Chapter 3

Thailand and World's Semiconductor Trade Structures and their Comparative Advantage

Chapter 3 is divided into three parts in orderly, the trading performance of the Thai Semiconductor Industry, the Concept of "Revealed" Comparative Advantage among Thailand, Malaysia, and Indonesia, and the market distribution structure of the USA, Japan, the European Union, and Singapore toward this industry.

3.1 Trading Performance of the Thai Semiconductor Industry

In this section, the industrial trading performance is presented according to import-export patterns, market distribution, and changes in world demand.

Import and Export Pattern

From Table 3.1, it can be seen that the import values of integrated circuits and parts has gradually increased. The import value of integrated circuits will be discussed first and then the import value of parts will be discussed later.

From Table 3.1, both Thailand's import and export value for IC and parts increased every year. The import values were higher than the export value in IC and parts. Thailand's IC industry is aimed only at the assembly of IC and parts into components before exporting to foreign markets. That's because firstly Thailand does not have visible technology to produce IC's part resulting the highly import of IC and parts. Consequently, some of ICs are embodied in the export of electronic and electrical products. The trade balance in ICs is then deficit. Thailand does not yet

have viable technology to produce ICs parts, and therefore has to import them, which results in import values being higher than export values.

Table3.1

Thai Export and Import of IC and Parts

Years	Import	Export	Export-Import
1988	865,103,645	746,988,906	-118,114,739
1989	868,060,242	717,166,212	-150,894,030
1990	1,080,222,182	853,301,700	-226,920,482
1991	1,277,281,713	1,007,842,726	-269,456,987
1992	1,449,311,433	1,124,518,664	- 324,792,769
1993	1,921,515,119	1,401,813,880	-519,701,239
1994	2,604,023,243	1,798,650,258	-805,372,985
1995	3,744,172,252	2,529,727,564	-1,214,444,688
1996	3,953,101,340	2,317,030,311	-1,636,071,029

Sources: Foreign Trade Statistics of Thailand 1988 - 1996 Figures shown in $ US

Bank of Thailand

SITC can be defined as follows:

SITC 8542.110-009 Monolithic Integrated Circuit, Digital

SITC 8542.190-006 Other Monolithic Integrated Circuit

SITC 8542.200-004 Hybrid Integrated Circuits

SITC 8542.800-000 Electronic Microassembles

SITC.8542.900-002 Parts of Electronic Integrated Circuit and Microassembles

Considering separately the SITC 8542. of IC and Parts , table 3.2 and figures 3.1 to 3.5, Foreign Trade Statistics of Thailand over time SITC 8542, the export value of both monolithic integrated circuits and electronic microassemblies was greater than the import value; on the other hand, the import value of both hybrid integrated circuits

and parts of integrated circuits & microassemblies was greater than the export value. This can be interpreted as, the main proportion of import IC parts will be used to support IC to get full range function and re-export them. The others will be used for local production of goods such as computer parts, electrical appliances, and etc.

Also the proportion of IC and parts under SITC 8542 showed that monolithic integrated circuits have the highest proportion of 81.68 percent of the total export of IC and parts, followed by IC parts and Microassemblies, 13.20 percent, Electronic IC & Microassemble, 4.64 percent, and Hybrid ICs, 0.48 percent. This leads to the assumption that Monolithic IC is mainly an indicator in driving IC and parts in either a decreasing or an increasing direction under 4 digits of SITC 8542.

In summary, The IC industry is entirely assembly and export-oriented at present. The industry consists of a few large US, a few large Japanese and some local firms. The range of devices assembled is quite diverse, as is the variety of packaging types. Regardless of the number of IC assembly firms in Thailand, the material sources are still very limited especially when the global markets for IC assembly parts have increased. Precision parts and main materials, produced in neighboring countries, are imported in great volume. As a result, the direct material cost is high and relies mainly on foreign production. This import trend is likely to continue for some time. Likewise, as the market for IC assembly parts grows, the need for semi-skilled labor also increases which could reduce the number of unemployment in Thailand.

The export of Thai semiconductor is related directly to world demand for integrated circuits. The share of Thai IC trade in world trade increases in proportion to the increase in world trade demand. There are two reasons why Thailand has been able to perform successfully: firstly, Thailand has an ability to fulfill and export the

expected need the world demands due to availability of land and labor and favorable of GSP arrangements. Also, the country is ready to create attractive policies in order to adjust to changes which occur consistently in the information technology (IT) market.

Table 3.2

Import and Export of IC and Parts in terms of SITC 8542

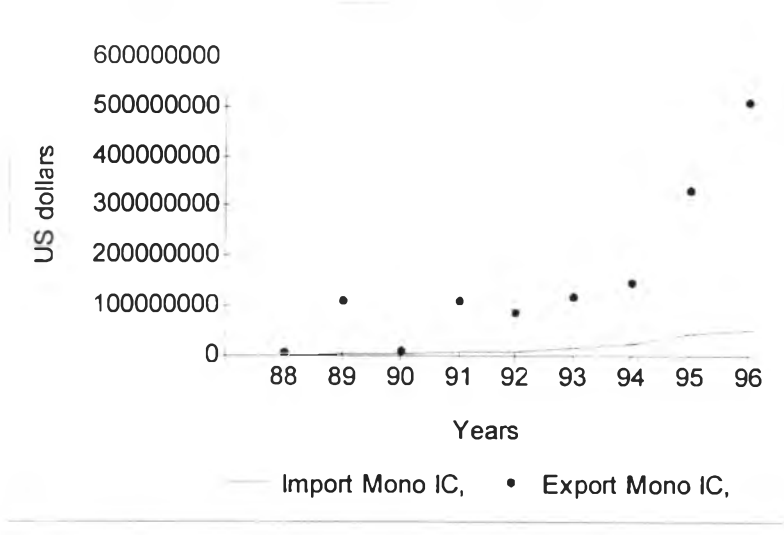
YEAR	IM	EX	IM	EX	IM	EX	IM	EX	IM	EX
	MONO IC, Dig		OTHER MONO IC		HYBRID IC		ELECTRONIC IC		PART OF IC	
1988	878,062	6,901,620	85,906,700	64,449,455	9,468,414	7,184,429	9,546,447	265,113,689	759,203,989	401,855,398
1989	2,319,146	112,283,801	191,287,894	93,126,086	13,300,732	36,354	14,634,603	23,997,189	660,592,807	499,071,894
1990	5,479,599	13,600,480	269,477,500	123,826,774	18,069,417	907,246	26,126,658	17,411,021	761,417,258	565,486,675
1991	7,133,711	111,868,316	369,466,763	256,133,378	31,045,208	53,285	40,584,366	83,593,187	836,185,375	557,457,816
1992	733,586	88,480,890	511,346,310	448,173,573	37,100,501	1,116,226	45,845,372	108,477,710	847,687,161	478,256,359
1993	17,702,443	121,943,219	818,696,773	856,583,936	36,523,024	5,630,798	55,266,125	63,721,157	993,326,752	353,917,500
1994	23,133,659	148,285,854	1,266,394,418	1,225,435,389	37,482,999	6,859,147	98,174,260	73,212,241	1,267,206,305	344,826,210
1995	43,080,945	333,101,754	1,532,739,710	1,532,125,632	63,839,801	8,787,661	132,540,028	61,077,888	1,877,052,705	394,591,029
1996	51,475,237	513,182,015	1,686,815,097	1,379,289,442	80,429,627	11,043,443	162,567,241	107,321,152	2,044,179,239	306,194,256

Source: Foreign Trade Statistic of Thailand 1988-1996

Note: Figures shown in $US

Figure3.1

Import and Export of Monolithic ICs, Digital of Thailand



Source: Foreign Trade Statistic of Thailand 1988-1996

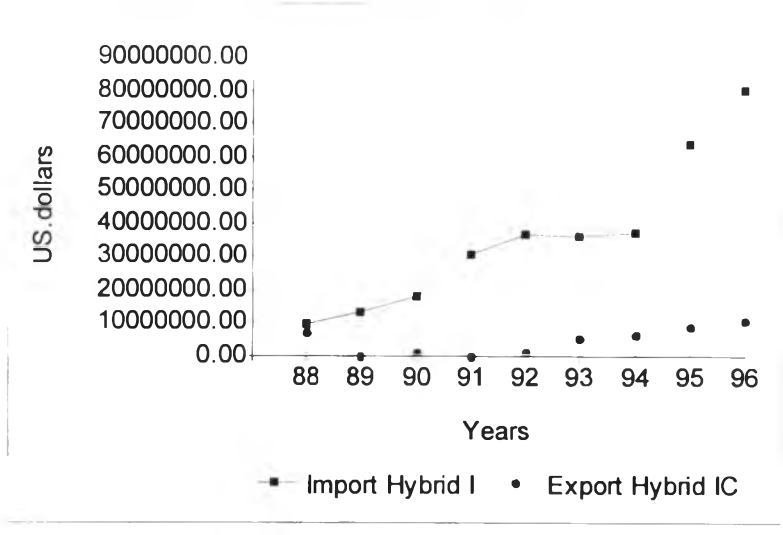
Figure 3.2

The Import and Export of Other Monolithic Integrated Circuits of Thailand

Source: Foreign Trade Statistics of Thailand 1988-1996

Figure3.3

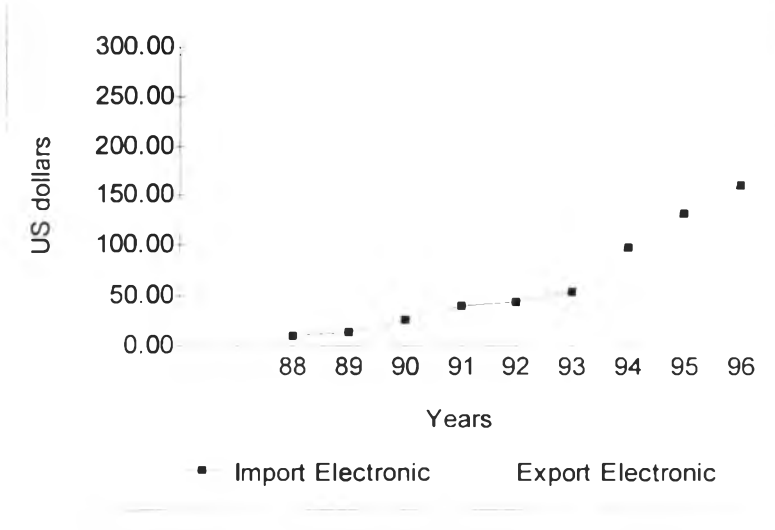
Import and Export of Hybrid ICs of Thailand



Source: Foreign Trade Statistics of Thailand 1988-1996

Figure3.4

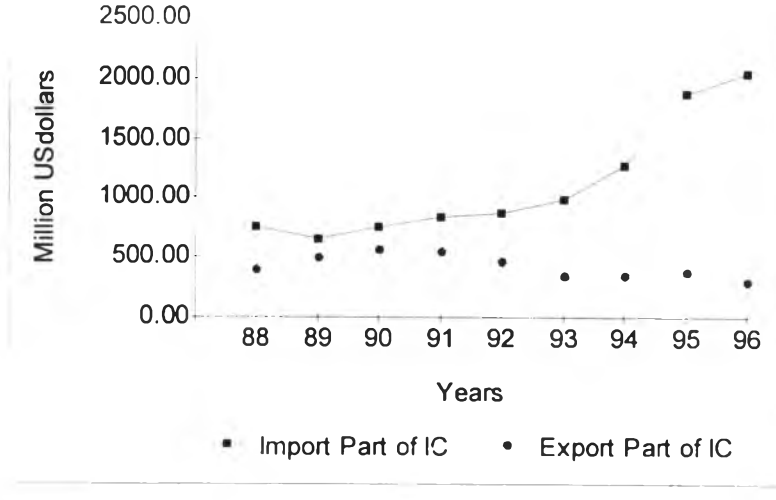
Import and Export ICs and Microassemblies



Source : Foreign Trade Statistics of Thailand 1988-1996

Figure3.5

Import and Export of Parts of IC and Microassemblies



Source: Foreign Trade Statistics of Thailand 1988-1996

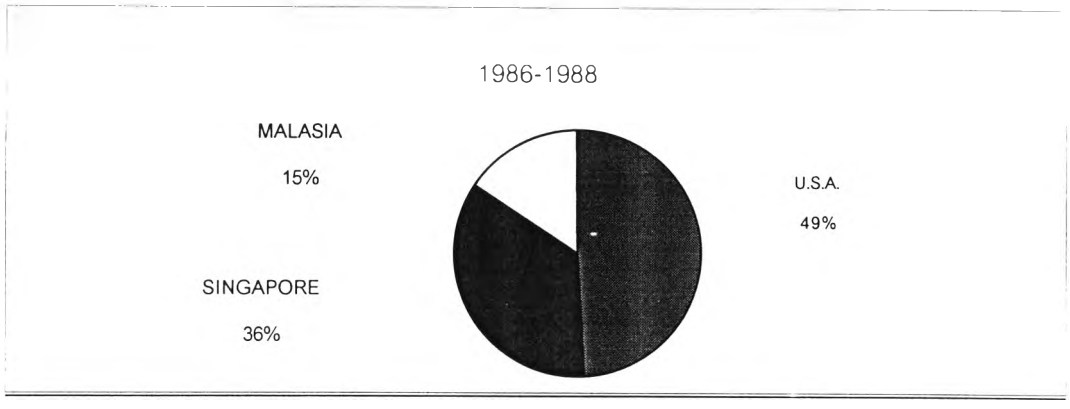
Market Distribution

In order to illustrate the trading performance of Thailand's IC industry, it is important to investigate the Thai market distribution in IC and parts and to define the specific areas of exportation.

Table 3.3 and Figure 3.6 recorded by The Bank of Thailand shows the total import value of integrated circuits and parts among Thailand's major markets from 1986 to 1988 the USA was the largest importer, Singapore was the second, and Malaysia was the third.

Figure 3.6

The Average of Top three Thai's Market Distribution IC and Parts in Year 1986- 1988



Source: Foreign Trade Statistic of Thailand 1986-1988 (in US dollars)

Table 3.3

Market Distribution of IC and Parts

	USA	SINGAPORE	MALAYSIA	HONGKONG	JAPAN
1986	1	2	3	-	-
1987	1	2	3	-	-
1988	1	2	3	-	-
1989	1	2	-	3	-
1990	1	2	-	3	-
1991	1	2	-	3	-
1992	2	1	-	-	3
1993	1	2	-	-	3
1994	2	1	-	-	3
1995	2	1	-	-	3
1996	1	2	-	-	3

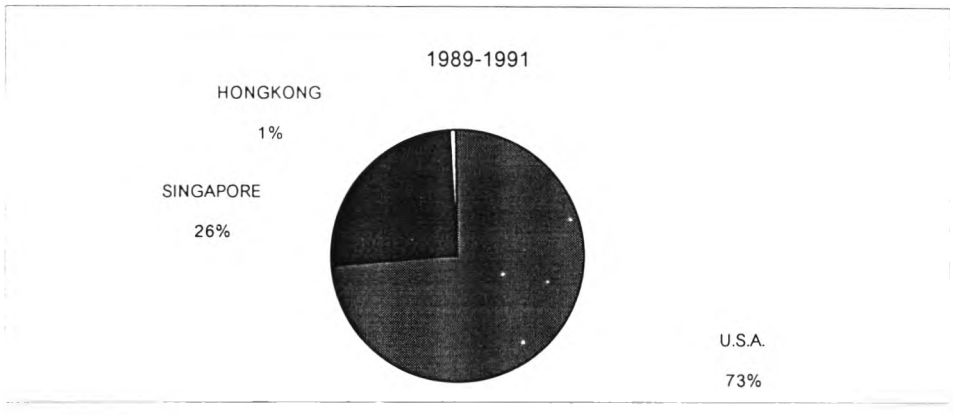
Source: Foreign Trade Statistic of Thailand 1986-1996 (in US dollar)

Note: This ranking number is ranked by 1 to 3. For 1 means that particular country has the most highest import IC and parts value from Thailand follows by number 2 to3, orderly.

From figure 3.7, continuing to the years 1989 to 1991, the data changed slightly; the USA maintained its status as the largest importer, followed by Singapore; however Hong Kong was third and Malaysia fourth.

Figure 3.7

The Average of Top Three Thai's Market Distribution of IC and Parts in the Years 1989-1991

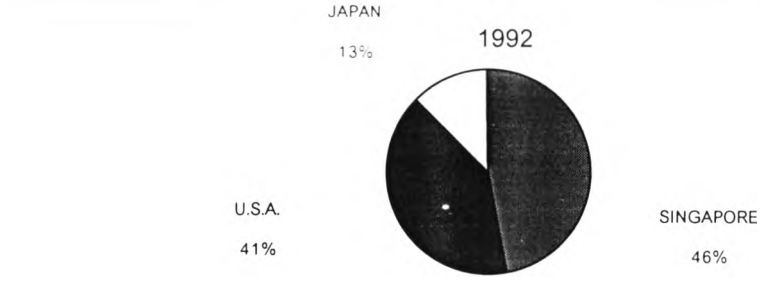


Source: Foreign Trade Statistics of Thailand 1989-1991 (in US dollars)

The market share among importers changed tremendously during 1992, figure 3.8 and from 1994 to 1995, figure 3.10 Singapore became the largest importer of Thailand's integrated circuits and parts. The United States moved down to second and Japan became third. For the year 1993, figure 3.9 and 1996, figure 3.11, the United States was the largest, followed by Singapore and Japan respectively. The analysis of the Thai market share in each market will indicate our competitiveness in that market.

Figure 3.8

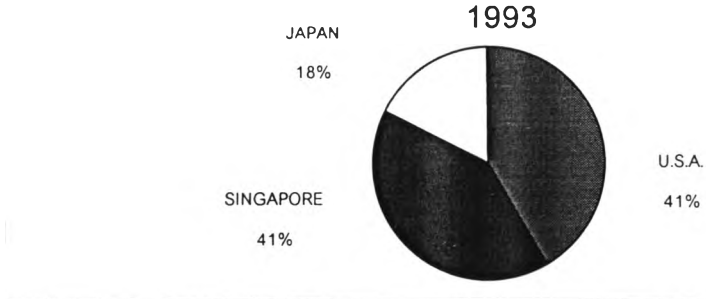
The Top Three Thai Market Distribution of IC and Parts in the Year 1992



Source: Foreign Trade Statistics of Thailand 1992 (in US dollars)

Figure 3.9

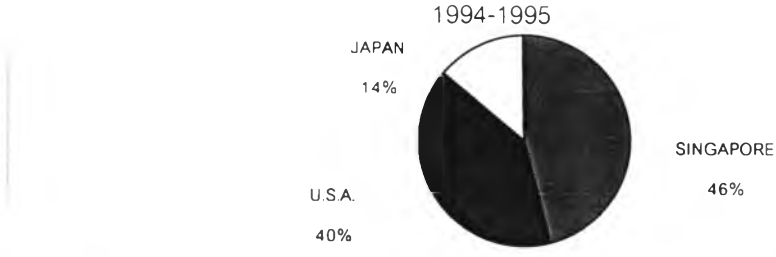
The Top Three Thai Market Distribution of IC and Parts in the Year 1993



Source: Foreign Trade Statistics of Thailand 1993 (in US dollars)

Figure 3.10

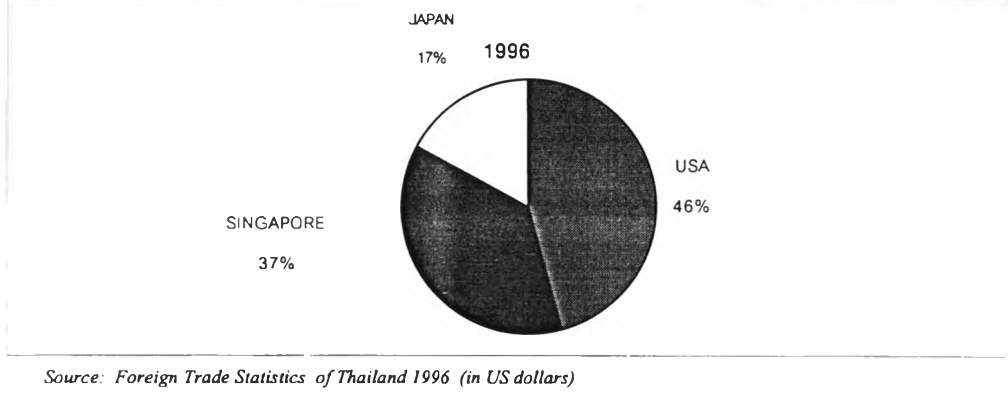
The Average Top Three of Thai's Market Distribution of IC and Parts in the Years 1994-1995



Source: Foreign Trade Statistics of Thailand 1994-1995 (in US dollars)

Figure 3.11

Top Three Thai Market Distribution of IC and Parts in the Year 1996



Source: Foreign Trade Statistics of Thailand 1996 (in US dollars)

In 1986, the Thai market share in the Untied States market was greater than in the other three markets. The share decreased in 1992, picked up in 1993 and has been declining to the present. The statistics show that the United States' demand for Thailand's IC and parts did not fluctuate much.

Unlike the United States market, the Singaporean market continued to expand. Since 1992, with the exception of 1993, Singapore became the largest importer of Thailand IC and parts until 1995; on the other hand, Thailand's export of IC and parts to Singapore in 1996 dropped sharply in terms of export value. This result can

indicate that Thailand has lost its market share in Singapore's IC market. (for further analysis please see chapter 3.3)

Changes in world demand

In the last two decades, the world demand for Integrated Circuits depended upon human need for electronic products in accordance with the world's Information Technology (IT). Table 3.4 shows that both the world demand for IC and Thailand 's export value in IC have continuously increased since 1988. Both variables, the world IC trade and Thailand's export for IC have maintained an increasing trend until 1995, but in 1996 Thailand's export of IC and parts dropped.

Table 3.4

Comparison Between World Demand for IC&Parts and Thailand's Export of IC&Parts

Years	(1) WIC	(2) TIC	(2)/(1) %
1988	51,000	746	1.46
1989	54,000	717	1.32
1990	55,000	853	1.55
1991	60,000	1,007	1.68
1992	65,000	1,124	1.73
1993	86,000	1,401	1.63
1994	111,000	1,798	1.62
1995	151,000	2,329	1.54
1996	158,000	2,318	1.47

WIC World Demand for IC & Parts

TIC Thailand Export Value of IC & Parts

(2) / (1) The Share of Thai IC & Parts in World IC & Parts

Sources: (1) WIC From Data Quest 1996

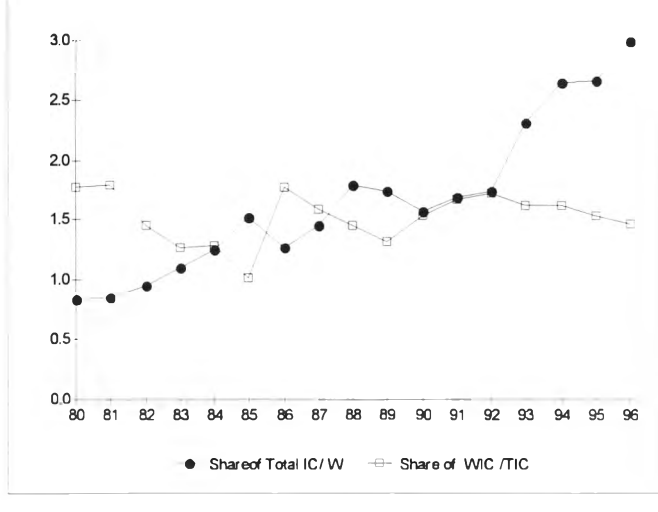
(2) TIC From Bank of Thailand

Thailand's share of the worldwide IC market rose between 1989 and 1992. The peak point was during the years 1990 to 1992. Moreover, the world demand for IC and Thailand's export of IC have increased; the share of Thailand's IC in the world's IC market decreased between 1993 and 1996. Or it can be said that even though Thailand's export value of IC has risen consistently, it is unable to catch up with the fast growing total world demand. Thus, the share of Thai IC market in the world IC has decreased.

Figure 3.12 shows the relationship between the share of total integrated circuits and parts trade in total world trade and the share of IC trade in World IC trade. The share of Thai IC in total Worldwide Trade IC and Parts increased from the years 1980 to 1996 while the share of IC trade in World IC trade rather fluctuated and decreased in 1996.

Figure3.12

The Share of Total IC in World Trade and Growth of Thai IC



Source: Data Quest May, 1996

International Financial Statistic October, 1997

Unctad Commodity Yearbook 1990-1995

Bank of Thailand Monthly Review October, 1996

World Semiconductor Trade Statistic

The share of IC trade in World IC trade dropped dramatically in 1996. The reason for this is Thailand does not have enough both capability and efficiency in IC market compare with world IC.

3.2 Thailand's Comparative Advantage in the Semiconductor Trade

In order to test the comparative advantage of Thailand in the integrated circuit trade, the Revealed Comparative Advantage (RCA) is employed as an indicator. To fulfill the test of comparative advantage, the followings will be done:

1. To analyze separate components of RCA over time namely,

A. Tic/Tx : The share of Thailand's IC exports in total Thai exports.

B. Tic/Wic : The share of Thailand IC exports in world IC exports.

C. Wic/Wx : The share of IC trade in total world export.

Where as IC = integrated circuit and parts, T = Thailand, and W = world

2. To compare Thailand's RCA with Indonesia' s RCA and Malaysia's RCA.

3. To analyze RCA changes over time and their relationship to Thailand's export of integrated circuit.

1. To analyze separate components of RCA over time

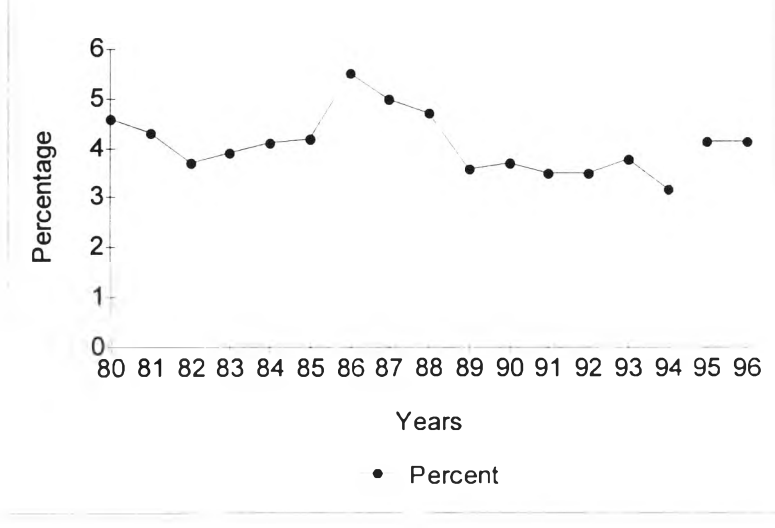
In this study, the analysis of the separate components of RCA over time will be shown as the share of Thailand's IC exports in total Thai exports, the share of Thailand IC exports in world exports, and the share of IC exports in total world exports.

A. The share of Thailand's IC and parts exports in total Thai exports [Tic/Tx].

From table 3.5 and figure 3.13, it can be seen that the trend of the share of Thailand's integrated circuit and parts in total Thai exports was stable with a peak period from years 1986 to 1988. According to the Board of Investment (BOI)'s 1995 study, this could imply that after 1985, Thailand moved toward higher value-added and more advanced products such as telecommunication equipment that included IC and parts.

Figure3.13

The Share of Thai IC in Total Thai Export



Sources: Quarterly Bulletin. (1991, September). (Vol. 31, No. 3) Bank of Thailand.

Quarterly Bulletin. (1997, June). (Vol.xxxvii, No. 2) Bank of Thailand

Table 3.5

The Share of Thailand IC Exports in Total Thai Exports

Years	Tic	TX	Tic/Tx(%)
1980	299,951,267	6,505,000,000	4.6
1981	307,057,745	7,038,000,000	4.3
1982	257,826,086	6,945,000,000	3.7
1983	253,343,782	6,368,000,000	3.9
1984	310,472,972	7,413,000,000	4.1
1985	303,235,294	7,122,000,000	4.2
1986	486,636,294	8,753,000,000	5.5
1987	588,789,759	11,546,000,000	5.0
1988	746,988,906	15,952,000,000	4.7
1989	717,166,212	20,078,000,000	3.6
1990	853,301,700	23,070,000,000	3.7
1991	1,007,824,726	28,428,000,000	3.5
1992	1,724,518,664	32,473,000,000	3.5
1993	1,401,813,883	36,800,000,000	3.8
1994	1,798,650,258	45,160,778,080	3.2
1995	2,329,987,500	56,342,588,141	4.13
1996	2,317,076,069	55,947,345,483	4.14

Tic : Thailand Export for IC and Parts

Tx: Thailand Export all the Commodities

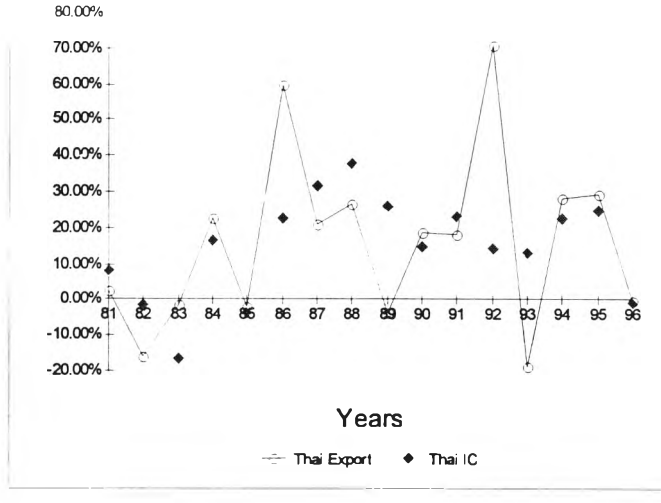
Sources: Foreign Trade Statistic of Thailand 1980-1994.

Transational Corporations in the International Semiconductor Industry (1996) New York: United Nation

Figure 3.14 shows that the growth of Thailand's integrated circuit exports and the growth of total Thai exports were both fluctuating. The growth rate of Thailand's integrated circuit and parts were generally higher than total exports in the years 1987, 1988, 1990, 1991, and 1992, and that both the growth of the Thai export of IC and the total of Thai exports after 1996 dropped dramatically in 1996.

Figure3.14

The Comparison between the Growth of Thai IC and Total of Thai Exports

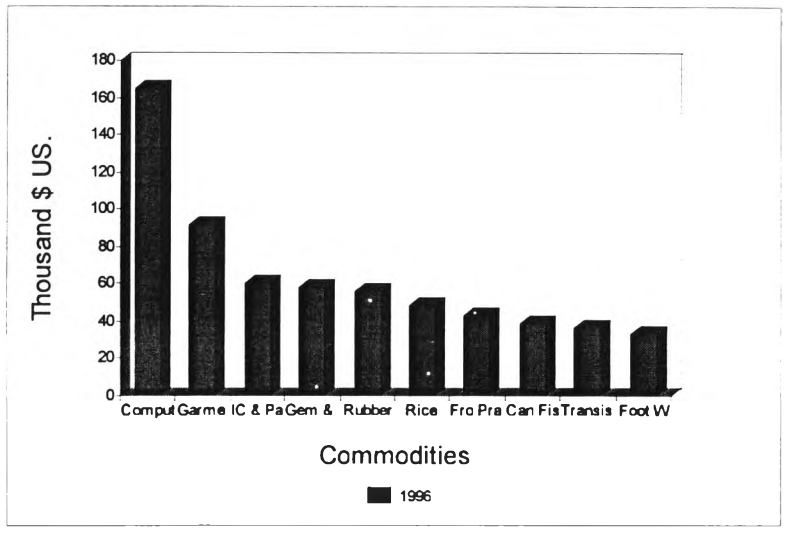


Source: *Foreign Trade Statistic of Thailand 1980-1996*

For these reasons, the export of Thailand's integrated circuits and parts became more and more significant in the composition of the total Thai exports; in 1996, IC & parts became the third highest export items. (see figure 3.15) Moreover, figure 3.14 shows the drop of both the growth of Thai integrated circuits and parts and the total of Thai exports in 1996 which indicates that both variables have a direct proportional effect on each other.

Figure 3.15

Top Ten Export Items of Thailand



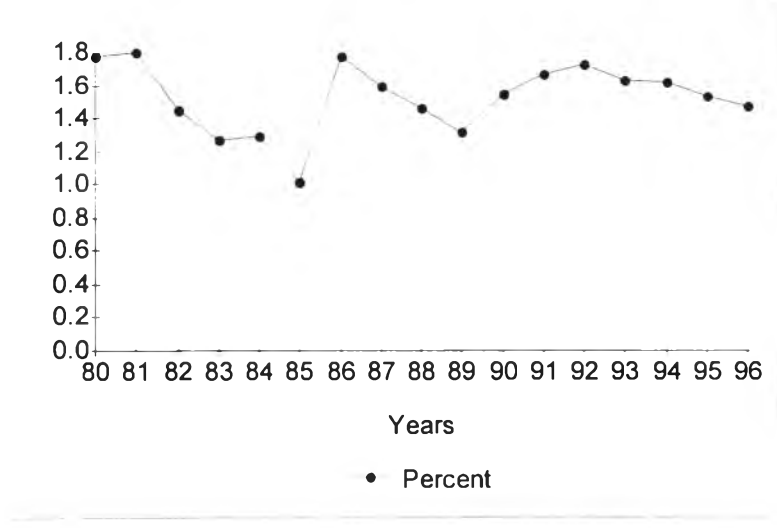
Source: Bank of Thailand

B. The share of Thailand's integrated circuit and parts exports in world integrated circuit exports [Tic/Wic].

From figure 3.16 and table 3.6, it can be seen that the share of Thai IC trade in world IC trade fluctuated and the trend seemed to have moved down because the volume of world IC trade can be said to be increasing gradually while the volume of Thai IC trade itself rather fluctuated, despite an increasing trend at the end of the period . There is a potential increase in the share of IC trade in World trade after the fluctuation of the middle period years 1982 to 1989 and the decline of the years 1994 to 1996. However, although the Thai export of IC is expected to slow down in the short period of time, it should be up raised in the long run due to the fast growth of world technology.

Figure3.16

The Share of Thai Exports of IC in World Exports of IC



Sources: Foreign Trade Statistics of Thailand 1981-1996.

Data Quest. (1996, May)

Transnational Corporation s in the Semiconductor Industry. (1986) . New York: United Nations.

Table 3.6

Thailand's Share of IC Exports in World IC Exports (value in US dollars)

YEARS	Tic	Wic	Tic/WIC (%)
1980	299,951,267	16,915,000,000	1.77
1981	307,057,745	16,970,000,000	1.80
1982	257,826,086	17,675,000,000	1.45
1983	253,343,782	19,935,000,000	1.27
1984	310,472,972	23,920,000,000	1.29
1985	303,235,294	29,455,000,000	1.02
1986	486,636,294	27,334,073,000	1.78
1987	588,789,759	36,644,340,000	1.60
1988	746,988,906	51,000,000,000	1.46
1989	717,166,212	54,000,000,000	1.32
1990	853,301,700	55,000,000,000	1.55
1991	1,007,824,726	60,000,000,000	1.67
1992	1,724,518,664	65,000,000,000	1.73
1993	1,401,813,883	86,000,000,000	1.63
1994	1,798,650,258	111,000,000,000	1.62
1995	2,329,687,500	151,000,000,000	1.54
1996	2,317,076,069	158,000,000,000	1.47

Tic : Thailand Export for IC and Parts

Wic : World Export For IC and Parts

Sources: Foreign Trade Statistic of Thailand 1980-1994,

Transational Corporations in the International Semiconductor Industry (1996) New York: United Nation

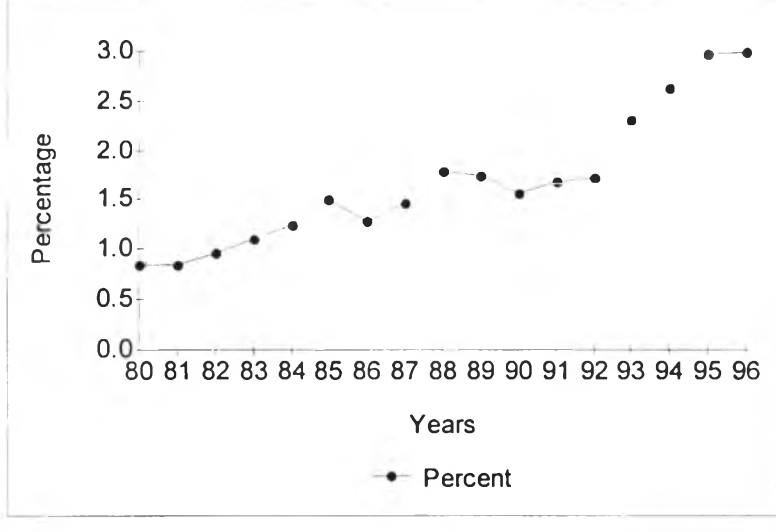
Data Quest. (1996)

C. The share of integrated circuit and parts trade in total world trade [Wic/Wx]

From the table 3.7 and figure 3.17, the share of IC in total world trade had an increasing trend because of a huge demand for electronic components that included semiconductor components just like ICs due to the fast grôwing of our world technology. In the world of technology, the IC industry is the link between the development of high-technology and the development of world communication.

Figure3.17

The Share of World IC in Total World Exports



Sources: Data Quest. (1996, May)

Tansnational Corporation in the Semiconductor Industry. (1986) . New York: United Nations.

Table 3.7

The Share of IC Trade in Total World Trade

Years	Wic	Wx	Wic/Wx (%)
1980	16,915,000,000	2,001,999,000,000	0.84
1981	16,970,000,000	1,976,099,000,000	0.85
1982	17,675,000,000	1,836,399,000,000	0.96
1983	19,935,000,000	1,811,000,000,000	1.10
1984	23,920,000,000	1,906,999,000,000	1.25
1985	29,455,000,000	1,931,000,000,000	1.52
1986	27,334,073,000	2,128,199,000,000	1.28
1987	36,644,340,000	2,499,199,000,000	1.46
1988	51,000,000,000	2,847,805,000,000	1.79
1989	54,000,000,000	3,079,682,000,000	1.75
1990	55,000,000,000	3,488,075,000,000	1.57
1991	60,000,000,000	3,519,091,000,000	1.70
1992	65,000,000,000	3,723,675,000,000	1.74
1993	86,000,000,000	3,710,281,000,000	2.31
1994	111,000,000,000	4,202,100,000,000	2.64
1995	151,000,000,000	5,078,900,000,000	2.97
1996	158,000,000,000	5,258,700,000,000	3.00

Wic : World Export For IC and Parts

Wx : World Export of all Commodities

Sources: DataQuest, 1995

Unctad Commodity Yearbook 1990 - 1995 , United Nations New York

Transnational Corporations in the International Semiconductor Industry, United Nations New York ,1986

2. To compare Thailand's RCA, Malaysia's RCA and Indonesia's RCA

Since Malaysia and Indonesia are seen as trading competitors of Thailand, they have been selected for the comparison of RCA with Thailand. These are excellent choices for the comparison between the lower and upper level countries of (followed by) Indonesia and Malaysia, respectively. Due to a lack of Malaysian Trade Statistics, the availability of Malaysian RCA will be shown from 1989 to 1991.

A comparison between INRCA, MARCA, and TRCA is shown in table 3.8 and figure 3.18.

TABLE 3.8

Revealed Comparative Advantage among Thailand, Malaysia, and Indonesia

Years	TRAC	INRCA	MARCA
1989	2.118	0.031	14.236
1990	2.467	0.044	14.345
1991	2.059	0.070	12.821
1992	2.000	0.085	-
1993	1.652	0.043	-
1994	1.230	0.076	-

TRCA = The Revealed Comparative Advantage Index of Thailand's IC and parts Trade

INRAC = The Revealed Comparative Advantage Index of Indonesia's IC and Parts Trade

MARCA = The Revealed Comparative Advantage Index of Malaysia's IC and parts Trade

Sources : Foreign Trade Statistics of Thailand 1980 - 1994 The Customs Department

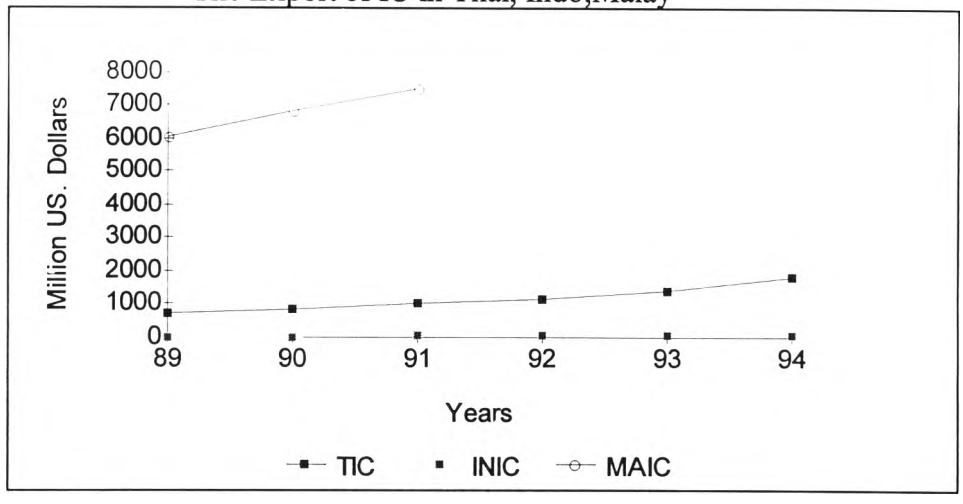
Indonesia Foreign Trade Statistics 1989 - 1994

Malaysia External Trade Statistics 1989 - 1994

Unctad Commodity Yearbook 1990 - 1995. United Nations.

Figure 3.18

The Export of IC in Thai, Indo,Malay



Sources: *Foreign Trade Statistics of Thailand 1980-1994. The Customs Department*
Indonesian Foreign Trade Statistics 1989-1994
Malaysian External Trade Statistics 1989-1991

Not: Value in US dollars

It can be seen that Indonesia INRCA has a value of less than one for the years 1989 to 1994. This implies that Indonesia had a comparative disadvantage in IC and parts or a deteriorating comparative advantage. Malaysia MARCA has an RCA index of six and seven times more than Thailand TRCA. From the RCA interpretation, Malaysia's advantage is greater than Thailand's both in terms of RCA index and export values. This is because, " In 1969, with the start of the semiconductor assembly in other countries of the region, the Government(USA) made a determined attempt to attract export-oriented TNCs to Malaysia, by offering very attractive incentives and facilities in export processing zones (EPZs)" United Nations, 1995. Malaysia has become the largest offshore production base in South-East Asia. By the same token, in Thailand in 1972 some foreign firms started assembling, and ICs were established. It can be seen that Malaysia first developed this industry with attractive incentives and export processing while Thailand lagged further behind followed by Indonesia.

Table 3.9, shows that Malaysia exceeded Thailand and Indonesia in terms of RCA index and export value toward the industry.

Table 3.9

The Export of IC and Parts by Thailand, Malaysia, and Indonesia

YEARS	TIC	INIC	MAIC
1989	717.2	12.1	6,070.3
1990	853.3	18.2	6,870.4
1991	1,007.9	37.7	7,498.5
1992	1,124.6	51.7	-
1993	1,401.9	34.8	-
1994	1,789.7	79.7	-

TIC: Thailand's Export Value of IC and Parts

INIC: Indonesia's Export Value of IC and Parts

MAIC: Malaysia's Export Value of IC and Parts

Sources: *Foreign Trade Statistics of Thailand 1980-1994*, *The Customs Department*

Indonesia's Foreign Trade Statistic 1989-1994

Malaysia's External Trade Statistic 1989-1991

Note: Value in million US dollars

3. To analyze RCA changes over time and their relationship to Thailand's export of IC exports.

In order to incorporate the trend factor, the RCA index is calculated annually . As in table 3.10, the RCA index is fluctuating but on average has a decreasing trend. The smallest number, 1.23, was in 1994, and the greatest , 5.48, was in 1980. However, the overall the value of Revealed Comparative Advantage or RAC index was greater than one which indicates that Thailand has a comparative advantage in IC and parts. The decreasing Thailand Revealed Comparative Advantage (TRCA) did not indicate that Thailand has its comparative advantage. Although the RCA index decreased over a period of time, export values indicated an increasing value. The supporting reason was that Thailand is unable to catch up with the fast growth in world demand for IC and parts. Therefore, the proportion of the Thai market share to world market share (TRCA index) decreased. At present, Thailand is unable to keep up with global demand because it does not yet have its own production line and its technology is behind that of neighboring countries. The major IC industry is still assembly-for-export oriented.

TABLE 3.10

The RCA of Thailand's IC and parts and Thailand's IC and parts

YEARS	TRAC	TIC
1980	5.48	299.951
1981	5.13	307.057
1982	3.71	257.862
1983	3.61	253.343
1984	3.35	310.472
1985	2.80	303.235
1986	4.34	486.636
1987	3.49	588.789
1988	2.62	746.988
1989	2.11	717.166
1990	2.46	853.301
1991	2.05	1,007.824
1992	2.00	1,124.518
1993	1.65	1,401.813
1994	1.23	1,798.650
1995	1.37	2329.727
1996	1.36	2,317.08

TRCA = The Revealed Comparative Advantage Index of Thailand IC and parts Trade

TIC = Thailand's Export Value of IC and parts (in million n US. dollars)

Sources: Foreign Trade Statistics of Thailand 1980 - 1994 The Customs Department

Annual Economic Report 1981 - 1990 Bank of Thailand

Unctad Commodity Yearbook 1990 - 1995 United Nations , New York and Geneva

Direction of Trade Statistics Yearbook 1995

3.3 Worldwide Trade in the Semiconductor Industry

In order to analyze the reasons for the decreasing trend of Revealed Comparative Advantage in Thailand's semiconductor industry and the dramatically decreasing growth of Thai exports of IC and Parts after 1995, two factors will be considered. First, the market distribution of imports of IC and parts to the United States, the European Union, Japan, and Singapore . The reason why we need to analyze the USA, Japan and the EU is that those three countries are the leaders of the semiconductor industry. Singapore, on the other hand, was the top of the three largest importers of Thailand's IC and parts from 1986 to 1995. Second, the over supply of the semiconductor industry has to be analyzed due to the drop in values and growth in 1996. Further analysis is structured as follows:

3.3.1 To analyze the import structure of the USA, Japan, the EU, and Singapore in IC and parts.

A. To analyze the import structure of the United states in IC and parts.

B. To analyze the import structure of Japan in IC and parts

C. To analyze the import structure of the EU in IC and parts

D. To analyze the import structure of Singapore in IC and parts

3.3.2 The over supply of the semiconductor industry.

3.3.1 To analyze the market distribution import structure in IC and parts by the USA, Japan, the European Union, and Singapore.

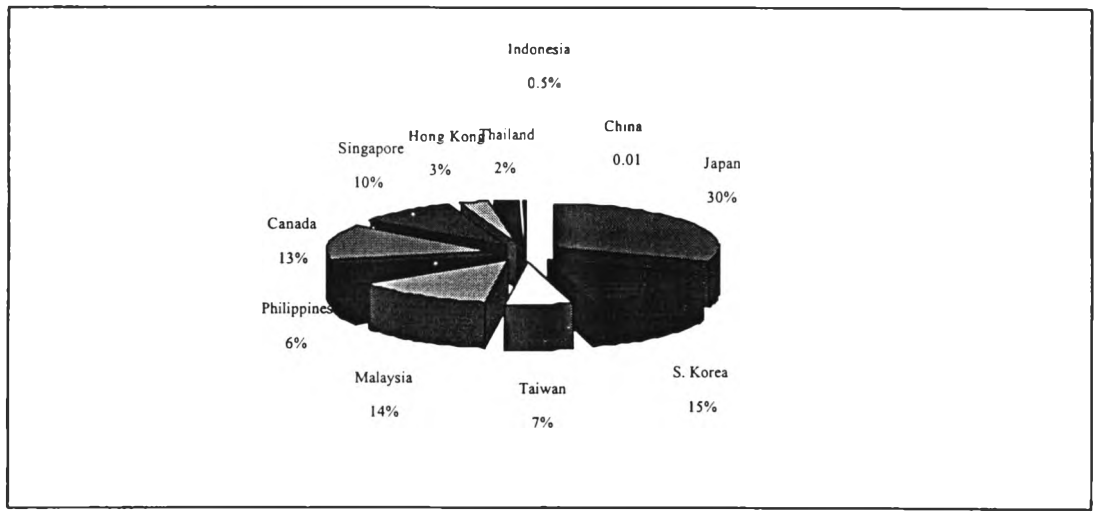
A. To analyze the import structure of the United States in IC and Parts.

The United States is the leading country in the Semiconductor industry. The first developers of the Semiconductor Industry were American firms as mentioned in chapter1. The decision of those semiconductor firms in the USA to establish subsidiaries in developing countries or areas was due to the competitiveness of labor costs. Even though the semiconductor industry is capital intensive, and despite the use of high technology, some parts of the industry still require labor for assembling and packaging of the parts. As a result, those American firms in the semiconductor industry decided to import IC and parts from others countries where assembling and packing took place due to the competitiveness of the cost of labor in developing countries.

Figure 3.19 and table 3.11 show the import of IC and parts to the USA classified by country. Japan had the largest value of exports of IC and parts to the USA, followed by South Korea and Malaysia.

Figure 3.19

Imports of USA Classified by Country as by Average of the Years1992-1996



Source: The Statistics Center, Department of Business Economics, Thailand

Japan, South Korea, the Philippines, Singapore, Indonesia, China, and Thailand also increased their export values for the years 1992 to 1996 . Figure 3.13 shows the percentage of Thai IC export toward other countries. Thailand's share was only 2 percent of the exports of IC and Parts to the USA, compared to other countries such as Japan, South Korea and Malaysia whose shares were 30 percent, 15 percent, and 14 percent respectively. Thailand was in its infant stage for the export of IC and Parts to the USA.

Table 3.11

The Import of IC and Parts by the USA. Classified by Country

The Import IC and Parts of USA Classified by Country						Growth Rate		
Country	1992	1993	1994	1995	1996	1994	1995	1996
Japan	3926	5231	6841	9621	7654	30.7	40.6	-20.4
S. Korea	1894	2434	3870	6937	6120	59	79.2	-11.7
Taiwan	841	1268	1794	2795	2728	41.4	55.8	-2.4
Malaysia	1729	2452	3113	4616	4575	26.6	48.2	-0.9
Philippines	731	966	1252	1800	2277	29.6	43.7	26.4
Canada	1706	1342	1313	1656	2063	-2.1	26.1	24.5
Singapore	1237	1380	2001	2716	2846	45	35.7	4.8
Hong Kong	347	495	616	1064	1035	24.4	72.6	-2.7
Thailand	308	464	663	863	898	42.7	30.1	4.1
Indonesia	43	44	54	127	160	21.1	135	26.2
China	2	5	27	99	141	454.4	256.5	42.7

Source: Trade Statistics Center, Department of Business Economic, Thailand

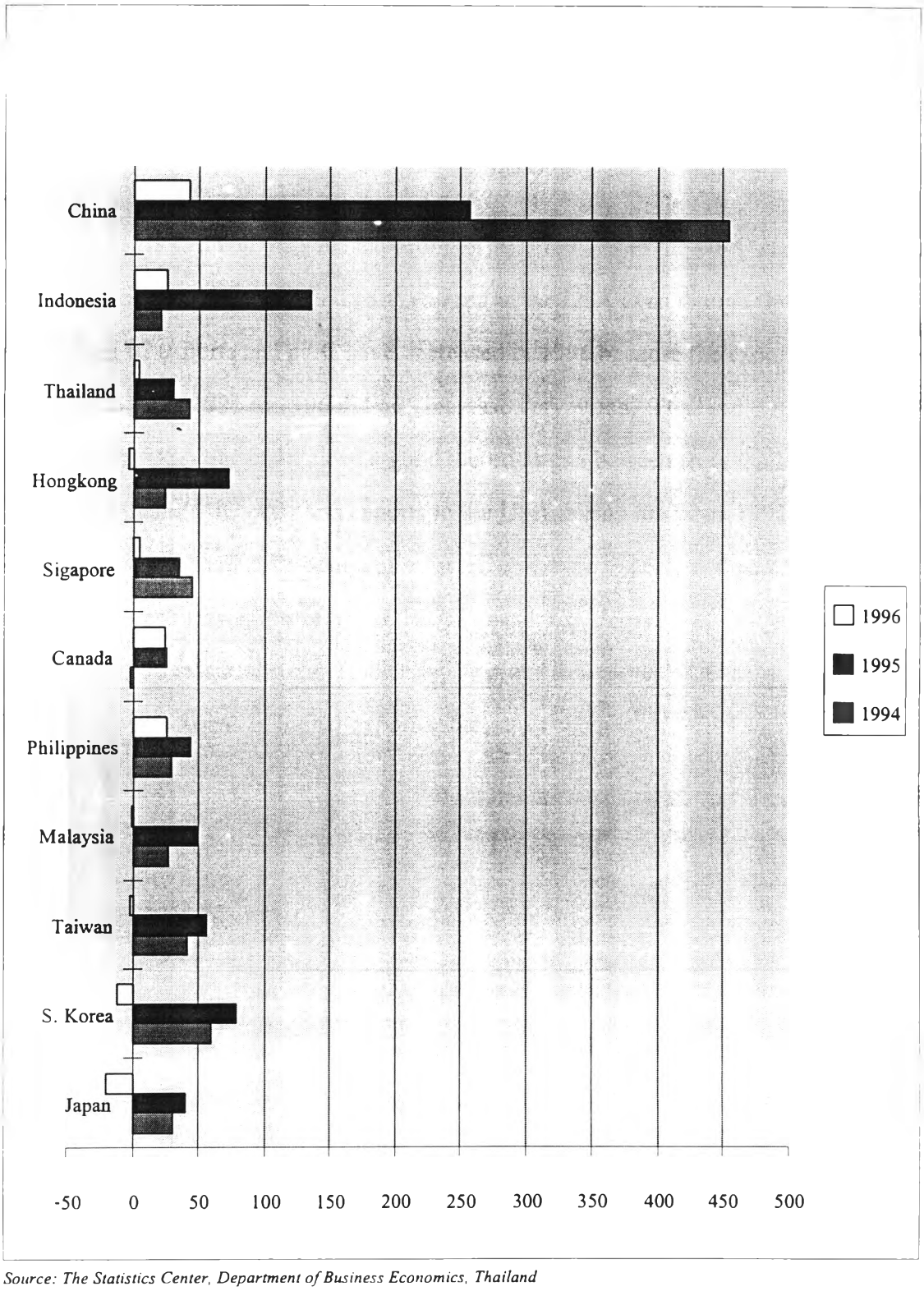
Value in million US dollars

As indicated earlier, the RCA was calculated by using Thai IC exports and total Thai exports divided by the world IC export and total world exports. The RCA showed a direct proportion of Thai IC exports toward the world IC exports. The decreasing trend in Thailand's RCA indicated that Thailand's share in world IC exports had been lost or taken away by other countries. "Somebody wins mean somebody loses" there was a Zero Sum Game in the market.

Table 3.11 and figure 3.20 show the growth rate of the import of IC and parts of the USA classified by country for 1994, 1995, and 1996. In 1994 and

Figure3.20

The Growth Rate of USA Import Classified by Country



Source: The Statistics Center, Department of Business Economics, Thailand

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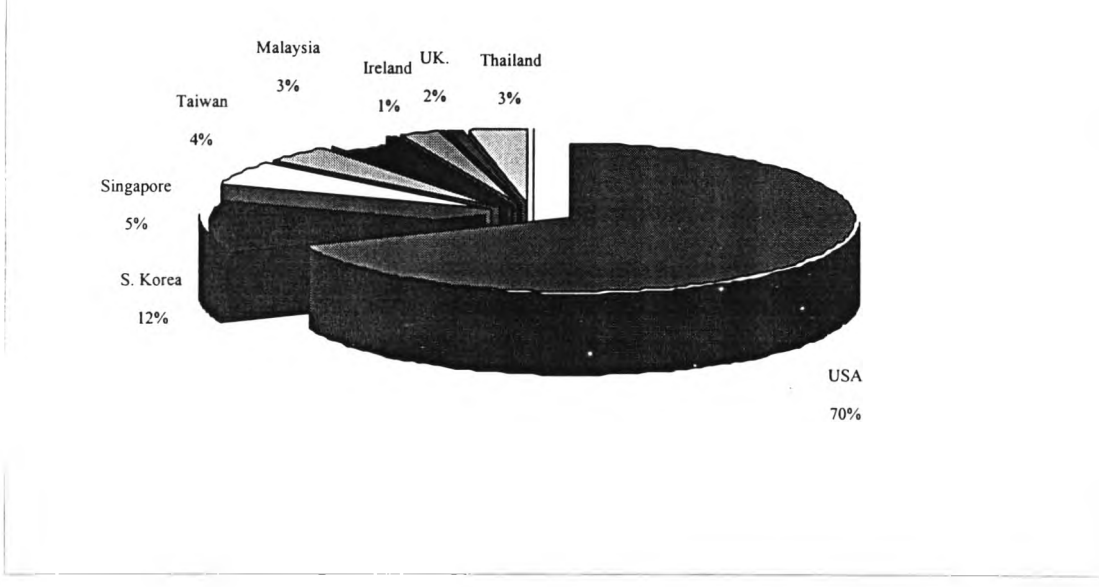
B. To analyze the import structure of Japan in IC and Parts.

Following the USA, Japan is the world's second largest in the Semiconductor Industry. "From the start, Japanese semiconductor firms relied to a greater extent than their United States counterparts on the introduction of labor-intensive automated assembly equipment in their domestic facilities. By contrast, the United States firms chose overwhelmingly to invest in offshore assembly..." United Nation, 1986 Or it can be said that Japanese semiconductor firms also needed large numbers of labor to be able to assemble the equipment. The raising labor costs in Japan in the 1970s induced a number of Japanese firms to invest in only a small percentage of their total assembly needs. The semiconductor industry in Japan has transferred its production base to other developing countries due to the lower cost of labor as the US semiconductor industry had done earlier.

Table 3.12 and figure 3.21 show that USA, South Korea, and Singapore were major exporters of IC and Parts to Japan.

Figure3.21

Imports of Japan Classified by Country as Average of the Years 1992- 1996



Source: The Statistic Center, Department of Business Economic, Thailand

These numbers increased during the period between 1992-1996. From the percentage share of those 13 countries, the USA ranked the highest at 70 percent; South Korea occupied 12 percent followed by Singapore at 5 percent. Japan only imported 3 percent of IC and Parts from Thailand. It should be noted from the previous section that the USA was the major importer of Japan in the IC and parts industry. (From table 3.11) Similarly, Japan was the major importer of the US semiconductor industry (from table 3.12). Since there are many components to the IC industry, it can be seen that both countries were trading partners of different types of IC and Parts.

From table 3.12 and figure 3.22, the export growth rates of the US, Singapore, Taiwan, Malaysia, Ireland, and Thailand to Japan were increasing during the years 1993 to 1995 . In 1996, the IC and Parts export trend to Japan decreased for Malaysia, the UK, Mexico, Ireland, and Thailand.

Table 3.12

The Import of IC and Parts of Japan Classified by Country

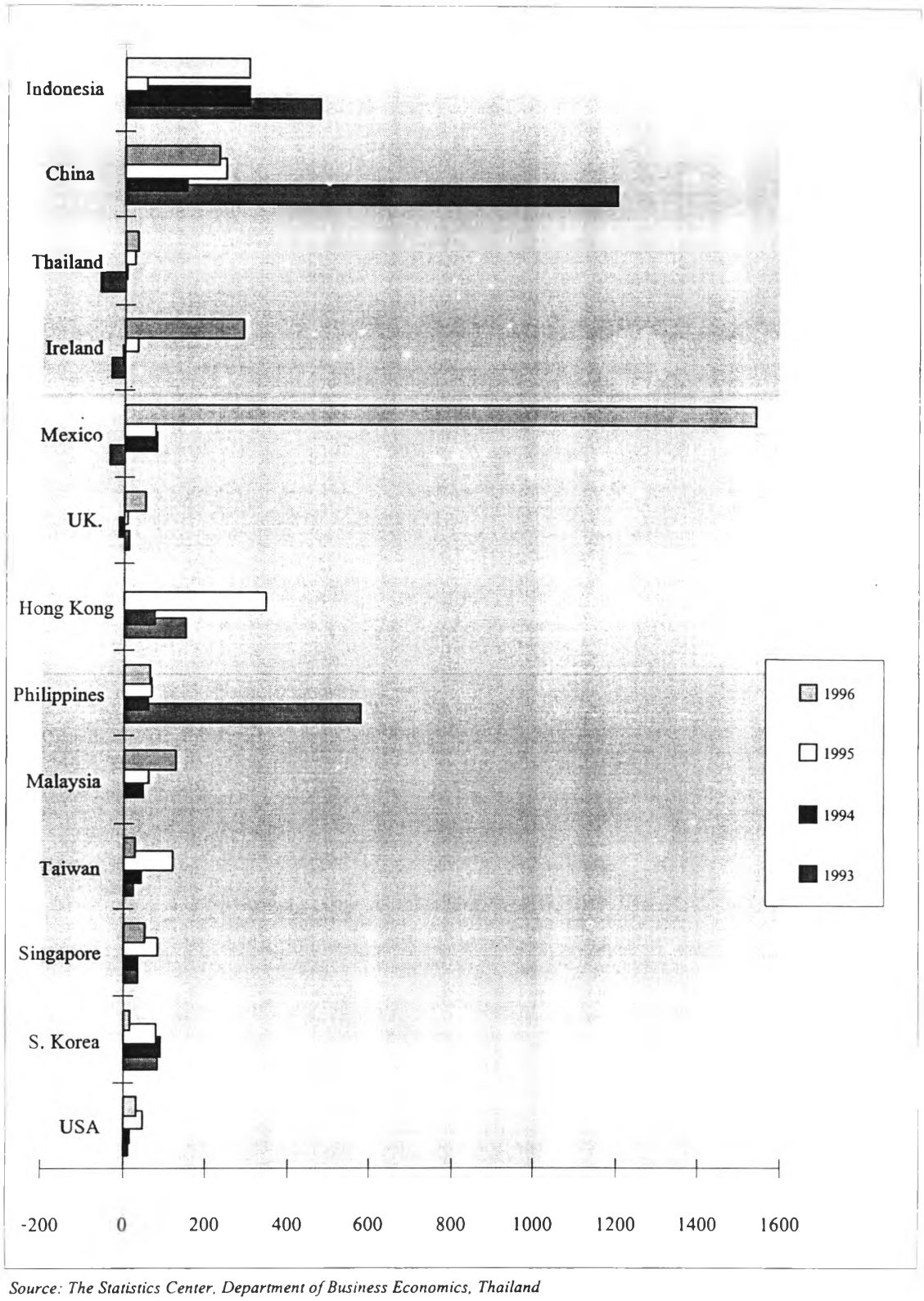
Import of IC and Parts of Japan Classified by Country						Growth Rate			
	1992	1993	1994	1995	1996	1993	1994	1995	1996
USA	251.2	287.6	333.2	493.7	662.3	14.4	15.8	48.1	34.1
S. Korea	43.4	80.7	156.4	282.3	234.6	85.7	93.7	80.5	16.8
Singapore	18.7	26.6	35.9	66.9	103.6	39.1	38.2	85.9	54.9
Taiwan	15.2	19.2	28.3	62.8	81.2	26.1	47.2	122	29.2
Malaysia	11.5	11.8	17.5	27.9	64	3.3	47.8	59.2	128.6
Philippine	0.9	6.1	9.9	16.7	27.3	580	61	68.4	63.5
Hong Kong	1.2	3	5.4	24.4	25.5	151.8	77.4	345.7	3
UK.	8.6	9.8	8.7	9.7	14.9	13.1	-10.6	10.6	53.7
Mexico	0.4	0.2	0.4	0.8	14.3	-32	80.3	78.3	1540.8
Ireland	3	2	1.9	2.6	10.4	-31	-3.9	35.2	289.1
Thailand	12.6	5.5	5.7	7.2	9.7	-56.1	4.1	25.1	33.8
China	0	0.1	0.3	1.2	4.2	1199.7	153.5	247.4	233.1
Indonesia	0	0	0.3	0.5	2	476.9	302.8	51.5	302.4

Source: Trade Statistics Center, Department of Business Economics, Thailand *Value: 1000 Million Yen*

Thailand has a good track record for exporting IC and parts to Japan even though the Thai Share in Japan was only 3 percent. The interpretation is that Thailand did not lose any Japanese market share in exporting IC and parts as can be seen from the increase of both exporting and growth rates in table 3.12 over the years 1993 to 1996.

Figure3.22

The Growth Rate of Imports of Japan Classified by Country



Source: The Statistics Center, Department of Business Economics, Thailand

Thailand's export of IC and parts to Japan is competitive in the Japanese IC market itself in terms of both value and growth rates increasing consistently during the years 1993 to 1996. It could be interpreted that Thailand had competitive labor cost during those years in the past. But when compared to Malaysia, Thailand's export of IC and parts had less competitiveness than Malaysia's export of IC and parts to Japan as Malaysia's exports to Japan were of higher values because Malaysia had better supporting plans such as the unique government policies compared to Thailand. (more explanation in chapter 4) Also, Malaysia had set up a target to become an IC production base in Asia. In contrast, Indonesia was not at all competitive in the Japanese IC market due to a much reduced value of Indonesia's export of IC and parts to Japan compared with other countries as shown in table 3.12 and figure 3.21. In the Japanese IC market, Indonesia could not be counted as Thailand's competitor at all.

C. To analyze the import structure of the European Union in IC and parts.

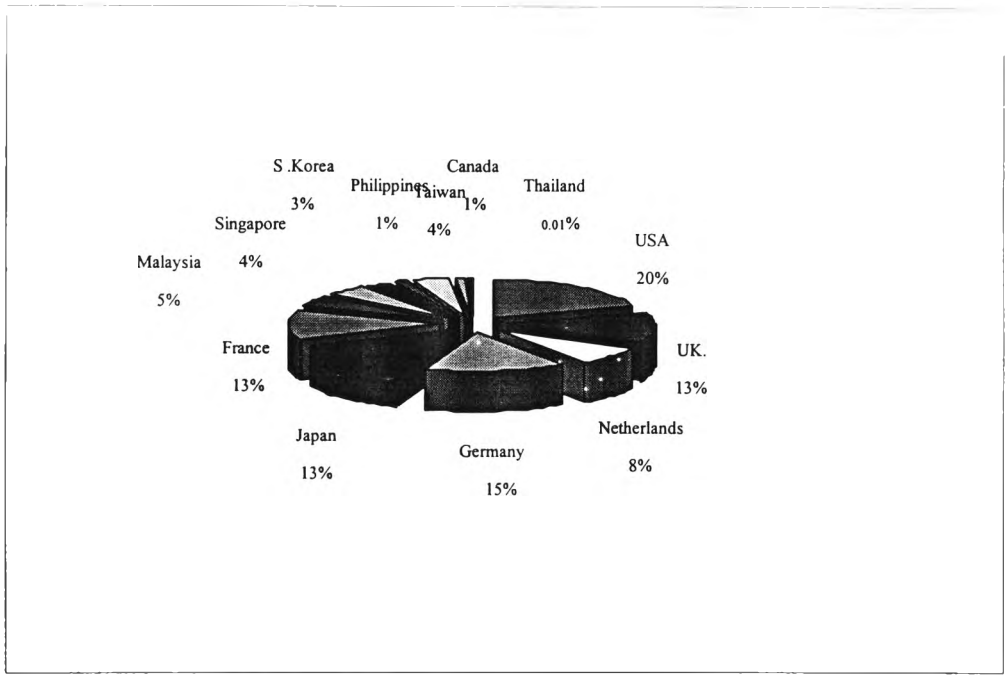
Following USA and Japan, the European Union is one of the largest alliances where the IC industry exists. During the first decade of the existing industry, from the early 1950s through the early 1960s, the major transnational corporations were United States-based merchant Semiconductor producers. "A number of those producers invested in Western European countries, principally to establish manufacturing or point-of-sale(POS) assembly facilities. Of those still active, Texas Instrument was the most prominent investor in Western Europe through the mid 1960s. The decision of several United States-based transnational corporations to establish subsidiaries in Western European countries was largely motivated by the restricted market access of semiconductor import in many of those countries..." United Nations, 1986

Table 3.13 and 3.23 show the imports of IC and parts of the European Union classified by country. The USA, the UK, the Netherlands, Germany, France, and Japan were the major importers of IC and Parts in the European Union, respectively.

The percentages of the EU import mentioned countries increased from the years 1992 to 1996. The percentage of the EU Imports, shows that the USA had a share of 20 percent; Germany had 15 percent; and the UK, Japan, and France had 13 percent, in the export of IC and parts to the European Union. Thailand had close to zero percent export of IC and parts to the EU compared with others which had a large export value of IC and Parts to the EU. (see figure 3.23) As a result of that, there should not have been any effect on Thailand of exporting IC and Parts to the EU due to the very small amount of Thai export value to the EU

Figure3.23

Import of the Intra-EU Trade Classified by Country as Average of the Years 1992-1996



Source: The Statistics Center, Department of Business Economics, Thailand

Table 3.13 and figure 3.24, show that overall, the growth rates of the Netherlands, Germany and France increased in the years 1993 to 1995 . The growth rate of other countries fluctuated.

In conclusion, Thailand's export of IC and parts to the EU was not competitive at all, as there was intra-trade among countries of the European Union; besides which there was preferential trading or regional blocks among the Union.

Table 3.13

Imports of IC and Parts of EU. Classified by Country

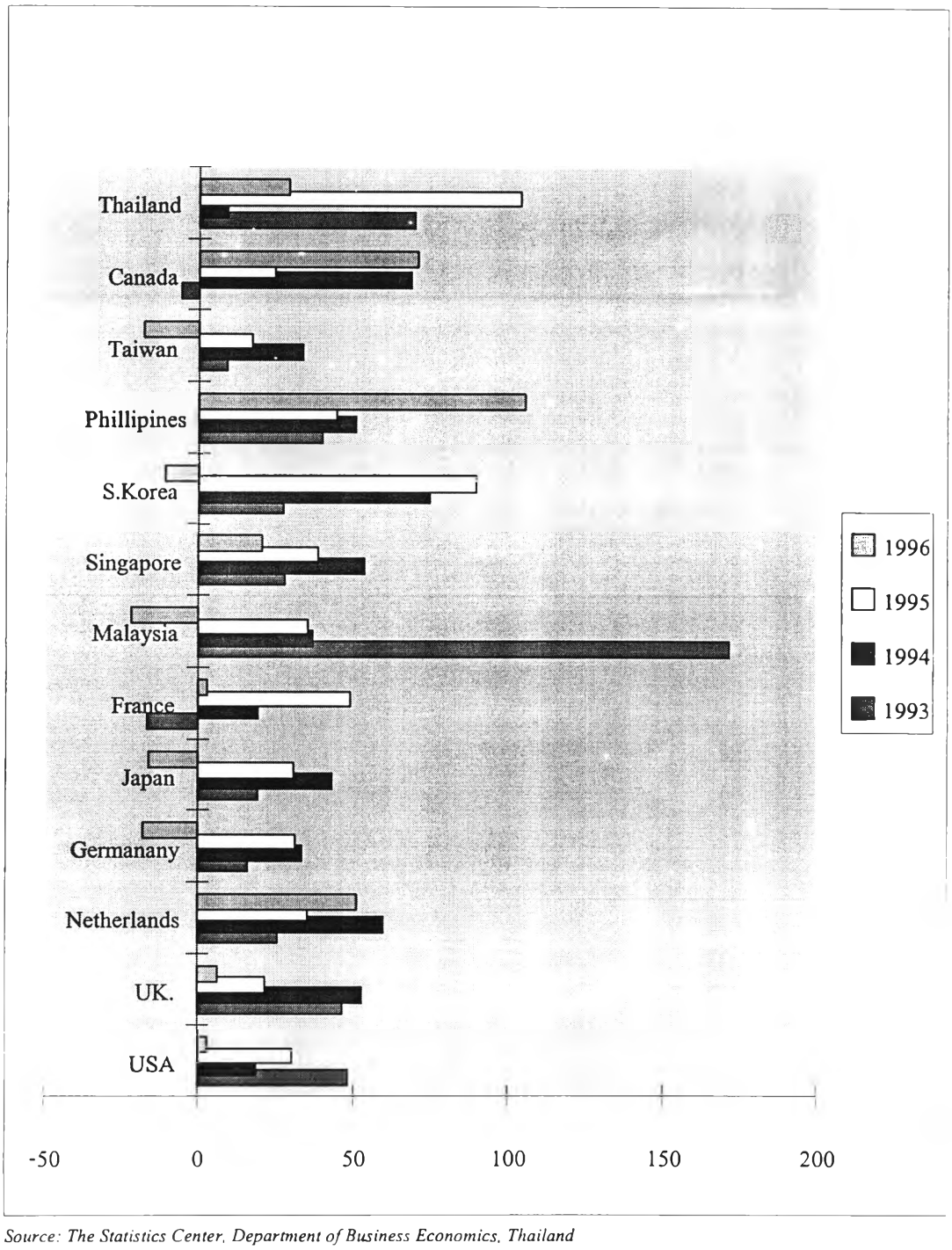
Imports IC and Parts of EU. Classified by Country						Growth Rate			*Unit:Percent*
	1992	1993	1994	1995	1996	1993	1994	1995	1996
USA	1574.7	2339.4	2777.3	3615.4	3705.8	48.5	18.7	30.1	2.5
UK.	1023.1	1499.6	2290.2	2782	2955.3	46.5	52.7	21.4	6.2
Netherlands	649.2	814.1	1300.6	1763.1	2664.3	25.3	59.7	35.5	51.1
Germany	1225.7	1420.5	1898	2489.5	2048.6	15.8	33.6	31.1	-17.7
Japan	1033.2	1232.5	1765.6	2303.1	1931	19.2	43.2	30.4	-16.1
France	1036.6	861.8	1028.7	1534	1575.5	-16.8	19.3	49.1	2.7
Malaysia	372.9	1013.5	1386.1	1818.5	1462.1	171.7	36.7	35.4	-22.1
Singapore	356	455.3	699.3	970.5	1170.3	27.9	53.5	38.7	20.5
S.Korea	229.6	292	510.7	967.9	861.7	27.2	74.8	89.5	-10.9
Philippines	111.1	155.5	234.2	338	695.9	39.9	50.5	44.3	105.8
Taiwan	316	343.7	458.9	537.1	441.7	8.7	33.5	17	-17.7
Canada	105.1	98.9	166.7	206.8	353.3	-5.9	68.4	24.1	70.8
Thailand	34.5	58.5	63.9	130.5	168.1	69.5	9.1	104.1	28.8

Source: Trade Statistics Center, Department of Business Economics, Thailand

Note: In Unit and Percent

Figure3.24

The Growth Rate of the EU Classified by Country



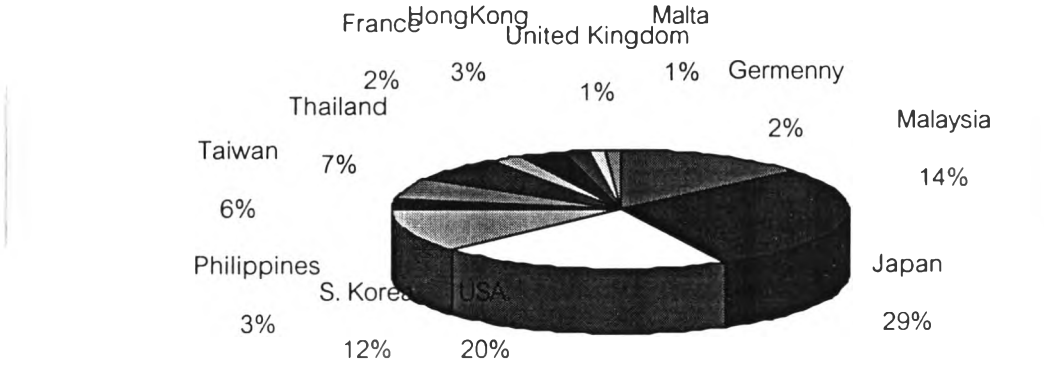
Source: The Statistics Center, Department of Business Economics, Thailand

D. To analyze the import structure of Singapore in Integrated Circuits.

Singapore was one of the Thailand's major importers of IC and parts during the years 1986 to 1996, following the US and Japan. Also Singapore's semiconductor industry has been the largest contributor to export growth over the past twenty years or so. In semiconductors, TI and SGS(of Italy) set up testing and assembly facilities in 1969 to exploit low-cost labor. Today TI, SGS-Thomas, Canon an Hewlett Packgard carry out advanced wafer fabrication within Singapore. Moreover, AT&T set up an advanced manufacturing operation in Singapore in 1986. Table 3.14 and figure3.25 show Singaporean IC imports classified by country of origin where Malaysia had the highest export value to Singapore in Integrated Circuits, followed by Japan, USA, South Korea, the Philippines, Taiwan, and Thailand .

Figure 3.25

Import of Singapore Classified by Country as Average of the Years 1992-1996



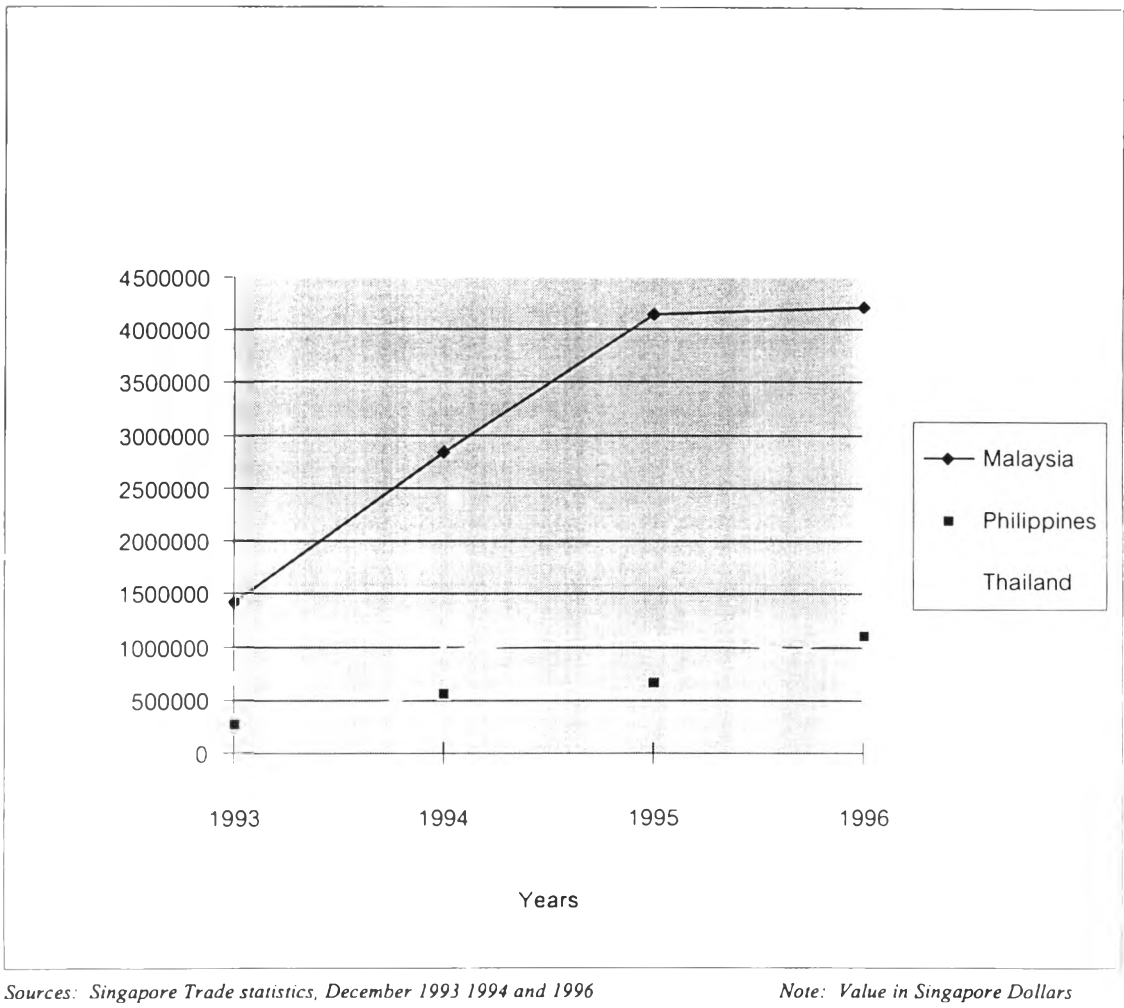
Sources: Singapore Trade statistic, December 1993 1994 and 1996

Economic Development Board of Singapore

Most of the countries such as Malaysia and the Philippines had dramatically increased export values to Singapore for IC and parts during the years 1993 to 1996. Thailand had decreased export values to Singapore during the years 1995 to 1996. In figure 3.26. Malaysia and the Philippines were in the top five of IC and parts exporters to Singapore, while Thailand was seventh place on the Singaporean imports IC and parts table 3.14. These facts were crucial parameters signifying that Thailand had lost its market share of the Singaporean IC market to either Malaysia or the Philippines during the years 1995 to 1996, figure 3.26.

Figure 3.26

The Import by Singapore of IC and Parts from Thailand, Malaysia, and the Philippines



Sources: Singapore Trade statistics, December 1993 1994 and 1996 *Note: Value in Singapore Dollars*

Table3.14

Import of IC by Singapore Classified by Country

Import of IC by Singapore Classified by Country					Growth Rate *Unit:Percent*		
	1993	1994	1995	1996	1994	1995	1996
Malaysia	1,412,883	2,835,019	4,133,778	4,209,454	106	45	1.8
Japan	2,964,313	4,205,511	5,556,513	4,199,540	41	32	-24.42
USA.	2,101,680	2,627,290	3,084,692	3,442,849	25	17	11.61
S. Korea	1,264,863	2,319,547	3,084,692	2,214,621	83	56	-38.82
Philippines	267,899	567,993	671,229	1,107,619	89	8.6	73
Taiwan	625,157	665,420	1,006,110	1,105,639	6.4	51	9.8
Thailand	694,382	968,899	1,077,805	920,056	42	11	-14.6
France	225,277	383,030	5,214,857	861,966	70	36	65
Hong Kong	321,461	708,877	882,238	816,667	120	24	-7.4
Germany	192,512	480,016	538,482	806,405	270	12	49
Malta	98,913	124,553	218,179	332,107	25.9	75	52
UK.	119,774	185,383	169,877	166,157	54	-8.3	-2.1

Sources: Singapore Trade statistics, December 1993 1994 and 1996 *Note: Value in Singapore Dollars*

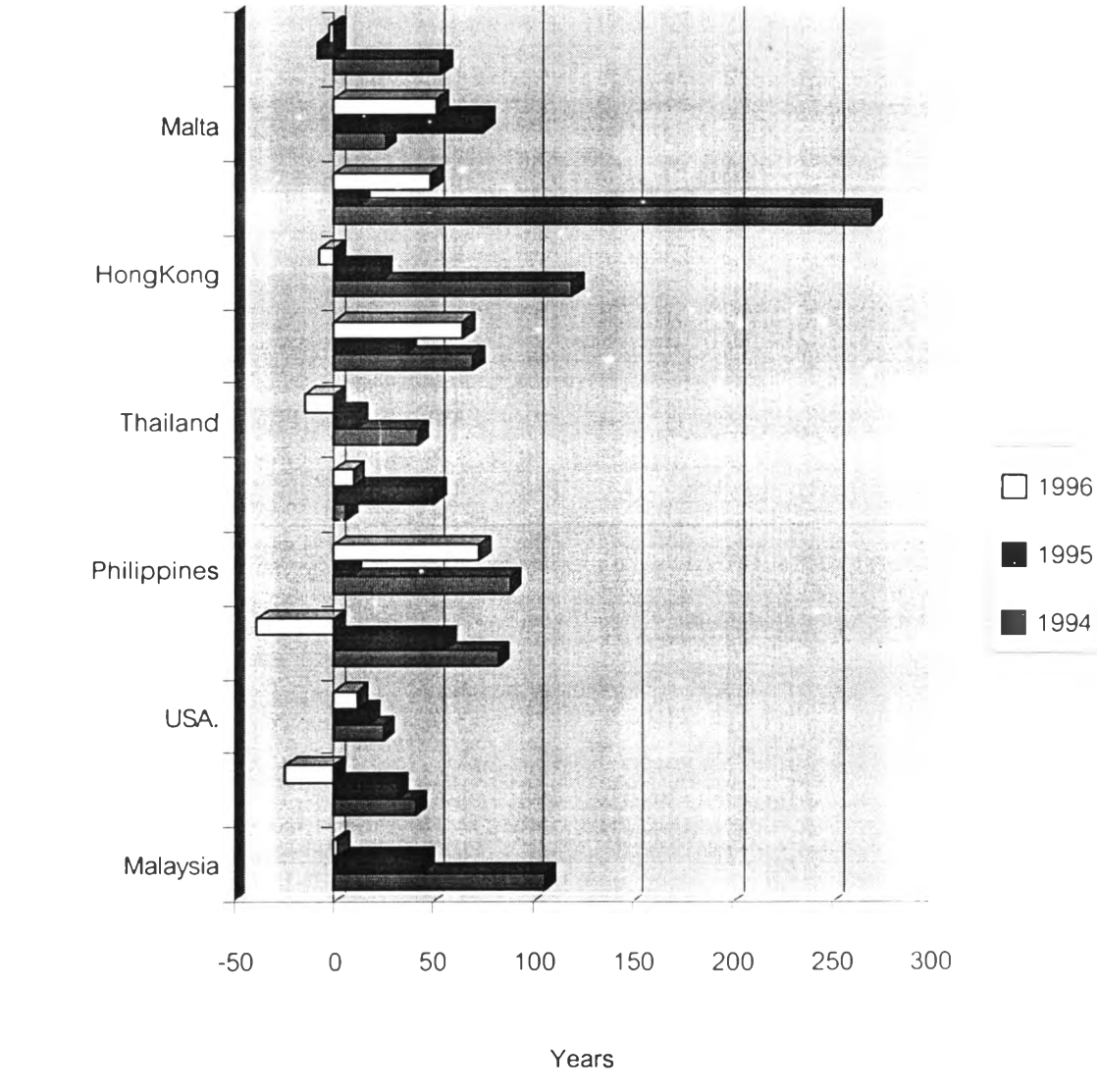
Economics Development Board of Singapore

The growth rates of the countries mentioned in table 3.4 and figure 3.27 have decreased in the years 1995 to 1996 except for the Philippines, France, and the UK. Germany. Moreover, the export IC of the UK had no effect on Thailand's IC trade structure. Thailand's direct competitor was the Philippines. While Thailand had both decreasing export values and growth rates in the years 1995 to 1996, the Philippines had both increasing export values and growth rates in the years 1995 to 1996. Therefore Thailand had lost her market share in exporting IC and Parts to Singapore. That could be interpreted as while Thailand did not improve in the semiconductor

industry in terms of both its technology and quality, the Philippines and others have shifted themselves to a stage of development.

Figure 3.27

The Growth Rate of Singapore by Destination



Sources: Singapore Trade statistic, December 1993 1994 and 1996

Economic Development Board of Singapore

3.3.2 Over supply of the semiconductor industry

The Revealed Comparative Advantage had a decreasing trend starting in 1980, 5.48, to 1996, 1.36. One of the possible reasons could be the over supply in this industry.

From The Economist of November 15TH, 1997 mentioned that the world deflation was caused by an excess of supply over demand that included integrated circuits "Chips". In particular, that was what had happened around Asia. "It's a pity that Asia's strand has got itself entwined with excess supply strand, because it deserves to be taken seriously, whereas the excess supply argument is mainly bunk" "Will the world slump" The Economist, November 15TH 1997

It is true that there was excess capacity in certain industries not just in America but around the world industries such as car manufacturers, chip producers, ship builders, and clothing manufacturers. "The deflation" case is quite straight forward around the world, too many factories are making too many cars, too many computer chips, and too many chemicals" "Deflation and all that" The Economist, November 15, 1997

As a result of excess supply, the overwhelming amount of chips, greater than the investment in Asia, caused the price of memory chips to tumble by 80 percent in 1996. That could be one of the best interpretations why the Thai Revealed Comparative Advantage (TRCA), the Malaysian Revealed Comparative Advantage (MARCA), and the Indonesian Revealed Comparative Advantage (INRCA) dropped in the number of RCA index over time, besides which the growth of Thai IC exports in the Total World IC exports had dropped, especially in 1996 where it dropped dramatically.

In fact, the dropping trend of the Thailand Revealed Comparative Advantage (TRCA) or the sluggish trend of the IC industry should slow down at the moment, and in the long run this industry will continually grow. This is because the IC industry is the link between world technology and communication both of which are already a part of people's basic everyday need. Moreover the electronic consumer products which are conducted by integrated circuits have very short life cycles or it can be said that the product life cycle in the IC industry has a brief duration. There will be an eternal demand for the IC industry to introduce new products to be up to date with the advances of world technology.

Conclusion

The concept of comparative advantage is intellectually important and has a significant association for trade policy. Economists have analyzed the relevance of the concept of comparative advantage as a guide to optimal resource allocation in an open economy. Thailand, Malaysia, and Indonesia have the advantage in terms of low cost of labor. As developing countries, they rely on foreign investment in order to develop their balance of payments which have been in deficit for a period of time. In particular, the semiconductor industry is an export-oriented, and most of the investment in the semiconductor industry has been made by joint-venture, and transnational corporations.

After testing the Revealed Comparative Advantage among Thailand, Malaysia, and Indonesia, the comparative advantages only exist for Malaysia and Thailand, while results show that Indonesia has a comparative disadvantage in the IC industry.

Firstly, Thailand had a comparative advantage in terms of RCA index during the past ten years, 1986 to 1996, but the trend decreased over time ;in contrast, the value of exports increased. This was because Thailand was unable to catch up with the fast

growing world demand for the IC industry. Singapore and the USA were the largest importers of IC and parts from Thailand. The important reason was in 1996 the value in IC exports and IC growth dropped dramatically for two reasons. First, Thailand might lose her market share to the Philippines and Malaysia according to the analysis of the Singapore import IC structure in the years 1993 to 1996 as well as the analysis of over supply in the IC industry.

Secondly, Malaysia had dominants in exporting ICs in terms of export value and RCA. Malaysia had the highest degree of RCA compare to Thailand and Indonesia. Also, Malaysia's export value was the highest in the export of IC and parts compared to Thailand and Indonesia. The supporting reason was Malaysia had the highest investment potential in the IC industry compared to neighboring countries.

Thirdly, Indonesia had an increasing volume in the export IC industry but Indonesia did not have the comparative advantage in this industry due to a RCA value of less than unity. Indonesia practically had the most potential in terms of lowest labor cost due to the large population number. Even though Indonesia's export of IC and parts increased in value, the IC export value was less than that of both Thailand and Malaysia. This indicates that Indonesia is still far behind her neighboring countries such as Thailand and Malaysia in terms of the export of IC and parts.

Being developing countries, it is important to secure markets to promote industrial development. Since the domestic market is limited in most developing countries, especially at the early stage of industrial development, it is essential to gain access to export markets such as IC exports.