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Assessing the Competitiveness of the Philippine IT Industry

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Assessing the Competitiveness of the Philippine IT Industry

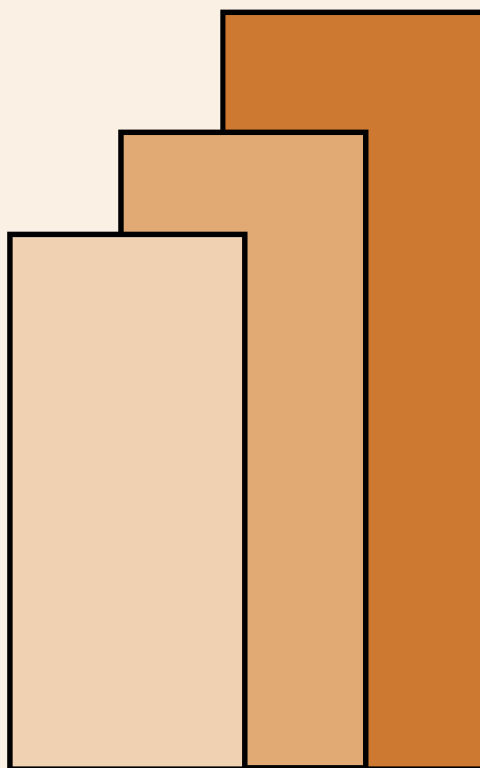
Myrna S. Austria

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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.

Assessing the Competitiveness of the Philippine IT Industry

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 electronics¹ 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 1998, 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 semiconductors 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 |

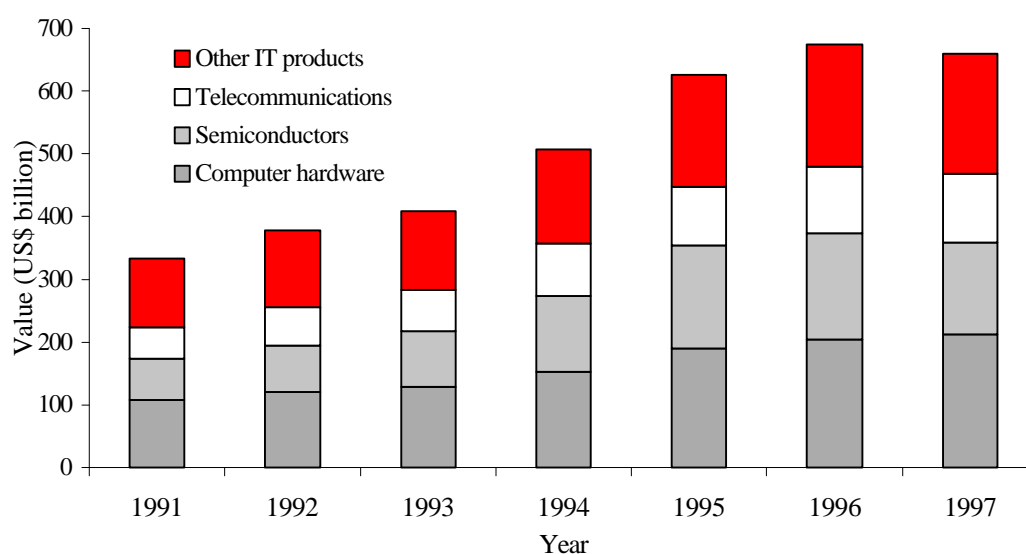
Source: PCTAS.

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.

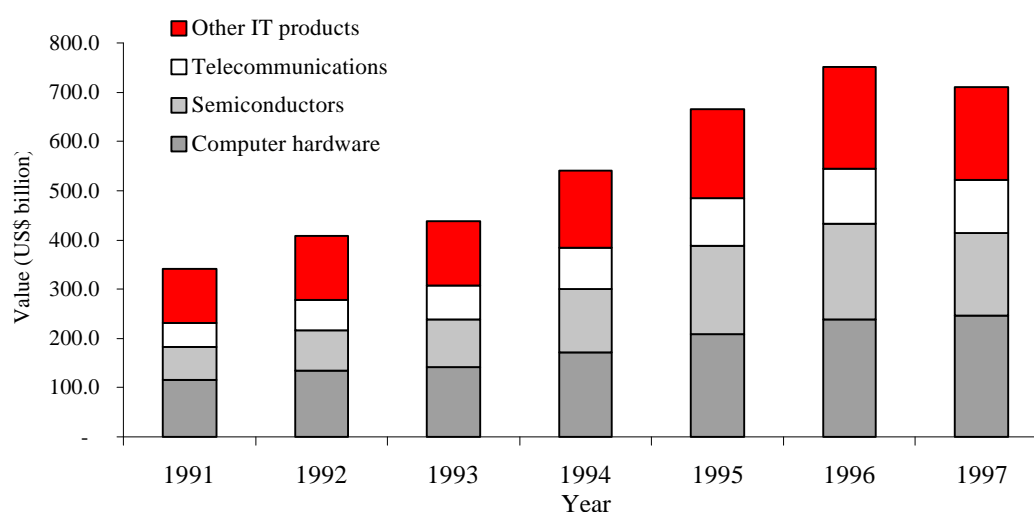
Imports. The total world IT imports increased from US\$341.6 billion in 1991 to US\$711 billion in 1997 (Figure 2), the bulk of which are computer hardware with an average share of 33 percent during the period (Table 6). The share of IT to total world imports in 1997 reached 16 percent from 11.2 percent 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 OEM² 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 conglomerates³ (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

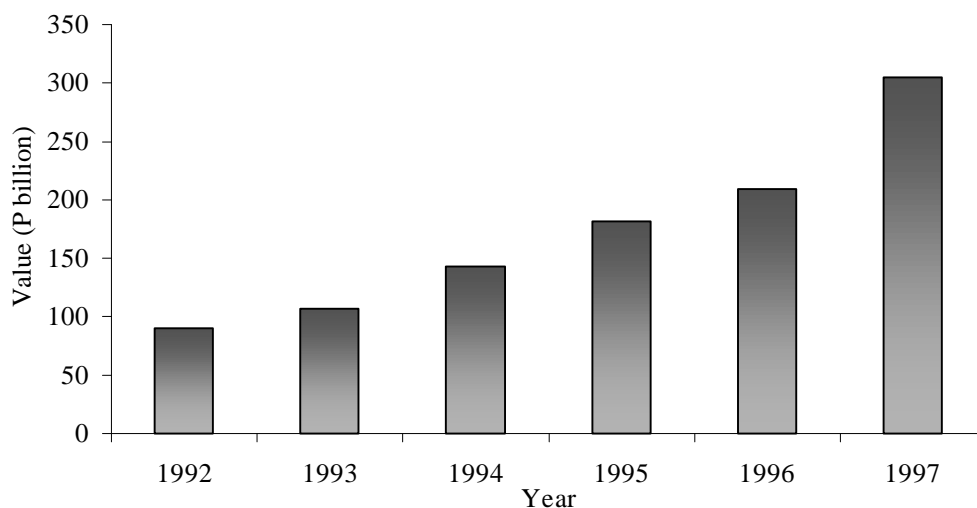
provides wide variety of product choices for the consumers. Nonetheless, greater competition promotes efficiency in the economy. Furthermore, while the country's exports will also be exposed to greater competition abroad, tariff reduction in other countries would mean greater market access for the country's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

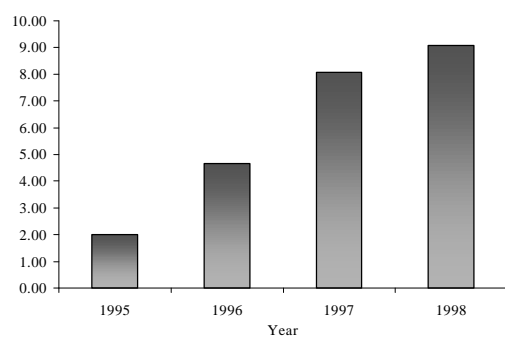
Table 10. Telecommunications industry structure, 1996-1998.

| 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 |

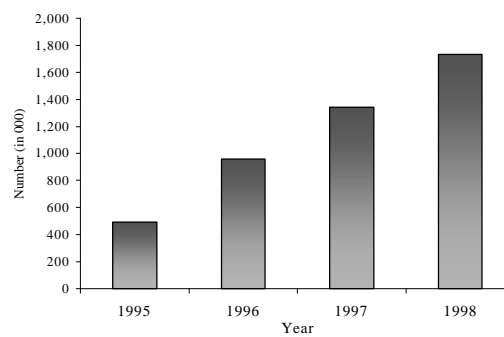
Source: 1998 NTC Annual Report.

Figure 4. IT users, 1995-1998

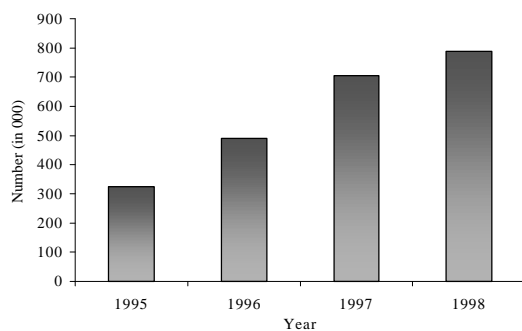
Telephone density, 1995-1998



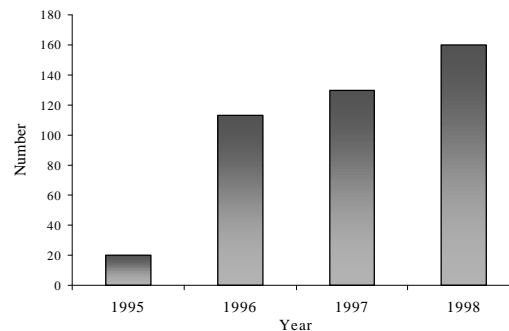
Cellular subscribers, 1995-1998



Radio paging subscribers, 1995-1998



Internet service provider, 1995-1998



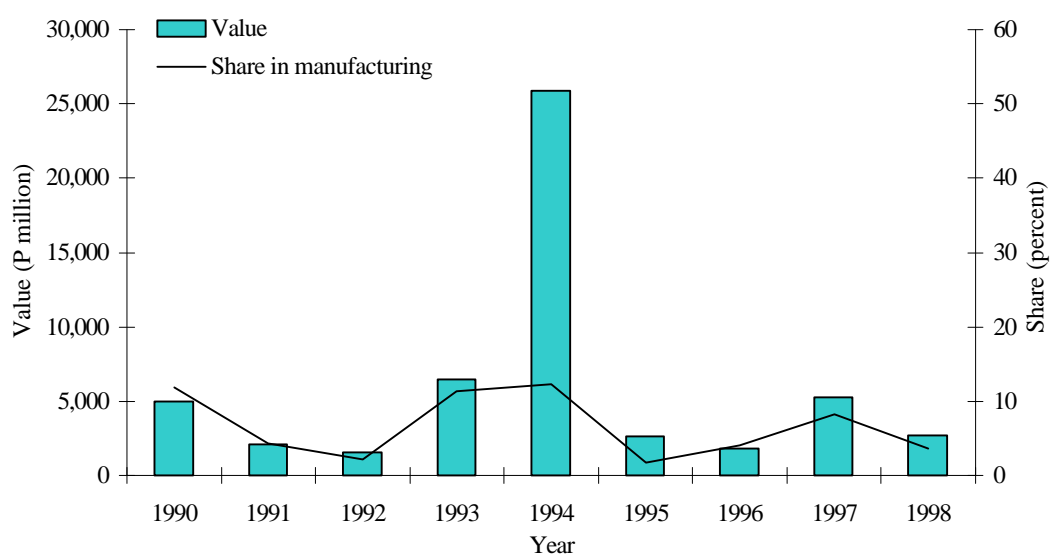
Source: 1998 NTC Annual Report.

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

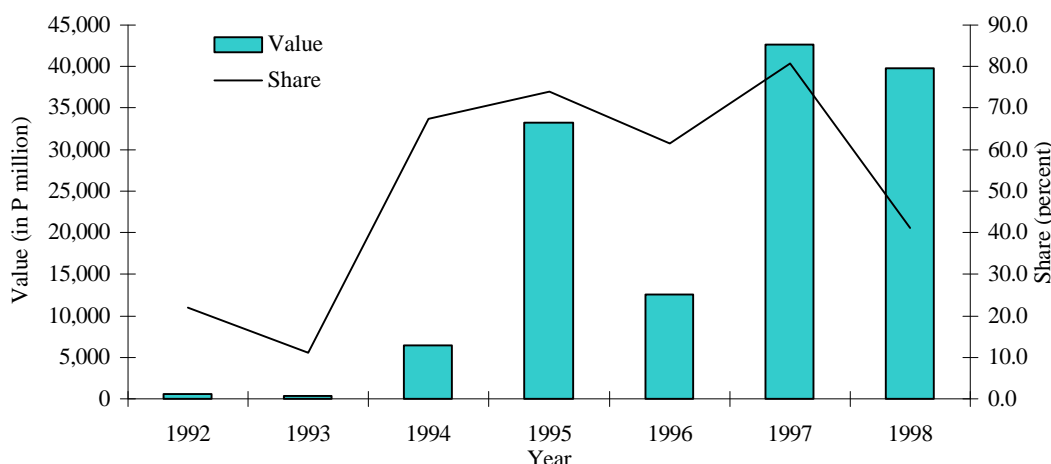


Source: BOI, DTI.

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.

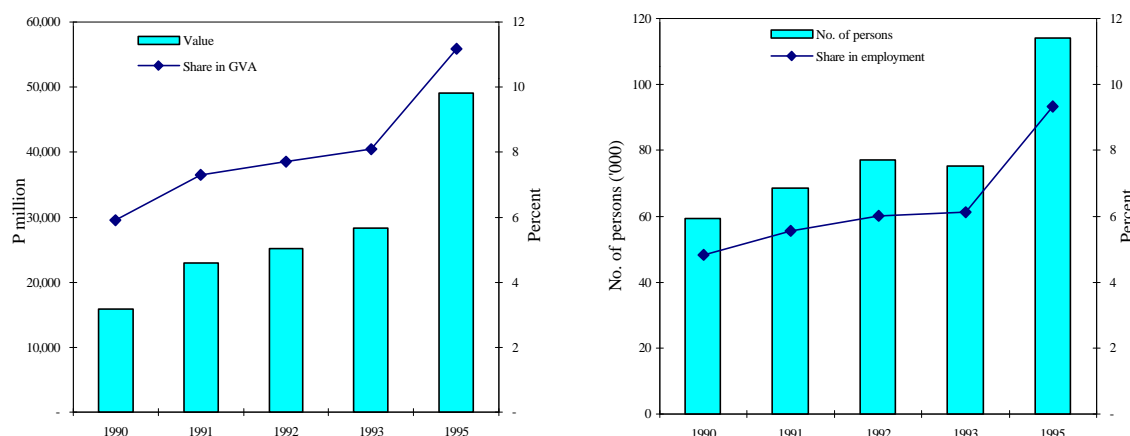
(2) IT products

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.

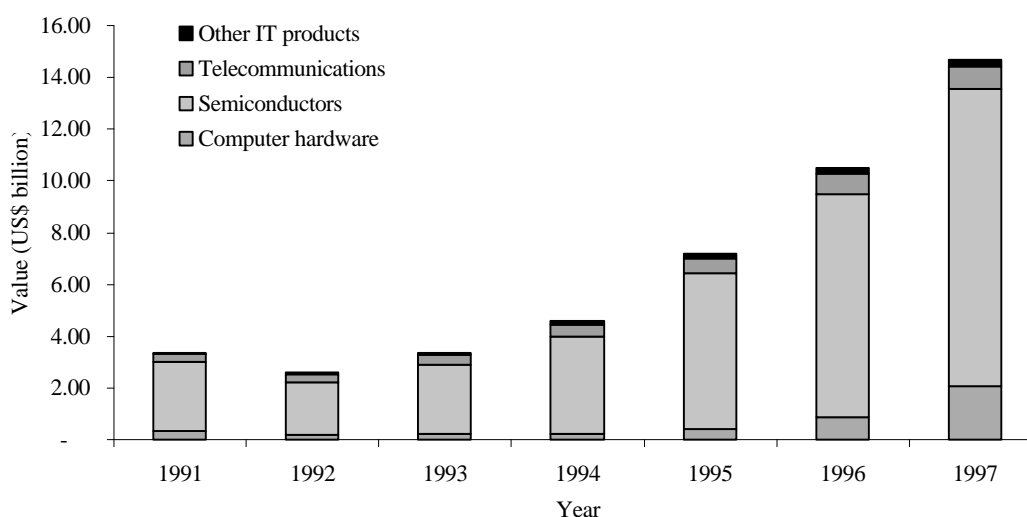
Table 11. Productivity and factor intensity of the Philippine IT industry, 1990-1997.

| 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)

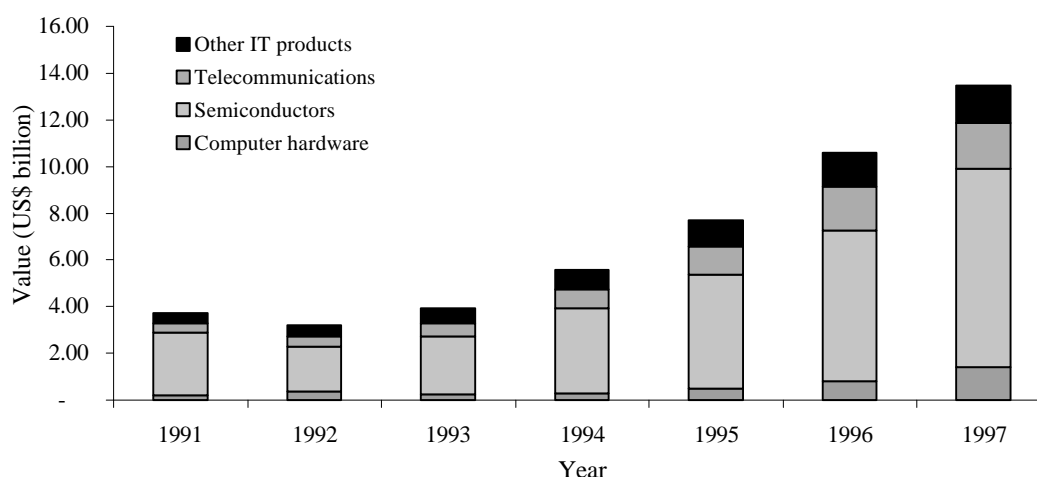
| Product | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | Average share 1991-1997 |
|--------------------|------|------|------|------|------|------|------|----------------------------|
| Computer hardware | 0.3 | 0.2 | 0.2 | 0.2 | 0.2 | 0.4 | 1.0 | 0.3 |
| Semiconductors | 4.0 | 2.7 | 3.0 | 3.1 | 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 |

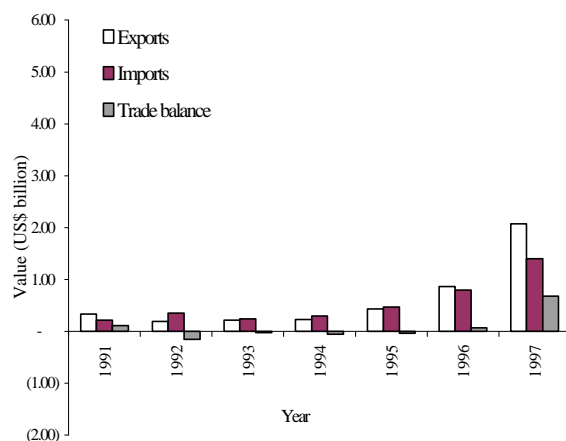
Source: PCTAS.

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.

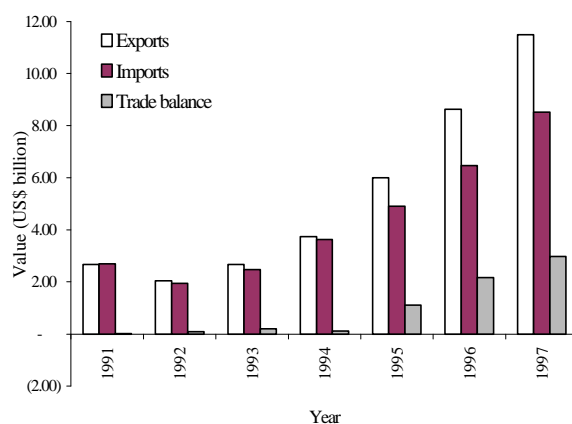
A more detailed analysis of 5-digit SITC products reveals that there are a few IT products which are net foreign exchange earners since 1991. These include input or output units whether or not containing units in the same housing (SITC 75260), diodes, other than photosensitive or light emitting (SITC 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)

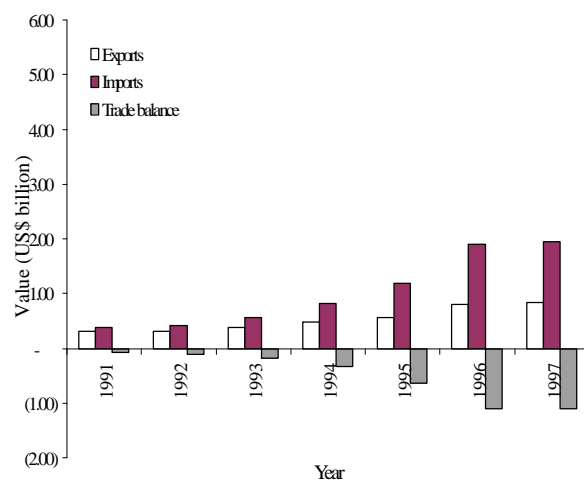
Computer hardware



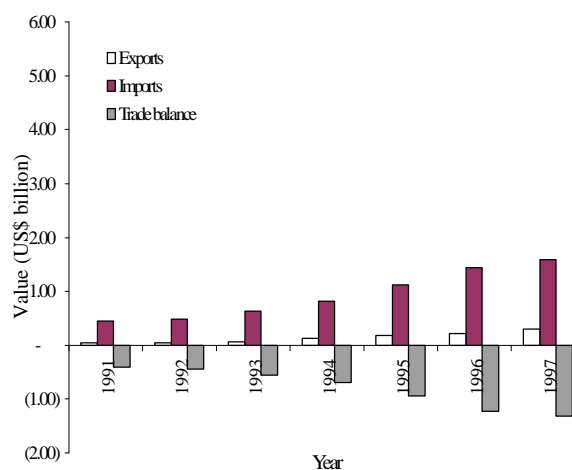
Semiconductors



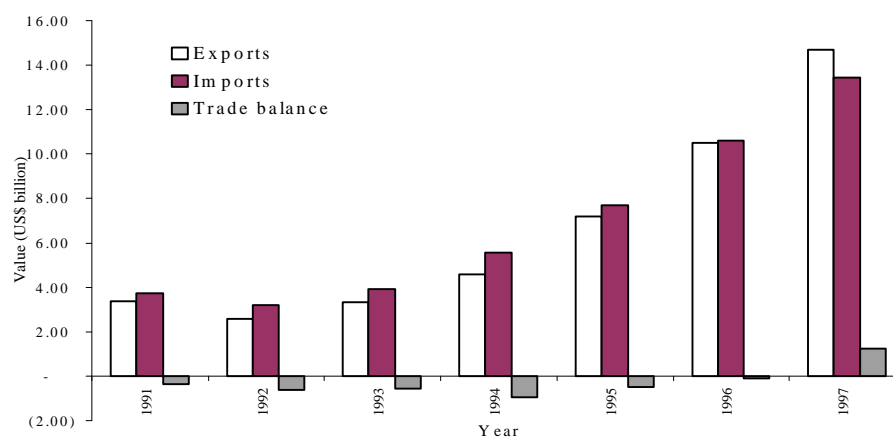
Telecommunications Equipment



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 trade⁵. 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 - 1991 and China - 1991

Source: Estimates of the author using PCTAS.

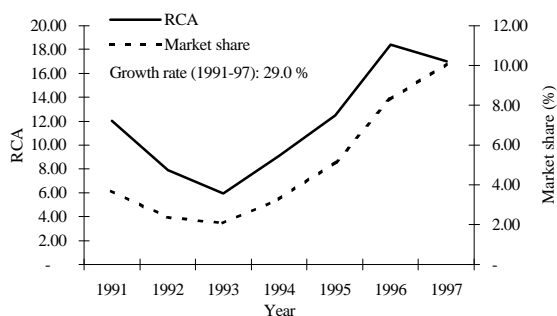
Table 27. List of competitive and non-competitive IT products, Philippines, 1991-1997

| 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 semiconductor 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 dryer 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 electrolytic fixed capacitors |
| | | 77865 | Ceramic dielectric, multilayer fixed capacitors |

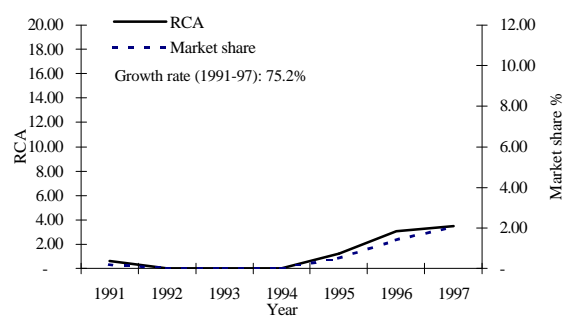
| Competitive | | Non-competitive | |
|-------------|-------------|-----------------|---|
| Code | Description | Code | Description |
| | | 77866 | Dielectric fixed capacitors of papers and plastics |
| | | 77867 | Other fixed capacitors |
| | | 77868 | Variable or adjustable (pre-set) apparatus |
| | | 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

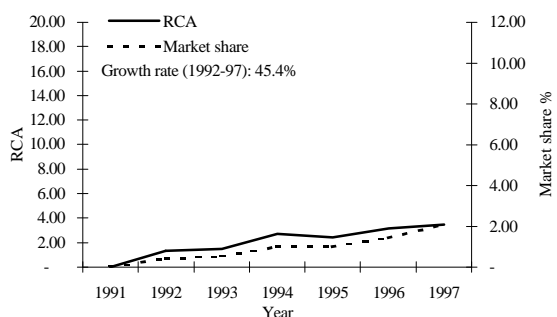
SITC 77632 - Transistors with 1 W dissipation rate



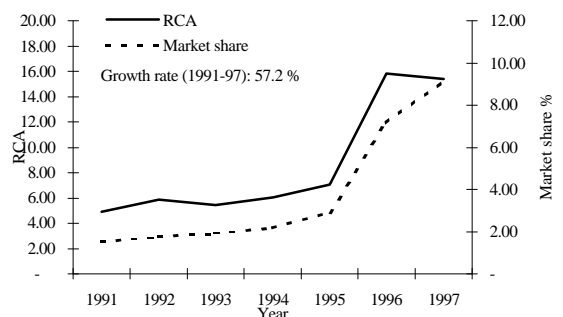
SITC 77641 - Digital monolithic integrated circuits



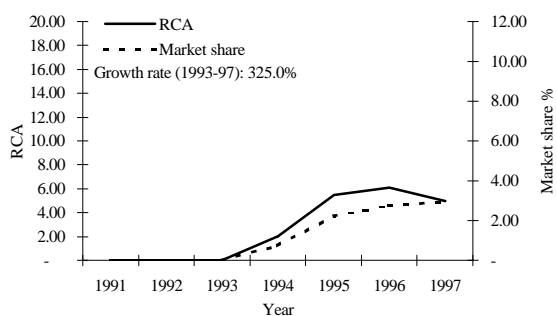
SITC 78433 - Brakes, servo-brakes and parts



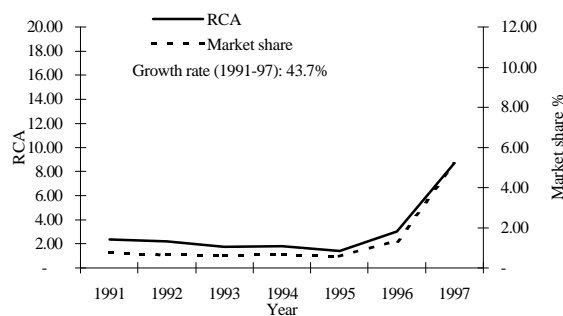
SITC 76411 - Telephone sets and videophones



SITC 76424 - Line telephone handsets



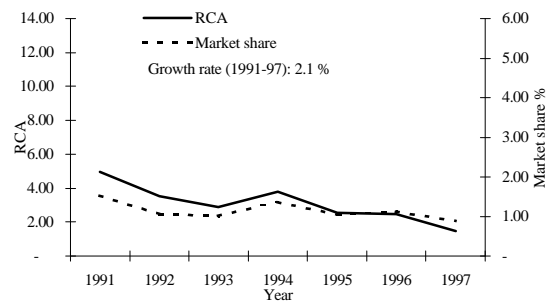
SITC 75260 - Input or output units



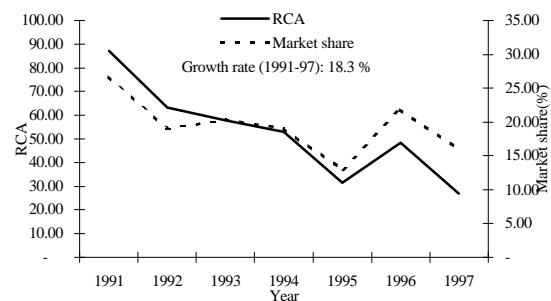
Source: Estimates by the author using PCTAS.

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

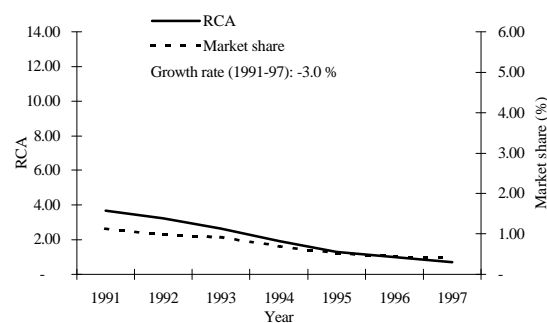
SITC 77631 - Diodes, nor photosensitive nor light emitting



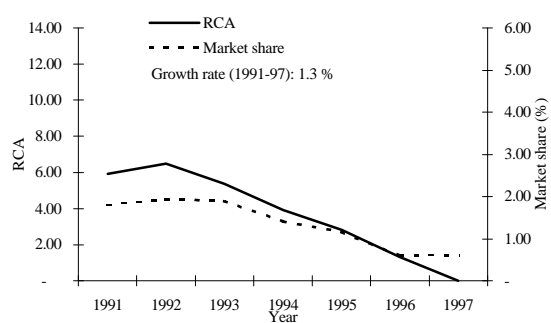
SITC 77639 - Other semiconductor devices



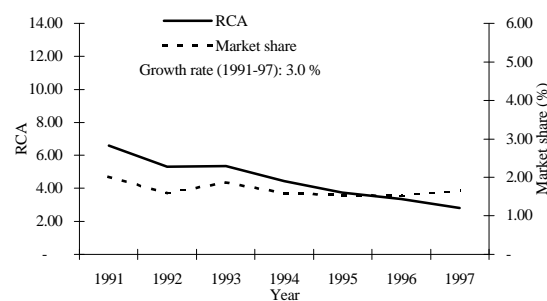
SITC 77681 - Piezo-electrical crystals, mounted



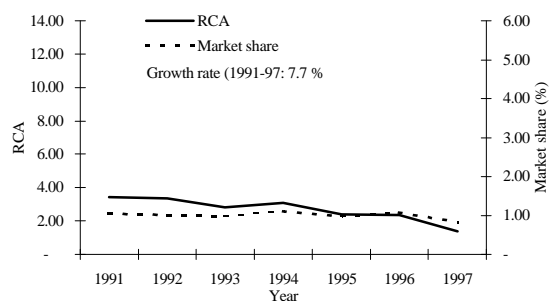
SITC 76432 - Transmission apparatus



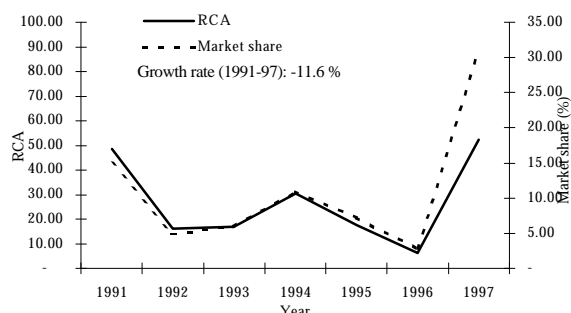
SITC 76492 - Parts of microphones and speakers



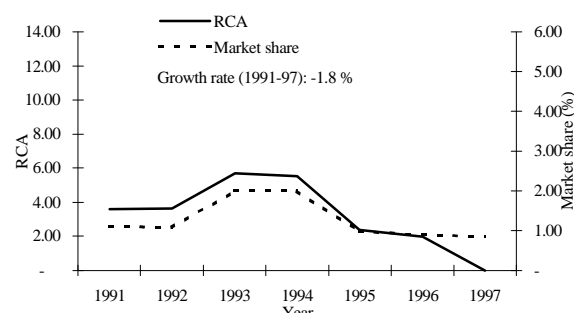
SITC 77125 - Inductors for power supplies of data processing machines and telecom apparatus



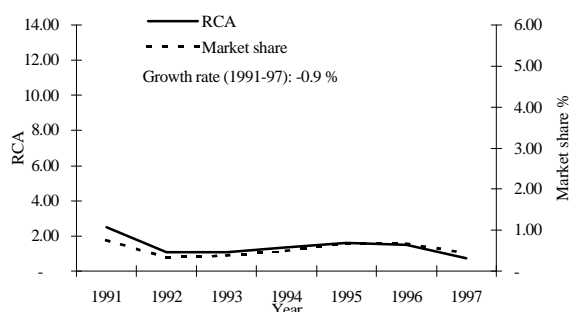
SITC 77649 - Electronic microassemblies



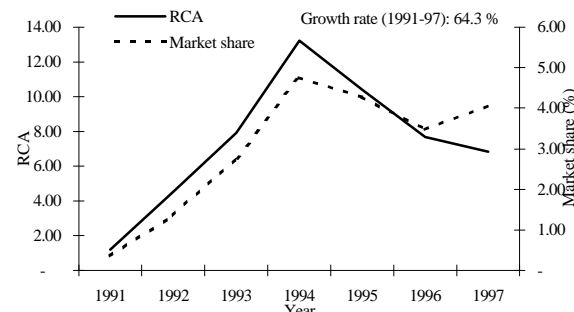
SITC 76483 - Radar and remote control apparatus other than for toys



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 type |
| 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 dryer for semiconductor wafer processing | 72819 | Parts of machines used for semiconductor 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 antennae and parts used for radio telephony and radio telegraphy | 87449 | Parts and accessories of products of heading 8744 | 74189 | Chemical vapor deposition apparatus for semiconductor production |
| 77121 | Static converters for automatic data processing machines and telecommunications | 76499 | Magnetic type sound heads and parts for recording | 88136 | Parts and accessories of the apparatus of heading 88135 | | |
| | | 72855 | Parts of apparatus for the assembly of semiconductors | 75910 | Parts and accessories of photocopying apparatus | 74359 | Spin dryer for semiconductor wafer processing |
| 77232 | Other fixed resistors for power handling capacity | 74918 | Parts of automated machines for transport of the manufacture of semiconductor devices | 76424 | Line telephone handsets | 77868 | Variable or adjustable (pre-set) apparatus |
| 77255 | Electronic switches | | | 77885 | Parts of apparatus of sub-heading 77884 | 87426 | Parts and accessories of optical instruments |
| 77258 | Plugs and sockets for co-axial cables and printed circuits | 77125 | Other inductors for power supplies for data processing machines | | | 87439 | Parts and accessories of instruments of heading 759.1 |
| 77259 | Connection and contact elements for wires and cables | 77314 | Electronic conductors | | | 87443 | Spectrometers, spectrophotometers and spectographs using optical radiations |
| 77865 | Ceramic dielectric, multilayer fixed capacitors | 77315 | Other electronic conductors | | | 87446 | Other instruments and apparatus under heading 8744 |
| 77867 | Other fixed capacitors | 77863 | Aluminum electrolytic fixed capacitors | | | 88135 | Apparatus for making circuit patterns for semiconductor wafers |
| 77869 | Parts of capacitors | 77878 | Proximity cards and tags | | | 89845 | Magnetic tapes of a width exceeding 6.5mm |
| 87435 | Instruments for measuring or checking pressure | 77884 | Indicator panels incorporating LCD or LED | | | 76492 | Parts of amplifiers, microphones and loudspeakers |
| 89879 | Other media for reproducing phenomena | 87425 | Optical instruments and appliances | | | 77235 | Other variable resistors |
| | | 87478 | Instruments and apparatus for semiconductor wafers | | | 77238 | Parts of variable resistors |
| | | 89859 | Other magnetic tapes and discs | | | 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 typ | 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 semiconductor 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 dryer 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 electrolytic 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 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 typ | 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 antennae 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 dryer 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 electrolytic fixed capacitors | 0.0 | 0.3 | 0.3 | 0.0 | 0.3 | 0.2 |
| 77864 | Ceramic dielectric 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 stereoscopic 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 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 typ | | 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 wafers | | | | | | |
| 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 dryer 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 electrolytic fixed capacitors | - | 1.1 | 1.1 | - | 0.7 | 0.7 |
| 77864 | Ceramic dielectric 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 stereoscopic 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 typ | 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 electrolytic fixed capacitors | 1.8 | 2.2 | 0.4 | 1.8 | 1.5 | (0.3) |
| 77864 | Ceramic dielectric 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 stereoscopic microscopes | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 87149 | Parts and accessories 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 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 typ | | 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 wafers | | | | | | |
| 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 dryer 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 electrolytic 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 stereoscopic 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 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 typ | 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 dryer 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 electrolytic fixed capacitors | 6.8 | 6.6 | (0.2) | 2.7 | 2.4 | (0.3) |
| 77864 | Ceramic dielectric 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 stereoscopic 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 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 typ | 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 antenae 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 wafers | | | | | | |
| 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 dryer 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 electrolytic 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 stereoscopic 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 typ | | 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 dryer 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 stereoscopic 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 | | |