inductors for power supplies for automatic data processing machines							
Exports	9,324	11,400	12,876	19,536	21,288	22,401	16,814
Imports	2,017	3,151	5,373	7,049	8,920	15,715	24,142
Trade balance	7,307	8,249	7,503	12,487	12,368	6,686	(7,328)
SITC 77232 - Other fixed resistors for power handling capacity							
Exports	2,819	11,775	29,194	65,416	68,797	56,425	64,110
Imports	12,611	10,128	10,087	17,043	24,121	31,090	16,042
Trade balance	(9,792)	1,647	19,107	48,373	44,676	25,335	48,068

Source: PCTAS.

Appendix Table 3. Revealed comparative advantage and market share, Philippine IT exports, 1991-1997

Code	Description	Market share (%)			Revealed comparative advantage		
		1991	1997	Change	1991	1997	Change
Computer hardware							
75220	Other digital automatic data processing unit	0.0	0.0	(0.0)	0.0	0.0	(0.0)
75230	Digital automatic data processing unit other than those of sub-heading 7522	-	0.0	0.0	-	-	-
75260	Input or output units	0.7	5.1	4.4	2.4	8.7	6.3
75290	Other units of automatic data processing machines	0.0	0.0	0.0	0.0	0.1	0.0
75997	Part and accessories of heading 752	0.4	0.5	0.1	1.3	0.8	(0.4)
Total		0.3	1.0	0.7	1.0	1.6	0.6
Semiconductors							
77220	Printed circuits	0.6	1.6	1.0	1.9	2.7	0.8
77631	Diodes, other than photosensitive or light emitting	1.5	0.9	(0.7)	5.0	1.5	(3.5)
77632	Transistors with a dissipation rate of less than 1W	3.7	10.1	6.4	12.0	17.0	5.0
77633	Transistors with a dissipation rate of 1W or more	0.1	-	(0.1)	0.3	-	(0.3)
77635	Thyristors, diacs and triacs	1.1	-	(1.1)	3.4	-	(3.4)
77637	Photosensitive semiconductor devices	0.5	0.2	(0.3)	1.7	0.4	(1.3)
77639	Other semiconductor devices	26.7	16.0	(10.7)	87.3	27.0	(60.3)
77641	Digital monolithic integrated circuits	0.2	2.1	1.9	0.6	3.5	2.9
77643	Other monolithic integrated circuits	0.2	0.0	(0.2)	0.7	0.0	(0.7)
77645	Hybrid integrated circuits	0.1	0.0	(0.1)	0.4	0.0	(0.4)
77649	Electronic microassemblies	14.8	31.0	16.1	48.5	52.2	3.7
77681	Mounted piezo-electric crystals	1.1	0.4	(0.7)	3.7	0.7	(3.0)
77688	Parts of mounted piezo-electric crystals	5.6	0.6	(5.0)	18.3	1.0	(17.3)
77689	Parts of electronic integrated circuits and microassemblies	0.9	2.3	1.5	2.8	3.9	1.2
78433	Brakes and servo-brakes	0.0	2.1	2.1	0.0	3.5	3.5
Total		4.0	7.9	3.8	7.0	3.6	(3.3)
Telecommunications							
76382	Transcribing machines	-	-	-	-	116.1	116.1
76383	Sound reproducing apparatus, cassette type	0.5	0.2	(0.2)	1.5	-	(1.5)
76384	Magnetic tape recorders, cassette typr	0.1	-	(0.1)	0.2	-	(0.2)
76411	Line telephone sets with cordless handsets	1.5	9.1	7.6	4.9	15.4	10.5
76415	Telephonic or telegraphic switching apparatus	0.1	-	(0.1)	0.2	-	(0.2)
76419	Other apparatus including entry-phone systems	0.0	-	(0.0)	0.1	-	(0.1)
76431	Transmission apparatus	-	-	-	-	9.4	9.4
76432	Transmission apparatus incorporating reception apparatus	1.8	0.6	(1.2)	5.9	-	(5.9)
76481	Portable receivers for calling, alerting and paging	-	-	-	-	1.7	1.7
76483	Radar and remote control apparatus	1.1	0.8	(0.3)	3.6	1.4	(2.2)
76491	Parts of electrical apparatus for line telephony and telegraphy	0.2	0.4	0.1	0.8	0.6	(0.2)
76492	Parts of amplifiers, microphones and loudspeakers	2.0	1.7	(0.4)	6.6	2.8	(3.8)
76493	Aerials and antennae and parts used for radio telephony and radio telegraphy	0.8	0.4	(0.3)	2.5	0.7	(1.7)
76499	Magnetic type sound heads and parts for recording	0.2	0.0	(0.2)	0.8	0.1	(0.7)
Total		0.6	0.8	0.2	2.0	1.3	(0.7)
Other IT products							
59850	Chemical elements doped for use in electronics	-	0.0	0.0	-	0.0	0.0
72819	Parts of machines used for semiconductors wafers	0.0	0.0	(0.0)	0.1	0.0	(0.1)
72842	Encapsulation equipment for assembly of semiconductors	0.0	0.0	(0.0)	0.0	0.0	(0.0)
72852	Parts of encapsulation equipment	0.0	0.0	(0.0)	0.1	0.0	(0.1)
72855	Parts of apparatus for the assembly of semiconductors	0.0	0.0	(0.0)	0.1	0.0	(0.1)
73111	Machines for the removal of material by laser in the production of semiconductor waves	-	-	-	-	2.6	2.6
73591	Parts of focused iron beam milling machines	0.2	0.4	0.3	0.5	-	(0.5)
74131	Furnices and ovens for the production of semiconductor devices	-	-	-	-	0.0	0.0
74133	Apparatus and parts of the manufacture of semiconductor devices	0.0	0.0	0.0	0.0	-	(0.0)
74135	Parts of apparatus for rapid heating of wafers	-	-	-	-	0.0	0.0
74189	Chemical vapor deposition apparatus for semiconductor production	0.0	0.0	(0.0)	0.0	-	(0.0)
74190	Parts of chemical vapor deposition apparatus for semiconductor production	-	0.0	0.0	-	0.0	0.0

Code	Description	Market share (%)			Revealed comparative advantage		
		1991	1997	Change	1991	1997	Change
74359	Spin dryer for semiconductor wafer processing	0.0	0.0	(0.0)	0.2	0.0	(0.1)
74391	Parts of spin dyrer for semiconductor wafer processing	-	0.0	0.0	-	0.0	0.0
74565	Cleaning machines for semiconductor packages	-	-	-	-	0.0	0.0
74918	Parts of automated machines for transport of the manufacture of semiconductor devices	0.0	0.0	(0.0)	0.0	-	(0.0)
75113	Word processing machines	-	-	-	-	22.9	22.9
75131	Electrostatic photocopying apparatus	-	9.3	9.3	-	-	-
75133	Other photocopying apparatus	-	-	-	-	8.0	8.0
75910	Parts and accessories of photocopying apparatus	-	0.1	0.1	-	0.1	0.1
75995	Parts and accessories of machines of sub-heading 751.2	-	2.7	2.7	-	4.5	4.5
76421	Microphones having a frequency range of 300 Hz to 3.4 KHz	0.0	0.7	0.7	0.0	1.3	1.2
76423	Loudspeakers, without housing	0.6	0.7	0.1	2.1	1.2	(0.9)
76424	Line telephone handsets	0.0	3.0	3.0	0.0	5.0	5.0
77121	Static converters for automatic data processing machines and telecommunications	0.0	0.0	0.0	0.0	0.1	0.1
77125	Other inductors for power supplies for data processing machines	1.0	0.8	(0.2)	3.4	1.4	(2.0)
77231	Fixed carbon resistors, composition or film types	0.1	0.2	0.1	0.2	0.3	0.0
77232	Other fixed resistors for power handling capacity	0.4	4.1	3.7	1.2	6.8	5.6
77233	Wirewound variable resistors, including rheostats and potentiometers	-	-	-	-	0.0	0.0
77235	Other variable resistors	0.1	0.0	(0.1)	0.3	-	(0.3)
77238	Parts of variable resistors	0.1	-	(0.1)	0.4	-	(0.4)
77255	Electronic switches	0.0	0.0	0.0	0.0	0.1	0.0
77258	Plugs and sockets for co-axial cables and printed circuits	-	0.0	0.0	-	0.0	0.0
77259	Connection and contact elements for wires and cables	0.0	0.4	0.4	0.1	0.7	0.6
77314	Electronic conductors	0.0	-	(0.0)	0.1	-	(0.1)
77315	Other electronic conductors	0.0	-	(0.0)	0.1	-	(0.1)
77863	Aluminum alectrolytic fixed capacitors	0.1	-	(0.1)	0.2	-	(0.2)
77865	Ceramic dielectric, multilayer fixed capacitors	-	0.2	0.2	-	0.3	0.3
77866	Dielectric fixed capacitors of papers and plastics	-	-	-	-	6.1	6.1
77867	Other fixed capacitors	0.0	2.3	2.3	0.0	-	(0.0)
77868	Variable or adjustable (pre-set) apparatus	1.1	-	(1.1)	3.5	-	(3.5)
77869	Parts of capacitors	-	0.2	0.2	-	0.3	0.3
77878	Proximity cards and tags	0.0	0.0	(0.0)	0.0	-	(0.0)
77879	Parts of 77878	-	-	-	-	0.0	0.0
77884	Indicator panels incorporating LCD or LED	-	0.0	0.0	-	-	-
77885	Parts of apparatus of sub-heading 77884	0.0	0.0	(0.0)	0.2	0.0	(0.1)
87131	Electron beam microscopes	-	0.0	0.0	-	0.0	0.0
87425	Optical instruments and appliances	0.0	-	(0.0)	0.1	-	(0.1)
87426	Parts and accessories of optical instruments	0.0	0.0	(0.0)	0.1	0.0	(0.1)
87431	Instruments for measuring or checking the flow of liquids	-	-	-	-	-	-
87435	Instruments for measuring or checking pressure	-	0.3	0.3	-	-	-
87437	Other instruments for measuring and checking of heading 759.1	-	-	-	-	0.7	0.7
87439	Parts and accessories of instruments of heading 759.1	-	0.0	0.0	-	-	-
87443	Spectrometers, spectrophotometers and spectographs using optical radiations	0.0	-	(0.0)	0.0	-	(0.0)
87445	Other instruments and apparatus using optical radiations	-	-	-	-	0.0	0.0
87446	Other instruments and apparatus under heading 8744	0.0	0.0	(0.0)	0.0	-	(0.0)
87449	Parts and accessories of products of heading 8744	0.0	-	(0.0)	0.0	-	(0.0)
87477	Instruments and apparatus designed for telecommunications	-	-	-	-	0.0	0.0
87478	Instruments and apparatus for semiconductor wafers	0.0	0.0	(0.0)	0.1	-	(0.1)
87479	Parts and accessories of instruments for semiconductor devices	-	-	-	-	0.0	0.0
88135	Apparatus for making circuit patterns for semiconductor wafers	0.0	0.0	0.0	0.0	-	(0.0)
88136	Parts and accessories of the apparatus of heading 88135	-	0.0	0.0	-	0.0	0.0
89845	Magnetic tapes of of a width exceeding 6.5mm	0.0	-	(0.0)	0.0	-	(0.0)
89859	Other magnetic tapes and discs	0.4	0.0	(0.4)	1.2	0.0	(1.2)
89867	Magnetic tapes for reproducing phenomena other than sound	0.7	-	(0.7)	2.1	-	(2.1)
89879	Other media for reproducing phenomena	0.0	0.1	0.1	0.0	0.2	0.2
Total		0.0	0.2	-0.1	0.1	0.3	0.1
Grand Total (IT)		1.0	2.2	-1.2	2.1	1.6	(0.4)

Source: Estimates of author using PCTAS

Appendix Table 4. Revealed comparative advantage and market share of Indonesia's IT exports, 1991-1997

SITC No.	Description	Market share (%)			Revealed comparative advantage		
		1991	1997	1997-91	1991	1997	1997-91
Computer hardware							
75210	Electronic calculators	0.0	0.3	0.3	0.0	0.2	0.2
75220	Other digital automatic data processing unit	0.0	0.1	0.1	0.0	0.1	0.1
75230	Digital automatic data processing unit other than those of sub-heading 7522	0.0	0.0	0.0	0.0	0.0	0.0
75260	Input or output units	0.0	0.4	0.4	0.0	0.3	0.3
75270	Storage units	0.1	0.0	(0.1)	0.1	0.0	(0.1)
75290	Other units of automatic data processing machines	0.2	0.7	0.5	0.2	0.6	0.4
75997	Part and accessories of heading 752	0.0	0.8	0.8	0.0	0.6	0.6
Total		0.0	0.4	0.4	0.0	0.3	0.3
Semiconductors							
77220	Printed circuits	0.0	0.1	0.1	0.0	0.1	0.1
77629	Parts of other electronic tubes and valves	0.0	0.6	0.6	0.0	0.5	0.5
77631	Diodes, other than photosensitive or light emitting	0.0	0.0	0.0	0.0	0.0	0.0
77632	Transistors with a dissipation rate of less than 1W	0.0	0.0	0.0	0.0	0.0	0.0
77633	Transistors with a dissipation rate of 1W or more	0.0	0.1	0.1	0.0	0.1	0.1
77637	Photosensitive semiconductor devices	0.0	0.0	0.0	0.0	0.0	0.0
77639	Other semiconductor devices	0.0	0.5	0.5	0.0	0.4	0.4
77641	Digital monolithic integrated circuits	0.1	0.2	0.0	0.1	0.1	(0.0)
77643	Other monolithic integrated circuits	0.0	0.0	0.0	0.0	0.0	0.0
77645	Hybrid integrated circuits	0.0	0.2	0.2	0.0	0.2	0.2
77649	Electronic microassemblies	0.1	0.0	(0.1)	0.1	0.0	(0.1)
77681	Mounted piezo-electric crystals	0.3	0.7	0.4	0.3	0.5	0.2
77688	Parts of mounted piezo-electric crystals	0.0	0.1	0.1	0.0	0.1	0.1
77689	Parts of electronic integrated circuits and microassemblies	0.0	0.2	0.2	0.0	0.2	0.2
78433	Brakes and servo-brakes	0.0	0.0	(0.0)	0.0	0.0	(0.0)
Total		0.1	0.1	0.1	0.1	0.1	0.0
Telecommunications							
76382	Transcribing machines	0.0	0.0	0.0	0.0	0.0	0.0
76383	Sound reproducing apparatus, cassette type	0.1	2.6	2.5	0.1	2.0	2.0
76384	Magnetic tape recorders, cassette typr	0.0	4.0	3.9	0.0	3.1	3.1
76411	Line telephone sets with cordless handsets	1.5	0.8	(0.7)	1.5	0.6	(0.9)
76415	Telephonic or telegraphic switching apparatus	0.0	1.0	1.0	0.0	0.8	0.8
76417	Other apparatus for carrier-current line systems	0.0	0.0	0.0	0.0	0.0	0.0
76419	Other apparatus including entry-phone systems	0.0	1.4	1.3	0.0	1.1	1.1
76431	Transmission apparatus	0.0	0.0	0.0	0.0	0.0	0.0
76432	Transmission apparatus incorporating reception apparatus	0.0	0.0	0.0	0.0	0.0	0.0
76481	Portable receivers for calling, alerting and paging	0.0	0.0	(0.0)	0.0	0.0	(0.0)
76483	Radar and remote control apparatus	0.0	0.0	(0.0)	0.0	0.0	(0.0)
76491	Parts of electrical apparatus for line telephony and telegraphy	0.0	0.1	0.1	0.0	0.1	0.1
76492	Parts of amplifiers, microphones and loudspeakers	0.3	1.7	1.4	0.3	1.3	1.1
76493	Aerials and antannae and parts used for radio telephony and radio telegraphy	0.4	0.8	0.4	0.4	0.6	0.3
76499	Magnetic type sound heads and parts for recording	0.3	1.0	0.7	0.3	0.8	0.5
Total		0.2	0.6	0.4	0.2	0.4	0.3
Other IT products							
66591	Quartz reactor tubes and holders	0.0	0.1	0.1	0.0	0.1	0.1
72811	Machines for the processing of semiconductor wafer	0.0	0.0	0.0	0.0	0.0	0.0
72819	Parts of machines used for semiconductors wafers	0.0	0.0	(0.0)	0.0	0.0	(0.0)
72842	Encapsulation equipment for assembly of semiconductors	0.0	0.1	0.1	0.0	0.0	0.0
72852	Parts of encapsulation equipment	0.0	0.0	0.0	0.0	0.0	0.0
72855	Parts of apparatus for the assembly of semiconductors	0.0	0.1	0.1	0.0	0.1	0.1
74133	Apparatus and parts of the manufacture of semiconductor devices	0.0	0.0	0.0	0.0	0.0	0.0
74135	Parts of apparatus for rapid heating of wafers	0.0	0.0	0.0	0.0	0.0	0.0

74189	Chemical vapor deposition apparatus for semiconductor production	0.0	0.0	0.0	0.0	0.0	0.0
7419	Parts of chemical vapor deposition apparatus for semiconductor production	0.0	0.0	(0.0)	0.0	0.0	(0.0)
74359	Spin dryer for semiconductor wafer processing	0.0	0.0	0.0	0.0	0.0	0.0
74391	Parts of spin dyrer for semiconductor wafer processing	0.0	0.0	0.0	0.0	0.0	0.0
74918	Parts of automated machines for transport of the manufacture of semiconductor devices	0.0	0.0	0.0	0.0	0.0	0.0
75113	Word processing machines	0.1	6.2	6.2	0.1	5.0	4.9
75121	Electronic calculators	0.0	0.1	0.1	0.0	0.1	0.1
75122	Other calculating machines	0.0	4.9	4.9	0.0	3.9	3.9
75128	Machines incorporating calculating device	0.0	0.2	0.2	0.0	0.2	0.2
75131	Electrostatic photocopying apparatus	0.0	0.3	0.3	0.0	0.3	0.3
7591	Parts and accessories of photocopying apparatus	0.0	0.1	0.1	0.0	0.0	0.0
75995	Parts and accessories of machines of sub-heading 751.2	0.0	0.0	0.0	0.0	0.0	0.0
76421	Microphones having a frequency range of 300 Hz to 3.4 KHz	0.0	0.2	0.2	0.0	0.2	0.1
76423	Loudspeakers, without housing	1.3	3.8	2.6	1.3	3.1	1.8
76424	Line telephone handsets	0.0	3.7	3.7	0.0	3.0	3.0
77121	Static converters for automatic data processing machines and telecommunications	0.0	0.4	0.4	0.0	0.4	0.3
77125	Other inductors for power supplies for data processing machines	0.0	0.1	0.1	0.0	0.1	0.1
77232	Other fixed resistors for power handling capacity	0.0	2.4	2.4	0.0	1.9	1.9
77233	Wirewound variable resistors, including rheostats and potentiometers	0.0	1.4	1.4	0.0	1.1	1.1
77235	Other variable resistors	0.0	0.0	0.0	0.0	0.0	0.0
77238	Parts of variable resistors	0.0	0.0	0.0	0.0	0.0	0.0
77255	Electronic switches	0.0	0.1	0.1	0.0	0.1	0.1
77259	Connection and contact elements for wires and cables	0.0	0.3	0.3	0.0	0.2	0.2
77314	Electronic conductors	0.0	0.3	0.3	0.0	0.3	0.2
77315	Other electronic conductors	0.1	0.6	0.5	0.1	0.5	0.4
77318	Optical fibre cables	0.0	0.1	0.1	0.0	0.1	0.1
77861	Fixed capacitors designed for use in 50/60 Hz circuits	0.0	1.5	1.5	0.0	1.2	1.2
77862	Tantalum fixed capacitors	0.0	0.3	0.3	0.0	0.2	0.2
77863	Aluminum alectrolytic fixed capacitors	0.0	0.3	0.3	0.0	0.3	0.2
77864	Ceramic die-lectric fixed capacitors	0.3	0.0	(0.3)	0.3	0.0	(0.3)
77866	Dielectric fixed capacitors of papers and plastics	0.0	0.4	0.4	0.0	0.3	0.3
77867	Other fixed capacitors	0.0	0.1	0.1	0.0	0.1	0.1
77868	Variable or adjustable (pre-set) apparatus	0.1	1.8	1.7	0.1	1.4	1.3
77869	Parts of capacitors	0.0	0.0	0.0	0.0	0.0	0.0
77878	Proximity cards and tags	0.0	0.1	0.1	0.0	0.1	0.1
77879	Parts of 77878	0.0	0.6	0.6	0.0	0.4	0.4
77884	Indicator panels incorporating LCD or LED	0.0	0.1	0.1	0.0	0.1	0.1
77885	Parts of apparatus of sub-heading 77884	0.0	1.1	1.1	0.0	0.9	0.9
87141	Optical steroscopic microscopes	0.0	0.0	0.0	0.0	0.0	0.0
87422	Pattern generating apparatus of a kind used for producing masks	0.0	0.0	0.0	0.0	0.0	0.0
87424	Parts of such pattern generating apparatus	0.0	0.0	0.0	0.0	0.0	0.0
87425	Optical instruments and appliances	0.0	0.0	0.0	0.0	0.0	0.0
87435	Instruments for measuring or checking pressure	0.0	0.0	0.0	0.0	0.0	0.0
87439	Parts and accessories of instruments of heading 759.1	0.0	0.2	0.1	0.0	0.1	0.1
87446	Other instruments and apparatus under heading 8744	0.0	0.0	(0.0)	0.0	0.0	(0.0)
87449	Parts and accessories of products of heading 8744	0.0	0.0	0.0	0.0	0.0	0.0
87478	Instruments and apparatus for semiconductor wafers	0.0	0.0	0.0	0.0	0.0	0.0
88135	Apparatus for making circuit patterns for semiconductor wafers	0.0	0.0	(0.0)	0.0	0.0	(0.0)
88136	Parts and accessories of the apparatus of heading 88135	0.0	0.0	0.0	0.0	0.0	0.0
89841	Magnetic tapes of a width not exceeding 4mm	1.3	1.0	(0.3)	1.3	0.8	(0.5)
89843	Magnetic tapes of a width exceeding 4mm but not 6.5mm	0.0	0.1	0.1	0.0	0.1	0.1
89845	Magnetic tapes of of a width exceeding 6.5mm	0.0	0.1	0.1	0.0	0.1	0.1
89851	Magnetic discs	0.0	0.1	0.1	0.0	0.1	0.1
89859	Other magnetic tapes and discs	0.9	0.4	(0.5)	0.9	0.3	(0.6)
89879	Other media for reproducing phenomena	0.0	0.0	0.0	0.0	0.0	0.0
Total		0.0	0.2	0.2	0.0	0.2	0.1
Grand Total (IT)		0.1	0.3	0.3	0.1	0.2	0.2

Source: Estimates of author using PCTAS.

Appendix Table 5. Revealed comparative advantage and market share of Malaysia's IT exports, 1991-1996

SITC No.	Description	Market share (%)			Revealed comparative advantage		
		1991	1996	1996-91	1991	1996	1996-91
Computer hardware							
75210	Electronic calculators	0.0	0.6	0.6	0.0	0.3	0.3
75220	Other digital automatic data processing unit	0.0	1.3	1.3	0.0	0.7	0.7
75230	Digital automatic data processing unit other than those of sub-heading 7522	0.0	0.2	0.2	0.0	0.1	0.1
75260	Input or output units	0.0	5.0	5.0	0.0	2.9	2.9
75270	Storage units	0.0	0.3	0.3	0.0	0.2	0.2
75290	Other units of automatic data processing machines	1.7	13.7	12.1	1.4	8.0	6.6
75997	Part and accessories of heading 752	2.8	6.4	3.6	2.3	3.7	1.4
Total		1.2	4.3	3.1	1.0	2.5	1.5
Semiconductors							
77220	Printed circuits	2.5	9.3	6.8	2.1	5.4	3.3
77629	Parts of other electronic tubes and valves	2.7	3.0	0.3	2.2	1.7	(0.5)
77631	Diodes, other than photosensitive or light emitting	15.0	11.6	(3.4)	12.6	6.7	(5.9)
77632	Transistors with a dissipation rate of less than 1W	5.5	4.5	(1.0)	4.6	2.6	(2.0)
77633	Transistors with a dissipation rate of 1W or more	23.1	16.9	(6.2)	19.4	9.8	(9.6)
77635	Thyristors, diacs and triacs	0.1	3.0	3.0	0.0	1.7	1.7
77637	Photosensitive semiconductor devices	4.9	8.8	4.0	4.1	5.1	1.0
77639	Other semiconductor devices	1.5	1.5	0.1	1.2	0.9	(0.3)
77641	Digital monolithic integrated circuits	0.2	0.7	0.5	0.2	0.4	0.2
77643	Other monolithic integrated circuits	8.7	16.0	7.3	7.3	9.3	2.0
77645	Hybrid integrated circuits	38.6	5.2	(33.4)	32.5	3.0	(29.5)
77649	Electronic microassemblies	26.2	54.1	28.0	22.0	31.4	9.4
77681	Mounted piezo-electric crystals	4.9	5.1	0.2	4.1	3.0	(1.2)
77688	Parts of mounted piezo-electric crystals	2.6	6.0	3.4	2.2	3.5	1.3
77689	Parts of electronic integrated circuits and microassemblies	13.1	10.5	(2.7)	11.1	6.1	(5.0)
78433	Brakes and servo-brakes	0.0	0.1	0.0	0.0	0.0	0.0
Total		7.3	8.0	0.7	6.2	4.7	(1.5)
Telecommunications							
76382	Transcribing machines	15.4	0.5	(15.0)	13.0	0.3	(12.7)
76383	Sound reproducing apparatus, cassette type	2.2	11.5	9.3	1.8	6.7	4.8
76384	Magnetic tape recorders, cassette typr	8.1	11.3	3.2	6.8	6.5	(0.2)
76411	Line telephone sets with cordless handsets	11.4	11.1	(0.3)	9.6	6.4	(3.2)
76413	Teleprinters	0.0	23.7	23.7	0.0	13.8	13.7
76415	Telephonic or telegraphic switching apparatus	0.5	0.4	(0.1)	0.4	0.2	(0.2)
76417	Other apparatus for carrier-current line systems	0.1	0.7	0.7	0.1	0.4	0.4
76419	Other apparatus including entry-phone systems	1.0	4.4	3.4	0.9	2.6	1.7
76431	Transmission apparatus	0.0	1.2	1.2	0.0	0.7	0.7
76432	Transmission apparatus incorporating reception apparatus	2.7	0.5	(2.3)	2.3	0.3	(2.0)
76481	Portable receivers for calling, alerting and paging	2.5	4.0	1.6	2.1	2.3	0.3
76483	Radar and remote control apparatus	2.0	4.0	2.0	1.7	2.3	0.6
76491	Parts of electrical apparatus for line telephony and telegraphy	0.8	1.5	0.7	0.7	0.9	0.2
76492	Parts of amplifiers, microphones and loudspeakers	6.8	5.0	(1.8)	5.7	2.9	(2.8)
76493	Aerials and antennae and parts used for radio telephony and radio telegraphy	3.9	5.0	1.2	3.2	2.9	(0.3)
76499	Magnetic type sound heads and parts for recording	8.1	11.4	3.3	6.8	6.6	(0.2)
Total		3.3	4.0	0.8	2.8	2.3	(0.4)
Other IT products							
59850	Chemical elements doped for use in electronics	-	11.4	11.4	-	6.6	6.6
66591	Quartz reactor tubes and holders	0.3	0.1	(0.2)	0.2	0.0	(0.2)
72811	Machines for the processing of semiconductor wafer	0.0	0.4	0.4	0.0	0.2	0.2
72819	Parts of machines used for semiconductors wafers	0.1	0.4	0.3	0.1	0.2	0.1
72842	Encapsulation equipment for assembly of semiconductors	-	0.5	0.5	-	0.3	0.3
72852	Parts of encapsulation equipment	-	0.6	0.6	-	0.4	0.4
72855	Parts of apparatus for the assembly of semiconductors	-	0.7	0.7	-	0.4	0.4
73111	Machines for the removal of material by laser in the	0.0	0.2	0.2	0.0	0.1	0.1

	production of semiconductor waves						
73114	Apparatus for cleaning semiconductor wafers	0.2	0.2	(0.0)	0.2	0.1	(0.1)
73591	Parts of focused iron beam milling machines	-	0.3	0.3	-	0.2	0.2
74131	Furnices and ovens for the production of semiconductor devices	0.0	0.1	0.0	0.0	0.0	0.0
74132	Inductance and furnaces for the mfr of devices for semiconductor wafers	0.0	0.1	0.1	0.0	0.0	0.0
74133	Apparatus and parts of the manufacture of semiconductor devices	0.1	0.6	0.5	0.1	0.3	0.2
74135	Parts of apparatus for rapid heating of wafers	0.1	0.2	0.1	0.1	0.1	0.0
74189	Chemical vapor deposition apparatus for semiconductor production	0.1	0.2	0.1	0.1	0.1	0.0
74190	Parts of chemical vapor deposition apparatus for semiconductor production	-	0.3	0.3	-	0.2	0.2
74359	Spin dryer for semiconductor wafer processing	0.0	0.5	0.4	0.0	0.3	0.2
74391	Parts of spin dyrer for semiconductor wafer processing	0.4	0.2	(0.2)	0.3	0.1	(0.2)
74565	Cleaning machines for semiconductor packages	0.0	0.1	0.1	0.0	0.1	0.0
74918	Parts of automated machines for transport of the manufacture of semiconductor devices	-	0.2	0.2	-	0.1	0.1
75113	Word processing machines	0.0	0.4	0.4	0.0	0.2	0.2
75121	Electronic calculators	-	5.1	5.1	-	3.0	3.0
75122	Other calculating machines	-	22.1	22.1	-	12.8	12.8
75124	Cash registers	-	4.7	4.7	-	2.7	2.7
75128	Machines incorporating calculating device	0.0	0.2	0.2	0.0	0.1	0.1
75131	Electrostatic photocopying apparatus	0.2	1.7	1.5	0.1	1.0	0.8
75910	Parts and accessories of photocopying apparatus	-	0.4	0.4	-	0.2	0.2
75995	Parts and accessories of machines of sub-heading 751.2	0.1	3.0	2.8	0.1	1.7	1.6
76421	Microphones having a frequency range of 300 Hz to 3.4 KHz	-	4.8	4.8	-	2.8	2.8
76423	Loudspeakers, without housing	-	7.3	7.3	-	4.2	4.2
76424	Line telephone handsets	-	2.2	2.2	-	1.3	1.3
77121	Static converters for automatic data processing machines and telecommunications	-	1.6	1.6	-	0.9	0.9
77125	Other inductors for power supplies for data processing machines	-	3.4	3.4	-	2.0	2.0
77231	Electrostatic photocopying apparatus	-	20.2	20.2	-	11.7	11.7
77232	Other fixed resistors for power handling capacity	-	0.3	0.3	-	0.1	0.1
77233	Wirewound variable resistors, including rheostats and potentiometers	0.7	0.2	(0.5)	0.6	0.1	(0.5)
77235	Other variable resistors	-	3.7	3.7	-	2.2	2.2
77238	Parts of variable resistors	0.8	5.1	4.2	0.7	2.9	2.2
77255	Electronic switches	-	0.7	0.7	-	0.4	0.4
77258	Plugs and sockets for co-axial cables and printed circuits	0.1	0.3	0.2	0.0	0.2	0.1
77259	Connection and contact elements for wires and cables	-	1.9	1.9	-	1.1	1.1
77314	Electronic conductors	-	2.0	2.0	-	1.2	1.2
77315	Other electronic conductors	-	1.0	1.0	-	0.6	0.6
77318	Optical fibre cables	0.0	0.2	0.2	0.0	0.1	0.1
77861	Fixed capacitors designed for use in 50/60 Hz circuits	-	15.3	15.3	-	8.9	8.9
77862	Tantalum fixed capacitors	0.0	0.1	0.0	0.0	0.0	0.0
77863	Aluminum alectrolytic fixed capacitors	-	1.1	1.1	-	0.7	0.7
77864	Ceramic die-lectric fixed capacitors	-	1.1	1.1	-	0.6	0.6
77865	Ceramic dielectric, multilayer fixed capacitors	-	4.0	4.0	-	2.3	2.3
77866	Dielectric fixed capacitors of papers and plastics	-	0.8	0.8	-	0.5	0.5
77867	Other fixed capacitors	-	6.6	6.6	-	3.8	3.8
77868	Variable or adjustable (pre-set) apparatus	-	4.1	4.1	-	2.4	2.4
77869	Parts of capacitors	-	2.2	2.2	-	1.3	1.3
77871	Ion implanters for doping semiconductor materials	0.0	0.0	0.0	0.0	0.0	(0.0)
77878	Proximity cards and tags	-	0.2	0.2	-	0.1	0.1
77879	Parts of 77878	-	1.6	1.6	-	0.9	0.9
77884	Indicator panels incorporating LCD or LED	2.8	1.8	(1.0)	2.4	1.1	(1.3)
77885	Parts of apparatus of sub-heading 77884	-	1.3	1.3	-	0.8	0.8
87131	Electron beam microscopes	0.1	0.2	0.1	0.1	0.1	0.0
87139	Parts and accessories of electron beam microscopes	0.0	1.0	0.9	0.0	0.6	0.5
87141	Optical steroscopic microscopes	-	0.2	0.2	-	0.1	0.1
87149	Parts and accessories of 87141	0.0	0.3	0.3	0.0	0.2	0.1
87422	Pattern generating apparatus of a kind used for producing masks	0.2	0.2	(0.0)	0.2	0.1	(0.1)
87424	Parts of such pattern generating apparatus	0.1	0.1	(0.0)	0.1	0.1	(0.0)
87425	Optical instruments and appliances	-	0.4	0.4	-	0.3	0.3
87426	Parts and accessories of optical instruments	0.1	0.5	0.4	0.1	0.3	0.2

87431	Instruments for measuring or checking the flow of liquids	0.0	0.1	0.1	0.0	0.1	0.0
87435	Instruments for measuring or checking pressure	0.3	0.2	(0.1)	0.2	0.1	(0.1)
87437	Other instruments for measuring and checking of heading 759.1	0.2	0.2	(0.0)	0.2	0.1	(0.1)
87439	Parts and accessories of instruments of heading 759.1	0.2	0.2	0.1	0.1	0.1	0.0
87442	Chromatographs and electrophoresis instruments	-	0.0	0.0	-	0.0	0.0
87443	Spectrometers, spectrophotometers and spectographs using optical radiations	0.0	0.0	(0.0)	0.0	0.0	(0.0)
87445	Other instruments and apparatus using optical radiations	0.0	0.0	0.0	0.0	0.0	0.0
87446	Other instruments and apparatus under heading 8744	0.1	0.2	0.1	0.1	0.1	0.0
87449	Parts and accessories of products of heading 8744	0.0	0.1	0.0	0.0	0.0	0.0
87477	Instruments and apparatus designed for telecommunications	0.0	0.4	0.3	0.0	0.2	0.2
87478	Instruments and apparatus for semiconductor wafers	0.2	0.1	(0.0)	0.1	0.1	(0.1)
87479	Parts and accessories of instruments for semiconductor devices	0.3	0.2	(0.2)	0.3	0.1	(0.2)
88135	Apparatus for making circuit patterns for semiconductor wafers	0.0	0.1	0.1	0.0	0.1	0.0
88136	Parts and accessories of the apparatus of heading 88135	0.0	0.1	0.1	0.0	0.1	0.1
89841	Magnetic tapes of a width not exceeding 4mm	-	0.3	0.3	-	0.2	0.2
89843	Magnetic tapes of a width exceeding 4mm but not 6.5mm	0.0	0.1	0.1	0.0	0.1	0.1
89845	Magnetic tapes of of a width exceeding 6.5mm	-	0.7	0.7	-	0.4	0.4
89851	Magnetic discs	-	4.5	4.5	-	2.6	2.6
89859	Other magnetic tapes and discs	-	8.6	8.6	-	5.0	5.0
89861	Discs for laser reading systems for reproducing phenomena	0.2	1.6	1.4	0.2	0.9	0.8
89865	Other discs	0.0	0.1	0.1	0.0	0.1	0.0
89867	Magnetic tapes for reproducing phenomena other than sound	0.1	0.2	0.0	0.1	0.1	(0.0)
89871	Media for reproducing phenomena other than sound	0.0	0.6	0.6	0.0	0.4	0.3
89879	Other media for reproducing phenomena	-	0.3	0.3	-	0.2	0.2
Total		0.1	1.3	1.3	0.1	0.8	0.7
Grand Total (IT)		2.4	4.3	2.0	2.0	2.5	0.5

Source: Estimates of author using PCTAS.

Appendix Table 6. Revealed comparative advantage and market share of Thailand's IT exports, 1991-1997

SITC No.	Description	Market share (%)			Revealed comparative advantage		
		1991	1997	1997-91	1991	1997	1997-91
Computer hardware							
75210	Electronic calculators	0.0	0.0	0.0	0.0	0.0	0.0
75220	Other digital automatic data processing unit	0.2	0.1	(0.1)	0.2	0.0	(0.1)
75230	Digital automatic data processing unit other than those of sub-heading 7522	0.0	0.0	0.0	0.0	0.0	(0.0)
75260	Input or output units	0.1	4.1	4.0	0.1	2.8	2.7
75270	Storage units	4.2	2.6	(1.6)	4.3	1.8	(2.5)
75290	Other units of automatic data processing machines	0.0	2.6	2.5	0.0	1.7	1.7
75997	Part and accessories of heading 752	3.1	5.5	2.4	3.2	3.8	0.6
Total		1.7	3.3	1.6	1.7	2.2	0.5
Semiconductors							
77220	Printed circuits	1.0	6.9	5.9	1.0	4.7	3.6
77629	Parts of other electronic tubes and valves	0.2	1.9	1.7	0.2	1.3	1.1
77631	Diodes, other than photosensitive or light emitting	0.9	1.1	0.2	0.9	0.8	(0.2)
77632	Transistors with a dissipation rate of less than 1W	1.0	5.1	4.1	1.0	3.5	2.5
77633	Transistors with a dissipation rate of 1W or more	0.4	5.4	5.0	0.4	3.7	3.3
77635	Thyristors, diacs and triacs	0.0	0.0	(0.0)	0.0	0.0	(0.0)
77637	Photosensitive semiconductor devices	1.9	2.3	0.4	1.9	1.6	(0.4)
77639	Other semiconductor devices	0.3	9.8	9.5	0.3	6.7	6.4
77641	Digital monolithic integrated circuits	0.5	0.9	0.4	0.5	0.6	0.1
77643	Other monolithic integrated circuits	2.7	5.8	3.1	2.7	4.0	1.2
77645	Hybrid integrated circuits	0.0	0.2	0.2	0.0	0.1	0.1
77649	Electronic microassemblies	1.2	4.7	3.6	1.2	3.2	2.0
77681	Mounted piezo-electric crystals	1.2	4.1	2.9	1.3	2.8	1.5
77688	Parts of mounted piezo-electric crystals	0.1	0.2	0.1	0.1	0.1	0.0
77689	Parts of electronic integrated circuits and microassemblies	21.9	8.2	(13.6)	22.3	5.6	(16.7)
78433	Brakes and servo-brakes	0.1	0.2	0.0	0.1	0.1	(0.0)
Total		1.7	2.7	0.9	1.8	1.8	0.0
Telecommunications							
76383	Sound reproducing apparatus, cassette type	1.0	1.4	0.4	1.0	0.9	(0.1)
76384	Magnetic tape recorders, cassette typr	1.8	2.3	0.5	1.9	1.6	(0.3)
76411	Line telephone sets with cordless handsets	8.0	2.8	(5.2)	8.1	1.9	(6.2)
76413	Teleprinters	61.9	81.5	19.6	63.1	55.5	(7.6)
76415	Telephonic or telegraphic switching apparatus	0.3	0.3	0.0	0.3	0.2	(0.1)
76417	Other apparatus for carrier-current line systems	0.1	1.3	1.2	0.1	0.9	0.8
76419	Other apparatus including entry-phone systems	0.2	0.7	0.5	0.2	0.4	0.3
76431	Transmission apparatus	0.1	0.2	0.1	0.1	0.1	0.1
76432	Transmission apparatus incorporating reception apparatus	0.8	0.5	(0.3)	0.8	0.3	(0.5)
76481	Portable receivers for calling, alerting and paging	0.2	0.4	0.2	0.2	0.3	0.1
76483	Radar and remote control apparatus	0.0	0.0	0.0	0.0	0.0	0.0
76491	Parts of electrical apparatus for line telephony and telegraphy	0.6	0.6	(0.0)	0.6	0.4	(0.2)
76492	Parts of amplifiers, microphones and loudspeakers	1.3	1.4	0.1	1.4	1.0	(0.4)
76493	Aerials and antennae and parts used for radio telephony and radio telegraphy	0.6	1.3	0.7	0.6	0.9	0.3
76499	Magnetic type sound heads and parts for recording	5.7	5.1	(0.6)	5.8	3.5	(2.3)
Total		1.4	1.4	(0.1)	1.5	0.9	(0.5)
Other IT products							
66591	Quartz reactor tubes and holders	-	0.0	0.0	-	0.0	0.0
72811	Machines for the processing of semiconductor wafer	0.0	0.0	0.0	0.0	0.0	(0.0)
72819	Parts of machines used for semiconductors wafers	0.1	0.1	(0.0)	0.1	0.0	(0.1)
72842	Encapsulation equipment for assembly of semiconductors	0.2	0.3	0.1	0.2	0.2	(0.0)
72852	Parts of encapsulation equipment	0.0	0.0	0.0	0.0	0.0	0.0
72855	Parts of apparatus for the assembly of semiconductors	0.0	0.1	0.0	0.0	0.0	0.0
73591	Parts of focused iron beam milling machines	0.4	0.4	(0.0)	0.4	0.2	(0.2)
74131	Furnices and ovens for the production of semiconductor devices	0.0	0.0	0.0	0.0	0.0	0.0

74133	Apparatus and parts of the manufacture of semiconductor devices	0.1	0.2	0.2	0.1	0.2	0.1
74135	Parts of apparatus for rapid heating of wafers	0.0	0.4	0.4	0.0	0.3	0.2
74189	Chemical vapor deposition apparatus for semiconductor production	0.0	0.0	0.0	0.0	0.0	0.0
7419	Parts of chemical vapor deposition apparatus for semiconductor production	0.1	0.1	0.0	0.1	0.1	(0.0)
74359	Spin dryer for semiconductor wafer processing	0.0	0.1	0.1	0.0	0.1	0.0
74565	Cleaning machines for semiconductor packages	0.0	0.1	0.1	0.0	0.1	0.0
74918	Parts of automated machines for transport of the manufacture of semiconductor devices	0.1	0.3	0.2	0.1	0.2	0.1
75113	Word processing machines	0.0	-	(0.0)	0.0	-	(0.0)
75121	Electronic calculators	17.7	12.0	(5.7)	18.0	8.2	(9.9)
75122	Other calculating machines	1.4	2.6	1.2	1.4	1.8	0.4
75124	Cash registers	0.0	0.0	0.0	0.0	0.0	0.0
75128	Machines incorporating calculating device	0.0	0.1	0.1	0.0	0.0	0.0
75131	Electrostatic photocopying apparatus	0.0	0.2	0.2	0.0	0.1	0.1
75133	Other photocopying apparatus	-	0.0	0.0	-	0.0	0.0
75910	Parts and accessories of photocopying apparatus	0.0	1.4	1.3	0.1	0.9	0.9
75995	Parts and accessories of machines of sub-heading 751.2	0.1	0.8	0.7	0.1	0.6	0.5
76421	Microphones having a frequency range of 300 Hz to 3.4 KHz	0.9	0.7	(0.2)	0.9	0.4	(0.5)
76423	Loudspeakers, without housing	2.9	0.9	(2.0)	2.9	0.6	(2.3)
76424	Line telephone handsets	1.1	0.7	(0.4)	1.1	0.5	(0.6)
77121	Static converters for automatic data processing machines and telecommunications	0.2	2.3	2.0	0.2	1.5	1.3
77125	Other inductors for power supplies for data processing machines	1.1	1.8	0.7	1.1	1.2	0.1
77231	Electrostatic photocopying apparatus	1.9	1.3	(0.5)	1.9	0.9	(1.0)
77232	Other fixed resistors for power handling capacity	0.1	0.9	0.8	0.1	0.6	0.5
77233	Wirewound variable resistors, including rheostats and potentiometers	0.3	0.4	0.2	0.3	0.3	0.0
77235	Other variable resistors	1.2	2.3	1.1	1.2	1.5	0.3
77238	Parts of variable resistors	0.1	0.1	0.0	0.1	0.1	(0.0)
77255	Electronic switches	0.4	0.7	0.3	0.4	0.5	0.1
77258	Plugs and sockets for co-axial cables and printed circuits	0.1	0.8	0.7	0.1	0.5	0.4
77259	Connection and contact elements for wires and cables	0.1	0.5	0.4	0.1	0.3	0.3
77314	Electronic conductors	3.8	1.9	(1.9)	3.9	1.3	(2.6)
77315	Other electronic conductors	0.3	1.1	0.7	0.4	0.7	0.4
77318	Optical fibre cables	0.0	0.0	0.0	0.0	0.0	0.0
77861	Fixed capacitors designed for use in 50/60 Hz circuits	1.6	1.6	0.1	1.6	1.1	(0.5)
77862	Tantalum fixed capacitors	1.9	9.5	7.6	1.9	6.5	4.5
77863	Aluminum alectrolytic fixed capacitors	1.8	2.2	0.4	1.8	1.5	(0.3)
77864	Ceramic die-lectric fixed capacitors	2.2	1.2	(1.1)	2.3	0.8	(1.5)
77865	Ceramic dielectric, multilayer fixed capacitors	-	0.0	0.0	-	0.0	0.0
77866	Dielectric fixed capacitors of papers and plastics	-	0.1	0.1	-	0.0	0.0
77867	Other fixed capacitors	0.3	1.8	1.5	0.3	1.2	0.9
77868	Variable or adjustable (pre-set) apparatus	7.6	1.8	(5.8)	7.8	1.2	(6.6)
77869	Parts of capacitors	2.6	0.7	(1.9)	2.6	0.5	(2.2)
77871	Ion implanters for doping semiconductor materials	-	0.1	0.1	-	0.0	0.0
77878	Proximity cards and tags	0.2	0.4	0.2	0.2	0.3	0.1
77879	Parts of 77878	0.3	0.9	0.6	0.3	0.6	0.3
77884	Indicator panels incorporating LCD or LED	0.0	0.5	0.4	0.0	0.3	0.3
77885	Parts of apparatus of sub-heading 77884	2.8	0.0	(2.8)	2.9	0.0	(2.8)
87141	Optical steroscopic microscopes	0.0	0.0	0.0	0.0	0.0	0.0
87149	Parts and acessories of 87141	0.0	0.3	0.3	0.0	0.2	0.2
87422	Pattern generating apparatus of a kind used for producing masks	0.0	0.0	0.0	0.0	0.0	(0.0)
87425	Optical instruments and appliances	0.1	0.2	0.1	0.1	0.1	0.1
87426	Parts and accessories of optical instruments	0.0	0.2	0.1	0.0	0.1	0.1
87431	Instruments for measuring or checking the flow of liquids	0.1	0.0	(0.1)	0.1	0.0	(0.1)
87435	Instruments for measuring or checking pressure	0.4	0.2	(0.2)	0.5	0.2	(0.3)
87437	Other instruments for measuring and checking of heading 759.1	0.1	0.1	0.0	0.1	0.1	0.0
87439	Parts and accessories of instruments of heading 759.1	0.1	0.7	0.5	0.1	0.5	0.3
87442	Chromatographs and electrophoresis instruments	-	0.0	0.0	-	0.0	0.0
87443	Spectrometers, spectrophotometers and spectographs using optical radiations	-	0.0	0.0	-	0.0	0.0
87445	Other instruments and apparatus using optical radiations	-	0.0	0.0	-	0.0	0.0
87446	Other instruments and apparatus under heading 8744	0.0	0.0	0.0	0.0	0.0	0.0
87449	Parts and accessories of products of heading 8744	-	0.0	0.0	-	0.0	0.0

87477	Instruments and apparatus designed for telecommunications	0.0	0.0	0.0	0.0	0.0	0.0
87478	Instruments and apparatus for semiconductor wafers	0.1	0.0	(0.1)	0.1	0.0	(0.1)
87479	Parts and accessories of instruments for semiconductor devices	0.2	0.0	(0.1)	0.2	0.0	(0.1)
88135	Apparatus for making circuit patterns for semiconductor wafers	0.0	0.1	0.1	0.0	0.1	0.1
88136	Parts and accessories of the apparatus of heading 88135	0.0	0.0	0.0	0.0	0.0	0.0
89841	Magnetic tapes of a width not exceeding 4mm	1.6	8.8	7.2	1.6	6.0	4.3
89843	Magnetic tapes of a width exceeding 4mm but not 6.5mm	0.1	0.4	0.3	0.1	0.3	0.2
89845	Magnetic tapes of of a width exceeding 6.5mm	1.0	0.4	(0.5)	1.0	0.3	(0.7)
89851	Magnetic discs	0.0	1.5	1.5	0.0	1.1	1.1
89859	Other magnetic tapes and discs	0.3	2.6	2.3	0.3	1.8	1.4
89861	Discs for laser reading systems for reproducing phenomena	0.3	0.8	0.5	0.3	0.5	0.2
89865	Other discs	0.1	0.0	(0.0)	0.1	0.0	(0.0)
89867	Magnetic tapes for reproducing phenomena other than sound	0.0	0.0	(0.0)	0.0	0.0	(0.0)
89871	Media for reproducing phenomena other than sound	0.1	0.2	0.1	0.1	0.2	0.0
89879	Other media for reproducing phenomena	0.0	0.2	0.2	0.0	0.1	0.1
Total		0.5	0.7	0.3	0.5	0.5	0.0
Grand Total (IT)		1.3	2.1	0.8	1.3	1.4	0.1

Source: Estimates of author using PCTAS.

Appendix Table 7. Revealed comparative advantage and market share of Singapore's IT exports, 1991-1997

SITC No.	Description	Market share (%)			Revealed comparative advantage		
		1991	1997	1997-91	1991	1997	1997-91
Computer hardware							
75210	Electronic calculators	0.2	-	(0.2)	0.1	-	(0.1)
75220	Other digital automatic data processing unit	17.8	10.1	(7.7)	8.7	3.3	(5.4)
75230	Digital automatic data processing unit other than those of sub-heading 7522	0.3	7.5	7.1	0.2	2.4	2.3
75260	Input or output units	24.7	12.5	(12.2)	12.1	4.1	(8.0)
75270	Storage units	1.7	37.4	35.7	0.8	12.3	11.4
75290	Other units of automatic data processing machines	2.0	6.6	4.6	1.0	2.2	1.2
75997	Part and accessories of heading 752	5.3	13.5	8.2	2.6	4.4	1.8
Total		9.1	16.2	7.1	4.5	5.3	0.8
Semiconductors							
77220	Printed circuits	3.8	6.5	2.7	1.9	2.1	0.3
77629	Parts of other electronic tubes and valves	0.5	5.1	4.6	0.2	1.7	1.4
77631	Diodes, other than photosensitive or light emitting	4.3	10.4	6.0	2.1	3.4	1.3
77632	Transistors with a dissipation rate of less than 1W	11.9	5.0	(7.0)	5.8	1.6	(4.2)
77633	Transistors with a dissipation rate of 1W or more	-	18.4	18.4	-	6.0	6.0
77635	Thyristors, diacs and triacs	-	7.4	7.4	-	2.4	2.4
77637	Photosensitive semiconductor devices	11.2	4.8	(6.5)	5.5	1.6	(4.0)
77639	Other semiconductor devices	-	35.8	35.8	-	11.7	11.7
77641	Digital monolithic integrated circuits	-	8.7	8.7	-	2.9	2.9
77643	Other monolithic integrated circuits	-	32.3	32.3	-	10.6	10.6
77645	Hybrid integrated circuits	-	56.8	56.8	-	18.6	18.6
77649	Electronic microassemblies	49.8	2.8	(46.9)	24.4	0.9	(23.4)
77681	Mounted piezo-electric crystals	4.4	8.0	3.6	2.2	2.6	0.5
77688	Parts of mounted piezo-electric crystals	-	11.6	11.6	-	3.8	3.8
77689	Parts of electronic integrated circuits and microassemblies	8.7	17.8	9.2	4.2	5.8	1.6
78433	Brakes and servo-brakes	-	0.1	0.1	-	0.0	0.0
Total		6.7	14.0	7.3	3.3	4.6	1.3
Telecommunications							
76382	Transcribing machines	-	0.0	0.0	-	0.0	0.0
76383	Sound reproducing apparatus, cassette type	-	11.1	11.1	-	3.6	3.6
76384	Magnetic tape recorders, cassette typr	18.9	3.2	(15.7)	9.3	1.1	(8.2)
76411	Line telephone sets with cordless handsets	6.2	5.9	(0.3)	3.1	1.9	(1.1)
76413	Teleprinters	-	0.4	0.4	-	0.1	0.1
76415	Telephonic or telegraphic switching apparatus	0.3	0.2	(0.0)	0.1	0.1	(0.1)
76417	Other apparatus for carrier-current line systems	0.4	0.6	0.2	0.2	0.2	(0.0)
76419	Other apparatus including entry-phone systems	2.6	2.7	0.1	1.3	0.9	(0.4)
76431	Transmission apparatus	19.5	1.3	(18.3)	9.6	0.4	(9.2)
76432	Transmission apparatus incorporating reception apparatus	-	3.5	3.5	-	1.2	1.2
76481	Portable receivers for calling, alerting and paging	4.4	26.5	22.1	2.2	8.7	6.5
76483	Radar and remote control apparatus	2.5	2.4	(0.1)	1.2	0.8	(0.4)
76491	Parts of electrical apparatus for line telephony and telegraphy	1.1	1.7	0.6	0.6	0.6	0.0
76492	Parts of amplifiers, microphones and loudspeakers	2.7	8.1	5.4	1.3	2.7	1.3
76493	Aerials and antennae and parts used for radio telephony and radio telegraphy	8.9	8.0	(0.9)	4.4	2.6	(1.7)
76499	Magnetic type sound heads and parts for recording	13.5	22.1	8.6	6.6	7.2	0.6
Total		5.6	5.7	0.1	2.7	1.9	(0.9)
Other IT products							
59850	Chemical elements doped for use in electronics	-	5.8	5.8	-	1.9	1.9
66591	Quartz reactor tubes and holders	0.6	0.8	0.2	0.3	0.3	(0.0)
72811	Machines for the processing of semiconductor wafer	0.3	0.4	0.2	0.1	0.1	0.0
72819	Parts of machines used for semiconductors wafers	0.7	2.5	1.8	0.4	0.8	0.5
72842	Encapsulation equipment for assembly of semiconductors	1.2	1.1	(0.0)	0.6	0.4	(0.2)
72852	Parts of encapsulation equipment	-	0.9	0.9	-	0.3	0.3
72855	Parts of apparatus for the assembly of semiconductors	-	4.4	4.4	-	1.4	1.4
73111	Machines for the removal of material by laser in the	-	0.3	0.3	-	0.1	0.1

	production of semiconductor waves						
73114	Apparatus for cleaning semiconductor wafers	-	0.2	0.2	-	0.1	0.1
73591	Parts of focused iron beam milling machines	-	0.9	0.9	-	0.3	0.3
74131	Furnices and ovens for the production of semiconductor devices	3.0	1.1	(1.9)	1.4	0.4	(1.1)
74132	Inductance and furnaces for the mfr of devices for semiconductor wafers	-	2.4	2.4	-	0.8	0.8
74133	Apparatus and parts of the manufacture of semiconductor devices	-	1.0	1.0	-	0.3	0.3
74135	Parts of apparatus for rapid heating of wafers	1.0	1.7	0.7	0.5	0.5	0.1
74189	Chemical vapor deposition apparatus for semiconductor production	0.9	1.2	0.3	0.4	0.4	(0.1)
74190	Parts of chemical vapor deposition apparatus for semiconductor production	0.4	0.5	0.1	0.2	0.1	(0.0)
74359	Spin dryer for semiconductor wafer processing	-	1.4	1.4	-	0.5	0.5
74391	Parts of spin dyrer for semiconductor wafer processing	-	0.7	0.7	-	0.2	0.2
74565	Cleaning machines for semiconductor packages	1.1	1.3	0.1	0.6	0.4	(0.1)
74918	Parts of automated machines for transport of the manufacture of semiconductor devices	-	1.0	1.0	-	0.3	0.3
75113	Word processing machines	2.1	0.6	(1.5)	1.0	0.2	(0.8)
75121	Electronic calculators	13.4	31.2	17.7	6.6	10.2	3.6
75122	Other calculating machines	0.0	21.2	21.2	0.0	7.0	7.0
75123	Accounting machines	0.0	-	(0.0)	0.0	-	(0.0)
75124	Cash registers	1.7	11.4	9.7	0.8	3.7	2.9
75128	Machines incorporating calculating device	0.2	3.5	3.3	0.1	1.2	1.1
75131	Electrostatic photocopying apparatus	-	30.0	30.0	-	9.8	9.8
75133	Other photocopying apparatus	-	0.6	0.6	-	0.2	0.2
75910	Parts and accessories of photocopying apparatus	0.9	2.3	1.4	0.4	0.8	0.3
75995	Parts and accessories of machines of sub-heading 751.2	2.9	8.4	5.5	1.4	2.8	1.3
76421	Microphones having a frequency range of 300 Hz to 3.4 KHz	3.1	3.7	0.6	1.5	1.2	(0.3)
76423	Loudspeakers, without housing	-	13.6	13.6	-	4.4	4.4
76424	Line telephone handsets	3.1	5.5	2.4	1.5	1.8	0.3
77121	Static converters for automatic data processing machines and telecommunications	3.8	3.7	(0.1)	1.9	1.2	(0.7)
77125	Other inductors for power supplies for data processing machines	7.7	12.6	4.9	3.8	4.1	0.4
77231	Electrostatic photocopying apparatus	35.7	32.1	(3.7)	17.5	10.5	(7.0)
77232	Other fixed resistors for power handling capacity	-	3.8	3.8	-	1.3	1.3
77233	Wirewound variable resistors, including rheostats and potentiometers	-	4.4	4.4	-	1.4	1.4
77235	Other variable resistors	-	15.0	15.0	-	4.9	4.9
77238	Parts of variable resistors	3.8	20.8	17.0	1.8	6.8	5.0
77255	Electronic switches	-	2.4	2.4	-	0.8	0.8
77258	Plugs and sockets for co-axial cables and printed circuits	3.0	2.4	(0.5)	1.5	0.8	(0.7)
77259	Connection and contact elements for wires and cables	-	7.4	7.4	-	2.4	2.4
77314	Electronic conductors	5.2	2.0	(3.2)	2.5	0.7	(1.9)
77315	Other electronic conductors	-	2.1	2.1	-	0.7	0.7
77318	Optical fibre cables	-	1.5	1.5	-	0.5	0.5
77861	Fixed capacitors designed for use in 50/60 Hz circuits	-	25.8	25.8	-	8.4	8.4
77862	Tantalum fixed capacitors	44.1	3.7	(40.4)	21.6	1.2	(20.4)
77863	Aluminum alectrolytic fixed capacitors	-	14.2	14.2	-	4.6	4.6
77864	Ceramic die-lectric fixed capacitors	-	14.2	14.2	-	4.6	4.6
77865	Ceramic dielectric, multilayer fixed capacitors	-	6.1	6.1	-	2.0	2.0
77866	Dielectric fixed capacitors of papers and plastics	-	2.5	2.5	-	0.8	0.8
77867	Other fixed capacitors	-	37.6	37.6	-	12.3	12.3
77868	Variable or adjustable (pre-set) apparatus	-	15.5	15.5	-	5.1	5.1
77869	Parts of capacitors	3.6	7.6	4.0	1.8	2.5	0.7
77871	Ion implanters for doping semiconductor materials	-	-	-	-	-	-
77878	Proximity cards and tags	0.5	2.2	1.8	0.2	0.7	0.5
77879	Parts of 77878	0.5	4.8	4.3	0.2	1.6	1.3
77884	Indicator panels incorporating LCD or LED	1.6	2.9	1.4	0.8	1.0	0.2
77885	Parts of apparatus of sub-heading 77884	7.2	3.7	(3.5)	3.5	1.2	(2.3)
87131	Electron beam microscopes	0.3	0.4	0.1	0.2	0.1	(0.0)
87139	Parts and accessories of electron beam microscopes	8.2	3.1	(5.1)	4.0	1.0	(3.0)
87141	Optical steroscopic microscopes	1.6	0.5	(1.1)	0.8	0.2	(0.6)
87143	Photomicrographic microscopes	-	1.5	1.5	-	0.5	0.5
87149	Parts and accessories of 87141	0.3	7.7	7.4	0.2	2.5	2.4
87422	Pattern generating apparatus of a kind used for producing masks	7.5	0.6	(6.9)	3.7	0.2	(3.5)

87424	Parts of such pattern generating apparatus	-	9.4	9.4	-	3.1	3.1
87425	Optical instruments and appliances	-	1.6	1.6	-	0.5	0.5
87426	Parts and accessories of optical instruments	-	1.8	1.8	-	0.6	0.6
87431	Instruments for measuring or checking the flow of liquids	2.7	0.8	(1.8)	1.3	0.3	(1.0)
87435	Instruments for measuring or checking pressure	-	3.5	3.5	-	1.2	1.2
87437	Other instruments for measuring and checking of heading 759.1	-	1.3	1.3	-	0.4	0.4
87439	Parts and accessories of instruments of heading 759.1	-	4.5	4.5	-	1.5	1.5
87442	Chromatographs and electrophoresis instruments	-	1.3	1.3	-	0.4	0.4
87443	Spectrometers, spectrophotometers and spectographs using optical radiations	-	1.1	1.1	-	0.4	0.4
87445	Other instruments and apparatus using optical radiations	-	0.1	0.1	-	0.0	0.0
87446	Other instruments and apparatus under heading 8744	-	2.0	2.0	-	0.7	0.7
87449	Parts and accessories of products of heading 8744	-	1.2	1.2	-	0.4	0.4
87477	Instruments and apparatus designed for telecommunications	-	0.5	0.5	-	0.2	0.2
87478	Instruments and apparatus for semiconductor wafers	-	0.4	0.4	-	0.1	0.1
87479	Parts and accessories of instruments for semiconductor devices	-	0.6	0.6	-	0.2	0.2
88135	Apparatus for making circuit patterns for semiconductor wafers	0.5	0.4	(0.1)	0.3	0.1	(0.1)
88136	Parts and accessories of the apparatus of heading 88135	0.7	0.8	0.0	0.4	0.3	(0.1)
89841	Magnetic tapes of a width not exceeding 4mm	12.0	5.0	(7.0)	5.9	1.6	(4.3)
89843	Magnetic tapes of a width exceeding 4mm but not 6.5mm	-	5.7	5.7	-	1.9	1.9
89845	Magnetic tapes of of a width exceeding 6.5mm	-	1.9	1.9	-	0.6	0.6
89851	Magnetic discs	-	13.3	13.3	-	4.4	4.4
89859	Other magnetic tapes and discs	-	12.6	12.6	-	4.1	4.1
89861	Discs for laser reading systems for reproducing phenomena	16.5	0.8	(15.6)	8.1	0.3	(7.8)
89865	Other discs	-	4.5	4.5	-	1.5	1.5
89867	Magnetic tapes for reproducing phenomena other than sound	-	0.4	0.4	-	0.1	0.1
89871	Media for reproducing phenomena other than sound	0.1	0.0	(0.1)	0.1	0.0	(0.1)
89879	Other media for reproducing phenomena	-	3.4	3.4	-	1.1	1.1
Total		1.4	4.0	2.6	0.7	1.3	0.6
Grand Total (IT)		5.6	10.4	4.8	2.7	3.4	0.7

Source: Estimates of author using PCTAS.

Appendix Table 8. Revealed comparative advantage and market share of Korea's IT exports, 1991-1996

SITC No.	Description	Market share (%)			Revealed comparative advantage		
		1991	1996	1996-91	1991	1996	1996-91
Computer hardware							
75210	Electronic calculators	0.0	0.0	0.0	0.0	0.0	0.0
75220	Other digital automatic data processing unit	5.5	0.5	(5.0)	2.2	0.2	(2.0)
75230	Digital automatic data processing unit other than those of sub-heading 7522	1.3	0.3	(1.1)	0.5	0.1	(0.4)
75260	Input or output units	5.5	10.9	5.4	2.2	4.0	1.8
75270	Storage units	0.4	2.0	1.6	0.2	0.7	0.6
75290	Other units of automatic data processing machines	1.8	0.9	(0.9)	0.7	0.3	(0.4)
75997	Part and accessories of heading 752	1.5	1.0	(0.6)	0.6	0.3	(0.3)
Total		2.5	2.7	0.1	1.0	1.0	(0.1)
Semiconductors							
77220	Printed circuits	1.7	4.0	2.3	0.7	1.5	0.8
77629	Parts of other electronic tubes and valves	2.6	8.5	5.9	1.0	3.1	2.1
77631	Diodes, other than photosensitive or light emitting	3.8	4.5	0.7	1.5	1.6	0.1
77632	Transistors with a dissipation rate of less than 1W	19.2	12.9	(6.3)	7.7	4.7	(3.0)
77633	Transistors with a dissipation rate of 1W or more	0.1	1.7	1.6	0.0	0.6	0.6
77637	Photosensitive semiconductor devices	5.5	3.4	(2.0)	2.2	1.3	(1.0)
77639	Other semiconductor devices	0.8	0.3	(0.5)	0.3	0.1	(0.2)
77641	Digital monolithic integrated circuits	6.5	16.4	10.0	2.6	6.0	3.4
77643	Other monolithic integrated circuits	36.7	1.4	(35.3)	14.7	0.5	(14.2)
77645	Hybrid integrated circuits	2.7	1.7	(0.9)	1.1	0.6	(0.4)
77649	Electronic microassemblies	0.4	0.1	(0.3)	0.1	0.0	(0.1)
77681	Mounted piezo-electric crystals	8.4	4.3	(4.1)	3.4	1.6	(1.8)
77688	Parts of mounted piezo-electric crystals	3.4	4.7	1.4	1.3	1.7	0.4
77689	Parts of electronic integrated circuits and microassemblies	1.6	1.4	(0.3)	0.7	0.5	(0.2)
78433	Brakes and servo-brakes	0.3	0.3	(0.0)	0.1	0.1	(0.0)
Total		8.8	9.3	0.6	3.5	3.4	(0.1)
Telecommunications							
76383	Sound reproducing apparatus, cassette type	2.1	-	(2.1)	0.9	-	(0.9)
76384	Magnetic tape recorders, cassette typr	4.5	11.2	6.7	1.8	4.1	2.3
76411	Line telephone sets with cordless handsets	8.2	3.3	(4.9)	3.3	1.2	(2.1)
76413	Teleprinters	0.0	0.0	0.0	0.0	0.0	0.0
76415	Telephonic or telegraphic switching apparatus	0.8	1.6	0.7	0.3	0.6	0.2
76417	Other apparatus for carrier-current line systems	0.7	0.4	(0.3)	0.3	0.2	(0.1)
76419	Other apparatus including entry-phone systems	4.8	6.4	1.6	1.9	2.3	0.4
76431	Transmission apparatus	0.1	0.2	0.2	0.0	0.1	0.1
76432	Transmission apparatus incorporating reception apparatus	2.8	2.5	(0.3)	1.1	0.9	(0.2)
76481	Portable receivers for calling, alerting and paging	15.8	8.9	(6.9)	6.3	3.2	(3.1)
76483	Radar and remote control apparatus	2.0	3.0	1.1	0.8	1.1	0.3
76491	Parts of electrical apparatus for line telephony and telegraphy	1.1	1.0	(0.1)	0.5	0.4	(0.1)
76492	Parts of amplifiers, microphones and loudspeakers	6.6	9.1	2.5	2.7	3.3	0.7
76493	Aerials and antennae and parts used for radio telephony and radio telegraphy	4.1	5.9	1.8	1.7	2.2	0.5
76499	Magnetic type sound heads and parts for recording	6.5	8.2	1.7	2.6	3.0	0.4
Total		3.5	3.7	0.2	1.4	1.4	(0.1)
Other IT products							
59850	Chemical elements doped for use in electronics	0.7	4.8	4.1	0.3	1.8	1.5
66591	Quartz reactor tubes and holders	0.1	0.3	0.2	0.0	0.1	0.1
72811	Machines for the processing of semiconductor wafer	0.3	1.7	1.4	0.1	0.6	0.5
72819	Parts of machines used for semiconductors wafers	0.1	1.3	1.2	0.1	0.5	0.4
72842	Encapsulation equipment for assembly of semiconductors	1.1	1.7	0.6	0.4	0.6	0.2
72852	Parts of encapsulation equipment	0.2	0.4	0.2	0.1	0.2	0.1
72855	Parts of apparatus for the assembly of semiconductors	0.5	3.0	2.5	0.2	1.1	0.9
73111	Machines for the removal of material by laser in the production of semiconductor waves	0.2	0.4	0.2	0.1	0.1	0.1
73114	Apparatus for cleaning semiconductor wafers	0.2	0.2	(0.0)	0.1	0.1	(0.0)

73591	Parts of focused iron beam milling machines	0.7	0.9	0.3	0.3	0.3	0.1
74131	Furnices and ovens for the production of semiconductor devices	0.6	0.6	(0.0)	0.3	0.2	(0.0)
74132	Inductance and furnaces for the mfr of devices for semiconductor wafers	0.3	0.1	(0.2)	0.1	0.1	(0.1)
74133	Apparatus and parts of the manufacture of semiconductor devices	1.6	0.9	(0.7)	0.7	0.3	(0.3)
74135	Parts of apparatus for rapid heating of wafers	0.4	0.3	(0.1)	0.2	0.1	(0.1)
74189	Chemical vapor deposition apparatus for semiconductor production	1.6	3.5	1.9	0.6	1.3	0.6
74190	Parts of chemical vapor deposition apparatus for semiconductor production	0.5	0.7	0.2	0.2	0.2	0.1
74359	Spin dryer for semiconductor wafer processing	0.5	0.2	(0.3)	0.2	0.1	(0.1)
74391	Parts of spin dyrer for semiconductor wafer processing	0.1	0.4	0.3	0.0	0.1	0.1
74565	Cleaning machines for semiconductor packages	0.0	0.3	0.3	0.0	0.1	0.1
74918	Parts of automated machines for transport of the manufacture of semiconductor devices	3.4	5.6	2.2	1.4	2.1	0.7
75113	Word processing machines	2.7	0.1	(2.7)	1.1	0.0	(1.1)
75121	Electronic calculators	0.2	0.0	(0.1)	0.1	0.0	(0.1)
75122	Other calculating machines	11.3	0.0	(11.3)	4.6	0.0	(4.5)
75124	Cash registers	1.4	13.6	12.3	0.5	5.0	4.4
75128	Machines incorporating calculating device	0.1	0.0	(0.1)	0.0	0.0	(0.0)
75131	Electrostatic photocopying apparatus	0.0	0.0	0.0	0.0	0.0	0.0
75910	Parts and accessories of photocopying apparatus	0.4	0.3	(0.2)	0.2	0.1	(0.1)
75995	Parts and accessories of machines of sub-heading 751.2	1.6	0.3	(1.3)	0.7	0.1	(0.6)
76421	Microphones having a frequency range of 300 Hz to 3.4 KHz	3.4	2.6	(0.7)	1.3	1.0	(0.4)
76423	Loudspeakers, without housing	14.2	6.9	(7.3)	5.7	2.5	(3.2)
76424	Line telephone handsets	23.3	13.4	(9.9)	9.4	4.9	(4.5)
77121	Static converters for automatic data processing machines and telecommunications	2.5	2.4	(0.2)	1.0	0.9	(0.2)
77125	Other inductors for power supplies for data processing machines	6.2	3.0	(3.2)	2.5	1.1	(1.4)
77231	Electrostatic photocopying apparatus	4.1	2.6	(1.5)	1.7	0.9	(0.7)
77232	Other fixed resistors for power handling capacity	1.0	2.0	1.0	0.4	0.7	0.3
77233	Wirewound variable resistors, including rheostats and potentiometers	0.1	0.1	0.0	0.0	0.0	(0.0)
77235	Other variable resistors	3.0	2.4	(0.6)	1.2	0.9	(0.3)
77238	Parts of variable resistors	0.2	1.2	1.0	0.1	0.4	0.3
77255	Electronic switches	1.5	1.1	(0.4)	0.6	0.4	(0.2)
77258	Plugs and sockets for co-axial cables and printed circuits	3.2	1.0	(2.1)	1.3	0.4	(0.9)
77259	Connection and contact elements for wires and cables	0.6	0.6	0.0	0.2	0.2	(0.0)
77314	Electronic conductors	1.0	0.9	(0.1)	0.4	0.3	(0.1)
77315	Other electronic conductors	1.9	2.2	0.3	0.8	0.8	0.0
77318	Optical fibre cables	0.4	1.6	1.2	0.2	0.6	0.4
77861	Fixed capacitors designed for use in 50/60 Hz circuits	0.5	0.2	(0.3)	0.2	0.1	(0.1)
77862	Tantalum fixed capacitors	0.3	1.2	0.9	0.1	0.4	0.3
77863	Aluminum alectrolytic fixed capacitors	6.8	6.6	(0.2)	2.7	2.4	(0.3)
77864	Ceramic die-lectric fixed capacitors	6.2	3.4	(2.8)	2.5	1.2	(1.2)
77865	Ceramic dielectric, multilayer fixed capacitors	0.4	1.6	1.3	0.1	0.6	0.5
77866	Dielectric fixed capacitors of papers and plastics	7.4	5.5	(1.9)	3.0	2.0	(1.0)
77867	Other fixed capacitors	1.9	1.6	(0.3)	0.8	0.6	(0.2)
77868	Variable or adjustable (pre-set) apparatus	7.7	1.7	(6.0)	3.1	0.6	(2.5)
77869	Parts of capacitors	1.5	1.8	0.3	0.6	0.7	0.1
77878	Proximity cards and tags	1.2	1.0	(0.2)	0.5	0.4	(0.1)
77879	Parts of 77878	0.1	0.2	0.1	0.0	0.1	0.0
77884	Indicator panels incorporating LCD or LED	3.0	0.1	(2.9)	1.2	0.0	(1.2)
77885	Parts of apparatus of sub-heading 77884	1.0	2.2	1.1	0.4	0.8	0.4
87131	Electron beam microscopes	2.8	0.3	(2.4)	1.1	0.1	(1.0)
87139	Parts and accessories of electron beam microscopes	1.8	0.5	(1.3)	0.7	0.2	(0.6)
87141	Optical steroscopic microscopes	0.4	0.2	(0.2)	0.1	0.1	(0.1)
87143	Photomicrographic microscopes	-	0.5	0.5	-	0.2	0.2
87149	Parts and accessories of 87141	0.1	0.1	(0.0)	0.0	0.0	(0.0)
87422	Pattern generating apparatus of a kind used for producing masks	0.1	0.6	0.5	0.0	0.2	0.2
87424	Parts of such pattern generating apparatus	0.1	0.2	0.1	0.0	0.1	0.0
87425	Optical instruments and appliances	0.3	0.6	0.3	0.1	0.2	0.1
87426	Parts and accessories of optical instruments	0.2	0.7	0.6	0.1	0.3	0.2
87431	Instruments for measuring or checking the flow of liquids	0.4	0.2	(0.2)	0.2	0.1	(0.1)
87435	Instruments for measuring or checking pressure	0.2	0.3	0.1	0.1	0.1	0.0

87437	Other instruments for measuring and checking of heading 759.1	2.2	0.7	(1.5)	0.9	0.3	(0.6)
87439	Parts and accessories of instruments of heading 759.1	0.4	0.2	(0.2)	0.2	0.1	(0.1)
87442	Chromatographs and electrophoresis instruments	0.0	0.0	0.0	0.0	0.0	0.0
87443	Spectrometers, spectrophotometers and spectographs using optical radiations	0.0	0.1	0.1	0.0	0.0	0.0
87445	Other instruments and apparatus using optical radiations	0.0	0.0	(0.0)	0.0	0.0	(0.0)
87446	Other instruments and apparatus under heading 8744	0.6	0.2	(0.4)	0.2	0.1	(0.2)
87449	Parts and accessories of products of heading 8744	0.0	0.1	0.1	0.0	0.0	0.0
87477	Instruments and apparatus designed for telecommunications	0.2	0.1	(0.1)	0.1	0.0	(0.0)
87478	Instruments and apparatus for semiconductor wafers	0.2	0.4	0.2	0.1	0.1	0.1
87479	Parts and accessories of instruments for semiconductor devices	0.3	0.4	0.1	0.1	0.1	0.0
88135	Apparatus for making circuit patterns for semiconductor wafers	0.3	0.5	0.2	0.1	0.2	0.1
88136	Parts and accessories of the apparatus of heading 88135	0.0	0.4	0.3	0.0	0.1	0.1
89841	Magnetic tapes of a width not exceeding 4mm	13.7	11.2	(2.5)	5.5	4.1	(1.4)
89843	Magnetic tapes of a width exceeding 4mm but not 6.5mm	0.0	3.8	3.7	0.0	1.4	1.4
89845	Magnetic tapes of of a width exceeding 6.5mm	17.5	20.1	2.6	7.0	7.3	0.3
89851	Magnetic discs	0.2	0.1	(0.2)	0.1	0.0	(0.1)
89859	Other magnetic tapes and discs	2.8	1.3	(1.6)	1.1	0.5	(0.7)
89861	Discs for laser reading systems for reproducing phenomena	0.1	0.0	(0.1)	0.1	0.0	(0.1)
89865	Other discs	0.2	0.5	0.2	0.1	0.2	0.1
89867	Magnetic tapes for reproducing phenomena other than sound	0.7	0.9	0.2	0.3	0.3	0.1
89871	Media for reproducing phenomena other than sound	0.0	0.1	0.0	0.0	0.0	0.0
89879	Other media for reproducing phenomena	0.2	0.2	0.0	0.1	0.1	(0.0)
Total		2.0	1.9	(0.1)	0.8	0.7	(0.1)
Grand Total (IT)		3.8	4.3	0.5	1.5	1.6	0.1

Source: Estimates of author using PCTAS.

Appendix Table 9. Revealed comparative advantage and market share of China's IT exports, 1992-1997

SITC No.	Description	Market share (%)			Revealed comparative advantage		
		1992	1997	1997-92	1992	1997	1997-92
Computer hardware							
75210	Electronic calculators	1.7	0.1	(1.6)	0.6	0.0	(0.6)
75220	Other digital automatic data processing unit	0.2	1.4	1.2	0.1	0.3	0.3
75230	Digital automatic data processing unit other than those of sub-heading 7522	0.0	1.2	1.1	0.0	0.3	0.3
75260	Input or output units	0.9	7.6	6.7	0.4	1.8	1.4
75270	Storage units	0.1	5.2	5.0	0.0	1.2	1.2
75290	Other units of automatic data processing machines	0.0	1.3	1.3	0.0	0.3	0.3
75997	Part and accessories of heading 752	1.1	2.8	1.7	0.4	0.7	0.2
Total		0.7	3.5	2.8	0.3	0.8	0.6
Semiconductors							
77220	Printed circuits	2.7	7.8	5.1	1.0	1.8	0.8
77629	Parts of other electronic tubes and valves	0.6	2.6	2.0	0.2	0.6	0.4
77631	Diodes, other than photosensitive or light emitting	2.6	3.8	1.2	1.0	0.9	(0.1)
77632	Transistors with a dissipation rate of less than 1W	1.1	3.0	2.0	0.4	0.7	0.3
77633	Transistors with a dissipation rate of 1W or more	0.1	1.3	1.2	0.0	0.3	0.3
77635	Thyristors, diacs and triacs	0.2	-	(0.2)	0.1	-	(0.1)
77637	Photosensitive semiconductor devices	1.6	3.2	1.6	0.6	0.7	0.1
77639	Other semiconductor devices	1.1	4.9	3.8	0.4	1.1	0.7
77641	Digital monolithic integrated circuits	0.1	0.4	0.4	0.0	0.1	0.1
77643	Other monolithic integrated circuits	0.2	1.6	1.4	0.1	0.4	0.3
77645	Hybrid integrated circuits	0.2	2.6	2.4	0.1	0.6	0.5
77649	Electronic microassemblies	0.1	2.5	2.3	0.1	0.6	0.5
77681	Mounted piezo-electric crystals	2.3	7.9	5.6	0.9	1.8	1.0
77688	Parts of mounted piezo-electric crystals	2.1	2.4	0.3	0.8	0.6	(0.3)
77689	Parts of electronic integrated circuits and microassemblies	1.0	1.5	0.5	0.4	0.3	(0.0)
78433	Brakes and servo-brakes	0.3	1.2	0.9	0.1	0.3	0.2
Total		0.5	1.7	1.2	0.2	0.4	0.2
Telecommunications							
76382	Transcribing machines	-	1.3	1.3	-	0.3	0.3
76383	Sound reproducing apparatus, cassette type	5.3	13.2	7.9	2.1	3.1	1.0
76384	Magnetic tape recorders, cassette typr	5.1	17.6	12.5	2.0	4.1	2.1
76411	Line telephone sets with cordless handsets	12.4	17.8	5.3	4.8	4.1	(0.7)
76413	Teleprinters	0.5	0.0	(0.4)	0.2	0.0	(0.2)
76415	Telephonic or telegraphic switching apparatus	0.2	0.6	0.4	0.1	0.1	0.1
76417	Other apparatus for carrier-current line systems	0.2	0.1	(0.1)	0.1	0.0	(0.0)
76419	Other apparatus including entry-phone systems	0.1	4.3	4.2	0.1	1.0	1.0
76431	Transmission apparatus	0.3	0.3	(0.0)	0.1	0.1	(0.0)
76432	Transmission apparatus incorporating reception apparatus	1.1	2.4	1.4	0.4	0.6	0.2
76481	Portable receivers for calling, alerting and paging	0.6	4.7	4.1	0.2	1.1	0.9
76483	Radar and remote control apparatus	1.3	2.6	1.3	0.5	0.6	0.1
76491	Parts of electrical apparatus for line telephony and telegraphy	0.5	1.4	0.9	0.2	0.3	0.1
76492	Parts of amplifiers, microphones and loudspeakers	3.7	12.2	8.5	1.4	2.8	1.4
76493	Aerials and antaenae and parts used for radio telephony and radio telegraphy	2.7	5.2	2.5	1.1	1.2	0.2
76499	Magnetic type sound heads and parts for recording	5.1	19.3	14.2	2.0	4.5	2.5
Total		2.5	5.1	2.6	1.0	1.2	0.2
Other IT products							
59850	Chemical elements doped for use in electronics	0.3	1.5	1.2	0.1	0.4	0.2
66591	Quartz reactor tubes and holders	1.3	2.3	1.0	0.5	0.5	0.0
72811	Machines for the processing of semiconductor wafer	0.2	0.3	0.1	0.1	0.1	(0.0)
72819	Parts of machines used for semiconductors wafers	0.2	0.4	0.2	0.1	0.1	0.0
72842	Encapsulation equipment for assembly of semiconductors	0.9	1.0	0.1	0.3	0.2	(0.1)
72852	Parts of encapsulation equipment	1.1	1.1	(0.0)	0.4	0.3	(0.2)
72855	Parts of apparatus for the assembly of semiconductors	0.2	0.3	0.1	0.1	0.1	0.0
73111	Machines for the removal of material by laser in the	0.0	0.0	(0.0)	0.0	0.0	(0.0)

	production of semiconductor waves						
73114	Apparatus for cleaning semiconductor wafers	0.3	0.2	(0.1)	0.1	0.1	(0.1)
73591	Parts of focused iron beam milling machines	0.5	1.7	1.2	0.2	0.4	0.2
74131	Furnices and ovens for the production of semiconductor devices	0.1	0.1	(0.0)	0.0	0.0	(0.0)
74132	Inductance and furnaces for the mfr of devices for semiconductor wafers	0.1	0.5	0.4	0.0	0.1	0.1
74133	Apparatus and parts of the manufacture of semiconductor devices	0.4	0.3	(0.2)	0.2	0.1	(0.1)
74135	Parts of apparatus for rapid heating of wafers	0.1	0.5	0.4	0.0	0.1	0.1
74189	Chemical vapor deposition apparatus for semiconductor production	0.1	0.3	0.2	0.0	0.1	0.0
74190	Parts of chemical vapor deposition apparatus for semiconductor production	0.2	0.7	0.5	0.1	0.2	0.1
74359	Spin dryer for semiconductor wafer processing	0.2	0.6	0.4	0.1	0.1	0.1
74391	Parts of spin dyrer for semiconductor wafer processing	0.1	0.2	0.1	0.0	0.0	0.0
74565	Cleaning machines for semiconductor packages	0.2	0.4	0.3	0.1	0.1	0.0
74918	Parts of automated machines for transport of the manufacture of semiconductor devices	0.5	0.7	0.2	0.2	0.2	(0.0)
75113	Word processing machines	1.0	10.9	9.9	0.4	2.5	2.2
75121	Electronic calculators	14.9	29.8	14.9	5.8	6.9	1.2
75122	Other calculating machines	22.2	47.3	25.1	8.6	11.0	2.4
75123	Accounting machines	0.1	1.2	1.1	0.1	0.3	0.2
75124	Cash registers	0.8	10.4	9.6	0.3	2.4	2.1
75128	Machines incorporating calculating device	0.0	0.1	0.1	0.0	0.0	0.0
75131	Electrostatic photocopying apparatus	4.7	0.8	(3.9)	1.8	0.2	(1.6)
75133	Other photocopying apparatus	0.0	0.0	0.0	0.0	0.0	0.0
75910	Parts and accessories of photocopying apparatus	0.4	4.9	4.5	0.1	1.1	1.0
75995	Parts and accessories of machines of sub-heading 751.2	2.5	3.1	0.5	1.0	0.7	(0.3)
76421	Microphones having a frequency range of 300 Hz to 3.4 KHz	3.2	9.2	6.0	1.2	2.1	0.9
76423	Loudspeakers, without housing	9.0	22.2	13.2	3.5	5.2	1.7
76424	Line telephone handsets	7.9	19.8	12.0	3.0	4.6	1.6
77121	Static converters for automatic data processing machines and telecommunications	13.9	46.3	32.3	5.4	10.8	5.4
77125	Other inductors for power supplies for data processing machines	15.6	68.8	53.2	6.0	16.0	10.0
77231	Electrostatic photocopying apparatus	1.6	1.9	0.3	0.6	0.4	(0.2)
77232	Other fixed resistors for power handling capacity	2.3	7.9	5.6	0.9	1.8	0.9
77233	Wirewound variable resistors, including rheostats and potentiometers	0.5	0.5	(0.1)	0.2	0.1	(0.1)
77235	Other variable resistors	10.1	15.7	5.6	3.9	3.7	(0.2)
77238	Parts of variable resistors	0.2	0.3	0.2	0.1	0.1	0.0
77255	Electronic switches	6.3	6.0	(0.2)	2.4	1.4	(1.0)
77258	Plugs and sockets for co-axial cables and printed circuits	1.9	2.1	0.2	0.7	0.5	(0.2)
77259	Connection and contact elements for wires and cables	1.2	3.0	1.8	0.4	0.7	0.3
77314	Electronic conductors	1.7	2.1	0.4	0.6	0.5	(0.2)
77315	Other electronic conductors	26.0	32.0	6.0	10.1	7.4	(2.6)
77318	Optical fibre cables	0.0	2.5	2.5	0.0	0.6	0.6
77861	Fixed capacitors designed for use in 50/60 Hz circuits	0.1	0.9	0.8	0.0	0.2	0.2
77862	Tantalum fixed capacitors	0.1	0.4	0.3	0.0	0.1	0.1
77863	Aluminum alectrolytic fixed capacitors	11.7	8.5	(3.2)	4.5	2.0	(2.5)
77864	Ceramic die-lectric fixed capacitors	2.2	2.4	0.2	0.9	0.6	(0.3)
77865	Ceramic dielectric, multilayer fixed capacitors	1.3	9.6	8.3	0.5	2.2	1.7
77866	Dielectric fixed capacitors of papers and plastics	1.9	1.8	(0.0)	0.7	0.4	(0.3)
77867	Other fixed capacitors	2.7	13.6	10.9	1.0	3.2	2.1
77868	Variable or adjustable (pre-set) apparatus	7.8	4.8	(3.0)	3.0	1.1	(1.9)
77869	Parts of capacitors	2.1	2.6	0.5	0.8	0.6	(0.2)
77878	Proximity cards and tags	0.8	3.1	2.3	0.3	0.7	0.4
77879	Parts of 77878	0.9	2.9	2.0	0.4	0.7	0.3
77884	Indicator panels incorporating LCD or LED	4.3	8.3	4.0	1.6	1.9	0.3
77885	Parts of apparatus of sub-heading 77884	2.6	3.0	0.4	1.0	0.7	(0.3)
87131	Electron beam microscopes	1.6	0.7	(0.8)	0.6	0.2	(0.4)
87139	Parts and accessories of electron beam microscopes	1.6	0.6	(0.9)	0.6	0.2	(0.5)
87141	Optical steroscopic microscopes	3.2	4.1	0.9	1.3	1.0	(0.3)
87143	Photomicrographic microscopes	0.2	3.0	2.7	0.1	0.7	0.6
87149	Parts and accessories of 87141	0.8	3.3	2.6	0.3	0.8	0.5
87422	Pattern generating apparatus of a kind used for producing masks	1.1	2.8	1.8	0.4	0.7	0.3
87424	Parts of such pattern generating apparatus	1.3	4.3	3.0	0.5	1.0	0.5

87425	Optical instruments and appliances	0.2	0.3	0.1	0.1	0.1	(0.0)
87426	Parts and accessories of optical instruments	0.1	-	(0.1)	0.0	-	(0.0)
87431	Instruments for measuring or checking the flow of liquids	0.1	0.5	0.4	0.0	0.1	0.1
87435	Instruments for measuring or checking pressure	0.8	1.2	0.5	0.3	0.3	(0.0)
87437	Other instruments for measuring and checking of heading 759.1	0.3	0.2	(0.1)	0.1	0.0	(0.1)
87439	Parts and accessories of instruments of heading 759.1	0.1	0.8	0.7	0.0	0.2	0.1
87442	Chromatographs and electrophoresis instruments	0.4	0.1	(0.4)	0.2	0.0	(0.2)
87443	Spectrometers, spectrophotometers and spectographs using optical radiations	0.2	0.3	0.2	0.1	0.1	0.0
87445	Other instruments and apparatus using optical radiations	0.0	0.2	0.2	0.0	0.1	0.0
87446	Other instruments and apparatus under heading 8744	0.1	0.1	0.0	0.0	0.0	(0.0)
87449	Parts and accessories of products of heading 8744	0.0	0.3	0.3	0.0	0.1	0.1
87477	Instruments and apparatus designed for telecommunications	0.0	0.1	0.0	0.0	0.0	0.0
87478	Instruments and apparatus for semiconductor wafers	0.1	0.3	0.2	0.0	0.1	0.0
87479	Parts and accessories of instruments for semiconductor devices	0.6	0.8	0.2	0.2	0.2	(0.0)
88135	Apparatus for making circuit patterns for semiconductor wafers	0.1	0.3	0.2	0.0	0.1	0.0
88136	Parts and accessories of the apparatus of heading 88135	0.1	0.1	0.0	0.0	0.0	0.0
89841	Magnetic tapes of a width not exceeding 4mm	2.2	4.6	2.4	0.9	1.1	0.2
89843	Magnetic tapes of a width exceeding 4mm but not 6.5mm	1.0	3.8	2.9	0.4	0.9	0.5
89845	Magnetic tapes of of a width exceeding 6.5mm	3.2	7.0	3.8	1.2	1.6	0.4
89851	Magnetic discs	8.4	2.3	(6.1)	3.2	0.5	(2.7)
89859	Other magnetic tapes and discs	0.4	0.6	0.2	0.1	0.1	(0.0)
89861	Discs for laser reading systems for reproducing phenomena	0.2	0.3	0.0	0.1	0.1	(0.0)
89865	Other discs	0.1	0.4	0.3	0.0	0.1	0.1
89867	Magnetic tapes for reproducing phenomena other than sound	0.1	0.5	0.4	0.0	0.1	0.1
89871	Media for reproducing phenomena other than sound	1.3	0.1	(1.2)	0.5	0.0	(0.5)
89879	Other media for reproducing phenomena	0.1	0.4	0.3	0.0	0.1	0.1
Total		1.7	3.1	1.4	0.6	0.7	0.1
Grand total (IT)		1.3	3.2	2.0	0.5	0.8	0.3

Source: Estimates of the author using PCTAS.

Appendix Table 10. Revealed comparative advantage and market share of Mexico' s IT exports, 1991-1997

SITC No.	Description	Market share (%)			Revealed comparative advantage		
		1991	1997	1997-91	1991	1997	1997-91
Computer hardware							
75210	Electronic calculators	0.9	0.7	(0.2)	1.0	0.3	(0.7)
75220	Other digital automatic data processing unit	3.3	12.4	9.1	3.5	4.8	1.3
75230	Digital automatic data processing unit other than those of sub-heading 7522	0.2	1.3	1.1	0.2	0.5	0.3
75260	Input or output units	0.2	3.9	3.6	0.3	1.5	1.2
75270	Storage units	0.1	0.1	(0.0)	0.1	0.0	(0.1)
75290	Other units of automatic data processing machines	0.1	1.3	1.2	0.1	0.5	0.4
75997	Part and accessories of heading 752	0.5	2.4	1.9	0.5	0.9	0.4
Total		0.6	2.6	2.1	0.6	1.0	0.4
Semiconductors							
77220	Printed circuits	0.0	3.2	3.1	0.0	1.2	1.2
77629	Parts of other electronic tubes and valves	0.9	5.2	4.3	1.0	2.0	1.1
77631	Diodes, other than photosensitive or light emitting	0.0	6.7	6.7	0.0	2.6	2.6
77632	Transistors with a dissipation rate of less than 1W	0.7	0.4	(0.3)	0.8	0.1	(0.6)
77633	Transistors with a dissipation rate of 1W or more	0.3	1.2	0.8	0.3	0.5	0.1
77635	Thyristors, diacs and triacs	0.0	-	(0.0)	0.0	-	(0.0)
77637	Photosensitive semiconductor devices	0.0	0.8	0.7	0.0	0.3	0.3
77639	Other semiconductor devices	0.3	10.4	10.1	0.3	4.0	3.7
77641	Digital monolithic integrated circuits	0.0	1.0	1.0	0.0	0.4	0.4
77643	Other monolithic integrated circuits	0.0	0.5	0.5	0.0	0.2	0.2
77645	Hybrid integrated circuits	0.1	1.7	1.5	0.1	0.6	0.5
77649	Electronic microassemblies	0.0	2.9	2.9	0.0	1.1	1.1
77681	Mounted piezo-electric crystals	0.0	0.0	0.0	0.0	0.0	0.0
77688	Parts of mounted piezo-electric crystals	0.2	1.3	1.2	0.2	0.5	0.3
77689	Parts of electronic integrated circuits and microassemblies	0.0	0.0	0.0	0.0	0.0	0.0
78433	Brakes and servo-brakes	0.8	4.4	3.6	0.8	1.7	0.9
Total		0.1	1.6	1.5	0.1	0.6	0.5
Telecommunications							
76383	Sound reproducing apparatus, cassette type	0.0	4.0	4.0	0.0	1.6	1.5
76384	Magnetic tape recorders, cassette typr	0.0	5.1	5.1	0.0	2.0	1.9
76411	Line telephone sets with cordless handsets	0.2	15.1	15.0	0.2	5.9	5.7
76413	Teleprinters	-	0.0	0.0	-	0.0	0.0
76415	Telephonic or telegraphic switching apparatus	0.4	0.4	0.0	0.4	0.2	(0.3)
76417	Other apparatus for carrier-current line systems	0.2	1.7	1.5	0.2	0.6	0.5
76419	Other apparatus including entry-phone systems	0.0	0.1	0.1	0.0	0.1	0.0
76431	Transmission apparatus	0.1	8.5	8.4	0.1	3.3	3.2
76432	Transmission apparatus incorporating reception apparatus	0.3	1.2	0.9	0.3	0.4	0.2
76481	Portable receivers for calling, alerting and paging	0.1	21.6	21.5	0.1	8.3	8.3
76483	Radar and remote control apparatus	0.1	3.5	3.4	0.1	1.4	1.2
76491	Parts of electrical apparatus for line telephony and telegraphy	0.4	0.8	0.5	0.4	0.3	(0.1)
76492	Parts of amplifiers, microphones and loudspeakers	0.1	4.3	4.2	0.1	1.7	1.6
76493	Aerials and antennae and parts used for radio telephony and radio telegraphy	0.3	6.4	6.1	0.3	2.5	2.2
76499	Magnetic type sound heads and parts for recording	0.0	2.4	2.3	0.0	0.9	0.9
Total		0.2	3.8	3.6	0.2	1.5	1.3
Other IT products							
59850	Chemical elements doped for use in electronics	-	0.0	0.0	-	0.0	0.0
66591	Quartz reactor tubes and holders	0.3	0.9	0.6	0.3	0.3	0.0
72811	Machines for the processing of semiconductor wafer	0.0	0.0	0.0	0.0	0.0	0.0
72819	Parts of machines used for semiconductors wafers	0.0	0.3	0.3	0.0	0.1	0.1
72842	Encapsulation equipment for assembly of semiconductors	0.1	0.1	(0.0)	0.1	0.0	(0.1)
72852	Parts of encapsulation equipment	0.1	0.3	0.2	0.1	0.1	0.0
72855	Parts of apparatus for the assembly of semiconductors	0.1	0.2	0.2	0.1	0.1	0.0
73111	Machines for the removal of material by laser in the production of semiconductor waves	0.0	0.0	(0.0)	0.0	0.0	(0.0)

73114	Apparatus for cleaning semiconductor wafers	0.0	0.0	0.0	0.0	0.0	0.0
73591	Parts of focused iron beam milling machines	0.1	0.3	0.2	0.1	0.1	0.0
74131	Furnices and ovens for the production of semiconductor devices	0.1	0.0	(0.1)	0.1	0.0	(0.1)
74132	Inductance and furnaces for the mfr of devices for semiconductor wafers	0.3	0.3	(0.0)	0.3	0.1	(0.2)
74133	Apparatus and parts of the manufacture of semiconductor devices	0.1	0.1	0.1	0.1	0.1	(0.0)
74135	Parts of apparatus for rapid heating of wafers	0.1	0.3	0.2	0.1	0.1	0.0
74189	Chemical vapor deposition apparatus for semiconductor production	0.1	0.2	0.1	0.1	0.1	(0.0)
74190	Parts of chemical vapor deposition apparatus for semiconductor production	0.3	0.6	0.3	0.3	0.2	(0.1)
74359	Spin dryer for semiconductor wafer processing	0.1	0.1	0.0	0.1	0.0	(0.0)
74391	Parts of spin dyrer for semiconductor wafer processing	0.0	3.5	3.5	0.0	1.4	1.3
74565	Cleaning machines for semiconductor packages	0.1	0.1	0.0	0.1	0.0	(0.0)
74918	Parts of automated machines for transport of the manufacture of semiconductor devices	1.2	2.0	0.8	1.3	0.8	(0.5)
75113	Word processing machines	0.4	14.9	14.5	0.4	5.8	5.4
75121	Electronic calculators	0.0	0.1	0.1	0.0	0.1	0.1
75122	Other calculating machines	0.0	2.3	2.2	0.0	0.9	0.9
75124	Cash registers	0.0	0.1	0.1	0.0	0.0	(0.0)
75128	Machines incorporating calculating device	0.0	2.2	2.1	0.0	0.8	0.8
75131	Electrostatic photocopying apparatus	1.1	0.2	(0.9)	1.2	0.1	(1.1)
75133	Other photocopying apparatus	5.4	6.0	0.6	5.7	2.3	(3.4)
75910	Parts and accessories of photocopying apparatus	0.5	0.8	0.3	0.6	0.3	(0.3)
75995	Parts and accessories of machines of sub-heading 751.2	0.4	0.2	(0.2)	0.4	0.1	(0.3)
76421	Microphones having a frequency range of 300 Hz to 3.4 KHz	1.1	15.7	14.7	1.2	6.1	4.9
76423	Loudspeakers, without housing	0.0	10.6	10.6	0.0	4.1	4.1
76424	Line telephone handsets	0.0	1.5	1.5	0.0	0.6	0.5
77121	Static converters for automatic data processing machines and telecommunications	0.5	7.2	6.7	0.5	2.8	2.3
77125	Other inductors for power supplies for data processing machines	0.3	7.3	7.0	0.3	2.8	2.5
77231	Electrostatic photocopying apparatus	0.1	1.8	1.8	0.1	0.7	0.6
77232	Other fixed resistors for power handling capacity	0.0	2.1	2.1	0.0	0.8	0.8
77233	Wirewound variable resistors, including rheostats and potentiometers	0.2	2.3	2.1	0.2	0.9	0.7
77235	Other variable resistors	0.3	7.3	7.0	0.3	2.8	2.5
77238	Parts of variable resistors	0.0	0.7	0.6	0.0	0.3	0.2
77255	Electronic switches	0.2	9.0	8.8	0.2	3.5	3.2
77258	Plugs and sockets for co-axial cables and printed circuits	0.1	3.5	3.3	0.1	1.3	1.2
77259	Connection and contact elements for wires and cables	0.1	8.0	7.9	0.1	3.1	3.0
77314	Electronic conductors	1.1	22.9	21.8	1.2	8.9	7.7
77315	Other electronic conductors	2.5	9.8	7.3	2.6	3.8	1.2
77318	Optical fibre cables	0.3	1.1	0.8	0.3	0.4	0.1
77861	Fixed capacitors designed for use in 50/60 Hz circuits	0.1	0.0	(0.0)	0.1	0.0	(0.0)
77862	Tantalum fixed capacitors	0.0	16.5	16.5	0.0	6.4	6.4
77863	Aluminum alectrolytic fixed capacitors	0.0	2.0	2.0	0.0	0.8	0.8
77864	Ceramic die-lectric fixed capacitors	0.1	60.6	60.6	0.1	23.5	23.4
77865	Ceramic dielectric, multilayer fixed capacitors	0.0	7.9	7.9	0.0	3.0	3.0
77866	Dielectric fixed capacitors of papers and plastics	0.0	2.4	2.4	0.0	0.9	0.9
77867	Other fixed capacitors	1.0	1.3	0.4	1.0	0.5	(0.5)
77868	Variable or adjustable (pre-set) apparatus	0.0	3.1	3.1	0.0	1.2	1.2
77869	Parts of capacitors	0.0	0.2	0.2	0.0	0.1	0.1
77871	Ion implanters for doping semiconductor materials	0.0	0.1	0.1	0.0	0.0	0.0
77878	Proximity cards and tags	0.4	6.5	6.2	0.4	2.5	2.2
77879	Parts of 77878	0.2	6.5	6.3	0.2	2.5	2.4
77884	Indicator panels incorporating LCD or LED	0.2	12.5	12.3	0.2	4.8	4.6
77885	Parts of apparatus of sub-heading 77884	0.0	4.2	4.2	0.0	1.6	1.6
87131	Electron beam microscopes	-	0.1	0.1	-	0.0	0.0
87139	Parts and accessories of electron beam microscopes	-	0.1	0.1	-	0.0	0.0
87141	Optical steroscopic microscopes	0.1	0.2	0.1	0.1	0.1	(0.0)
87149	Parts and accessories of 87141	0.3	1.1	0.8	0.3	0.4	0.1
87422	Pattern generating apparatus of a kind used for producing masks	0.2	0.6	0.4	0.2	0.2	0.1
87424	Parts of such pattern generating apparatus	0.1	1.6	1.5	0.1	0.6	0.6
87425	Optical instruments and appliances	0.4	1.1	0.7	0.4	0.4	0.0
87426	Parts and accessories of optical instruments	0.1	-	(0.1)	0.1	-	(0.1)

87431	Instruments for measuring or checking the flow of liquids	0.5	1.5	1.0	0.5	0.6	0.1
87435	Instruments for measuring or checking pressure	0.3	1.8	1.5	0.3	0.7	0.4
87437	Other instruments for measuring and checking of heading 759.1	0.3	4.2	3.9	0.3	1.6	1.3
87439	Parts and accessories of instruments of heading 759.1	0.1	1.1	1.0	0.1	0.4	0.3
87442	Chromatographs and electrophoresis instruments	0.0	0.0	(0.0)	0.0	0.0	(0.0)
87443	Spectrometers, spectrophotometers and spectographs using optical radiations	0.1	0.2	0.1	0.1	0.1	(0.1)
87445	Other instruments and apparatus using optical radiations	0.1	0.0	(0.0)	0.1	0.0	(0.1)
87446	Other instruments and apparatus under heading 8744	0.1	0.2	0.1	0.1	0.1	(0.0)
87449	Parts and accessories of products of heading 8744	0.1	0.3	0.2	0.1	0.1	0.0
87477	Instruments and apparatus designed for telecommunications	0.3	0.2	(0.1)	0.3	0.1	(0.2)
87478	Instruments and apparatus for semiconductor wafers	0.3	0.3	(0.1)	0.4	0.1	(0.3)
87479	Parts and accessories of instruments for semiconductor devices	0.0	0.1	0.1	0.0	0.1	0.0
88135	Apparatus for making circuit patterns for semiconductor wafers	0.1	0.0	(0.0)	0.1	0.0	(0.1)
88136	Parts and accessories of the apparatus of heading 88135	0.0	0.1	0.1	0.0	0.1	0.0
89841	Magnetic tapes of a width not exceeding 4mm	1.2	9.4	8.2	1.3	3.6	2.3
89843	Magnetic tapes of a width exceeding 4mm but not 6.5mm	0.0	5.0	5.0	0.0	1.9	1.9
89845	Magnetic tapes of of a width exceeding 6.5mm	0.0	2.8	2.8	0.0	1.1	1.1
89851	Magnetic discs	3.3	1.8	(1.4)	3.5	0.7	(2.8)
89859	Other magnetic tapes and discs	0.0	5.1	5.1	0.0	2.0	2.0
89861	Discs for laser reading systems for reproducing phenomena	1.2	4.0	2.8	1.3	1.5	0.3
89865	Other discs	3.6	1.3	(2.3)	3.8	0.5	(3.3)
89867	Magnetic tapes for reproducing phenomena other than sound	1.9	2.1	0.2	2.0	0.8	(1.2)
89871	Media for reproducing phenomena other than sound	0.1	1.0	1.0	0.1	0.4	0.3
89879	Other media for reproducing phenomena	0.5	0.4	(0.1)	0.5	0.2	(0.3)
Total		0.5	4.2	3.7	0.5	1.6	1.1
Grand Total (IT)		0.4	3.1	2.7	0.4	1.2	0.8

Source: Estimates of the author using PCTAS.

Appendix Table 11. Market positioning, Indonesia, 1991-1997

Market Share of Indonesia	World Sectoral Share							
	Rising				Falling			
Rising	7521	77645	77121	77879	7526	74133	77238	
	7522	77681	77125	77884	7722	74189	77861	
	7523	77689	77232	77885	77688	74391	77862	
	7529	76415	77255	87425	78433	75113	77868	
	75997	76431	77259	87449	76382	75121	87141	
	77629	76491	77314	87478	76383	75122	87424	
	77631	76493	77315	89851	76384	75128	87435	
	77633	76499	77318		76419	75131	87439	
	77637	72855	77863		76492	7591	88136	
	77639	74918	77867		66591	76421	89843	
	77641	75995	77869		72842	76424	89845	
	77643	76423	77878		72852	77233		
Falling	7527	76417	77864	89879	77649	72819	74359	89841
	77632	76432	88135		76483	74135	87422	77235
	76411	76481	89859		72811	7419	87446	

Appendix Table 12. Market positioning, Thailand, 1991-1997

Market share of Thailand	World Sectoral Share							
	Rising				Falling			
Rising	7521	77643	74918	77863	7526	72811	75128	87149
	7529	77645	75995	77865	7722	72842	75131	87426
	75997	77681	77121	77687	77649	72852	75133	87437
	77629	78433	77125	77871	77688	74131	7591	87439
	77631	76415	77232	77878	76383	74133	77233	87446
	77632	76417	77255	77879	76384	74135	77235	88136
	77633	76431	77258	77884	76413	74189	77238	89841
	77637	76481	77259	87425	76419	7419	77861	89843
	77639	76493	77315	87449	76483	74359	77862	89861
	77641	72855	77318	88135	76492	74565	77866	89871
		89879	89859	89851	66591	75122	87141	87442
						75124	87445	87443
Falling	7522	76432	77864		77635	76424	87435	
	7523	76491	77869		72819	77231	89845	
	7527	76499	87477		73591	77868	89865	
	77689	76423	87478		75113	77885	89867	
	76411	77314	87479		75121	87431		

Appendix Table 13. Market positioning of China, 1992-1997

Market share of China	World Sectoral Share							
	Rising				Falling			
Rising	7522	77641	76493	77259	7526	74135	76424	87435
	7523	77643	5985	77314	77649	7419	77231	87439
	7527	77645	72855	77315	76382	74359	77235	87433
	7529	77681	73591	77318	76383	74391	77238	87445
	75997	77688	74189	77864	76384	74565	77861	87446
	7722	77689	74918	77865	76419	75113	77862	88136
	77629	78433	75995	77867	76483	75121	77869	89841
	77631	76411	76423	77878	76492	75122	77885	89843
	77632	76415	77121	77879	76499	75123	87141	89845
	77633	76432	77125	77884	66591	75124	87143	89861
	77637	76481	77232	87425	72811	75128	87149	89865
	77639	76491	77258	87449	72819	75133	87422	89867
	87477	88315	89859	89879	72842	7591	87424	
	87478				74132	76421	87431	
Falling	7521	73111	77863		77635	74131	77233	87131
	76417	76114	89851		76413	74133	77866	87139
	76431	77255			72852	75131	77868	87426
						87437	87422	89871

Appendix Table 14. Market positioning, Mexico, 1991-1997

Market share of Mexico	World Sectoral Share							
	Rising				Falling			
Rising	7522	77861	5985	77315	7526	73591	7591	87149
	7523	77689	72855	77318	7722	74133	76421	87422
	7529	78433	74918	77863	77649	74135	76424	87431
	75997	76411	76423	77864	77688	74189	77231	87435
	77629	76415	77121	77865	76383	7419	77233	87437
	77631	76417	77125	77867	76384	74359	77235	87439
	77633	76431	77232	77869	76419	74391	77238	87443
	77639	76432	77255	77871	76483	74565	77862	87446
	77641	76481	77258	77878	76491	75113	77866	88136
	77643	76493	77259	77879	76492	75121	77868	89841
	77645	76499	77314	77884	66591	75122	77885	89843
		87479	87449	87425	72811	75124	87131	89845
					72819	75128	87139	89861
					72852	75133	87141	89867
								89871
Falling	7521	77637	87477	89859	72842	77861	89865	
	7527	73111	87478	89879	74131	87426		
	77632	73114	88135		74132	87442		
	77635	75995	89851		75131	87445		