demand is being satisfied by domestic production. In 1990, a 1,200cc "people's car" concept was announced and new entries were anticipated on the basis of this. By 1990, Toyota, Honda and Mazda had entered the market as assemblers and two of those companies have invested in parts manufacturing plants.

Characteristic of the Philippines' policy for the automotive industry is that each assembler of imported CKD sets must earn foreign currency by herself at a prescribed share of importation of CKD – Counter Purchase Rule (50% for passenger cars and 25% for commercial vehicles). Because any increase in production requires the company concerned to obtain more foreign currency, the assemblers are engaged in export business in products other than automotive.

8.1.2 Electrical/electronic industry in ASEAN

The Yearbook of World Electronics Data 1993 predicts as follows regarding the production in the ASEAN electronics industry in 1993 (see Table 8.1–3). That is, Singapore will have had the greatest production at US$17.24 billion, followed by Malaysia at US$12.05 billion, and then Thailand at US$7.09 billion. In components as well, Singapore comes in first at US$5.70 billion followed by Malaysia at US$4.87 billion, with almost no difference seen with products.

Table 8.1–3 PRODUCTION OF ELECTRONICS INDUSTRY IN ASEAN ,1993

Unit: US$ million

	Indonesia	Malaysia	Philippines	Singapore	Thailand
EDP	220	1,455	126	8,266	2,633
Office equipment	43	1,369	14	305	135
Control & instrumentation	59	102	32	301	69
Medical & industrial	55	88	18	83	38
Comms & military	253	502	266	431	265
Telecommunications	240	691	120	251	458
Consumer	804	4,209	176	1,902	1,487
Components	378	4,872	1,838	5,706	2,011
Total	2,052	12,055	2,590	17,246	7,096

Source: Elsevier Advanced Technology (1993) Yearbook of World, Electronics Data 1993

Leaving aside the Philippines, the ASEAN countries are projected as continuing to enjoy high rates of economic growth in the future. Along with the rise in per

capita income, it is expected that demand for electrical/electronic products will rise as well. Data of the Electronic Industry Association of Japan (EIAJ) predicts that demand in the five ASEAN countries will rise an average annual 12.1 percent for color television sets from 1993 to 1996, 14.9 percent for VTRs, 21.6 percent for video cameras, and 11.3 percent for CD players (see Table 8.1-4).

Outline of each country's electrical/electronic industry within the ASEAN region is as follows:

(1) Electrical/electronic industry in Singapore

Policies for industrialization and import substitution in the ASEAN countries date back to around the beginning of the 1960s. To realize the above ASEAN countries adopted similar measures such as attracting foreign capital and import restrictions (setting customs duties at very high rates). In particular Singapore with its very small domestic market put special emphasis on the attracting of foreign capital to effect export orientated industrialization from around 1967 just after independence from the Malay Federation. With an average growth rate of 10.2% between 1960 and 1980, Singapore achieved the highest rate of economic growth among the ASEAN countries for this period. The main pillar of Singapore's export orientated industries were the electrical/electronic industries.

In 1965 production of black and white television sets began and in 1968 semiconductor industries were set up with American capital. Then the 1970s saw the entry of Japanese assembly manufacturers and this led to a surge of investments from Japanese electronics parts manufacturers. During this period there was an increasing diversification of product lines ranging from home appliances to computers and allied equipment. Industrial statistics for 1979 show that the number of enterprises had reached 240, with about 74,000 employees employed in this sector and a total production value of about 4.1 billion Singapore dollars (refer to Table 8.1-5). Moreover, exports account for just over 90% of output. Incidentally, at the end of 1991 there were 300 business locations in the same sector in Thailand which employed about 60,000 employees, so that it is possible to say that the size of Thailand's electrical/electronic industry is similar to that of Singapore some 20 years ago in terms of industry scale.

Table 8.1-4 TRENDS IN AND PROJECTIONS ON DEMAND FOR ELECTRICAL AND ELECTRONIC PRODUCTS IN ASEAN

(Unit: 1,000 sets)

		1993	1994	1995	1996	Average growth
Color television sets	ASEAN subtotal	2,250	2,490	2,740	3,170	12.1
	Thailand	950	1,050	1,100	1,200	8.1
	Malaysia	430	470	560	670	15.9
	Brunei	0	0	0	0	0.0
	Philippines	130	170	180	200	15.4
	Indonesia	650	800	900	1,100	19.2
VTRs	ASEAN subtotal	615	705	815	935	14.9
	Thailand	280	320	370	420	14.5
	Malaysia	170	200	240	290	19.5
	Brunei	0	0	0	0	0.0
	Philippines	65	70	75	80	7.2
	Indonesia	100	115	130	145	13.2
Video cameras	ASEAN subtotal	65	82	99	117	21.9
	Thailand	30	40	50	60	25.9
	Malaysia	26	30	36	40	15.4
	Brunei	0	0	0	0	0.0
	Philippines	3	4	4	5	18.6
	Indonesia	6	8	10	12	25.9
CD players	ASEAN subtotal	63	71	79	87	11.3
	Thailand	17	18	19	20	5.6
	Malaysia	31	32	33	34	3.1
	Brunei	0	0	0	0	0.0
	Philippines	5	6	7	8	16.9
	Indonesia	10	15	20	25	35.7
Tape recorders	ASEAN subtotal	6,210	6,400	6,630	6,840	3.3
	Thailand	1,750	1,800	1,850	1,900	2.8
	Malaysia	780	830	870	910	5.3
	Brunei	20	20	20	20	0.0
	Philippines	360	380	450	500	11.6
	Indonesia	3,300	3,370	3,440	3,510	2.1
Car stereos	ASEAN subtotal	973	972	1,066	1,172	6.4
	Thailand	398	395	434	477	6.2
	Malaysia	518	505	563	619	6.1
	Brunei	2	2	2	2	0.0
	Philippines	20	20	22	24	6.3
	Indonesia	35	40	45	50	12.6

Source: Electronics Industry Association of Japan

Subsequently the price competitiveness of Singapore's electrical/electronic industries has been increasingly eroded by the upsurge in labor and other production costs, and the industry has increasingly shifted over to areas which have a higher added value and to fields which are technologically intensive, so that the more labor intensive items in this sector have moved to neighboring countries. Nevertheless the share of electrical/electronic industries in the total added value resulting from the manufacturing sector of the Singapore economy remains very high, and in 1990 the sector accounted for 40% of the total value added of the manufacturing industries. In particular the government has encouraged foreign companies to locate their regional headquarter for ASEAN activities in Singapore since the late 1980s, and many assembly manufacturers beginning with Sony and Fujitsu, have set up so-called "International Procurement Office (IPO)" to coordinate international supplies and output of parts and products in the Asian region at present. Singapore handles the largest flow of electronic parts in the ASEAN region through international parts procurements.

Table 8.1-5 NUMBER OF ELECTRICAL & ELECTRONIC INDUSTRY IN SINGAPORE

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
No.of Industrial Establishments	64	79	94	107	138	149	173	196	216	240
No.of Employees	13,586	18,749	21,483	44,427	48,910	34,556	47,060	52,180	59,474	73,748
Turnover (Million S. Dollar)	283	401	741	1,253	1,600	1,600	1,487	2,503	3,111	4,068

Source: Yearbook of Statistics Singapore 1979/80

In this way the electrical/electronic industries achieved a steady development and contributed to the overall economic growth of Singapore, but the basic reliance of the country's finished exports on parts imports has not changed because of inherent restrictions on the domestic resources (including capital goods) available. Looking at statistics for imports and exports for the period from 1988 to 1990 we note that under the category of machinery and related equipment which includes electrical/electronic goods the value of imports on average has regularly accounted for more than 50% of the export value realized for a given year.

(2) Electrical/electronic industry in Malaysia

The electrical/electronic industries were started up slightly later than their counterparts in Singapore and Thailand, and the first investment came in 1965 with an undertaking by Matsushita for the production of dry cell batteries. However, the full fledged development of the industries first began in the 1970s. This is largely explained by the following factors;

1) the existence in the neighboring country of Singapore of export orientated electrical/electronic industries and business influence from there.

2) the implementation of a legal framework for investment incentives giving emphasis to labor intensive and export-oriented industries with the Investment Incentives Act passed in Sept.,1971. Especially, the investment in the electronics industry before January 31, 1973 could enjoy a tax deduction for 10 years.

3) the promotion of offshore production and simplification of customs procedures resulting from the passing of the Free Trade Zone Act in 1971.

4) the availability of good labor.

Against the above background there was a surge of foreign investment in the 1970s with Japanese manufacturers putting emphasis on investing in consumer electrical goods and American manufacturers emphasizing electronics parts, primarily integrated circuits. As a result by 1980 the electronic industry alone in Malaysia employed some 69,000 personnel and had reached a level of a manufacturing value added of 15%. At the same time the electrical/electronic industries in Malaysia had made the shift over to becoming export-oriented without actually having given sufficient time to the stage of import substitution of consumer electronic industries.

Initially consumer electrical goods had been developed in the context of import substitution policies but given the small size of the domestic market and the aim of developing export-oriented industries, the trend to view Malaysia as an export base as in the case of the electronic industries increasingly prevailed. Thus Japanese manufacturers started to integrate

their Malaysian factories into their overall production and sales networks including those serving Japan and North America, and so Malaysia was accorded importance as an Asian production base. After the upsurge in the value of the yen after 1985 this trend was accentuated and at the same period further strengthened by the relaxation of restrictions on foreign capital undertaken by the Malaysian government with the aim of promoting its export industries.

In 1991 production of color television sets had reached the 8.2 million set mark (output was 3.9 million in Thailand the same year), which represented 10% of the world demand of 84.94 million sets for the same year. Despite the fact that domestic Malaysian sales (that is domestic demand) of color TV sets had increased 24% over the previous year of 1990 only 310,000 sets were sold in 1991. In this connection, domestic sales of color TV sets in Thailand in 1991 reached the 930,000 set mark.

One of the main problems affecting the Malaysian electrical/electronic industries in common with other ASEAN countries is the weak industrial base resulting from insufficient development of peripheral and supporting industries. However, the entry of foreign affiliate assemblers and allied parts manufacturers in the later half of the 1980s has resulted in a considerable improvement in aspects relating to parts supplies. Taking the example of color TV sets the level of local content for some models produced by leading Japanese manufacturers has now reached a level of 90%.

In the case of Malaysia there are a number of items for which parts and materials are supplied locally or from Singapore. According to the "Report on the Local Supply of Parts by Japanese Firms Locally Incorporated in Asia in 1989" conducted and issued by the Japanese Ministry of International Trade and Industry the percentage of local supply in Malaysia is estimated to be considerably in excess of the average of 40.95% given as the overall average of local supply in Asia. However as mentioned above since the improvement in the local supply is largely the result of the entry of foreign affiliate parts manufacturers and an increasing rate of in-house production by the foreign affiliate assemblers, the genuine development of supporting industries involving technology transfer or supply of metal

molds to local small and medium scale industries is still insufficient. Once the labor intensive industries lose their current viability or competing edge the industries will be faced with problems posed by such insufficient development.

(3) Electrical/electronic industry in Indonesia

Production of dry cell batteries and incandescent light bulbs dates back to the 1930s while a small quantity of radios and color TV sets were already produced in the early 1960s. In this sense Indonesia was the earliest ASEAN country to develop its own electrical/electronic industries. However, the genuine development of these industries began with the second Five Year Development Plan from 1974. As with the other ASEAN countries the attraction of foreign capital (in fact mostly from Japanese firms) was undertaken in order to realize policy aims of import substitution. However the following points should be noted;

1) In February, 1978 new entries in certain special electric home appliance sectors were forbidden in order to avoid excessive competition between manufacturers and to improve productive efficiency.

2) Domestic demand stagnated during the economic recession of the early 1980s and the operating rates of factories manufacturing electrical home appliances fell to very low levels.

3) As a result of the concentration of foreign investment in Singapore and Malaysia for establishing export bases the electrical/electronic industries of Indonesia experienced a temporary stagnation.

Subsequently in contrast to other ASEAN countries Indonesia did not enjoy a period of intensive investment in the electrical/electronic industries, and at present Indonesia continues to follow policies of industrial development aiming at import substitution. Indonesia possesses a very large potential market for import substitution as can be seen from recent national statistics on trends in population and economic growth. Figure 8.1-1 presents in graph form the domestic demand for color TV sets, VTR and car stereo systems. Although the total demand is low, a comparison of the population

figures for the four countries being considered here will show that Indonesia possesses considerable potential for domestic demand.

(4) Comparative analysis of the three ASEAN countries

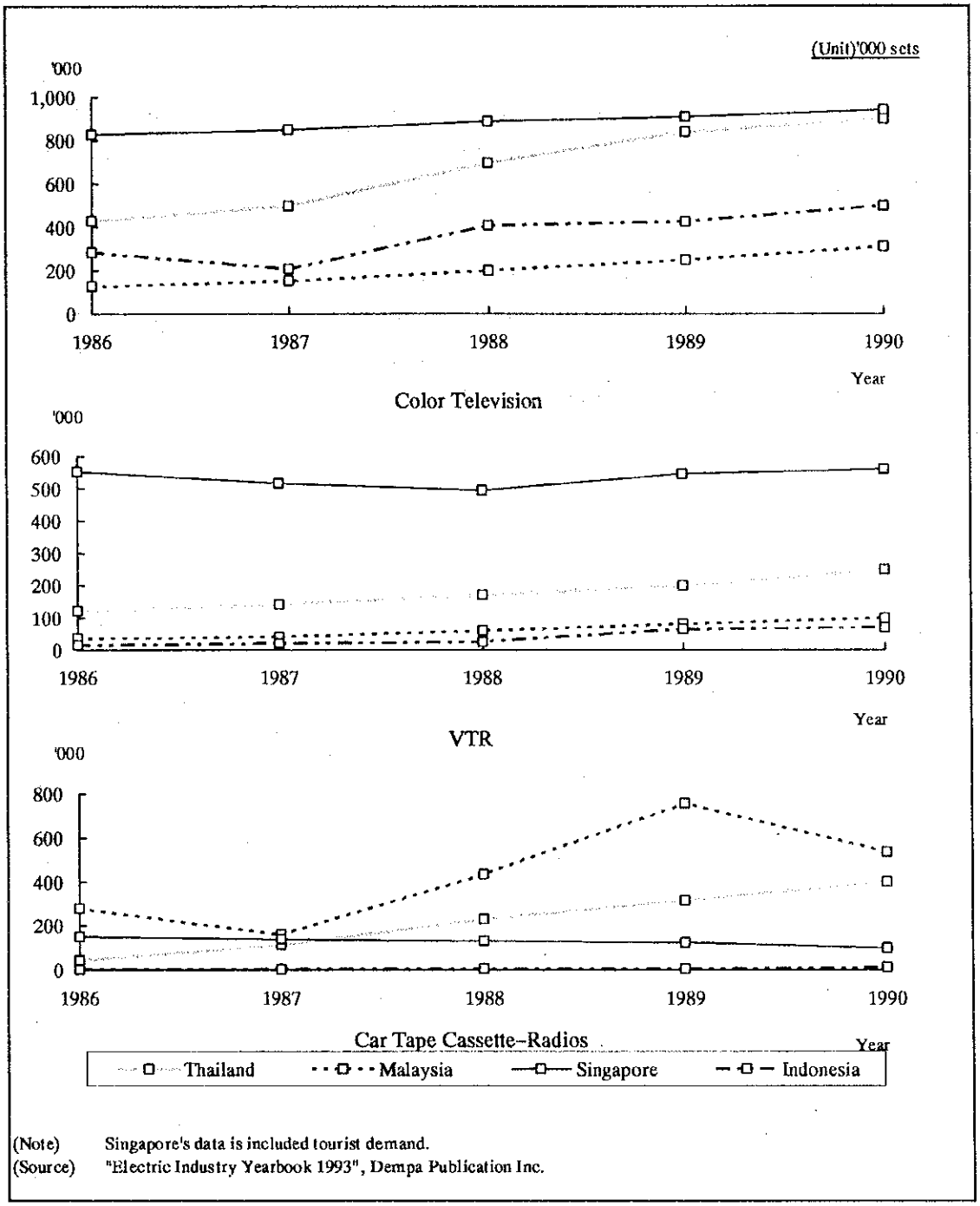
The particular characteristics of ASEAN electrical/electronic industries can be summed up as follows;

1) Development of Malaysia as a production base

The main bases for the electrical/electronic industries in the ASEAN region are Singapore, Malaysia and Thailand. Figure 8.1-2 presents a graphic comparison of recent production trends for the four major electrical items (air conditioners, color TV sets, VTR, and audio equipment). In all cases the importance of Malaysia's share is evident. Moreover, it is significant that Malaysia shows a considerable level of annual increase. In this manner Malaysia has become the major production base for the electrical/electronic industries in the ASEAN region. As mentioned above in the section devoted to Malaysia the local supply content of parts to electrical/electronic industries in Malaysia is very high and the Electronic Industrial Association of Japan (EIAJ) has estimated local content at an average level exceeding 70% in its "1993 Survey Report on Trends of Overseas Electronics Industries."

2) Concentration of parts manufacturers

Foreign parts manufacturers followed foreign assembly manufacturers' investments in the ASEAN region. As a result at the end of 1992 Japanese electronics parts manufacturers were concentrated in this area with 85 companies based in Malaysia and 50 based in Singapore (according to the EIAJ Survey). However there has been a change recently in the activities of the foreign parts manufacturers away from their traditional passive role of serving the assembly manufacturers which they have followed, to a more active stance embracing exports to third markets.



(Note) Singapore's data is included tourist demand.
(Source) "Electric Industry Yearbook 1993", Dempa Publication Inc.

Figure 8.1-1 MARKET DEMAND OF MAJOR ELECTRONIC ITEMS

3) Investment incentives

To date when selecting a location to support expansion in the ASEAN region Japanese manufacturers generally and not only parts manufacturers have generally borne in mind the following three points;

i) the availability of plentiful, cheap labor
ii) the implementation of active and intensive investment incentives by governments
iii) the simplification of customs procedures

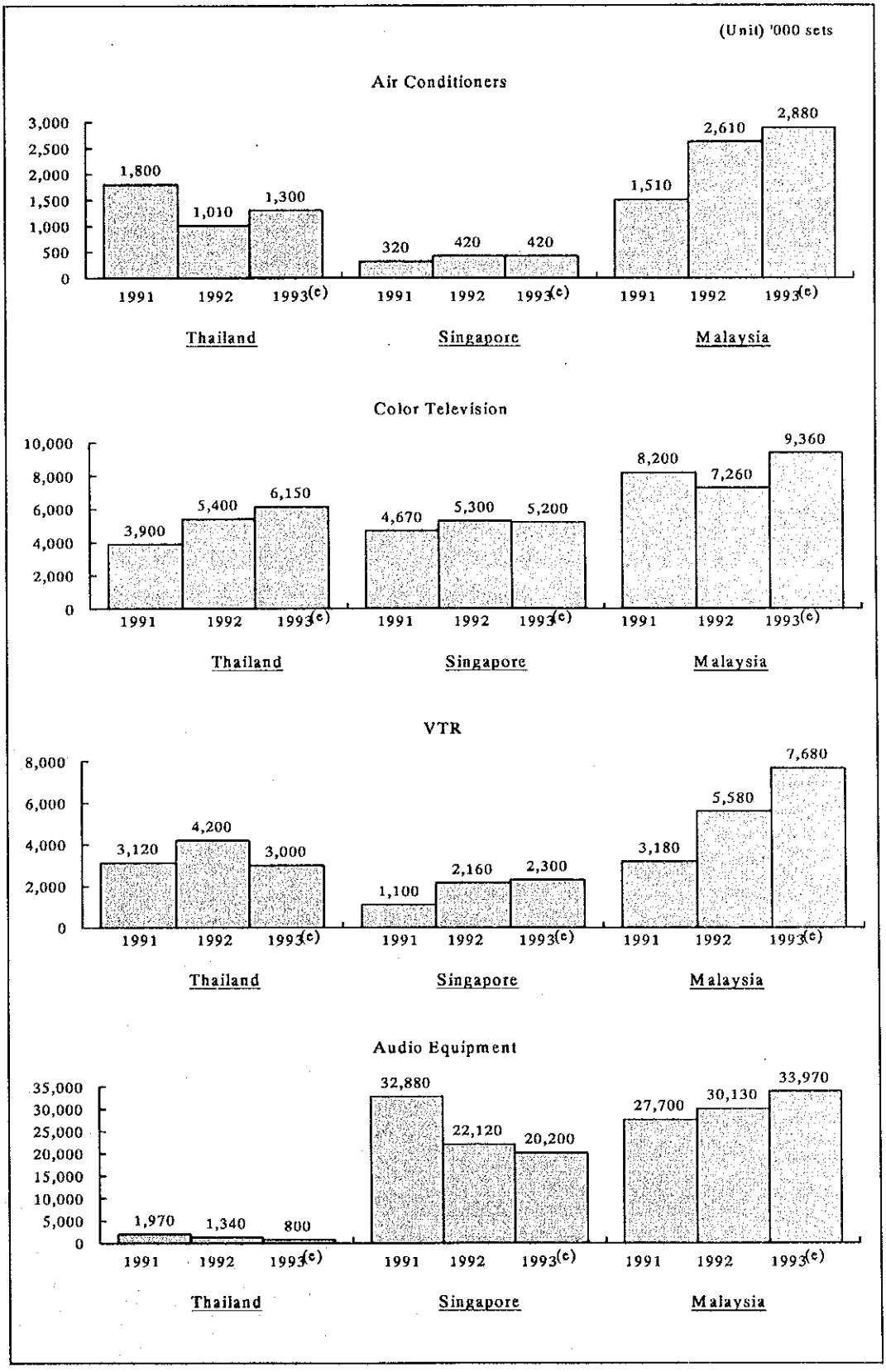


Figure 8.1-2 PRODUCTION OF MAJOR ELECTRICAL/ELECTRONIC EQUIPMENT

8.2 Parts Industries in ASEAN Countries

Here, an overview will be given of the part industries in the other ASEAN countries which are markets and at the same time competition countries to the parts industries of Thailand. The method used for the survey was mainly to utilize the official industrial statistics and trade statistics of the countries concerned and utilize reports of industrial organizations and research institutions.

8.2.1 Autoparts industries in ASEAN countries

(1) Autoparts industries in Indonesia

1) Policy

Indonesia has been promoting the formation of a self-contained automotive industry based on its giant domestic market – comprised of the biggest territory and population in ASEAN. Its policies are to refrain from participation in the BBC scheme and to maintain a negative stance toward auto parts in the CEPT scheme of AFTA as well. Indonesia has been pressing forward with plans for domestic production of parts since 1976, mainly for commercial vehicles, but has not made steady progress in the promotion of part industries. For this reason, it has been reevaluating its plans for domestic production with the aim of encouraging the development of competitive part industries. In 1993, its localization plan was reevaluated and a new plan which stipulated tariff reductions in accordance with the advancement of local content was announced. At the same time the import ban of completely build up car was lifted.

The Ministry of Industry has since 1976 been pushing forward with a plan for domestic production centered on commercial vehicles called the "Deletion Program". Under this, the ratio of local components was set to 70 percent for category I vehicles (commercial vehicles of less than 2.5 tons), 60 percent for category II vehicles (commercial vehicles of 2.5 to 9 tons), and 50 percent for category III vehicles (commercial vehicles of 9 to 24 tons).

The ban on imports of fully assembled cars was lifted in June 1993, but a system was introduced at the same time reducing the import tariff on parts

progressively in accordance with the height of the local content of domestically made cars. This was implemented starting June 10. An applicant for import tariff reduction is obliged to undergo factory site inspection by a surveyor (Sucofindo) in addition to documentary examination.

2) Production

According to statistics on large and medium sized industries as of 1991, nine of the 78 auto part companies in Indonesia were foreign ventures. These employed 14,120 workers and recorded 236.4 billion rupiahs in added value production. Foreign ventures accounted for a 17.9 percent share of the number of companies in the transport machinery industry, 14.3 percent of the number of employees, and 12.3 percent of the added value production. Note that there were about 11 companies producing engines. These employed 2,632 workers and recorded added value production of 45 billion rupees (see Table 8.2-1).

Table 8.2-1 SUMMARY OF AUTO PART INDUSTRY

	No. of companies	Foreign investments	No. of employees.	Added value production (million rupees)
A Internal combustion engines (38212)	11	5	2,632	45,018
B-1 Auto parts (38433)	78	9	14,120	236,486
B-2 Auto body (38432)	111	1	16,486	167,964
B-3 Auto assembly(38431)	15	3	20,937	306,945
B Auto industry (B)	204	13	51,543	711,395
C Auto industry (A+B)	215	18	54,175	756,413
D Transportation machinery (384)	441	24	99,087	1,916,552
E Metal machinery (38)	1,658	136	305,179	4,205,935
B-1 / D (%)	17.9	14.3	12.3	
B / D (%)	46.8	52.0	37.1	
C / D (%)	48.8	54.8	39.5	
C / E (%)	12.9	17.8	17.9	

Source: Biro Pusat Statistik (1993), Industrial Statistics 1991, Survey of Manufacturing Industries Large and Medium

There were 215 companies in the automotive industry, including producers of engines, auto parts, and auto bodies and assemblers of automotives.

These employed 54,175 workers and produced 755.4 billion rupiahs in added value. This added value production accounted for 39.5 percent of production in the transport machinery industry and 17.9 percent in the metal and machinery industry (see Table 8.2–1).

In Indonesia, large industries are defined as ones employing at least 100 workers while medium sized industries are defined as ones employing 20 to 99 workers. The above statistics do not include small industries of from five to 19 workers or cottage sized companies of four persons or less. If data on small industries and cottage sized industries are included, then the number of companies in the auto part industry would be higher than 78. Through the sizes of the companies are not indicated, but according to the Ministry of Industry there are 43 parts made domestically and 141 companies making them (see Table 8.2–2).

Table 8.2–2 DOMESTIC AUTO PARTS AND NUMBER OF MANUFACTURERS

No.	Name of domestic part	No. of domestic part makers	No.	Name of domestic part	No. of domestic part makers
1	Engines	10	23	Gaskets	3
2	Rear bodies	5	24	Shock absorbers	3
3	Wheel rims	4	25	Spark plugs	3
4	Chassis frames	7	26	Oil/air/fuel filter	6
5	Cabins	7	27	Oil/air/fuel filters	4
6	Radiators	3	28	Brake drums	3
7	Mufflers	9	29	Rubber parts	1
8	Piston rings	1	30	V–belts	1
9	Fuel tanks	7	31	Cylinder liners	1
10	Car air–conditioners	3	32	Alternators	3
11	Leaf springs	7	33	Starters	3
12	Coil springs	1	34	Jacks	3
13	Axles/propeller shafts	3	35	Tools	2
14	Brake/fuel tubes	2	36	Horns	2
15	Brake systems	2	37	Windowshield washers	1
16	Wire harnesses	4	38	Reserve tanks	1
17	Pistons	4	39	Glass (reinforced, safety)	1
18	Steering systems	8	40	Cushion foam	1
19	Transmissions	3	41	Seat reclining systems	1
20	Crutch systems	2	42	Sheet sliding systems	1
21	Brake linings	3	43	Window regulators	1
22	Seats and seat frames	1		Total	141

Source: Departmen Perindustrian, Republic of Indonesia

Table 8.2-3 shows the volume of production of auto parts during the fifth five-year plan. There was a surge in gasoline engines and steady gains in shock absorbers, piston rings, etc. as well.

Table 8.2-3 TRENDS IN PRODUCTION OF AUTO PARTS IN INDONESIA

Unit: 1000

	1988/89	1989/90	1990/91	1991/92	1992/93	1993/94
Shock absorbers	756.6	1,202.3	1,491.2	1,550.9	1,163.1	1,221.1
Radiators	143.8	170.6	244.0	256.2	211.6	222.1
Exhaust systems	233.6	311.5	225.7	239.3	253.0	265.6
Filter elements	3.0	3.6	4.2	4.6	4.9	4.9
Pistons	718.1	570.0	627.8	609.5	429.0	871.7
Piston rings	2,725.5	3,010.3	3,664.3	3,957.5	2,968.0	3,116.5
Spark plugs	23.0	27.2	30.8	33.9	28.3	29.7
Diesel engines	47.8	35.9	45.9	50.0	54.6	72.7
Gasoline engines	19.6	156.6	136.7	160.0	187.2	196.6
Cabins	115.0	128.2	138.7	136.0	139.0	107.0
Chassis	122.6	183.0	235.6	231.0	235.0	181.9
Axles	120.3	138.2	196.0	192.2	195.0	164.4
Propeller shafts	120.3	138.2	196.0	192.2	195.0	164.4
Rear bodies	48.2	53.0	66.9	65.6	66.7	64.3
Brake systems	291.9	273.2	319.6	313.4	320.0	246.7
Wheel rims	695.7	759.8	995.6	4,015.5	1,038.4	872.2
Fuel tanks	135.3	143.7	157.2	161.9	165.1	176.9
Leaf springs	19.0	22.2	25.3	25.5	26.0	22.2
Seats and seat frames	380.5	244.4	199.7	207.6	216.0	207.0
Clutch systems	119.6	129.5	144.8	141.9	160.1	168.1
Transmissions	126.4	146.8	209.4	205.3	209.0	176.9
Steering systems	158.0	133.8	153.6	150.6	152.7	164.8

Source: Lampiran Pidato Kenegaraan Presiden Republik Indonesia

3) Trade

In this way, progress has been made in converting to domestic production of parts, but, as shown in Table 8.2-4, imports are still relied on for engines, steering, etc.

Table 8.2-4 DOMESTIC PRODUCTION AND IMPORTS OF AUTO PARTS

Unit: units

	Imports	Imports + domestic production	(1) ÷ (2)
CKD diesel engines	67,330	90,856	0.74
CKD steering	27,588	57,588	0.48
Steering systems	3,620	3,620	1.00
CKD alternators	1,664	1,664	1.00

Source: Biro Pusat Statistik (1993), Industrial Statistics 1991 Survey of Manufacturing Industries Large and Medium

In the trade of auto parts, Indonesia exported US$22.4 million worth of parts and imported US$479.8 million dollars worth in 1992 for an overwhelmingly surplus of imports.

Table 8.2-5 TRADE IN AUTOMOTIVES AND PARTS IN INDONESIA

Unit: US$ million

	1989	1990	1991	1992
Exports				
Road vehicles (78)	25.1	38.7	61.2	181.5
Parts and accessories (784)	5.6	6.4	13.2	22.4
Imports				
Road vehicle (78)	849.4	1,403.2	1,306.8	1,040.0
Parts and accessories (784)	467.9	660.7	695.7	479.8

Source: Biro Pusat Statististik, Export and Import Statistics

(2) Autoparts industries in Malaysia

1) Policy

In Malaysia, the Proton Co., which holds an approximately 70 percent share of passenger car production, is proceeding with the promotion of the auto part industry through primarily bumiputra companies. Plans for domestic production were announced in 1969 and were reevaluated in 1972 and 1976. A Local Material Content Policy (LMCP) was launched in 1992.

The LMCP which started in February 1992 is being implemented in parallel with the Mandatory Deleted Item Policy. Vehicles are divided in a category I (passenger cars of less than 1,850 cc), category II (passenger cars of 1,851

cc to 2,850 cc and commercial vehicles of less than 2.5 tons) and category III (more than 2,850 cc passenger vehicles and more than 2.5 tons commercial vehicles) and improvement of the local content rates by the end of 1996 was made obligatory.

Target Year	Rate of domestic production		Target Year	Rate of domestic production	
Category I	Dec. 31, 1992	30%	Category II	Dec. 31, 1992	20%
	Dec. 31, 1993	40%		Dec. 31, 1993	30%
	Dec. 31, 1994	50%		Dec. 31, 1994	35%
	Dec. 31, 1995	55%		Dec. 31, 1995	40%
	Dec. 31, 1996	60%		Dec. 31, 1996	45%

Use of mandatory deleted items is obligatory for the category III of passenger cars of over 2,850 cc and commercial vehicles of over 2.5 tons. Local content is divided into 9 large classifications, i.e. engines, power transmissions, electrical systems, brakes, suspensions and steering, wheels, body parts, direct consumables and materials, accessories, and exhaust systems and further subdivided into smaller classes. Local content points are determined based on these and the total is used to calculate the local content rate.

2) Production

The Malaysian auto part industry, according to industrial statistics, included 45 companies in 1993. These employed 9202 workers and had factory shipments of 830.6 million ringgits (see Table 8.2-6). There has been rapid growth since 1989, with the number of companies increasing 1.6-fold, the number of employees 2.7-fold, and the factory shipments 3.3-fold.

Table 8.2-6 SUMMARY OF MALAYSIAN AUTO PART INDUSTRY (1993)

	No. of companies	No. of employees	Factory shipments (1000 MR)
Motor vehicles Parts and accessories (38439)	45	9,202	830,649
Motor vehicles Motor vehicle assembly (38432)	12	7,594	3,030,135

Source: Department of Statistics, Monthly Manufacturing Statistics

Table 8.2-7 TRENDS IN AUTO PART INDUSTRY

	1989	1990	1991	1992	1993
No. of companies	28	28	29	36	45
No. of employees	3,465	4,323	4,940	5,191	9,202
Factory shipments (Millon MR)	233	324	451	476	831

Source: Department of Statistics, Monthly Manufacturing Statistics

The Malaysian parts industry started as producers of replacement equipment manufacturing parts (REM). Along with the plans for domestic production, OEM production increased. According to MIDA, there are approximately 200 companies in the auto parts industry of which 70 percent are engaged in OEM production. Table 8.2-8 shows the main auto parts and numbers of companies making them based on MIDA materials.

Table 8.2-8 MAIN DOMESTICALLY PRODUCED PARTS

	No. of companies		No. of companies
Engines	2	Rubber parts	3
Transmissions	1	Injection molded parts	6
Steering systems	1	Bumpers	1
Gaskets	3	Oil filters	9
Alternators and starters	2	Batteries	7
Cylinder liners	3	Fuel tanks	1
Pistons	2	Safety glass	1
Suspension systems, brake-related	11	Tires	7
Clutch disks, cover, etc.	4	Sheets	4
Wire harnesses	2	Safety belts	5
Shock absorbers	2	Mirrors	2
Radiators	2	Horns	1
Spark plugs	4	Doors (knobs, handles, etc.)	2
Exhaust pipes	5	Air-conditioners	7
Fuel tanks	1	Total	101

Source: MIDA (1994), Industry Brief.

Proton Co. made 269 of autoparts in-house and subcontracted out 1047 parts as of December 1992. There were about 100 vender companies (of which about 40 were Japanese ventures). In July 1992, a parts supplier's

cooperative group was organized and received technical assistance from Mitsubishi Motor Corporation in improvement of quality, productivity, delivery, and cost. The main parts procured domestically by Proton are as follows. Proton is starting foundry and machinery projects with the aim of domestic production of engines and transmissions.

Table 8.2-9 PARTS LOCALLY PROCURED BY PROTON CO.

Fuel tanks, exhaust systems, safety glass, weather side strips and moldings, engine parts such as filters, radiators, radiator hoses, air filter housing, spark plugs, pistons and piston liners; drive, transmission, and steering parts such as wheel rims, wheel nuts and studs, control cables, rack and pinion steering assemblies; suspension parts such as coils and leaf springs, U-bolt and shackle assemblies, shock absorbers and disc pads; electrical parts such as batteries, horns, wiring harnesses, alternators, starter motors, voltage regulators, wiper and washer assemblies, instrument clusters, relays and fuse boxes; trim and upholstery such as carpets, floor mats, rear parcel shelves, seat assemblies, safety belts and melt damping sheets; general parts such as paint and thinners, underseals, tires and tubes, air-conditioners, radios, and screw jacks.

3) Trade

There are import surplus in the trades of automotives and auto parts. Exports of automotives have however steadily increased and in 1992 reached 680 million ringgits. This was due to the start of exports by Proton to the U.K. in 1989. In 1992, Proton exported 18,790 cars - 16,423 to the U.K. and 1,824 to Singapore. (See Table 8.2-10) Import tariff for auto parts are 30 percent.

Table 8.2-10 TRADE IN AUTOMOTIVES AND PARTS IN MALAYSIA

Unit: million MR

(SITC No.)	1989	1990	1991	1992
Exports				
Road vehicles (78)	266	324	420	684
Parts & accessories (784)	31	50	49	65
Export Total	297	374	469	749
Imports				
Road vehicles (78)	2,524	3,455	4,139	2,986
Parts and accessories (784)	279	339	385	352
Import Total	2,803	3,794	4,524	3,338
Export-Import	-2,506	-3,420	-4,055	-2,589

Source: Department of Statistics, External Trade Statistics

(3) Autoparts industries in Philippines

1) Policy

The Philippine autoparts industry is being promoted by regulations requiring domestic production and regulations requiring acquisition of foreign currency. The automotive market is smaller than the rest of ASEAN and has been in a slump since the late 1980s due to the economic set back there, so there are fewer Japanese ventures there than in the rest of ASEAN.

The new automotive policy begun in 1987 sets a Car Developing Program (CDP) covering passenger cars and a Commercial Vehicle Developing Program (CVDP) covering commercial vehicles. The local content requirement was 40 percent in the CDP for 1990. The requirement for the CVDP was divided into seven categories according to weight. In 1990, the highest requirement was 54.86 percent for category I and lowest requirement was 13.53 percent for category IV.

On the other hand, seven companies are registered with the BOI for the People's Car Program (PCP) announced in March 1990. The local content requirement of the PCP was set to a target of 50 percent for 1993.

2) Production

Industrial statistics were not available, so the statistical state of the autopart industry is not known. According to materials of the Japanese Chamber of Commerce and Industry in the Philippines, there are 40 manufacturers members of the Association of Consolidated Automotive Parts Producers Inc. (ACAPP) which employ some 40,000 workers. The members include eight Japanese ventures as well. The main products made by these 40 companies are as follows (see Table 8.2–11).

Table 8.2-11 PARTS PRODUCED BY ACAPP MEMBER

Air-conditioners, shock absorbers, brake parts, transmissions, axles, gears, and other castings, dies, heat treatment, jeep chassis, minibus parts, aluminum alloy wheels, plastic parts, under body chassis, seats, doors, lamps, horns, oil filters, oil seals, seat springs, radiators, brake disks, brake drums, exhaust manifolds, glass, seat covers, rubber belts, stampings, etc.

Source: Philippine Japanese Chamber of Commerce and Industry, Guidebook to the Philippine Economy.

3) Trade

Trade statistics show that imports pf autoparts are declining, but that exports are increasing, though fluctuating (see Table 8.2-12).

Most of import tariff for autoparts are 10 percent, and partly 20, 30 and 45 percent.

Table 8.2-12 TRADE IN AUTOMOTIVES AND PARTS IN THE PHILIPPINES

Unit: US$1000

	1989	1990	1991	1992
Exports				
Road vehicles (78)	46,986	21,396	46,344	64,494
Parts & accessories (784)	19,519	60,116	23,459	55,482
Export Total	66,505	81,512	69,803	119,176
Imports				
Road vehicles (78)	509,802	551,170	478,781	632,463
Parts and accessories (784)	205,550	192,091	71,223	91,535
Import Total	715,352	743,261	550,004	723,998
Export-Import	-648,847	-661,749	-480,210	-604,022

Source: National Statistics Office, Foreign Trade Statistics

(4) Autoparts industries in Singapore

1) Production

Singapore does not assemble finished cars. However, there are making small number of autoparts makers by using its location as a center of shipping and communications and its superior infrastructure.

Industrial statistics show that there are 14 companies in the autoparts industry which employ 652 workers and have an added value production of US$18.99 million. Even with adding in auto bodies, the sector accounts for only 7.9 percent of the number of companies in the transport machinery field (385), 5.3 percent of the employees, and 2.6 percent of the added value production (see Table 8.2–13).

Table 8.2–13 AUTOPARTS INDUSTRY OF SINGAPORE

	No. of companies	No. of employees	Added value production (S$1000)
AAuto parts (38533)	14	652	18,993
BAuto bodies (138531, 38532)	5	932	15,843
A + B	19	1,584	34,836
CTransportation machinery (385)	238	29,737	1,307,702
A / C	5.9	2.2	1.5
(A + B) / C	7.9	5.3	2.6

Source: Economic Development Board, Report on the Census of Industrial Production

However, these figures only cover "autoparts" as defined by the system of classification of industrial statistics. There are more industries engaged in production of autoparts than the data shows. For example, there are 102 companies and 7,630 workers engaged in precision plastic parts (35716), 15 companies and 1,649 workers in die casting, 19 companies and 4,575 workers in forging (138179), and 113 companies and 3,612 workers in dies (38243).

2) Trade

Exports and imports of auto parts are shown in Table 8.2-14.
Import tariff for autoparts is nil.

Table 8.2-14 TRADE IN AUTOMOTIVES AND PARTS IN SINGAPORE

Unit: S$1000

	1989	1990	1991	1992
Export				
Road vehicles (78)	817,287	983,814	1,016,885	1,198,133
Parts and accessories (784)	358,589	369,182	369,414	318,498
Import				
Road vehicles (78)	2,254,835	2,734,059	2,341,855	2,472,933
Parts and accessories (784)	842,706	1,070,135	844,298	891,641

Source: Singapore Trade Development Board, Singapore Trade Statistics

8.2.2 Electrical/electronic parts industries in ASEAN countries

(1) Indonesia

1) General outlook

Indonesia fell behind Singapore, Malaysia, and Thailand as a base for production and supply of electrical and electronic components, but as labor costs were kept lower than the above three countries, so in the 1990s there was an increase in foreign investments such as Matsushita Kotobuki Electronics Industries and other Japanese firms and Samsung Electronics and other Korean companies.

2) Production

Industrial statistics show that there are 111 companies in the electrical and electronic component industry, of which 19 are foreign ventures employing 19,377 workers and producing an added value of 183 billion rupees. The electrical and electronic component industry accounts for 37.8 percent of the companies, 26.4 percent of the number of workers, and 21.1 percent of the added value production in the electrical machinery and electronic

industry. The electrical machinery and electronic industry accounts for a 20.6 percent share of the added value production in the metal product and machinery industries (see Table 8.2–15).

Table 8.2–15 SUMMARY OF ELECTRICAL AND ELECTRONIC COMPONENT INDUSTRY IN INDONESIA

	No. of companies	Foreign investments	No. of employees	Added value production (million rupiahs)
A Electric motors (38312)	5	3	815	1,810
B Transformers, rectifiers, voltage stabilizers (38313)	20	2	2,164	22,691
C Electric panels and switch gear (38314)	16		1,306	10,828
D Electric components (38324)	36	9	9,214	90,801
E Other electrical apparatus and components (38399)	34	5	5,878	56,921
F Electrical parts (A + B + C + D + E)	111	19	19,377	183,051
G Electrical machineries (383)	293	53	73,455	866,402
H Metal Products and Machineries (38)	1,658	136	305,179	4,205,935
F / G (%)	37.8	26.4	21.1	
G / H (%)	17.6	24.1	20.6	

Source: Biro Pusat Statistik (1993), Industrial Statistics Survey of Manufacturing Industries Large and Medium

The amount of production of electrical and electronic components rapidly increased during the period of the fifth plan (1989 to 1993). For example, IC production rose 3.8–fold compared with the last year of the fourth plan, and resistor production rose 5.1–fold. The production of semiconductors during the period from 1990 to 1993 was doubled (see Table 8.2–16).

Table 8.2-16 TRENDS IN PRODUCTION OF ELECTRICAL AND ELECTRONIC COMPONENTS IN INDONESIA

Unit: US$ million

	1990	1991	1992	1993
Tubes and valves	5	5	6	6
Semiconductors	80	122	140	160
Capacitors	11	12	12	13
Resistors	3	4	4	4
Connectors	5	5	5	6
Transformers and inductors	1	2	2	2
Switches and relays	5	5	5	6
Printed circuit boards	17	21	23	26

Source: Elsevier Advanced Technology (1993), Yearbook of World Electronics Data 1993

3) Trade

In trade, exports of electrical and electronic products reached US$930 million in 1992 and imports reached US$2.38 billion. Exports of electrical and electronic components reached US$370 million and imports US$1,760 million, for an overwhelming surplus in imports. Exports of both products and parts have grown rapidly however (see Table 8.2-17, 8-2-18). Import tariff for electrical and electronic parts are mostly 0 percent, but some are 10 percent, 20 percent, 40 percent.

Table 8.2-17 TRADE IN ELECTRICAL AND ELECTRONIC COMPONENTS IN INDONESIA

Unit: US$1000

Exports (SITC No.)	1989	1990	1991	1992
Telecommunication equipment (76)	49,912	105,170	205,682	598,656
Electrical machinery (77)	72,756	98,557	197,653	335,850
Total	122,668	203,727	403,335	934,506
Imports (SITC No.)	**1989**	**1990**	**1991**	**1992**
Telecommunication equipment (76)	316,967	490,350	634,422	874,448
Electrical machinery (77)	601,082	835,558	1,049,556	1,514,128
Total	918,049	1,325,908	1,683,978	2,388,576

Source: Biro Pusat Statistiks, Export and Import Statistics

Table 8.2-18 TRADE IN ELECTRICAL AND ELECTRONIC COMPONENTS IN INDONESIA

Unit: US$1000

Exports (SITC No.)	1989	1990	1991	1992
Telecommunication equipment parts (764)	28,879	59,511	111,811	249,282
Electrical power machinery and parts (771)	3,514	7,738	12,001	21,389
Electrical apparatus for making and breaking Electrical Units (772)	311	402	1,789	44,754
Thermoionic cold cathode and photo cathode valves and tubes (776)	13,402	18,314	40,592	60,935
Total	46,106	85,965	166,193	376,360
Imports	1989	1990	1991	1992
Telecommunication equipment parts (764)	298,419	463,157	605,447	841,863
Electrical power machinery and parts (771)	56,738	76,653	128,880	175,685
Electrical apparatus for making and breaking electrical units (772)	135,754	229,230	283,201	550,634
Thermoionic cold cathode and photo cathode valves and tubes (776)	77,487	155,559	173,698	189,912
Total	568,398	924,599	1,191,226	1,758,094

Source: Biro Pusat Statistiks, Export and Import Statistics

(2) Malaysia

1) General outlook

Malaysia is a base of production for set manufacturers in Asia. Along with the surge in production, production of parts has risen as well. In particular, there are over 25 Japanese, American, and European companies in semiconductors there, making Malaysia the biggest producer in ASEAN. The electronic industry is the biggest export producer in Malaysia and provides 12 percent of the employment in the manufacturing sector.

2) Production

Industrial statistics show that there were 146 companies in the electrical and electronic component industry in Malaysia as of 1993 and that they employed 165,892 workers and had factory shipments of 27.465 billion ringgits. In the period from 1989 to 1993, the number of companies, the employment, and the added value production all substantially doubled (see Table 8.2–19).

Table 8.2–19 SUMMARY OF ELECTRICAL AND ELECTRONIC COMPONENT INDUSTRY OF MALAYSIA

	1988	1989	1990	1991	1992
No. of companies	78	98	120	129	146
No. of employees	93,615	110,375	129,636	143,353	165,892
Factory shipments (million MR)	12,382	15,626	18,560	21,335	27,465

Source: Department of Statistics, Monthly Manufacturing Statistics

According to the Yearbook of World Electronics Data 1993, production of electrical and electronic components in Malaysia in 1993 reached US$4.87 billion. While this was not as high as in Singapore, it was over double that of the US$2.01 billion of Thailand (see Table 8.2–20). By component, IC production ranked largest. Production of all components grew steadily in the 1990s.

Table 8.2–20 TRENDS IN PRODUCTION OF ELECTRICAL AND ELECTRONIC COMPONENTS IN MALAYSIA

Unit: US$ million

	1990	1991	1992	1993
Color television tubes	0	0	36	73
Other valves & tubes including parts	60	71	76	84
ICs & other microunits	527	575	589	607
Capacitors	2,527	2,622	2,727	2,945
Resistors	56	69	80	91
Connectors	47	58	69	80
Small transformer chokes coils & other inductors	100	109	120	131
Relay	13	15	16	18
Switches	25	31	35	40
Printed circuit boards	106	149	178	211

Source: Elsevier Advanced Technology (1993), Yearbook of World Electronics Data 1993

3) Trade

In trade, there is a surplus of exports of electrical and electronic products. The trade in electrical and electronic components turned to a surplus of exports in 1991 (see Tables 8.2–21). Most of the items are imposed with import tariffs of 0 percent and 5 percent, but some items have tariffs of 20 percent, 25 percent, 30 percent, 45 percent, 50 percent.

Table 8.2–21 TRADE IN ELECTRICAL AND ELECTRONIC COMPONENTS IN MALAYSIA

Unit: million MR

Exports (SITC No.)	1989	1990	1991	1992
Telecommunication equipment parts (764)	2,105	3,148	4,111	4,410
Electrical power machinery and parts (771)	620	675	913	933
Electrical apparatus for making and breaking electrical units(772)	660	869	1,342	1,463
Thermoionic cold cathode and photo cathode valves and tubes (776)	10,176	11,685	13,051	14,357
Total	13,561	16,377	19,417	21,163
Imports (SITC No.)				
Telecommunication equipment parts (764)	2,166	2,944	5,188	4,483
Electrical power machinery and parts (771)	388	496	828	878
Electrical apparatus for making and breaking electrical units (772)	1,427	2,485	3,420	3,817
Thermoionic cold cathode and photo cathode valves and tubes (776)	8,663	10,308	12,493	13,681
Total	12,644	16,233	21,929	22,859

Source: Department of Statistics, External Trade Statistics

(3) Singapore

1) General outlook

The Singaporean electrical machinery and electronic industry started in 1960 and grew steadily due to an influx of foreign investment. Almost all major manufacturers in the world set up factories in Singapore. Singapore is currently the world's biggest producer of disk drives in the world. In technology as well, it is advancing from the assembly to the design and R&D level. There has been an increase in companies with R&D centers as well.

2) Production

Industrial statistics for 1991 show that the electronic industry (384) of Singapore accounts for 6.4 percent of the companies in the manufacturing sector, seventh place, but 34.1 percent of the employees and 35.0 percent of the added value production, so is the biggest industry in that country. Of these, the electronic components field accounted for 172 of the companies, 77,544 of the workers, and US$3.42 billion of the added value production. In terms of added value production, components accounted for 55.1 percent of the production of the electronic industry. The greatest number of companies, 66, were producing printed circuit boards. If electrical components are added, then there were 214 companies employing 86,832 workers and producing US$3.8 billion in added value (see Table 8.2-22).

Table 8.2-22 SUMMARY OF ELECTRICAL AND ELECTRONIC COMPONENT INDUSTRY OF SINGAPORE

	No. of companies	No. of employees	Added value production (S$1000)
Disk drives (38412)	12	122,418	1,224,181
Semiconductor devices (38441, 38443, 38449)	22	15,096	626,555
Capacitors (38461)	8	3,804	165,704
Resistors (38462)	7	1,029	22,611
Printed circuit boards without electronic parts (38463)	21	5,552	249,980
Printed circuit boards without electronic parts (38464)	66	14,064	734,032
Other electronic products & components (NEC)	36	10,308	401,903
A Total	172	77,544	3,424,966
B Electronic products & components (384)	243	123,358	6,216,604
A / B (%)	70.18	62.8	55.1
Electrical motor & generators (38311, 38312)	15	3,525	128,669
Transformers (38321)	12	742	26,009
Switches (38322)	7	3,212	93,002
Connectors (38355)	8	1,809	128,668
C Total	42	9,288	376,348
A + C	214	86,832	3,801,314

Source: Economic Development Board. Report on the Census of Industrial Production

According to the Yearbook of World Electronics Data 1993, Singapore produced US$5.71 billion in electronic components in 1993 – substantially the same as Taiwan and the biggest amount in ASEAN. By component, ICs are the biggest item followed by printed circuit boards (see Table 8.2–23).

Table 8.2–23 TRENDS IN PRODUCTION OF ELECTRICAL AND ELECTRONIC COMPONENTS IN SINGAPORE

Unit: S$ million

	1990	1991	1992	1993
Color television tubes	204	213	231	243
Other valves & tubes	8	12	12	13
Discrete semiconductor	213	223	225	231
ICs & other micro units	2,674	3,354	3,410	3,584
Capacitors	158	197	208	220
Resistors	27	41	43	45
Transformer & inductors	14	25	26	27
Relays	43	41	39	38
Switches	50	49	46	43
Printed circuit boards	170	209	229	249

Source: Elsevier Advanced Technology (1993), Yearbook of World Electronics Data 1993

3) Trade

The trade in electrical and electronic products changed to an import surplus in 1990 and Singapore has suffered a deficit ever since then. Exports of electrical and electronic components have been increasing, but Singapore continues to import greater amounts (see Table 8.2–24). Customs tariff for electrical and electronic parts is 0 percent.

Table 8.2-24 TRADE IN ELECTRICAL AND ELECTRONIC COMPONENTS IN SINGAPORE

Unit: S$ million

Exports (SITC No.)	1989	1990	1991	1992
Telecommunication equipment parts (764)	3,701	4,220	4,481	4,699
Electrical power machinery and parts (771)	506	601	845	673
Electrical apparatus for making and breaking electrical units (772)	1,399	1,386	1,547	1,611
Thermoionic cold cathode and photo cathode valves and tubes (776)	6,456	6,634	7,924	10,131
Total	12,062	12,851	14,797	17,114
Imports (SITC No.)				
Telecommunication equipment parts (764)	3,469	4,234	4,619	4,892
Electrical power machinery and parts (771)	870	967	1,164	1,055
Electrical apparatus for making and breaking electrical units (772)	2,168	2,384	2,640	2,763
Thermoionic cold cathode and photo cathode valves and tubes (776)	7,593	8,108	9,031	8,870
Total	14,100	15,963	17,654	17,580

Source: National Statistics Office, Foreign Trade Statistics

(4) Philippines

1) General outlook

The Philippine electronic component industry started with the establishment of two firms in 1969. Later, there were investments from Motorolla, Intel, Texas Instruments, and other American companies, making this sector a leading industry in terms of both employment and exports. The Philippine electronic industry exports products made by labor-intensive processes using imported parts and the country's low wages. The main product is semiconductors, with 56 companies registered with the BOI for the same. There are local firms as well, but about 70 percent of the semiconductor exports are from multinationals. Electronic components constitute the biggest export industry - accounting for 16 to 17 percent of the export value.

2) Production

According to publication of the Japanese Chamber of Commerce and Industry in the Philippines, there were 61,607 workers in the electronic component industry in 1991. Exports totaled US$1.55 billion. According to the Yearbook of World Economic Data 1993, production of electronic components in the Philippines reached US$1.84 billion in 1993, somewhat less than Thailand (see Table 8.2-25). By product, semiconductors accounted for an overwhelmingly large share.

Table 8.2-25 TRENDS IN PRODUCTION OF ELECTRONIC COMPONENT INDUSTRY OF THE PHILIPPINES

Unit: S$ million

	1990	1991	1992	1993
Monochrome television tubes	2	2	2	2
Semiconductors	1,300	1,410	1,510	1,660
Capacitors	13	15	17	19
Resistors	6	7	8	8
Transformers & inductors	17	22	24	26
Relay	2	3	3	3
Switches	4	4	4	5
Printed circuit boards	37	41	45	50

Sources: Elsevier Advanced Technology (1993)
Yearbook of World Electronics Data 1993

3) Trade

Trade statistics show that trade turned to an import surplus in 1990. Trade in electrical and electronic components changed from a deficit to a surplus in 1992 (see Table 8.2-26). Customs tariff for electric and electronic part is mostly 10 percent, some are 20 percent, 30 percent, 35 percent.

Table 8.2-26 TRADE IN ELECTRICAL AND ELECTRONIC COMPONENTS IN THE PHILIPPINES

Unit: US$ million

Exports (SITC No.)	1989	1990	1991	1992
Telecommunication equipment parts (764)	117	207	247	324
Electrical power machinery and parts (771)	11	24	23	43
Electrical apparatus for making and breaking electrical units (772)	17	16	23	43
Thermoionic cold cathode and photo cathode valve and tube (776)	465	385	485	887
Total	670	632	778	1,297
Imports (SITC No.)				
Telecommunication equipment parts (764)	206	258	322	410
Electrical power machinery and parts (771)	23	47	56	94
Electrical apparatus for making and breaking electrical units (772)	87	119	145	190
Thermoionic cold cathode and photo cathode valves and tubes (776)	341	399	474	548
Total	657	823	997	1,242

Source: National Statistics Office, Foreign Trade Statistics

8.2.3 Material processing industries

Here parts industry is analyzed in terms of material processing, material processing encompasses casting, forging, press, plastic injection and foaming, rubber processing etc. According to a survey report by the Material Process Technology Center of Japan: (Handbook of Overseas Development of Casting Industry, March 1994), the situation is as follows:

(1) Indonesia

The casting industry, excluding the in-house operations of a few large government corporations and foreign ventures, is mostly comprised of cottage sized local enterprises. These enterprises concentrate in the Sukabumi, Ceper, and Tegal regions. Their products are mainly supplied to general machinery, pumps, automotives, auto parts, sugar making machinery industries. The only forging factories are owned by a few assembly manufacturers and four specialized manufacturers in Jakarta. The number of manufacturers in the die and mold industry is not known, but it is said that

there are just a few specialized manufacturers. There is a slight shortage in supply of molds and dies in the country. Molds and dies of a certain degree of sophistication are ordered to and imported from Hong Kong, Taiwan, Thailand, Malaysia, and India.

(2) Malaysia

The casting industry finds its main demand from the rubber, palm, and lumber related sectors, so has been stagnant in recent years. Recently, however, demand has begun to appear from the automotive industry. Foreign machinery assembly ventures mostly have their own in-house operations. The local businesses are run by local ethnic Chinese. There are a few forging factories working with nonferrous metals in the forging industry. There are an estimated 400 or more manufacturers in the mold and die industry. Sixty of these are specialized manufacturers, most of which are small or medium scale enterprises. The industries using these molds and dies are the electrical machinery and electronic industries and the plastic forming industry. Some demand also comes from the metal working and rubber working industries. About 70 percent of the demand for molds and dies is met by imports. Simple molds and dies are exported to Singapore and Thailand.

(3) Philippines

The casting industry of the Philippines has a long history. The OEM market, however, has never developed and in recent years the industry has stagnated. The main demand was from the mining and cement machinery sectors, but in recent years demand has arisen from the automotive and general machinery industries as well. Most local enterprises are run by local ethnic Chinese. The majority of the foundries are concentrated in the metropolitan Manila area. While there are a large number of cottage sized forging operations in the forging industry, there are only three companies equipped with press machinery and able to produce die-forged parts. These have die making and heat treatment equipment and produce products of a somewhat satisfactory level of quality. There are about 100 companies in the mold and die industry, including both in-house and specialized operations. Of these, just a small 10 are specialized in mould- and die-making. Most material processing companies have in-house operations. The handful of local companies and

foreign ventures at the top of the industry have reached the level of the advanced countries in terms of both facilities and technology, but the majority of the companies rely on general use machine tools and hand finishing.

(4) Singapore

There are about 30 companies in the casting industry. The four majors account for over half of the production. Factories are being shifted to Malaysia, however, due to high wages and labor shortages. Cast steel factories producing repair parts for ships, once a booming business, have been closed one after the other. The main applications now are for cast iron pipes, cast iron joints, ship parts, and machine tools. There is not even a single forging factory. There are 460 manufacturers in the mold and die industry, almost all of which are small and medium sized enterprises. There are no companies producing for the automotive industry. Most companies work for the electrical machinery and electronic industries. In particular, they focus on precision molds and dies for electronic components (for Malaysian electronic industry). Due to the short history of the industry, manufacturing technology is still not up to par, but some local companies are working to switch to numerical control, electro discharge machining, machining centers, and other modernized facilities.

8.3 Evaluation of Competitiveness of Thai Parts Industry

8.3.1 Methods of evaluation of competitiveness

The methods of evaluation of the international competitiveness of an industry include (1) analysis of the trade specification index, RCA analysis, and other analyses of exports and imports, (2) comparison of prices, (3) comparison of costs, (4) comparison of level of technology, (5) analysis by product cycle theory, (6) evaluation by competitive advantage of country.

(1) Trade specification index analysis and Revealed Comparative Advantage (RCA)

The fact that a product is being exported means that the product of the country has a comparative advantage. The fact that it is being imported means that the product of that country is comparatively disadvantageous. Based on this thinking, the trade specification index is calculated from the ratio of the net value of exports to the total value of exports and imports of the product in question. When a plus figure, it indicates an export surplus, and when a minus figure, it indicates an import surplus. The RCA is the ratio of the export ratio of industrial products of a country with respect to the export ratio of industrial products of the world. When over 1, it indicates a competitiveness more than the world average.

(Note) Analysis by the trade specification index and analysis by the RCA have a certain limitation as its nature: The analyses are limited to after-the-fact analysis using trade statistics: The goods which are not traded are automatically excluded from analyses even it those have domestic production.

(2) Comparison of prices

This method compares the prices of the products concerned. In evaluating the international competitiveness of the autoparts of Taiwan, a comparison is made of the factory shipment price (ex-factory) of autoparts and the import price (CIF) of invoices. In the survey of the electronics industry of Indonesia, a comparison was made of the retail prices of color television sets of three countries. The problems in a price comparison are whether the price data can be obtained and if it is suitable as an indicator of international

competitiveness. Retail prices, which are easy to obtain, include distribution costs and margins of retail outlets which differ with each country, so are not suitable as an indicator of international competitiveness. On the other hand, it is difficult to obtain precise factory shipment prices and invoice prices.

(3) Comparison of costs

There are two methods: a comparison of the manufacturing costs of specific products and a comparison of the wages and other production elements and utilities. The specific manufacturing costs of products are company secrets and companies refuse to divulge them. Prices of production elements and utilities differ even in the same country depending on the location, industry, size of the company, etc. An accurate international comparison therefore becomes further difficult. Several comparative studies of costs have been reported, but these are fairly rough.

(4) Comparison of level of technology

In the survey of the electronics industry of Indonesia, the survey team diagnosed five points of production technology and product technology. To eliminate any skew in the evaluation of the level of technology, it is necessary to select a large number of factories and have the same experts diagnose the situation at the actual factories. Accordingly, a highly reliable international comparison of the level of technology requires diagnosis of a large number of factories by the same technical experts at a number of countries at substantially the same time.

(5) Evaluation by product cycle theory

In the survey of the competitiveness of the export industries of Israel, industries are classified into three stages of "new", "growth", and "mature" and countries into "less developed", "developed", and "advanced". An evaluation is made of capital, unskilled labor, and other production elements, five in all. An evaluation by the product cycle theory means to divide industries into growth industries and sunset industries and analyze the industries of the developing country which might have competitiveness. It is easy to pinpoint industries which might have competitiveness in a developing

country when comparing an advanced country against that developing country, but it is hard when comparing developing countries at the same level of development.

(6) Evaluation of competitive advantage of country

This evaluation is based not on "comparative advantage", but on "competitive advantage". The idea is that the comparative advantage of resources and labor is complemented by such "artificial resources" as capital, technology, domestic markets, information, infrastructure, and corporate strategy. Individual companies may make efficient use of elements of artificial resources to try to cut costs, improve quality, and boost efficiency and thereby secure a competitive advantage for the country.

The method used in this survey, in consideration of the facts that it is a survey of documents and field surveys of other countries are not possible and in consideration of the above points, was to evaluate the export competitiveness of the automotive and electrical and electronic component industries of Thailand by the following methods:

(a) The trade specification indexes of Thailand and surrounding countries
(b) Cost comparison simulation for Thailand and surrounding countries
(c) Introduction of the cost comparison data recently reported

In this way, by using a number of techniques and by considering the results all together, an attempt was made to minimize the problems and restrictions in the individual techniques.

8.3.2 Competitiveness analysis of parts industries of Thailand

(1) Analysis of trade specification index

To evaluate the competitiveness of the autoparts and electrical and electronic components of Thailand, the trade specification index (T.S.I.) was calculated and analysis performed using the figures for exports and imports in customs clearance statistics for the years 1989 to 1992. Trade specification is calculated by the following equation.

$$\text{T.S.I.} = \frac{(\text{Export} - \text{Import})}{(\text{Export} + \text{Import})}$$

The trade specification index is 1 when a country is exporting but not importing and is minus 1 when it is not exporting, but only importing. Accordingly, the larger the comparative advantage of a certain commodity, the closer the index is to 1, while the larger the comparative disadvantage, the closer it is to −1 (minus one). Further, changes of the trade specification index along with time show changes in comparative advantage (comparative disadvantage) of parts. In selecting parts for T.S.I. anaysis (1) a priority was given to tradable goods and (2) strategic goods like glass manufacturing and basic materials were excluded from the analysis.

As revealed by Table 8.3-1 automotive industry highly depends on import with T.S.I. of −0.9 to −0.95. One reason for this is lift of ban for CBU import. Statistics on auto part is not fully available, but dependency on import is judged to be same as high as automotive industry. This analysis tells that automotive industry lacks international competitiveness at the present time.

Table 8.3-1 TRADE SPECIFICATION INDEX OF AUTOMOTIVE INDUSTRY

UNIT: million Bahts

	1989	1990	1991	1992	1993
Export					
Passenger car and parts	2,094	1,506	1,966	1,653	5,335
Import	40,031	55,722	47,288	58,363	82,658
– Cars, Buses & Trucks	9,079	13,445	16,541	30,429	41,249
– Auto parts, incl. tires	30,970	42,277	30,747	27,934	41,409
A. Export – Import	(23,252)	(54,216)	(45,322)	(56,710)	(77,323)
B. Export + Import	56,810	57,228	49,259	60,016	87,993
Trade Specification Index (A/B)	−0.41	−0.95	−0.92	−0.95	−0.88

Source: Bank of Thailand, Monthly Bulletin, April 1994

As statistics on electrical and electronic industry is available to such extent that T.S.I. can be calcualated for both finished products and parts. Trade statistics and T.S.I. are shown in Table 8.3-2. Electrical machinery and electronics industry as a whole records T.S.I. of -0.08 in 1992 and -0.13 in 1993, indicating balance of export and import. This is attributable to T.S.I. of finished products, such as home electrical appliances and computer showing 0.3 ~ 04. However part is still in the stage of comparative disadvantage with T.S.I. of 0.-0.3.

Table 8.3-2 TRADE SPECIFICATION INDEX OF ELECTRICAL & ELECTRONIC INDUSTRY

UNIT: million Bahts

	1989	1990	1991	1992	1993
Export					
- Total export	72,163	104,690	139,880	166,656	188,218
- Finished goods 1/	30,317	41,662	61,030	73,270	86,617
- Parts	41,846	63,028	78,850	93,386	101,601
Import					
- Total import	107,348	148,687	170,988	195,427	242,769
- Finished goods 1/	17,808	26,010	30,477	30,689	43,657
- Of which parts	89,540	122,677	140,511	164,738	199,112
A. Export - Import (Total)	(35,185)	(43,997)	(31,108)	(28,771)	(54,551)
B. Export + Import (Total)	179,411	253,377	310,868	362,083	430,987
Trade specification Index (A/B)	-0.20	-0.17	-0.10	-0.08	-0.13
C. Export - Import (Goods)	(12,509)	(15,652)	(30,553)	(42,581)	(42,960)
D. Export + Import (Goods)	48,125	67,672	91,507	103,959	130,274
Trade specification Index (C/D)	0.26	0.23	0.33	0.41	0.33
E. Export - Import (Parts)	(47,694)	(59,649)	(61,661)	(71,352)	(97,511)
F. Export + Import (Parts)	131,386	185,705	219,361	258,124	300,713
Trade specification Index (E/F)	-0.36	-0.32	-0.28	-0.28	-0.32

Note: 1/ Computers and Electrical appliances
Source: Bank of Thailand, Monthly Bulletin, April 1994

Next, autoparts and electrical and electronic components were selected from the HS10 digit classification of the trade statistics of Thailand, trade

specialization indexes were calculated for 1989 to 1992, the commodities were divided into autoparts, electrical and electronic components, and dies, and these were divided into those with comparative advantage and those with comparative disadvantage. The commodities were further divided into commodities with a strong comparative advantage (trade specification index of 0.7 to 1.0), commodities with a medium comparative advantage (0.3 to 0.7), commodities with a weak comparative disadvantage (less than 0.3), and commodities with a strong comparative disadvantage (−1.0 to −0.7).

Comparative advantage		Comparative disadvantage	
Large	0.7～1.0	Large	−0.7～−1.0
Medium	0.3～0.7	Medium	−0.3～−0.7
Small	0.0～0.3	Small	−0.3～0.0

Further, commodities where the comparative advantage grew stronger in the five year period and commodities where the comparative disadvantage grew weaker are shown by circle marks and commodities where the comparative advantage grew weaker and commodities where the comparative disadvantage grew stronger are shown by the x marks (see Table 8.3–3). Note that since the 10–digit classification is used, indirect exports are not included. These are summarized in Tables 8.3–4 and 8.3–5.

Table 8.3–4 COMPARATIVE ADVANTAGE OF THAI PARTS INDUSTRIES

	Comparative advantage		Comparative disadvantage		Total
Auto parts	3	(10.0%)	27	(90.0%)	30
Electrical and electronical components	24	(31.2%)	53	(68.8%)	77
Dies and molds	0	(0.0%)	8	(100.0%)	8
Total	27	(23.5%)	88	(76.5%)	115

Table 8.3-3 CHANGES IN TRADE SPECIALIZATION INDEX FROM 1989 T0 1992 (HS 10-DIGIT CLASSIFICATION)

	AUTO PARTS		ELECTRICAL/ELECTRONIC COMPONENTS			DIES
0.7～1.0	8502.130-001 (○)		8414.300-004 (○)	8532.210-003 (○)	8540.410-003 (○)	
			8471.930-000	8532.220-004 (○)	8542.110-009 (○)	
			8531.900-004 (○)	8532.300-004 (○)		
		(1)	8532.210-000 (○)	8533.310-000 (○)	(10)	
0.3～0.7			8532.250-007 (○)	8541.400-906 (○)	8542.800-000 (○)	
			8536.410-009 (○)	8541.500-004 (○)	(5)	
0.0～0.3	8511.100-000 (○)		8415.900-006 (○)	8516.900-002	8533.400-001	
	8511.200-002 (○)		8473.300-008 (○)	8529.909-205	8534.000-004 (○)	
		(2)	8504.330-006 (○)	8532.900-005 (○)	8541.600-001 (○) (9)	
-0.3～0.0	8409.910-506		8473.100-004 (×)	8522.900-008 (×)	8540.890-906 (○)	8480.490-009 (○)
	8512.200-008		8504.310-004 (○)	8529.902-009 (○)	8542.190-006 (○)	
	8512.300-100 (○)		8504.400-005 (○)	8532.230-005 (○)	8542.900-002	
		(3)	8504.900-004 (○)	8540.200-009 (○)	(11)	(1)
-0.7～-0.3	8409.910-203	8484.900-001 (○)	8471.920-004 (○)	8531.800-008 (○)	8541.290-002 (○)	8480.790-004 (○)
	8421.230-001 (×)	8502.200-000 (○)	8473.290-004 (○)	8533.100-006 (○)	8541.900-007 (○)	
	8483.500-009 (○)	8511.300-004	8473.400-004 (○)	8533.210-009 (×)		
	8483.600-101 (○)	8511.400-006	8504.310-005	8540.110-008 (○)		
	8483.600-202 (○)	8511.800-901 (○)	8504.340-007 (○)	8540.910-002 (○)		
	8484.100-007 (○)	(12)	8518.900-003 (×)	8541.100-002 (○)	(14)	(1)
-1.0～-0.7	8409.910-102	8511.900-005 (○)	8414.400-001	8529.909-901	8540.890-109	8480.100-005
	8409.910-405	8512.400-001	8471.990-006	8531.200-007 (×)	8540.990-004	8480.200-007
	8408.910-904	8511.900-000	8473.210-007	8532.290-000	8541.210-005 (×)	8480.300-009
	8421.390-009		8504.210-002 (○)	8533.390-008 (×)	8541.300-006	8480.410-001
	8483.100-001		8504.220-003 (○)	8533.900-000	8542.200-004	8480.600-004 (○)
	8483.400-007		8504.230-004 (×)	8536.490-006	8543.100-003	8480.710-007
	8483.900-006		8504.500-007	8540.120-009 (×)	8543.200-005	
	8502.110-004		8516.800-000 (×)	8540.300-000 (×)	8543.300-007	
	8502.120-000		8529.901-002	8540.490-000		
	8511.800-104	(13)	8529.909-104 (×)	8540.810-000	(28)	(6)

Note: (○) marks indicate improvement and (×) marks indicate deterioration.

Table 8.3-5 TRANSITION OF COMPARATIVE ADVANTAGE OF THAI PARTS INDUSTRIES

	Auto parts	Electrical and electronic components	Dies and molds
Comparative advantage stronger	3	19	
Comparative disadvantage weaker	10	21	
Total	13	40	
Comparative advantage weaker			3
Comparative disadvantage stronger	1	10	
Total	1	10	3
No change	17	23	5

From this table, the following features become clear.

1) There are more products among autoparts, electrical and electronic components, and dies and molds that have a comparative disadvantage rather than comparative advantage (see Table 8.3-4).

2) A comparison of autoparts and electrical and electronic components shows that 31.2 percent of the electrical and electronic components have a comparative advantage or about 3 times the figure (9.4%) of autoparts (see Table 8.3-4).

3) In both autoparts and electrical and electronic components, there were more products which grew stronger in comparative advantage and products which grew weaker in comparative disadvantage than products which grew weaker in comparative advantage and products which greater stronger in relative disadvantage in the period from 1988 to 1992 (see Table 8.3-5).

Next, analyzing the components with a comparative advantage, it becomes clear that ① the only autoparts with a comparative advantage are spark plugs and other electrical components, ② there are many components with a comparative advantage in electrical and electronic components such as capacitors, resistors, integrated circuits, semiconductor devices, relays, printed circuits, and other electronic components, and ③ the electrical components with a comparative advantage are refrigerator compressors, air-conditioner parts, electric heating equipment parts, etc. (see Table 8.3-6).

The main destinations of autoparts with a comparative advantage are shown in Table 8.3-6 Electronic components mostly are transferred to Singapore. While not possible to judge from trade statistics alone, it is considered that there are exported by foreign ventures using Singapore as an International Procurement office (IPO). The biggest destination for refrigerator compressors and air-conditioner parts is Hong Kong. From the destinations and visits to companies and industrial associations, it is believed that the autoparts go to the after-sales service market, but this cannot be confirmed from trade statistics. On the other hand, it is believed that a large percentage of the electrical and electronic components are exported by foreign ventures or companies with technical tieups with foreign companies.

Table 8.3-6 COMPARATIVELY ADVANTAGEOUS PARTS AND MAIN DESTINATIONS

	Auto parts	Electrical and Electronic Components
Parts with large comparative advantage (0.7~1.0)	Power generators supplied as sets with piston type internal cobustion engines (Laos)	* Refrigerator compressors (Hong Kong and Taiwan) * Main memeory devices (U.S. and Netherlands) * Components for electric audio and visual signal equipment (Singapore and Japan) * Capacitors (tantalum capacitors, Japan and Singpaore) * Electrolytic capacitors (Singapore), coil type variable resistors (U.S.) * Microwave oven magneto-elecric tubes (Japan) * Digital type integrated circuits (U.S. and Netherlands)
Parts with medium comparative advantage (0.3~0.7)		* Paper capacitors and plastic capacitors (India) * Relay devices (voltage used 60V to 1000V) (Japan and U.S.) * Semiconductor devices (passive (U.S. and Taiwan) and others (Singapore) Assembly of micro-size and precision goods (Singapore and Japan)
Parts with small comparative advantage (0.0~0.3)	Spark plugs (U.S., France, Japan)	* Air-conditioner parts (Hong Kong and Singapore) * Automotive data processing equipment parts (Singapore and U.S.) * Transformers (capacity 16 KVA to 500 KVA) (Singapore) * Electric heating equipment components (U.S.and Japan) * Radio and television cabinet components (Japan) * Capacitor componenets (Japan) * Variable resistors (Singapore and U.S.) * Printed circuits (U.S. and Malaysia) * Piezoelectric crystal devices (Japan)

A similar analysis was performed for each of Indonesia, Malaysia, and Singapore, for which use can be made of HS classified trade statistics. Table 8.3-7 shows only the components with a comparative advantage.

Table 8.3-7 COMPARATIVELY ADVANTAGEOUS PARTS IN FOUR ASEAN COUNTRIES

Autoparts

	Thailand	Malaysia	Indonesia	Singapore
Parts with strong comparative advantage 0.7 ~ 1.0	* Power generators supplied as sets with piston type internal cobusion engines (Laos)		* Piston and piston ring for other engines of vehicles of heading No. 87.01	
Parts with medium comparative advantage 0.3 ~ 0.7			* Piston and piston ring	* Carburetors & parts for engines * Other electrical starting equipment for internal combustion engines
Parts with weak comparative advantage 0.0 ~ 0.3	* Spark plugs (U.S., France, Japan)			* Ignition magnetos magnets * Dynamos & magnetic flywheels

Electrical and Electronic Components

	Thailand	Malaysia	Indonesia	Singapore
Parts with strong comparative advantage 0.7 ~ 1.0	* Refrigerator compressors (Hong Kong and Taiwan) * Main memory devices (U.S. and Netherlands) * Components for electric audio and visual signal equipment (Singapore and Japan) * Capacitors (tantalum capacitors, Japan and Singapore) * Electrolytic capacitors (Singapore), coil type variable resistors (U.S.) * Microwave oven magneto-electric tubes (Japan) * Digital type integrated circuits (U.S. and Netherlands)	* Parts of air conditioners for road vehicle * Transformers for toys having a power capacity N.E./KVA * Other transformers having a power capacity EXD 16 KVA * Inductors for use in radio eqp. * Relays for a voltage > 60V for a domestic use for a current of <16 AMPS * Transmission and reception apparatus * Hybrid integrated circuits * Other fined capacitors ceramic dielectric, multi-leyer of a capacitors of 111 F and above	* Digital monolithic I.C.	* Compressor for refrigerating equipment * Disk drive * Tape drive * Adapter units * Parts for shavers & hair clippers
Parts with medium comparative advantage 0.3 ~ 0.7	* Paper capacitors and plastic capacitors (India) * Relay devices (voltage used 60V to 1000V) (Japan and U.S.) * Semiconductor devices (passive (U.S. and Taiwan) and others (Singapore) * Ultra-small scale assembly (Singapore and Japan)	* Evaporators for automatic air conditioners, non-domestic * Parts & acc. for automatic data processing machines * Matching transformers having a power capacity NE./KVA * Relays for a voltage more than 60V, for other uses * Television camera tubes * Transistors, other than photosensitive transistors with a dissipation rate of </W * Other transistors * Photosensitive semiconductor devices, including photoroetaic cells; light emitting diodes * Other hybrid integrated circuits * Other fixed capacitors, ceramic dielectric multi-layer of a capacitance of </1 UF		* Digital central processing units digital processors for microcomputers * Key-to-disks * Other transformers
Parts with weak comparative advantage 0.0 ~ 0.3	* Air-conditioner parts (Hong Kong and Singapore) * Automobile data processing equipment parts (Singapore and U.S.) * Transformers (capacity 16 KVA to 500 KVA) (Singapore) * Electric heating equipment components (U.S.and Japan) * Radio and television cabinet components (Japan) * Capacitor components (Japan) * Variable resistors (Singapore and U.S.) * Printed circuits (U.S. and Malaysia) * Printed circuits (U.S. and Malaysia) * Piezoelectric crystal devices (Japan)	* AC motors, multi-phase of an output EXD 750W but N.E. 75Kw * Parts for motors of > 1.5Kw but not > 75Kw * Parts other than serials and serial reflectors for television * Other machining transformers * Static converters * Other inductors * Fixed carbon resistors, composition of film types * Relays for a voltage N.E. 60V for other uses * Parts for cathode-ray television picture tubes * Diodes other than photosensitive or light emitting diodes * Monolithic integrated circuits other than digital * 8542 60-000		* Other peripheral units * Parts of typewriters * Parts of other offices & choque writing machines * Parts of television & radio-broadcast receivers & telecom apparatus include serials & serial reflectors * Static converters rectifiers & rectifying apparatus * Cathode-ray television picture tubes color * Other semiconductor devices

In Indonesia, an overwhelming majority of the components in the fields of autoparts, electrical and electronic components, and dies have a comparative disadvantage. The only components with a comparative advantage are engine parts in autoparts and some ICs in electrical and electronic components.

In Malaysia, some electrical and electronic components have a comparative advantage and which are more than other countries. Strong comparative advantages are shown by air-conditioner parts, inductor relays, transformers, hybrid ICs, and CRTs. All autoparts have a comparative disadvantage.

Singapore has an increasing number of electrical and electronic components with a comparative advantage and few with a strong comparative disadvantage. Compared with other ASEAN countries, it exhibits a strong competitiveness. A strong comparative advantage is enjoyed by compressors, disk drives, tape drives, adapter units, and electric shaver parts.

8.3.3 Cost comparison simulation for Thailand and surrounding countries

(1) The Focus of the Cost Simulation, and the Base Data

A cost comparison simulation was developed on the basis of 8 industries (listed below) of Japanese parts industries for Thailand and the surrounding countries. The "Cost Index of Small and Medium Scale Industries (Fiscal 1993)," an annual publication of the of Small and Medium Enterprise Agency of Japan, was used as the base data. Local factors in the various countries including Thailand were assumed and applied to the base data. The base cost index of Japan is shown in an average figure derived from sample companies. The number of samples and average number of employees per company that provided information is shown in parenthesis. The subsectors from the item 2) to the item 8) below are common for autoparts industries and electrical/electronic industries.

	Parts industries	Samples	Average employees
1)	Autoparts assy	(69)	101
2)	Presswork	(27)	38
3)	Foundry	(63)	77
4)	Forging	(20)	66

5)	Die-casting light metal	(6)	74
6)	Die & mould-making	(36)	30
7)	Plastic processing	(42)	70
8)	Rubber processing	(32)	108

The simulation deals with 5 countries: the 4 ASEAN countries that have an automotive industry and, from the Asian NIEs, Taiwan.

1) Thailand
2) Indonesia
3) Malaysia
4) Philippines
5) Taiwan

Differences in actual manufacturing costs between different regions of the same country are sometimes greater than these between different countries. As an example, the gap between Jakarta and northern Sumatra in Indonesia may be greater than that between Indonesia and Thailand. In certain cases, the cost difference between companies in the same trade of the same country may also be greater than the cost difference between countries. What is compared here is deemed to be the average costs of small and medium scale companies located in the metropolitan regions of the various countries. Market prices of parts and components vary with demand and supply situations, so the costs simulated here do not necessarily correspond to the market prices that were actually paid, but indicate price levels that could be paid.

The cost structure of the small and medium scale Japanese companies in each of the 8 parts industries – all of which are strongly related to the automotive parts and the electric/electronic parts industries – is as shown in the table below.

Table 8.3-8 COST STRUCTURE OF PARTS SUPPLIERS IN JAPAN (FY1993)

	Autoparts	Presswork	Foundry	Forging	Die-cast	Die-making	Plastic	Rubber
A. Material Cost	39.4	27.0	19.4	38.4	37.6	10.7	40	25
B. Labor cost	26.3	41.3	28.9	23.7	32.0	41.3	21.8	26.9
C. Depreciation	4.6	3.9	3.7	3.9	3.1	5.3	4.5	3.5
D. Other Costs	16.60	10.30	21.60	16.50	15.70	17.40	13.20	19.60
E. Production Cost	86.9	82.5	73.6	82.5	88.4	74.7	79.5	75
F. Overhead	10.3	14.8	23.5	14.8	8.8	22.5	17.7	22
G. Total Production cost	97.2	97.3	97.1	97.3	97.2	97.2	97.2	97
H. Profit	2.8	2.7	2.9	2.7	2.8	2.8	2.8	3.0
I. Sales Revenue	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

(Source) Cost Index of Small-and Medium-Scale Industry, 1994, Small and Medium Enterprise Agency of Japan

(2) Local Factors Affecting Material Costs

Most of ASEAN countries import the materials used in the automotive parts and the electric/electronic parts industries of materials because requirements for quality of materials are severe for parts industries. The imports mostly come from Japan. Therefore, the import prices from Japan were used as material costs for all countries. The main materials used in the automotive parts and the electric/electronic parts industries are steel and plastics. Domestically produced materials, if available, are usually sold at the same prices as import prices that include a tariff (for example, plastics in Thailand). With regard to the rubber industry, natural rubber is produced domestically in the 5 countries. However, the tire manufacturing industry - the biggest user of natural rubber - was not included in the rubber parts industry above. For these, imported synthetic rubber is the main rubber material which is to be met by imports.

For each country, the import prices of materials were determined by adding transportation costs and import tariffs to the ex-work prices in Japan. The transportation costs consist of the following items.

Table 8.3-9 TRANSPORTATION COST OF MATERIALS

1)	Inland tranportation (Japan)
2)	Shipping Change (Japan)
3)	FOB Japan (1)+2))
4)	Ocean freight
5)	C & F (3)+4))
6)	Marine insurance
7)	Port Change (Domestic)
8)	Inland transportation (Domestic)
9)	Miscellaneous (Domestic)
10)	Transportation cost total

Each country's tariffs were computed by multiplying C&F (the item 5) of Table 8.3-9) by the country's tariff rates. Table 8.3-10 shows each country's material cost indexes when the cost of materials in Japan is taken as 1.0.
In the case of steel sheets exported from Japan, however, the export price is set lower than the price in the Japanese market. Therefore, the cost in Japan was put at 0.8.

Table 8.3-10 MATERIAL COST INDEX BY COUNTRY BY SUBSECTOR 1/

	1) Autoparts	2) Presswork	3) Foundry 4) Foging 5) Die-casting 6) Die-making	7) Plastic	8) Rubber
Japan	1.00	0.80 2/	1.00	1.00	1.00
Thailand	1.44 (40)	0.91 (10)	1.34 (30)	1.44 (40)	1.55 (50)
Indonesia	1.45 (40)	0.84 (0)	1.45 (40)	1.35 (30)	1.45 (40)
Malaysia	1.33 (30)	0.84 (2)	1.33 (30)	1.33 (30)	1.03 (0)
Philippines	1.34 (30)	1.08 (30)	1.14 (10)	1.24 (20)	1.24 (20)
Taiwan	1.29 (25)	1.29 (25)	1.16 (12.5)	1.06 (2.5)	1.05 (2)

(NOTE) 1/ Figures in the parenthesis represent tariff rate of materials in percent.

2/ Export prices of steel sheets are lower than those in Japanese market.

Material costs for each country are obtained by multiplying the above cost index to that of Japan. Differences in import prices among the countries to differences in their tariff rates. Differences in their transportation, however, costs are not so big as tariff rates. Transportation costs for all the countries fall in the level of about 3% of the material's market price in Japan. It is lowest for Malaysia, 2.71%, and highest for Indonesia, 3.72%.

(3) Local Factors Affecting Labor Costs

A unit cost index for labor was created primarily from figures on the personnel expenses actually paid in the countries, in 1993, by a Japanese company, although other published data and wage increases through 1995 were also taken into account. The following exchange rates for the countries are used for the unit labor cost comparison.

US Dollar	: 1US$=¥100,	Thai Baht	: 1Baht=¥3.99
Indonesia RP	: 1RP=¥0.05,	Malaysia $	: 1M$=¥38.49
Philippines Peso	: 1Peso=¥3.80,	Taiwan NT$¥	: 1NT$=¥3.71

In considering the cost of labor, it is necessary to take into account the quality of labor – that is, productivity. This was done through a "productivity index" that shows the number of people required for a job that can be done by 1.0 Japanese. This index, shown in the table, was also estimated on the basis of the actual experience of the said company.
The unit cost index multiplied by the productivity index gives the labor cost index.

Table 8.3-11 LABOR COST INDEX

	a) Unit cost	b) Productivity	c) Laborcost(a×b)
Japan	1.00	1.0	1.00
Thailand	0.20	1.5	0.30
Indonesia	0.08	2.0	0.16
Malaysia	0.25	1.5	0.375
Philippines	0.15	2.0	0.30
Taiwan	0.37	1.3	0.481

(Source) JICA team estimate

(4) Local Factors Affecting Depreciation Costs

The burden of fixed costs, which are typified by depreciation costs for factory buildings and machines/equipment, increases proportionately with the following situations.

1) Production capacity is small.
2) The capacity utilization is low.
3) The product defect rate is high.
4) Equipment purchasing costs are high, or there is much depreciable equipment.

These situations tend to occur in the factories of developing countries, or the 5 countries as well. Approximation is made: If factories in Japan are taken as 100%, one can conservatively assume that the factories in the 5 countries have, on average, a production capacity of 50%, an operating rate of 80%, costs increased by defects to 120%, and equipment purchasing costs of 110%.

$$\frac{\text{Defect rate (1.2) x Equipment cost (1.1)}}{\text{Production capacity (0.5) x Operating rate (0.8)}} = 3.3$$

Here in each country the burden for depreciation is assumed to be 3.3 times greater than in Japan.

(5) Other Costs and Overhead

"Other costs" include local parts purchasing costs and other direct costs (royalties, etc.), as well as indirect personnel expenses, energy costs and other indirect costs (frienge benefit costs, utilities costs, etc.). The amount of personnel expenses and energy and utilities costs makes "other costs." The unit cost of the energy and utilities is cheaper in the 5 countries than in Japan too.

"Overhead" includes selling expenses and administrative expenses. The overhead costs companies personnel expenses and expenses for transportation, entertainment and paying interest.
It has not been possible to obtain data on the 5 countries' "other costs" and

"overhead." Therefore, the labor cost index in Table 8.3-11 has been hypothetically used for them.

(6) Ratio of Profit to Sales, and Sales Revenue

Japan's parts manufacturers are being pressed to sharply lower their costs. In all of the industries in this simulation, the profit to sales ratio is 2.8%.

(Note) In Table 8.3-8, this ratio varies slightly from industry to industry. However, that is due to errors in calculation.

In the 5 countries, the parts market is a seller's market. The quantity of parts produced is small, and it is not popular to sell large quantities at a narrow margin of profit, like in Japan. Based on the experience of people in charge of international procurement department of Japanese companies, the ratio of profit to sales in the 5 countries was put at 15% in the simulation. In actuality, there are many cases where the margin of profit is even greater. However, unless it is at least 15%, a transaction is unlikely to take place. Thus, 15% was used.

Sales revenue equals this profit added to cost.

(7) Simulation Results and Remarks

Table 8.3-12 shows sales revenue a parts manufacturer by subsector in each of the 5 countries when the average sales revenue per company in Japan is taken as 100. For the details of the related calculations, see Table 8.3-13.

Table 8.3-12 RESULTS OF COST SIMULATION

(Japan=100)

	Thailand	Indonesia	Malaysia	Philippines	Taiwan	Average (5coutries)
1) Autoparts	103	95	103	99	108	102
2) Presswork	68	54	71	73	82	70
3) Foundry	71	61	77	67	83	72
4) Forging	95	91	100	86	99	94
5) Die-casting	91	87	96	82	95	90
6) Die-making	66	54	73	64	81	68
7) Plastic	104	91	103	94	97	98
8) Rubber	83	69	74	74	83	77
Average (8 Subsectors)	85	75	87	80	91	84

According to the averages by country in the above table, Indonesia, at 75, is the most cost-competitive country. In second place, with 80, is the Philippines. Then come Thailand and Malaysia, with 85 and 87, respectively. Taiwan, with 91, is at the bottom of the cost-competitiveness scale. According to the simulation results, the more industrialized a country is, – that is, the higher its labor costs are – the lower its cost competitiveness is.

(Note) Not all of the countries produce the same quality of products. Generally speaking, Taiwan manufactures parts of higher quality and with a higher value added than Indonesia. In that sense, the table should be thought of as showing a certain kind of "potential not so much the current situation."

Looking at the cost structure of companies in Japan, one finds that material costs comprise a large proportion of total costs in the autoparts assembly, forging, die-casting and plastic industries. Therefore, countries that have a low import tariff rate for the materials used in those industries have a corresponding competitive edge. The reason that the Philippines is first in forging and die-casting, even ahead of Indonesia, is that its import tariff rate is 10%, while that of Indonesia is 40%. Difference is 30%.

In autoparts assembly, the Philippine import tariff rate is 30% and the Indonesian, 40%; in plastic processing, the Philippine rate is 20% and the

Table 8.3-13 ESTIMATED PRODUCTION COST STRUCTURE

1. THAILAND

	(1) Auto-parts	(2) Presswork	(3) Foundry	(4) Forging	(5) Die-cast	(6) Die-making	(7) Plastic	(8) Rubber
A. Material Cost	56.7	24.6	26.0	51.5	50.4	14.3	57.6	38.5
B. Labor Cost	7.9	12.4	8.7	7.1	9.6	12.4	6.5	8.1
C. Depreciation	15.2	12.9	12.2	12.9	10.2	17.5	14.9	11.6
D. Other Costs	5.0	3.1	6.5	5.0	4.7	5.2	4.0	5.9
E. Production Cost	84.8	52.9	53.4	76.4	74.9	49.4	83.0	64.0
F. Overhead	3.1	4.4	7.1	4.4	2.6	6.8	5.3	6.6
G. Total Production Cost	87.9	57.4	60.4	80.8	77.6	56.2	88.3	70.6
H. Profit	15.5	10.1	10.7	14.3	13.7	9.9	15.6	12.5
I. Sales Revenue	103.4	67.5	71.1	95.1	91.3	66.1	103.8	83.1

2. INDONESIA

	(1) Auto-parts	(2) Presswork	(3) Foundry	(4) Forging	(5) Die-cast	(6) Die-making	(7) Plastic	(8) Rubber
A. Material Cost	57.1	22.7	28.1	55.7	54.5	15.5	54.0	36.3
B. Labor Cost	4.2	6.6	4.6	3.8	5.1	6.6	3.5	4.3
C. Depreciation	15.2	12.9	12.2	12.9	10.2	17.5	14.9	11.6
D. Other Costs	2.7	1.6	3.5	2.6	2.5	2.8	2.1	3.1
E. Production Cost	79.2	43.8	48.4	75.0	72.4	42.4	74.5	55.2
F. Overhead	1.6	2.4	3.8	2.4	1.4	3.6	2.8	3.5
G. Total Production Cost	80.8	46.2	52.2	77.4	73.8	46.0	77.3	58.8
H. Profit	14.3	8.1	9.2	13.6	13.0	8.1	13.6	10.4
I. Sales Revenue	95.1	54.3	61.4	91.0	86.8	54.1	90.9	69.1

3. MALAYSIA

	(1) Auto-parts	(2) Presswork	(3) Foundry	(4) Forging	(5) Die-cast	(6) Die-making	(7) Plastic	(8) Rubber
A. Material Cost	52.4	22.7	25.8	51.1	50.0	14.2	53.2	25.8
B. Labor Cost	9.9	15.5	10.8	8.9	12.0	15.5	8.2	10.1
C. Depreciation	15.2	12.9	12.2	12.9	10.2	17.5	14.9	11.6
D. Other Costs	6.2	3.9	8.1	6.2	5.9	6.5	5.0	7.4
E. Production Cost	83.7	54.9	56.9	79.0	78.1	53.7	81.2	54.7
F. Overhead	3.9	5.6	8.8	5.6	3.3	8.4	6.6	8.3
G. Total Production Cost	87.5	60.5	65.8	84.6	81.4	62.2	87.8	63.0
H. Profit	15.4	10.7	11.6	14.9	14.4	11.0	15.5	11.1
I. Sales Revenue	103.0	71.1	77.4	99.5	95.8	73.1	103.3	74.1

4. PHILIPPINES

	(1) Auto-parts	(2) Presswork	(3) Foundry	(4) Forging	(5) Die-cast	(6) Die-making	(7) Plastic	(8) Rubber
A. Material Cost	52.8	29.2	22.1	43.8	42.9	12.2	49.6	31.0
B. Labor Cost	7.9	12.4	8.7	7.1	9.6	12.4	6.5	8.1
C. Depreciation	15.2	12.9	12.2	12.9	10.2	17.5	14.9	11.6
D. Other Costs	5.0	3.1	6.5	5.0	4.7	5.2	4.0	5.9
E. Production Cost	80.8	57.5	49.5	68.7	67.4	47.3	75.0	56.5
F. Overhead	3.1	4.4	7.1	4.4	2.6	6.8	5.3	6.6
G. Total Production Cost	83.9	62.0	56.5	73.1	70.0	54.0	80.3	63.1
H. Profit	14.8	10.9	10.0	12.9	12.4	9.5	14.2	11.1
I. Sales Revenue	98.7	72.9	66.5	86.1	82.4	63.6	94.4	74.2

5. TAIWAN

	(1) Auto-parts	(2) Presswork	(3) Foundry	(4) Forging	(5) Die-cast	(6) Die-making	(7) Plastic	(8) Rubber
A. Material Cost	50.8	24.6	22.5	44.5	43.6	12.4	42.4	26.3
B. Labor Cost	12.7	19.9	13.9	11.4	15.4	19.9	10.5	12.9
C. Depreciation	15.2	12.9	12.2	12.9	10.2	17.5	14.9	11.6
D. Other Costs	8.0	5.0	10.4	7.9	7.6	8.4	6.3	9.4
E. Production Cost	86.6	62.3	59.0	76.8	76.8	58.1	74.1	60.2
F. Overhead	5.0	7.1	11.3	7.1	4.2	10.8	8.5	10.6
G. Total Production Cost	91.6	69.4	70.3	83.9	81.0	69.0	82.6	70.7
H. Profit	16.2	12.2	12.4	14.8	14.3	12.2	14.6	12.5
I. Sales Revenue	107.8	81.6	82.7	98.7	95.3	81.1	97.2	83.2

(Source) JICA team estimate

Indonesian is 30%; in each case, the difference is 10%. In other words, as far as the difference in tariff rates is at a level of 10%, Indonesia, with its low personnel expenses, is the most cost competitive country.

Thus, in presswork, foundry, die-making and rubber processing – industries where personnel expenses comprise a large portion of the cost structure of Japanese companies – Indonesia, which ranks lowest on the labor cost index, is number one in cost competitiveness.

If all tariff rates were made 0%, so that the cost of materials was free of tariffs, then the countries would be cost competitive in the order that their personnel expenses are low.

In autoparts assembly, forging and plastic processing, the 5 countries are losing cost competitiveness vis-a-vis Japan. In certain cases their index figures exceed 100, making them less cost competitive than Japan. These are countries where materials account for a large proportion of total costs and the import tariff rates are high.

Next, looking at the 5-country averages for the various industries, one finds that the industries where the countries are most cost competitive compared to Japan are die-making (68), presswork (70) and foundry (72). All of these industries are ones in which personnel expenses account for a large proportion of total costs. In presswork, one factor, mentioned earlier, that has to be taken into account is that the export price of materials (thin steel sheets) from Japan is cheaper than the price in the Japanese market.

In 3 industries – presswork, foundry and die-making – Thailand's cost competitiveness is better than the 5-country average. The reason is that, in those industries, Thailand's import tariff rates for materials are low compared to those of the other countries. In general, however, as shown in Table 8.3-10, Thailand's tariff rates are comparatively high, and this is weakening its cost competitiveness.

8.3.4 Cost comparison of electrical and electronic production (by Sharp Corp)

This chapter presents cost comparison survey on electrical and electronic products which done by Sharp Corp. and announced in June 1994 in Japanese economic daily, the *Nihon Keizai Shibun* (Exchange rate used in this survey is 106 yen per 1 dollar for parts and material and 105.20 yen per dollar for personnel cost and land price)

The Sharp survey made a regional comparison, including Thailand, of management resources. According to the survey, Thailand has lower costs in all management resources except interest rates and water rates, which were either higher or equal in level. Compared with the U.S., however, it had higher costs not only in interest rates and water rates, but also overland shipping, forwarding agent fees, electric power, and office expenses. Further, compared with China, it had higher costs in personnel costs, electric power, water, and office expenses. This comparison, however, did not include the other ASEAN countries (Table 8.3-14).

Table 8.3-14 COMPARISON OF COSTS OF MANAGEMENT RESOURCES BY REGION

Item	Japan	U.S.	Europe	Thailand	China
Annual interest rates	100	110	220	230	300
Land (factory sites) per m^2	100	8	4	1	10 *1)
Building costs	100	73	56	45	–
Personnel costs/month	100	65	32	6	4
Overland shipping 300 km (20 ft containers)	100	19	15	25	–
Forwarding agent expenses (expenses for export customs clearance)	100	13	130	33	130
Rental warehouse space m^2/month	100	20	10	20	20
Electric power (kW/h)	100	30	25	45	28
Water (m^3)	100	19	4	100 *2)	1
Office expenses (ratio to sales)	100	45	35	50	20
Imcome Tax Rates	100	91	88	80	88

Notes: 1. Figures are indexes obtained by estimates based on typical factories in each country. For parts and materials, see separate table.
2. Index for China for land (*1) is based on rental fees.
3. Index for Thailand for water (*2) is based on case of transport by truck.

Source: Sharp Corporation, 1994

Next, a look at the comparative prime costs of household electrical appliances in Japan, Southeast Asia, Europe, and the U.S. shows that the costs in Southeast Asia are 80 to 85 percent that of Japan and stronger competitively compared with Europe and the U.S. as well (Table 8.3–15).

Table 8.3–15 COMPARISON OF PRIME COSTS OF HOUSEHOLD ELECTRICAL APPLIANCES
(ESTIMATES ASSUMING EXPORT)

Product	Costs	Japan	Southeast Asia	Europe	U.S.
Color TV	Materials	100	90	102	95
	Labor	100	15	55	60
	Total	100	84	99	92
VTRs	Materials	100	95	105	–
	Labor	100	15	60	–
	Total	100	85	100	–

Notes: 1. Figures are based on costs of materials plus direct labor costs (indexed to yen costs)
2. Figures are indexes obtained by estimates based on typical factories in each country.
3. Prices for materials in Japan factor in reduction through use of imported parts.

A comparative survey of the prices of electronic components and materials showed that Thailand had the lowest prices in everything but color steel plate. A look at the raw materials which were compared with Malaysia shows that Thai prices were about 80 percent of those of Malaysia in the case of cold rolled steel plate, 93 percent in the case of galvanized steel plate, and 94 percent in the case of ABS resin (see Table 8.3–16).

Table 8.3-16 STATE OF PRICE DIFFERENCE OF DOMESTIC AND OVERSEAS ELECTRONIC COMPONENTS AND MATERIALS

Product	Name of component/material	Country	Index (based on Japan as 100)
Microwaveoven	Magnetrons (800W)	Thailand	81
	Turntable motors	U.S.A.	82
	High voltage diodes	Thailand	83
		U.K.	94
		Thailand	86
		U.K.	95
Color TV	Flyback transformers	Malaysia	66
	(14-inch NTSC)	R. Korea	66
	Deflection yokes (14-inch NTSC)	Malaysia	65
	Transformers	R. Korea	75
	Tuners (NTSC)	China	75
	Remote controllers (24 key)	R. Korea	69
		Malaysia	83
		R. Korea	86
		Malaysia	71
		R. Korea	92
VTRs	Video heads (4HD)	Malaysia	98
	Single side printed circuit	Singapore	89
	boards (m2)	R. Korea	89
Telephones	Call code	Taiwan	84
	Micromotors	Singapore	75
Ferrous metal materials	Cold rolled steel plate	Malaysia	89
	Galvanized steel plate	Thailand	71
	Color steel plate	Malaysia	96
		Thailand	86
		Thailand	101
Plastics	ABS (general) (kg)	Malaysia	67
		Thailand	63

Notes: Figures are indexes obtained by estimates based on typical factories in each country. The comparison is made of purchases made at the point of production and there are differences in specifications, levels of quality, and prices depending on volumes ordered.

Source: Sharp Corporation

8.3.5 Overall evaluation of competitiveness of Thai parts industries

In this section will be summarized and an evaluation made of the competitiveness of the Thai part industries. Here, it should be noted that competitiveness is something that is relative and that easily changes. The prices of factors of production which make up competitiveness change (rise) every year and the rate of change differs with each country. Further, competitiveness is strongly influenced by changes in exchange rates. Accordingly, we would like to examine the competitiveness of the Thai part industries in ASEAN based on mainly data of the 1990s obtained from studies of available references (see Table 8.3–17).

(1) Size and degree of concentration of industries

Thailand has the biggest sized automotive industry in ASEAN. Thailand should also enjoy the highest rate of growth in demand in the future in view of the upward trend of these past few years, the current rate of car ownership, and rising incomes. Accordingly, production can be expected to expand tremendously in the Thai automotive industry. It is projected as surpassing 1 million cars a year and as accounting for 53.8 percent of the automotive production of ASEAN by the year 2002 (see Table 8.3–18). The bottleneck in the autoparts industry had been the higher production costs caused by the small size of production and therefore the lack of merits of scale. Increased automotive production, however, can be expected to lead to an increase in production of parts, so costs can be expected to be reduced due to the greater scale.

Table 8.3–18 PROJECTIONS ON AUTOMOTIVE PRODUCTION IN ASEAN

(Unit: 1000 cars)

	1997	2002
Indonesia	250	375
Malaysia	205	305
Philippines	130	200
Thailand	600	1,025

Source: Financial Times: *Management Report 1993*

Table 8.3-17 INDICATORS OF AUTOPART INDUSTRIES AND ELECTRICAL/ELECTRONIC COMPONENT INDUSTRIES IN ASEAN

			INDONESIA	MALAYSIA	PHILIPPINES	SINGAPORE	THAILAND
(1)	Population (millions) unid-1992		184.3	18.6	64.3	2.8	58.0
(2)	GDP (millions $) 1992		126,364	57,568	52,462	46,025	110,337
(3)	GDP Per Capita (Dollars) 1992		670	2,790	770	15,730	1,840
(4)	Sales of Automobile (Unit) 1992		171,898	158,106	59,526	34,308	362,987
(5)	Production of Electronic Industry (million $) 1993		2,052	12,055	2,590	17,246	7,096
(6)	Automobile Components and Parts Industry (Number of Companies)		(1991) 193	(1993) 45	40	(1991) 19	(1994) 272
(7)	Electric and Electronic Components and Parts Industry (Number of Companies)		(1991) 111	(1993) 146	56	(1991) 172	301
(8)	Japanese Affiliates in Automobile Components and Parts (Number of Companies)		39	39	19	35	79
(9)	Japanese Affiliates in Electric and Electronic Components and Parts (Number of Companies)		11	91	11	50	89
(10)	Metal Working Industry	Casting (1,000ton) 1991	120	90	180	40	600
		Forging	4 companies	600t (non-ferrous)	3 companies (modem)		30 companies 5,000t
		Die and Mold (Number of Companies)	less than 10	400	100	460	1,260
(11)	Automobile Policy		• Import of CBU not prohibited • Deletion program was abolished • Local content with tariff reduetion scheme	• Import of CBU prohibited • LMCP	• Import of CBU prohibited • Local content • Export obligation		• Import of CBU not prohibited • Local content (inclined to be relaxed)
(12)	Custom Tariff (1994)	Automobile Components and Parts	Dependent on local contents ratio	25% (Average)	20-30%	0%	20% (CKD)
		Electric and Electronic Conponents and Parts	0-5% (10,20,40%)	0,5% (20,25,30,45, 50%)	10% (20,30,35%)	0%	10%,20% (1,5,15,30,35%)

Source: Figures for (1), (2) and (3) are from World Bank, World Development Report (1994), figures for (4) are from Yearbook of World Electronic Data 1993, figures for (6) and (7) are from the Japanese Chamber of Commerce and Industry for the Philippines, from the JICA Study Team for Thailand and from industrial statistics of other countries and figures for (8) are from the Japan Auto Parts Industries Association, figures for (9) are from the Electronics Industries Association of Japan, figures for (10) as from the Sokeizai enter and figures for (12) are from the tariff schedules of the individual countries.

Thailand is also superior compared with the rest of ASEAN in terms of the state of concentration of companies in its autoparts industry. In particular, there are 79 Japanese autoparts ventures there – twice the number in Indonesia and Malaysia.

On the other hand, the electrical and electronics industries of Singapore and Malaysia wield greater weight in ASEAN. Thailand produces about three times the value of such goods as Indonesia and the Philippines, but about 60 percent that of Malaysia. Thailand's electronic component industry is also 41 percent the scale of that of Malaysia. Thailand produces about 5 times the amount of components as Indonesia, but just 10 percent more than the Philippines, where the semiconductor industry is well developed. Japanese component companies have concentrated their investment in Malaysia. Thailand enjoys just about half that of Malaysia though about three times the amount of Indonesia and the Philippines. Further, Japanese companies mostly flock to Singapore and Malaysia as bases for procurement of parts in ASEAN. The reasons are that Singapore offers IPO incentives and Malaysia has a large concentration of Japanese ventures producing parts.

In this way, Thailand is behind Singapore and Malaysia in terms of the size and concentration of industries in its electrical and electronics industries and its component industry. Its steady economic growth and rising incomes, however, mean that growth can be expected in demand for electrical and electronic products there. Accordingly, Thailand is projected as enjoying the greatest growth in future demand for electronic components in all of ASEAN.

(2) Evaluation on local procurement by Japanese companies

A look at the problems encountered by Japanese ventures in Thailand, Malaysia, and Indonesia in local procurement shows that in all three countries the problems most often mentioned, by over 50 percent of the ventures, were "poor quality and precision", "unstable delivery", and "lack of local suppliers". The most often mentioned problem was "poor quality and precision", but there less of a percentage of companies which mentioned this in Thailand compared with Malaysia and Indonesia. Compared with Malaysia,

there was a greater number of companies which mentioned problems with "difficulties in obtaining required quantities" and "higher prices and costs". (See Table 8.3-19)

Table 8.3-19 PROBLEMS IN LOCAL PROCUREMENT IN ASEAN

Unit: %

	Three countries total	Thailand	Malaysia	Indonesia
Difficulties in securing required quantities	15.8	19.6	3.7	22.2
Higher prices and costs	31.7	33.9	18.5	44.4
Poor quality and precision	64.4	60.7	66.7	72.2
Unstable delivery	53.5	50.0	51.9	66.7
Lack of local suppliers	52.5	51.8	55.6	50.0
Others	–	–	–	–
None in particular	5.0	5.4	3.7	5.6

Source: Japan Overseas Enterprises Association, *Study of Supporting Industries* (1994).

(3) Cost levels

Thailand enjoys overwhelmingly lower management costs than the advanced countries in areas such as land and personnel costs, but higher costs compared with even the West in areas of interest rates, water rates, and office expenses. Thailand's personnel expenses are lower than Malaysia's, but higher than Indonesia's and the Philippines'. The interest rates and utility rates in all the countries of ASEAN are generally high, so in summary Thailand's production costs may be assessed as being somewhat lower than those of Malaysia and somewhat higher than those of Indonesia.

(4) Accessability to ASEAN markets

The ASEAN countries have since the mid-1980s been moving to scrap or ease import restraints and reduce tariffs. This movement toward liberalization is being pushed even more with the start of the CEPT Concept of AFTA. The current tariff rates for electrical and electronic components are considerably low overall and there are no prohibitively high rates. All of the ASEAN countries are proceeding with plans for domestic production of automotives,

except Singapore, but the automotive manufacturers are moving ahead with complementary production of autoparts through the use of the BBC scheme etc.

(5) Analysis of trade statistics

An analysis of the trade specification index enables us to determine which products currently have a comparative advantage and which are growing in comparative advantage. Comparing the ASEAN countries except for the Philippines and Brunei, it was found that ① Singapore had many products with strong competitiveness in both the areas of autoparts and electrical and electronic components, ② Malaysia had many products with a comparative advantage in electrical and electronic components, and ③ Indonesia suffered from a comparative disadvantage in both autoparts and electrical and electronic components as a whole. Thailand was found to ① have many products suffering from a comparative disadvantage in both autoparts and electrical and electronic components, but ② to also have many products whose comparative disadvantages were weakening or whose comparative advantages were growing, and ③ to have more products in electrical and electronic components than in autoparts which enjoyed a comparative advantage. The products with the strongest competitiveness were shown to be some electronic components, refrigerator compressors, etc.

(6) Summary

All this can be summarized below.

1) Thailand leads the rest of ASEAN in the area of the numbers of local companies and foreign ventures in the autoparts industry and is situated between Singapore and Malaysia on the one hand and Indonesia and the Philippines on the other in the electrical and electronic component industries,

2) Thailand has the greatest number of companies in ASEAN in the material processing industries, except for the mold and die sector in which it is surpassed by Singapore,

3) Thailand is situated between Malaysia and Indonesia in terms of the costs of factors of production,

4) Thailand has problems as a source of local procurement according to the evaluation of Japanese ventures there, but is assessed as being worse than Malaysia and better than Indonesia, and

5) Thailand is situated between Singapore and Malaysia on the one hand and Indonesia on the other in terms of competitiveness according to an analysis of trade statistics and is growing in competitiveness in both autoparts and electrical and electronic components.

8.4 Asia Strategy of Japanese Companies

Automotive and electrical/electronic industries in ASEAN countries were initiated and developed with the advancement of private investment from Japan. Japanese affiliates account for 90 percent of car production in ASEAN and surpass 70 percent of production in electrical and electronic industry. Recently Japanese companies investment in component and part industry has shown rise. ASEAN strategy, Asia strategy and global strategy of Japanese companies are of vital importance to industrial policy in ASEAN countries, not to mention of Thailand. From this view point, an overview will be given of the Asia strategy of main Japanese manufacturers in the automotive industry and electrical and electronic industries based on publicized materials of the respective industrial associations and other sources. Table 8.4-14 shows investments by Japanese companies (whole industries) in ASEAN from 1980 to 1993.

8.4.1 Each company's approach to BBC Scheme compliance

(1) BBC Scheme

The ASEAN Brand to Brand Complementation (BBC) Scheme provides special incentive to automotive assemblers; that is 50% of import duty reduction and treated an imported parts as localy supplied parts. In October of 1988, Thailand, Malyasia and Philippines made an agreement, and Indonesia decided its participation in September of 1994. The purpose of BBC Scheme is to take advantage of characteristics of the ASEAN region, and promote trade and the automotive industry in the region, by a scheme of parts supply by each country, that makes the best of the advantages of that country.

Each country in the ASEAN region that is producing automotives has pursued its own policy for promotion of domestic production, but all confront the problems of a "cost penalty" in the event that the part that must be procured domestically is more expensive than if it were to be imported. A "quality penalty" in the event that the domestic part is somewhat inferior in quality to the same part imported. The greatest reasons are that the existence of a large number of car assemblers relative to the small scale of the market, and that the local parts producers have insufficient technological capabilities. The situation can be called one of enforced demerits of scale.

The BBC Scheme is an effort to create a mutually complementary arrangement among the ASEAN countries to offset or eliminate the problem of diseconomies of scale. Although it is generally thought that lowering of tariffs under the AFTA will sooner or later make this scheme unnecessary it nevertheless has meaning to the region's automotive makers in that it will create a regional production network in the ASEAN region at the outset of the AFTA era of regional cooperation. The following is a description of how four Japanese companies intend to deal with the BBC Scheme (with regard to parts sourcing).

(2) Strategy of Japanese automotive industry for BBC Scheme

Toyota Motor's strategy for Asia is to make use of the BBC scheme for mutual complementation of parts requiring large capital investment and to establish assembly, procurement and production of parts requiring small investment in each country by division of work. (See Table 8.4-1)

Table 8.4-1 MAIN COMPLEMENTATION PARTS OF TOYOTA

	Main complementation parts	Capacity	Start of production
Thailand	Diesel engines and pressed parts	100,000 units	July 1989
Indonesia	Small gasoline engines for commercial vehicles	60,000 units	Jan. 1985
Philippines	Transmissions for commercial vehicles	200,000 units	Sept. 1992
Malaysia	Steering linkages	150,000 units	July 1992

In Indonesia and Thailand, which are moving ahead with domestic production of engines, Toyota is making an effort to produce castings locally as well. The reasons given for the establishment of a casting factory in Indonesia were <1> the low labor costs and abundant labor force (difficult in Taiwan), <2> the ability to use the scraps of the press factory (no press factory in the Philippines), and <3> the lack of problems with electric power by using own generators to make up for any shortages (lack of power in the Philippines). The cylinder blocks of one particular model of car are all being

made in Indonesia and are being imported back into Japan. Imports for forgings, specialty steels, and thin plate are still relied on from Japan.

Mitsubishi Motor has been gradually moving forward with mutual complementation of parts where possible in accordance with its policy of local production in the host countries. Going beyond attaining a complementary parts supply arrangement in the ASEAN area, Mitsubishi's plans are for a pan-Pacific parts supply system with MMC, the parent company in Tokyo, at the center. That is, the company is planning a parts and vehicle-type supply system encompassing the area of North America, Korea, Taiwan, Australia, and New Zealand. Production subsidiaries in America and Japan have already worked out their "voluntary plans" for expansion of parts sourcing and have adopted targets for parts imports and in-country procurement. Its current system of complementation is as follows: (See Table 8.4-2)

Table 8.4-2 MITSUBISHI MOTOR'S SYSTEM OF REGIONAL COMPLEMENTATION

Transmissions	Philippines -> Thailand, Malaysia, Japan
Bumpers and pressed parts	Thailand -> Philippines
Door and body parts	Malaysia -> Thailand
Dies and sheet metal parts	Thailand -> Japan
Truck frames	Thailand -> Japan

Honda is scheduled to produce only a small 57,000 cars in ASEAN even in its 1995 plans and is behind Toyota and Mitsubishi in terms of establishing a system of complementation of parts in the region. Honda considers ASEAN as a base for production of parts which it is no longer profitable to procure in Japan. The supply pattern primarily comprises aluminum cylinder blocks and other castings from Indonesia, plastic parts from Malaysia, transmissions and axle parts from the Philippines, and body parts from Thailand. By means of this arrangement, Honda expects to increase the local content ratio. In this regard, six Japanese parts manufacturers announced in September 1994 that they would be setting up operations in the Philippines to supply Honda with engine covers, brake pedals, clutch parts, drive parts, steering wheels, car air-conditioner heat exchanger parts, plastics, dies, etc.

Nissan's basic strategy is for mutual complementation of specific parts for its "Asia car" announced at the end of 1992 (plans calling for production and sale of 35,000 of 1600 cc gasoline engine cars a year). Specifically, it is standardizing the Sunny as a new model and promoting common use of parts. Its base for production is Thailand. Nissan is investing 85 percent of the capital investment of 5.3 billion yen earmarked for the production of the Asia Car in Thailand. (See Table 8.4-3)

Table 8.4-3 NISSAN'S ASIA CAR PLAN

		Investment Amount
Thailand	Cylinder blocks, crank shafts, transaxles	4.5 billion yen
Taiwan	Body panels	400 million yen
Malaysia	Engine components, instrument panels, bumpers	200 million yen
Philippines	Engine components, instrument panels, bumpers	200 million yen

(3) Strategy of Japanese electrical and electronic industries

Time of entry of Japanese electronic companies into ASEAN reveals that from 1985 to 1989 investment showed steep increase (See Table 8.4-4). This period is named Investment boom in the late 1980's and the boom was centered on Malaysia.

Table 8.4-4 TIME OF ENTRY OF JAPANESE ELECTRONIC COMPANIES INTO ASEAN

Year	Indonesia	Malaysia	Philippine	Singapore	Thailand
-1964					
1965-69	2				2
1970-74		12			9
1975-79		3	2	21	
1980-84		5	1	4	3
1985-89		44	5	13	26
1990		15	3	2	4
1991	5	7			3
1992	2	4		1	1
1993	2	1			
Total	11	91	11	50	39

Source: Electronics Industry Association of Japan (1993), List of Overseas Corporations

Toshiba is proceeding with a global strategy based on four centers: Japan, Asia, the U.S., and Europe. In Asia, it is setting up production bases in Thailand, Malaysia, Singapore, China, and Taiwan. Asia now accounts for 25 percent of its total sales (1990). Singapore is positioned as a base for procurement of parts (See Table 8.4-5).

Table 8.4-5 TOSHIBA'S ASEAN PRODUCTION BASES

		No. of employees
Singapore	<1> VTR mass production, design of popular types	2,128
	<2> Color TVs, TV components, OA terminal displays	1,036
Thailand	<1> TV CRTs	2,000
	<2> Room air-conditioners, refrigerators	1,341
	<3> TVs, refrigerators, electric rice cookers, small motors	1,183
Malaysia	<1> Facsimiles	142
	<2> Semiconductor devices, integrated circuits	1,087

Hitachi Ltd. has set up production bases in Thailand, Singapore, Malaysia, China, and Taiwan and considers Asia to be a base for exports to the world markets and a base for production in Asia. It is in the middle of construction of a system for linking on-line Tokyo with its production and sales bases in

other countries in Asia for the mutual transmission of shipping and part information. It is supplying parts to Vietnam from Thailand and starting up production of electric rice cookers and small sized refrigerators there (See Table 8.4-6).

Table 8.4-6 ASEAN PRODUCTION BASES OF HITACHI LTD.

		No. of employees
Singapore	<1> TVs	1,090
	<2> TV CRTs	2,190
Malaysia	<1> Transformers and other devices	1,400
	<2> Semiconductor devices	2,060
	<3> TVs and VTRs	900
	<4> Air-conditioners and compressors	620
Thailand	<1> TVs, electric fans, refrigerators, washing machines	1,660
	<2> Electric fans	1,670

Matsushita Electric Industrial is using Thailand, Malaysia, Indonesia, and the Philippines as bases for production. In particular, Malaysia accounts for just under 20 percent of its overseas production in value. Singapore hosts its Asian headquarters, while Malaysia hosts an R&D center for air-conditioners. Malaysia is Matsushita's base for supply of air-conditioners to the world. It produces 1 million (1992) window-type air-conditioners in that country and exports to 124 countries around the world. In production of parts, it is boosting production of film capacitors and small sized motors in Malaysia (See Table 8.4-7).

Table 8.4-7 ASEAN PRODUCTION BASES OF MATSUSHITA ELECTRIC INDUSTRIAL

Country	Products	No. of employees
Singapore	<1> Radios, radio-cassette tape recorders, tape recorders, stereos	2,806
	<2> Small sized motors	2,146
	<3> Resistors, transformers, audio components	1,642
	<4> Facsimiles	172
	<5> Computer displays	346
Malaysia	<1> Color TVs, electric fans, refrigerators, washing machines	1,818
	<2> Air-conditioners	1,880
	<3> Transformers	1,378
	<4> Compressors and small sized coils	1,626
	<5> Color TVs	1,236
	<6> Air-conditioners	840
	<7> Small sized motors	446
	<8> Accumulators	50
	<9> Air-conditioner R&D center	50
Philippines	<1> Color TVs, radios, stereos, electric fans, refrigerators, washing machines	1,491
	<2> ECM, floppy disk drives, monitoring use TV cameras	718
Indonesia	<1> Color TVs, radios, radio-cassette tape recorders, stereos, electric fans, refrigerators, washing machines, air-conditioners	2,511
	<2> Dry cells	312
Thailand	<1> Color TVs, radio-cassette tape recorders, car audios, electric fans	2,212
	<2> Refrigerators, washing machines, air-conditioners	807

Sanyo Electric has established bases for production in Thailand, Singapore, Malaysia, the Philippines, Indonesia, China, Taiwan, and Hong Kong. The share of Asia in its total sales has hit 9 percent (fiscal 1990). It has part procurement centers in Singapore, Hong Kong, and Indonesia. In the future, it expects demand to increase in Thailand, Malaysia, and Indonesia (See Table 8.4-8).

Table 8.4-8 ASEAN PRODUCTION BASES OF SANYO ELECTRIC

Country	Products	No. of employees
Singapore	<1> Air-conditioner use electrical component boxes	176
	<2> Microwave ovens, washing machines	774
	<3> Color TVs, radio-cassette tape recorders, tape recorders, stereos, CD players, telephones	1,773
	<4> Air-conditioners	437
	<5> Compressors	243
Malaysia	<1> Electric fans, refrigerators, air-conditioners, electric rice cookers, blenders	634
	<2> Radio-cassette tape recorders, car stereos	654
	<3> Radios, headphone stereos, radio-cassette tape recorders, tape recorders, stereos, telephones	1,816
	<4> Car stereos	101
Philippines	<1> Monochrome TVs, electric fans, refrigerators, car recorders, stereos	576
Indonesia	<1> TVs, electric fans, refrigerators, air-conditioners	1,272
	<2> Transformers, VTRs	395
Thailand	<1> TVs, electric fans, refrigerators, washing machines, air-conditioners, compressors, telephones	4,321
	<2> Semiconductor devices	6

Sharp is set up bases for production in Thailand, Malaysia, the Philippines, Indonesia, China, and Taiwan. The value of production in Asia has reached over 50 percent of Sharp's overseas production. Sharp also has bases for procurement of parts in South Korea, Hong Kong, and Singapore. In the area of R&D, it is engaged in design and development of ICs and software in Singapore and color TVs and audio equipment in Malaysia. It is emphasizing Malaysia as a base of operations. Its five affiliated companies there employ 5,500 workers - the biggest number in the company's overseas locations. Operations there form an integrated system engaged in everything from research and development to production and sales (See Table 8.4-9).

Table 8.4-9 ASEAN PRODUCTION BASES OF SHARP

Country	Products	No. of employees
Malaysia	<1> Radio-cassette tape recorders, stereos, car audio	2,500
	<2> Color TVs, TV chassis	1,800
	<3> Color TVs, VTRs, refrigerators, washing machines, vacuum cleaners	430
	<4> VTRs	210
Philippines	<1> Color TVs, headphone stereos, radio-cassette tape recorders, washing machines	1,400
Thailand	<1> Microwave ovens, refrigerators, air-conditioners, facsimiles	2,700

Sony has bases for production in Asia in Thailand, Singapore, Malaysia, Indonesia, South Korea, and Taiwan. It has a base for procurement of parts in Singapore. It engages in the design and development of precision parts, factory automation, factory automation systems, and dies in Singapore and the design and development of televisions in Malaysia (See Table 8.4-10).

Table 8.4-10 ASEAN PRODUCTION BASES OF SONY

Country	Products	No. of employees
Malaysia	<1> Radio, tape recorders, Walkmans	1,200
	<2> Color TVs, deflection yokes, television tuners	1,700
	<3> Audios, radio-cassette tape recorders, CD radio-cassette tape recorders	4,300
	<4> Microfloppy disk drives	1,500
	<5> 1/2 inch VTRs, 8 mm videos	700
Singapore	<1> Optical pickups, video heads, video drums	1,500
	<2> Color TV CRTs	300
Thailand	<1> Video tapes, audio tapes	500
	<2> Semiconductor devices	650
	<3> Color TVs, tuners, deflection yokes	400

8.4.2 Bases for procurement of parts and bases for design and development

In addition to production bases, Japanese companies make such strategy as to converge international procurement office (base) into one or several countries in order to procure components and parts efficiently from Asian Countries.

Design and development function is also being now shifted from Japan to other Asian countries in some companies. Table 8.4-11 reveals these shifts. Singapore is most often selected for international procurement base of components and parts, followed by Hong Kong. Singapore is also most preferred as base for design and development.

Japanese components and parts manufactures proceed with investment into ASEAN. As shown in Table 8.4-12, Malaysia is the biggest host country with 132 companies and followed by Singapore and Thailand with about 70.

Table 8.4-12 STATE OF INVESTMENT OF JAPANESE ELECTRONIC COMPONENT MANUFACTURERS IN ASEAN

	Thailand	Singapore	Malaysia	Philippines	Indonesia
Resistors	2	1	8	1	
Capacitors	4	8	8	1	1
Transformers	3	6	25	2	1
Transformers	1	3	3	1	1
Magnetic heads	1	1	4	1	
Small-sized motors	4	1	7		2
Connectors	1	2	5	1	
Switches	2		8	2	2
Small-sized mechanical parts		2	10		
Composite parts	4	6	12	4	
Magnetic recording media	2		1		
Other electronic components	19	19	24	3	5
Semiconductor devices	8	4	8	1	
Integrated circuits	4	4	5	1	
Television CRTs	1	2	1		
Total	39	50	91	11	11
Total of Electrical Machinery & Component Manufacturers	68	71	132	19	21

Note: The total does not coincide with total figures from each component manufacture because some companies produce more than two components.
Source: Electronics Industry Association of Japan (1993), '93 List of Overseas Corporations

Table 8.4-11 BASES FOR PROCUREMENT OF PARTS AND BASES FOR DESIGN AND DEVELOPMENT

Company	Base for procurement of parts	Countries in which design and development divisions are established
Aiwa	Singapore Hong Kong	Singapore Performs up to production design of headphone stereos and CD radio-cassette tape recorders.
NEC	Hong Kong Taiwan Singapore	Singapore Performs ASIC design and product development of software for local exchanges and computer software.
Sanyo Electric	Singapore Hong Kong Indonesia	N.A.
Sharp	R. Korea (representative office) Hong Kong (representative office) Singapore (representative office)	Taiwan Malaysia Performs design and development of color TVs and audio equipment, IC design, and development of related software at both locations.
Sony	Singapore (IPO base)	Singapore Malaysia Performs design of specifications for precision parts, factory automation, factory automation systems, dies, and TVs.
Toshiba	Singapore (IPO base)	
Japan Victor		Singapore Performs product development of AV equipment.
Pioneer	Singapore	None
Matsushita Denko	(Considering establishing IPO base in Singapore)	Thailand Performs design of specifications for control components.
Matsushita Refrigerator	Singapore Malaysia Thailand	Singapore Performs basic development and design for compressor parts.
Mitsubishi Electric	Singapore	Singapore Performs applied design for display monitors.
Murata Seisakusho	Singapore Thailand Taiwan	None

Source: Jyukagaku Kogyo Tsusinsha (1993), Asia no Denshi Sangyo

State of investment by Japanese companies in material processing industries is shown by Table 8.4–13, which indicates that Thailand in the largest receiptment with 40 company's halved by casting and dies.

Table 8.4–13 STATE OF INVESTMENT BY JAPANESE COMPANIES IN MATERIAL PROCESSING INDUSTRIES

	Casting	Forging	Powder metallurgy	Metal pressing	Dies	Total
Indonesia	12	2	0	0	1	15
Malaysia	9	0	2	0	6	17
Philippines	3	0	0	0	1	4
Singapore	2	0	3	0	10	15
Thailand	17	0	3	1	19	40

Notes: Figures include in–house operations of assemblers.
Source: Sokeizai Center (1994), *Handbook of Overseas Development of Casting Industry* (V).

Table 8.4-14 TRENDS IN JAPANESE INVESTMENT IN ASEAN

	Philippines	Thailand	Malaysia	Indonesia	Singapore	World total
1980	36	58	132	96	132	2,442
	(78)	(33)	(140)	(529)	(140)	(4,693)
1981	28	52	164	88	164	2,563
	(72)	(36)	(266)	(2,434)	(266)	(8,932)
1982	19	66	154	84	154	2,549
	(34)	(94)	(180)	(410)	(180)	(7,703)
1983	20	73	184	89	184	2,754
	(65)	(72)	(322)	(374)	(322)	(8,145)
1984	12	76	108	82	108	2,499
	(46)	(119)	(225)	(374)	(225)	(10,155)
1985	9	51	110	62	110	2,613
	(61)	(48)	(339)	(408)	(339)	(12,217)
1986	9	58	88	46	85	3,198
	(21)	(124)	(302)	(250)	(302)	(22,320)
1987	18	192	64	67	182	4,584
	(72)	(250)	(163)	(545)	(494)	(33,364)
1988	54	382	108	84	197	6,076
	(134)	(859)	(387)	(586)	(747)	(47,022)
1989	57	403	159	140	181	6,589
	(202)	(1,276)	(673)	(631)	(1,902)	(67,540)
1990	58	377	169	155	139	5,863
	(258)	(1,154)	(725)	(1,105)	(840)	(56,911)
1991	42	258	136	148	103	4,564
	(203)	(807)	(880)	(1,193)	(613)	(41,584)
1992	45	130	111	122	100	3,741
	(160)	(657)	(704)	(1,676)	(670)	(34,138)
1993	56	127	92	813	97	3,488
	(207)	(578)	(800)	(813)	(644)	(36,025)

Source: Ministry of Finance Financial Statistics Monthly and other data

Chapter 9 Supply of Raw Materials to Supporting Industries in Thailand

9.1 Supply of Materials for Parts Industry

In a broad sense, supporting industries include the industry which supplies materials to parts industries. Therefore, this chapter describes the supply of materials most used in the autoparts and electrical/electronic parts industries of Thailand.

Figure 9.1–1 shows the compositions of materials per unit used for passenger cars and heavy trucks. Table 9.1–1 gives the compositions of materials per unit used for 2,000cc cars during recent years. This table indicates that the use of steel products per unit has tended to decrease, though it exceeded in weight 70% of the average car weight. On the contrary, an increasing tendency has been seen in the use of non-ferrous metals, especially aluminium, and plastic materials. These tendencies suggest that motor vehicles have been smaller in weight. The main materials used in the autoparts industry are as follows:

1) Iron and steel,
2) Plastic materials,
3) Rubber, and
4) Glass.

This chapter also describes the actual situation and future projects of supply for these materials in Thailand.

Note: It is difficult to show the composition of materials per product used in the electrical/electronic parts industry, which produces parts for a very wide range of electrical and electronic finished products. However, it is supposed that the types of materials for these parts can be covered by 4 items listed above.

Table 9.1-1 CHANGES IN COMPOSITION OF MATERIALS USED FOR A 2000cc CAR

(Unit: %)

		1973	1977	1980	1983	1986	1989	1992
Pig iron	Pig iron	3.2	3.2	2.8	2.2	1.7	1.7	2.1
Ordinary Steel Products	Bar	1.2	1.0	1.0	0.9	0.9	0.8	0.8
	Hot-rolled sheets (~ 8mm)	6.9	7.1	6.9	7.6	7.1	6.3	8.5
	Hot-rolled plates (3mm ~ 6mm)	7.5	7.2	5.9	5.7	4.7	4.8	3.6
	Hot-rolled plates (6mm ~)	0.2	0.5	0.8	0.6	0.4	0.4	0.3
	Cold-rolled sheets	38.9	37.9	33.8	29.4	26.0	22.5	15.0
	High tensile strength steel sheets	–	0.5	1.4	4.1	7.3	6.4	3.9
	Galvanized sheets		3.8	5.7	5.5	5.4	10.0	14.8
	Other coated sheets	1.6	0.6	1.5	2.3	2.8	2.9	5.4
	Steel pipes	2.3	2.2	2.3	2.3	2.7	2.4	2.0
	Others	1.8	0.8	1.2	1.1	0.4	0.4	0.6
	Total	60.4	61.6	60.5	59.5	57.7	56.9	54.9
Special Steel Products	Carbon steel	7.9	6.8	6.1	6.0	6.1	6.0	5.8
	Alloy steel	5.6	4.6	3.8	3.6	3.4	3.5	3.7
	Free cutting steel	–	0.7	1.0	1.0	1.4	1.9	2.1
	Stainless sheet-resistant steel	0.4	0.9	0.9	0.9	1.0	1.0	1.4
	Spring steel	2.2	2.0	1.5	1.5	1.5	1.4	1.3
	Bearing steel	–	0.9	0.9	0.9	0.9	0.7	0.6
	Others	1.4	0.2	0.5	0.4	0.7	0.6	0.4
	Total	17.5	16.1	14.7	14.3	15.0	15.1	15.3
Nonferrous Metal	Electrolytic cathode copper	1.0	0.9	0.8	0.9	1.0	1.3	1.0
	Pb ingot	0.6	0.6	0.8	0.6	0.6	0.6	0.5
	Zn ingot	0.5	0.5	0.3	0.4	0.4	0.4	0.3
	Al ingot	2.8	2.6	3.3	3.5	3.9	4.9	6.0
	Others	0.1	0.1	0.4	0.2	0.2	0.2	0.2
	Total	5.0	4.7	5.6	5.6	6.1	7.4	8.0
Plastics Synthetic Resin	Phenol	0.1	0.1	0.1	0.2	0.1	0.1	0.1
	Polyurethane (PU)	0.5	0.5	0.8	0.9	1.2	1.0	1.1
	Polyvinyl chloride (PVC)	0.9	1.1	1.4	1.7	1.7	1.6	1.1
	Polyethylene (PE)	0.2	0.2	0.3	0.4	0.5	0.4	0.3
	Polypropylene (PP)	0.5	0.5	0.9	1.2	2.0	2.4	2.5
	ABS resin	0.4	0.7	0.5	0.5	0.7	0.8	0.7
	Others	0.3	0.4	0.7	0.6	0.4	0.3	0.4
	Engineering plastic	–	–	–	0.2	0.7	0.9	1.1
	Total	2.9	3.5	4.7	5.7	7.3	7.5	7.3
Other non-metal	Paints	2.1	1.6	1.8	1.7	1.7	1.4	1.5
	Rubber	4.8	4.3	3.7	3.5	3.0	2.7	3.1
	Glass	2.8	2.7	3.1	3.2	3.3	3.0	2.8
	Fiber	–	0.7	1.2	1.3	1.4	1.2	1.2
	Wood	–	–	0.2	0.3	0.5	0.4	0.4
	Others	1.3	1.6	1.7	2.7	2.3	2.7	3.4
	Total	11.0	10.9	11.7	12.7	12.2	11.4	12.4
	Grand total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Automotive Industry, Vol.26, August

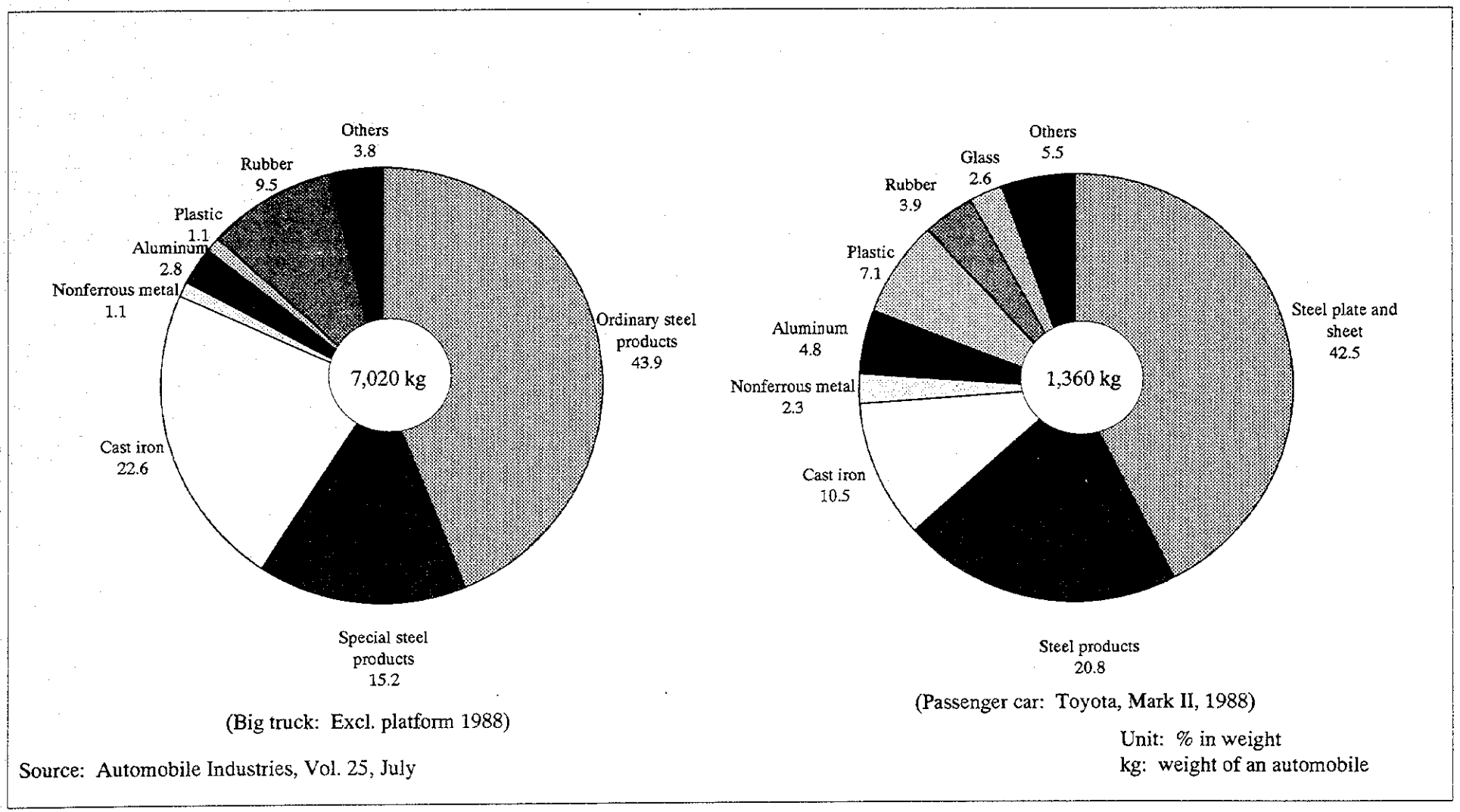


Figure 9.1-1 COMPOSITION OF MATERIALS USED FOR AUTOMOBILE

9.2 Iron and Steel

9.2.1 Supply and demand of iron and steel

Iron and steel production processes provide the following products in turn of processing:

1) Pig iron: Produced by reducing iron ores and extracting their iron components.
2) Crude steel: Steel ingots (such as ingot, blooms, slabs and billets) produced from pig iron and steel scrap.
3) Steel products: Steel plates, sheets, rods and pipes produced from crude steel materials.

Note 1: The "pig iron" generally means a product obtained by means of a blast furnace. The product which is made by the Direct Reduction of iron ores using natural gas is not called "pig iron", but "sponge iron" or "direct reduced iron".

Note 2: The "crude steel" is a statistical classification used to show the production and consumption of iron and steel. It includes steel ingots and cast steel. Crude steel is a product obtained by an intermediate production process between those for pig iron and steel products.

Note 3: The makers who produce pig iron by using blast furnace are generally called "Integrated steel mill", who manufacture crude steel and steel products as well.

(1) Apparent consumption of crude steel

Table 9.2–1 gives the annual apparent consumption of crude steel for recent years. In Thailand, the annual apparent consumption of crude steel increased from 5,732 thousand tons in 1989 to 10,471 thousand tons in 1993, or at the annual average growth rate of 16.3% for the four years. The annual production of crude steel doubled in this country between 1989 and 1993, as the construction of electric furnaces was accelerated. However, the domestic production accounted for 17.5% of the total supply in 1993, the rest (82.5%) being imported.

Table 9.2–1 APPARENT CONSUMPTION OF CRUDE STEEL

(Unit: 1,000 tons)

	1989	1990	1991	1992	1993	Annual G.R.
Apparent consumption	5,732	7,890	8,423	10,066	10,471	16.3%
Production (Crude steel)	750	900	1,000	1,100	1,500	18.9%
Import (Iron & steel products)	4,025	5,529	5,933	7,020	7,021	14.9%
Export (Iron & steel products)	193	152	223	123	120	−11.2%

(Note) Apparent consumption = Production + 1.3 x (Import – Export)
(Source) Production: IISI
Import/Export: Foreign Trade Statistics of Thailand, Thai Custom Department

Table 9.2-2 PRODUCTION AND IMPORT OF STEEL PRODUCTS IN THAILAND

(Unit: 1,000 tons)

Steel Products	1992			1993	
	Production	Import	Total	Import	Top 2 origins (Share %)
Construction materials	2,371	1,819	4,190	1,538	
Rail	-	5	5	1	Korea (56), Japan (15)
Sheet pile	-	2	2	5	Japan (60), Greece (40)
Shapes	650	374	1,024	396	Japan (26), Poland (20)
Bar	1,583	795	2,378	580	Indonesia (34), CIS (13)
Wire rod	138	643	781	556	Japan (13), CIS (13)
Plate & Sheet	-	3,225	3,225	3,517	
Plate	-	462	462	465	CIS (35), Brazil (18)
Hot-rolled coil	-	1,753	1,753	1,714	CIS (26), Japan (15)
Cold-rolled coil & sheet	-	1,010	1,010	1,338	Japan (64), Korea (11)
Coated sheet	499	387	886	393	
Silicon steel sheet	-	67	67	75	Japan (85), Korea (5)
Tinplate & Tin free sheet	206	101	307	52	Japan (77), S. Africa (8)
Galvanized sheet	293	197	490	232	Japan (55), Korea (33)
Other coated sheet	-	22	22	34	Japan (62), Korea (15)
Pipe	199	102	301	135	
Seamless pipe	-	38	38	59	Japan (83), U.K. (5)
Welded pipe	199	64	263	76	Japan (65), Korea (21)
Special steel	-	80	80	119	
Stainless sheet products	-	80	80	119	Japan (55), France (13)
Total (Steel Products)	3,069	5,613	8,682	5,702	
Pig iron	-	182	-	151	China (64), CIS (3)
Billet	-	1,224	-	1,167	CIS (35), Poland (18)
Total (Iron & steel)	-	7,019	-	7,020	

(Source) Production; Journals and others,
Import; Foreign Trade Statistics of Thailand, Thai Custom Department

(2) Production of crude steel

In Thailand, crude steel is produced by electric furnaces from scraps as well as materials of rerolled steel. There is not any ironworks where materials (pig iron and direct reduced iron) for crude steel are produced from iron ores.

There are 10 steel mills who use electric furnaces. The total production capacity of these furnaces is estimated about 2 million tons in 1993, while the actual production of crude steel was about 1.5 million tons. (Refer to the column "Production" in Table 9.2-1.) With an increasing demand for crude steel, every existing steel mill plans to expand its production capacity, and 4 other companies have an intention of participating in this industry. Therefore, it is expected that the total production capacity will reach 4.6 million tons by 1995/96. The domestic production, 1.5 million tons, of crude steel from electric furnaces is used for the production of construction materials; it is estimated that 1,100 thousand tons (73%) are used for round bars, 200 thousand tons (13%) for shape steel, and 200 thousand tons (13%) for wire rods. In short, the domestic production of crude steel in Thailand is not used to produce steel plates and sheets, that is, main materials indispensable in the automotive industry and the electrical/electronic industry. As of 1993, Thailand has no rolling mill to produce steel plates and sheets.

(3) Supply and demand of steel products

Table 9.2-2 indicates the production and imports (in weight) of steel products in Thailand. In the table, steel products are classified as follows:

Construction materials:	Rails, sheet piles, shapes, bars and wire rods.
Plates and sheets:	Plates, hot-rolled coils, cold-rolled coils, and cold-rolled coils & sheets.
Coated sheets:	Silicon steel sheets, tinplates & tin-free sheets, galvanized sheets, and other coated sheets.
Pipes:	Seamless pipes and welded pipes.
Special steel:	Stainless steel.

The production of steel products in 1993 was not available. The data in 1993 are as follows: The domestic production of steel products was 3.1 million

tons, with the imports of 5.6 million tons and the exports of 0.1 million tons (Table 9.2–1). Thus, the total consumption of steel products was 8.6 million tons.

From the data in Table 9.2–2, the self–sufficiency rates of steel products (the domestic production of each product divided by the total of domestic production and imports and multiplied by 100) are given as follows:

Table 9.2–3 SELF–SUFFICIENCY RATES OF STEEL PRODUCTS(1992)

	Self–supply(%)	Structure of consumption(%)
Construction materials	56.6	48.3
Plates & sheets	0	37.1
Coated sheets	56.3	10.2
Pipes	66.1	3.5
Special steel	0	0.9
Total	35.3	100.0

The self–sufficiency of steel products was 35.3% in 1992. It should be noted that steel plates and sheets accounted for 37.1% of the total domestic consumption of steel products, though they were not domestically produced. Coated sheets and pipes also are produced by processing and coating imported steel plates and sheets. Most sheets are imported in the form of coils, which will be cut into products of user–desired sizes at coil centers to be supplied to users. Almost 100% of steel products supplied to the automotive and electrical/electronic industries are imported.

Notes: The data in Table 9.2–3 are for 1992. The domestic production of steel plates and sheets was not yet launched in 1993. However, the first steel plate & sheet plant was started in operation in 1994. Future production plans for steel products, including plates and sheets, will be described in the next section.

Figure 9.2–1 shows the estimated supply flow of materials, ranging from raw materials to steel products, in Thailand during 1993. This flow chart indicates that the production of steel products depended upon imported materials, especially scraps, in Thailand during 1993 when there was no local ironworks.

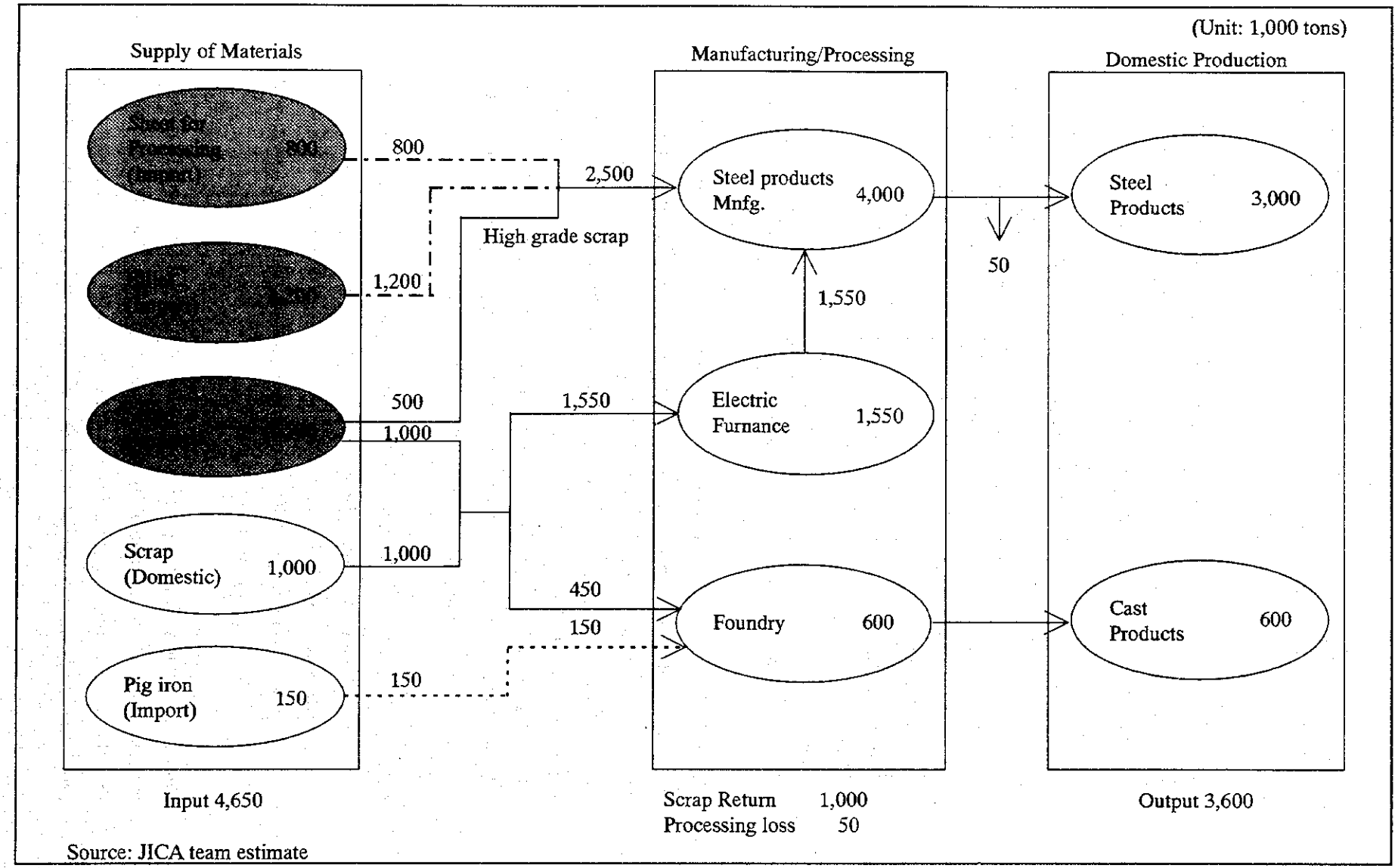


Figure 9.2-1 ESTIMATED DOMESTIC MATERIAL FLOW OF IRON STEEL IN THAILAND, 1993

Scrap imports have increased there in recent years, while the domestic supply of scraps was already levelled off. The annual imports of scraps increased from 865 thousand tons in 1992 to 1,450 thousand tons in 1993, up about 70%, though these data are not given in Table 9.2-2.

Table 9.2-4 below shows the consumption pattern of steel products in Thailand.

Table 9.2-4 CONSUMPTION PATTERN OF STEEL PRODUCTS CONSUMPTION IN THAILAND (1992)

By Industrial Sector	
Construction	63%
Electric	8%
General machinery	1%
Automobile	12%
Ship building	0%
Packaging (Cans)	8%
Wiring products	7%
Others	1%
Total	100%

The construction industry is the largest user of steel products, accounting for 63% of total consumption. An industrial source forecasts that steel products for automotives including steel sheets will grow in demand while consumption of steel products in the electric industry will level off.

9.2.2 Domestic production projects

As described above, the iron & steel industry in Thailand has adopted a production system wherein crude steel is produced by electric furnace from scraps, and processed into rods and shapes, for use in construction materials. In recent years, however, the imports of iron & steel products, especially steel plates and sheets, have been increasing as the automotive and electrical/electronic industries were developing. Of the annual apparent consumption, imports accounts for about 67% for crude steel (Table 9.2-1) and about 65% for steel products (Table 9.2-3). The annual supply of materials for crude steel and steel products is 4.65 million tons, of which 1 million ton of scraps is domestically supplied, the rest (over

78%) being imported (Figure 9.2-1, in weight).

Iron & steel imports in Thailand comprises mainly crude steel, scraps, hot-rolled coils and cold-rolled coils. Therefore, if the construction projects of new ironworks and rolling mills are realized in Thailand, it will be possible to reduce the imports of crude steel and scraps and those of steel plates and sheets or steel products respectively. From this point of view, new projects are now being developed in Thailand to assure the domestic production of steel plates and sheets and the construction of new ironworks as upstream capabilities. This section describes also domestic production projects developed by new steel and iron making plants under construction and planning.

Table 9.2-5 lists the new construction projects of iron and steel making plants, showing the production flow of steel plates and sheets, used as main materials in the automotive and electrical/electronic industries, going upstream to ironworks. In the steel plates and sheets production process, steel ingots are produced at first from pig iron, sponge iron, scraps and other materials. Then, hot-rolled coils are manufactured from slabs, a kind of steel ingots. A part of hot-rolled coils thus produced is directly supplied to end-users (such as press work industries), and the rest is used as materials for the production of cold-rolled coils and coated sheets. A part of cold-rolled coils is directly supplied to end-users, and the rest is used as materials for the production of coated sheets.

In iron and steel making plants, pig iron and steel ingots (ingots, slabs, billets and blooms) may be produced by means of blast furnaces if installed. One hundred fifty-one thousand tons of pig iron and 1,500 thousand tons of steel ingots, 1,651 thousand tons in total, were imported in Thailand during 1993. A part of imported scraps may be replaced by the domestic production of pig iron, sponge iron and steel ingots, if realized. The potential demand for these materials supplied by iron and steel making plants is estimated at 2,775 thousand tons, considering 1,500 thousand tons of imported scraps.

In Thailand, 3 construction projects of new iron and steel making plants are now under examination. NTS STEEL GROUP plans to construct a sponge iron production plant having a capacity of 1.5 million tons/year and employing a direct reduction process using natural gas. UNITED IRON AND STEEL CO., LTD. also plans to construct a sponge iron production plant having a capacity of 750

Table 9.2-5 PROJECTS AFTER 1993 IN STEEL INDUSTRY OF THAILAND

(Unit: 1,000 tons/year)

PRODUCTION FLOW	PIG IRON/INGOT	HOT-ROLLED SHEET	COLD-ROLLED SHEET	COATED SHEET
Import, 1993	Pig iron 115, Billet 1,167 Scrap 1,457 (Total 2,775)	HR Sheet 1,714	CR sheet 1,338	Tinplate 307 GI sheet 490
Projects after 1993	① NTS STEEL GROUP • Sponge iron 1,500 • Under planning ② UNITED IRON AND STEEL CO. • Sponge iron 750 • Application stage ③ THAI SPECIAL STEEL INDUSTRY CO. • Billet 1,200 • Sponge iron 120 • Under planning	① SAHAVIRIA STEEL INDUSTRY CO. (SSI) • HR sheet 1,800 (Expansion to 2,400 under discussion with BOI) • Operation start (Feb. 1994) • BOI project • Location: Bang Saphan ② SIAM CEMENT GROUP • Under negotiation with BOI for approval of a new project	① THAI COLD ROLLED STEEL SHEET CO. (TCRS) • CR sheet 670 • Obligation for construction start (Feb. 1995) & Operation start (Feb. 1997) • BOI approved • Location: Bang Saphan ② SIAM CEMENT GROUP • CR sheet 800~1,000 • Operation start (Feb. 1998) • BOI application stage • Location: Map ta Phut	① THAI COATED STEEL SHEET CO. (TCS) • Electro-galvanized coil 135 • Operation start (Apr. 1994) • Location: Bang Saphan

OTHER MAJOR PROJECTS AFTER 1993

Name of Company	Products	Capacity	Operation
① THAINOX STEEL CO., LTD.	Cold-rolled stainless steel	60	Dec. 1993
② SAHAVIRIA PLATE MILL CO., LTD.	Steel plate	200	End 1994
③ LPN PLATE MILL CO., LTD.	Steel plate	300	End 1994
④ SIAM YAMATO STEEL CO., LTD.	Heavy shapes & sections	600	End 1994

thousand tons/year and employing the same process, and it is reportedly about to submit the application to the BOI for approval. There is also a "THAI SPECIAL STEEL INDUSTRY" project. This project aims to produce 1,200 thousand tons/year of billets and 120 thousand tons/year of sponge iron by employing a COREX process (new process for producing molten iron by using a coal reduction method as well as sponge iron by using waste gas produced during the production of molten iron). (This information was provided by the Industrial Economic Study Division 1, Ministry of Industry.) These projected capacities simply total 3.57 million tons.
However, the feasibility of the 3 projects is not predictable for the reasons that the construction of an iron or steel making plant requires an enormous investment capital, and that the BOI's approval for all the projects may depend upon the forecasted future demand for materials.

Concerning hot-rolled steel sheets, SAHAVIRIA STEEL INDUSTRY CO., LTD. (SSI) (affiliated to SAHAVIRIA group) constructed the first hot-rolling plant in Thailand with the Italian Government's cooperation, and started its operation in 1994. This plant is situate at Bang Saphan along the west coast in the southern part of Thailand and has a production capacity of 1.8 million tons/year. For comparison, the imports of hot-rolled steel sheets in this country were 1.714 million tons in 1993. The BOI has since protected this company by prohibiting any other (SIAM CEMENT GROUP) from making a new participation in the production of hot-rolled sheets. However, other groups including SIAM CEMENT group are now making negotiations with the BOI to obtain its approval for their new projects, expecting that the demand for hot-rolled sheets will expand rapidly in Thailand. To respond to their challenges, SSI filed an application with the BOI to expand the production capacity of its plant from the initial level of 1.8 million tons/year to 2.4 million tons.

As for cold-rolled sheets, there are 2 new projects. One is the construction project of a plant having a production capacity of 670 thousand tons/year. THAI COLD ROLLED STEEL SHEET CO., LTD. (TCRS) , affiliated to SAHAVIRIA group, has already obtained the BOI's approval for this project. By the way, the imports of cold-rolled steel sheets reached 1,338 thousand tons in 1993. This project was approved by the BOI under the condition that the projected plant must start to be constructed in February 1995 and operated in 1997. Its site is located at Bang Saphan where SSI's hot-rolled sheets plant also is situated. Another project is a

plant having a production capacity of 0.8 to 1 million tons/year. SIAM CEMENT group has already filed the application of this project with the BOI for approval. Its expected site is located at Map Ta Phut in the East Coast industrial zone. It will be soon known whether or not TCRS will be able to launch in the construction of its new plant as expected, and whether or not SIAM CEMENT group will be able to obtain the BOI's approval for its project.

As regards coated sheets, local makers have already existed, and had a total production capacity of 499 thousand tons/year in 1992. The imports of coated sheets standed 387 thousand tons/ in 1992 and 393 thousand tons in 1993.

In April 1994, THAI COATED STEEL CO., LTD. (TCS), affiliated to SAHAVIRIA group, started the production of electro-galvanized coils at its new plant having a capacity of 135 thousand tons/year. This plant is situated at Bang Saphan and adjacent to SSI's hot-rolled sheet plant. The total imports of galvanized sheets reached 490 thousand tons in 1993.

The productions attained and projects made by other iron & steel makers for recent years are given as references in the lower part of Table 9.2-5, though there data are not directly related to automotive and electric & electronic industries.

9.2.3 Coil centers

Coil centers purchase steel plates and sheets in the form of coils, cut there coils in sheets of sizes desired by users (such as automotive, electric & electronic and welded pipe working industries), and supply cut sheets to users. They are also called "steel centers" or "steel service centers". They are equipped with uncoilers, levellers, slitters, shearers and other machines necessary for their activities.

Table 9.2-6 gives the outline of major coil centers in Thailand. There are now 20 coil centers in the country. They are now so excessively equipped that the total production of works exceeds 1 million tons a year. In Thailand, however, SIAM TECH CENTER (STC) is only one coil center that has a capacity to shear panels for passenger cars. As yet, STC has a supplying capacity enough to satisfy the local market's needs. Press workers are not included among coil centers, users, because they work purchased coils by means of rapid or continuous precision presses, to produce precisely pressed parts for electronic components. Thailand is

Table 9.2-6 OUTLINE OF MAJOR COIL CENTERS IN THAILAND

Coil center	Start of Operation	Ownership For./Loc.	Processing Capacity (tons/mo.)	Location	Clients
1. Siam Steel Service Center (SSSC)	1980.10	55/45	30,000	Samrongtai	Siam Matsushita, Saha Thai, Siam Steel Group
2. Bangkok Coil Center (BCC)	1989.11	51/49	12,000	Sukuwasad	Toshiba, Siam Nissan Motor
3. Bangkok Pacific Steel (BPS)	1981.05	0/100	12,000	Sukuwasad	Magnetic Steel, etc.
4. Thai Steel Service Center (TSSC)	1980.09	49/51	10,000	Sukuwasad	Thai Steel Pipe
5. Thai Sumilock (TSLX)	1990.12	60/40	1,000	n.a.	Magnetic Steel, etc.
6. CS Metal (CSM)	1987.12	50/50	10,000	Samrongtai	Minebea, Sharp
7. Central Metal (CMT)	1989.07	50/50	8,500	Bang Poo I.E.	BKK Container, etc.
8. United Coil Center (UCC)	1990.09	51/49	6,000	Sukuwasad	Mainly dome companies
9. Lohakit Steel Service Center (LHK)	1990.11	49/51	3,000	Sukuwasad	Mainly stainless steel
10. Siam Hi-Tech Steel Center (STC)	1993.03	80/20	13,000	Bang Pakong I.E.	Toyota, Isuzu, SUE, Top tube
11. Marubeni Steel Processing (MSP)	1994.04	75/25	500	Bangna-Trad-Hi-way	
12. Sumit Advanced Materials (SAM)	n.a.	40/60	3,000	Leam Chabang	
Total			109,000		

(Note) - Production = 109,000 MT/mo. x 12 mos./year x 80% = 1.05 million tons/year
- There are 20 or more coil center including the above over Thailand

(Source) JICA team compilation based on interview surveys

Table 9.2-7 PRICES AND IMPORT DUTIES OF STEEL PRODUCTS

		CIF Price '94	Import duty (%)		
		(US$/ton)	1993/4	1995/6	1997
Sheet:	Hot rolled	400	8	10	10
	Cold rolled	500	400 B/T		
	Electro-galvanized(*)	580	15	10	
	GI sheet(*)	565	17	13	10
	(*) 20% of the import duty is added as a surcharge for coil width less than 600 mm.				
Bars/wire rods			20	10	10
Special steel:	SC	510	25 (<35mm ϕ)	9 (35≧mm ϕ)	
	SCM	620	9		
Aluminum:	Ingot	1,615	6 (AFTA 3)		
	Plate	2,450	35		
Foundry mat'l:	Pig iron	190	5	1	1
	FeSi	610	6		
	FeMn	500	6		
	FeSiMn	550	6		
Crude:	Slab		5	5	5
	Billet		10	5	5
	Scrap (HMS No.1)	165	0		
	Domestic scrap				
	(HSM No.1)	115	–	–	–
	(HMS No.2)	96	–	–	–
	(Light scrap)	77	–	–	–

Source: JICA team's survey

still suffered from a shortage of coil centers that have a technological level required by the production of cut sheets for consumer electronics precision components.

9.2.4 Prices and import duties of steel products

Table 9.2-7 gives a list of prices (CIF in Bangkok) and import tariffs for steel products, crude steel and scraps. In this table, only the prices for scraps are shown among those for domestic products. One of complaints made by iron & steel-related industries is that import duties are not imposed on the actual import prices (CIF), but on estimated (or reference) prices. These reference prices are semiannually reviewed. However, they are often set at higher levels than the corresponding actual import prices. As a result, import duties tend to be higher than those estimated depending upon the corresponding actual import prices. Another complaint is that import tariffs imposed on cold-rolled sheets and coated sheets are actually higher than those on hot-rolled sheets. For reference, import duties on cold-rolled sheets are now 400 bahts/ton and equivalent to about 3% in import tariff, determined from the corresponding actual import prices.

There are other complaints such as imported steel products are often rusted or damaged during the prolonged customs clearance, and that customs clearance procedures are not always fair. These complaints are similar to the major issues that the parts industry pointed out, as described above.

9.3 Plastics

9.3.1 Plastics for automotive and electrical/electronic industries

The consumptions of plastics per unit in automotives and electrical/electronic equipment made in Japan are estimated from a wide range of data as follows:

Passenger cars (2,000 cc)	96.5 kg/unit
Electric washing machines	9.6 kg/unit
Electric refrigerators	13.6 kg/unit
Color TV sets	7.0 kg/unit
Electric vacuum cleaners	3.9 kg/unit

Table 9.3-1 and 9.3-2 indicate the consumption patterns of resins by type in 4 industries; automotive, electric equipment, electronic equipment and OA (office automation) equipment. These tables prove that among all the types of resin, the consumption of commodity thermoplastic resins is the highest in each of the 4 industries; electric equipment (75.4%), automotive (67.6%), electronic equipment (63.9%), and OA equipment (56.0%) in ranking. In the consumption of engineering resins, the ranking is reverse; OA equipment (32.8%), electronic equipment (28.3%), automotive (8.2%), and electric equipment (8.2%).

Table 9.3-1 A PATTERN OF PLASTIC CONSUMPTION BY PLASTIC BY INDUSTRIAL SECTOR

(Unit: % in weight)

Plastic	Automobile	Electrical Equipment	Electronic Equipment	OA Equipment
Commodity thermoplastic resins	67.6	75.4	63.9	56.0
Thermoset resins	15.8	16.9	7.1	5.2
Engineering plastics	8.2	5.5	28.3	32.8
Speciality engineering plastics	1.8	2.0	0.5	5.9
Other plastics	6.6	0.2	0.2	0.1
Total	100.0	100.0	100.0	100.0

Source: Structural Analysis of Synthetic Resin Consumption of Japan, 1983; Editorial Supervision by MITI

Table 9.3–2 THE TOP FIVE PLASTIC DEMAND BY INDUSTRIAL SUBSECTOR

(Unit: % by weight of total plastic consumption)

	1st rank		2nd rank		3rd rank		4th rank		5th rank	
Automobile										
Total plastic	PP	(28.8)	PVC	(21.5)	PU	(13.5)	ABS	(9.1)	HPPE	(4.6)
Engineering plastic	6N	(2.5)	PMMA	(1.7)	POM	(1.5)	MPPE	(1.4)	66N	(1.0)
Electrical Equipment										
Total plastic	PP	(37.2)	ABS	(15.5)	PS	(14.1)	PF	(6.5)	PU	(6.5)
Engineering plastic	PC	(1.4)	PMMA	(1.4)	6N	(1.2)	66N	(0.8)	POM,MPPE,PET	(0.6 each)
Electronic Equipment										
Total plastic	PS	(37.8)	ABS	(17.0)	PET	(13.9)	POM	(4.7)	PMMA	(4.2)
Engineering plastic	PET	(13.9)	POM	(6.2)	PBT	(3.2)	66N	(1.6)	MPPE	(1.6)
OA Equipment										
Total plastic	ABS	(41.7)	MPPE	(22.8)	PS	(7.5)	POM	(4.7)	PMMA	(4.2)
Engineering plastic	MPPE	(22.8)	POM	(4.7)	PMMA	(4.2)	PC	(3.0)	PBT,PPS	(1.1 each)

Source: Structural Analysis of Synthetic Resin Consumption of Japan 1993; Under editorial Supervision by MITI of Japan

Table 9.3-3 DEMAND/SUPPLY OF COMMODITY PLASTIC RESINS IN THAILAND

(Unit: 1,000 tons)

	1987	1988	1989	1990	1991	1992
LDPE/LLDPE						
Production	72.7	70.4	70.0	75.0	95.0	95.0
Import	5.0	2.2	26.0	44.4	38.5	53.4
Export	–	nil	nil	nil	nil	nil
Consumption	77.7	72.5	96.0	119.4	133.5	150.4
HDPE						
Production	67.3	60.0	31.1	154.6	161.2	197.8
Import	69.0	48.0	67.0	55.2	40.5	48.2
Export	–	nil	nil	10.9	28.7	35.0
Consumption	136.3	108.0	98.1	198.9	173.0	211.0
PP						
Production	–	–	9.0	139.0	192.0	229.0
Import	1.4	81.2	100.5	118.4	31.5	47.0
Export	–	3.9	5.3	4.1	48.7	6.3
Consumption	1.4	77.2	104.2	253.3	174.9	270.3
PVC						
Production	104.0	109.0	118.0	130.4	148.7	169.8
Import	20.0	27.0	37.0	59.0	74.0	88.0
Export	7.0	4.0	7.0	17.0	17.0	29.6
Consumption	117.0	132.0	148.0	172.4	205.0	228.2
PS						
Production	30.0	33.0	45.0	50.0	76.0	76.0
Shortage	7.0	8.5	6.0	16.0	19.0	44.0
Consumption	37.0	41.5	51.0	66.0	97.0	120.0
Total						
Production	274.0	272.4	273.1	549.0	672.9	767.6
Import	95.4	158.4	230.5	277.0	184.5	236.6
Consumption	369.4	431.2	497.3	810.0	783.4	979.9

Note: (Apparent) consumption = Production + Import – Export
Source: UNICO's database

Table 9.3-4 PRODUCTION CAPACITY OF PETROCHEMICAL PRODUCTS

(Unit: MTPA)

Products	Company	Location	Capacity		
			1992	Expansion (1994/5)	After Expansion
Ethylene	National Petrochemical (NPC)	MTP			
Propylene	National Petrochemical (NPC)	MTP	315,000	418,000	733,000
LDPE	Thai Petrochemical Industry (TPI)	RYG	105,000	211,000	316,000
HDPE/LLDPE	Thai Petrochemical Industry (TPI)	PYG	65,000	70,000	135,000
HDPE	Thai Polyethylene (TPE)	MTP	60,000	7,000	67,000
LLDPE	Thai Polyethylene (TPE)	MTP	120,000	12,000	132,000
HDPE	Bangkok Polyethylene (BPE)	MTP	80,000	15,000	95,000
PE Total					
LDPE	LDPE		65,000	70,000	135,000
LLDPE	LLDPE		80,000	15,000	95,000
HPDE/LLDPE (Co-produc	HPDE/LLDPE (Co-production)		60,000	700	67,000
HDPE	HDPE		120,000	212,000	332,000
Total	Total		325,000	297,700	629,000
PP	HMC Polymer (HMC)	MTP	140,000	10,000	240,000
	Thai Polypropylene (TPE)	MTP		10,000	100,000
	Total	-	140,000	20,000	340,000
VCM	Thai Plastic & Chemical (TPC)	MTP	140,000		140,000
	Vinythai	MTP		140,000	140,000
	Total	-	280,000	200,000	480,000
PVC	Thai Plastic & Chemical (TPC)	MTP/BKK	180,000		180,000
	Vinythai	MTP		135,000	135,000
	Total	-	180,000	135,000	315,000
PVC Compound	Thai Plastic & Chemical (TPC)	MTP	57,000		57,000
	Riken Thailand	SMP	12,000		12,000
	Total	-	69,000		69,000
PS	Thai Petrochemical Industry (TPI)	RYG	30,000		30,000
	HMT Polystyrene (HMT)	MTP	25,000		25,000
	Pacific Plastics Thailand	MTP	30,000		30,000
	Sritep Thai Plastcem	SMP	30,000		30,000
	Eternal Resin	BKK	25,000		25,000
	Total	-	140,000		140,000
ABS Resin	Thai ABS	RYG	18,000	12,000	30,000
Acrylic Resin	Siam Chemical Industry	BKK	1,800		1,800
Epoxy Resin	Thai Epoxy & Allied Products	MTP	10,000		10,000
PET Resin	Thai Polyester		15,000		15,000
Polyurethane Foam	Pacific Plastics Thailand	MTP	25,000		25,000
Polyurethane Premix	MTC Thailand	SMP	1,500		1,500
Urethane Resins	Siam Chemical Industry (SCI)	BKK	1,000		1,000
Urea Resins	Thai Chemical	BKK	25,000		25,000
Phenol Resin	Thai GCI Resitop	MTP	5,000		5,000
Alkyd-Phenol Resin	Internal Resins		7,700		7,700
Alkyd-Melamine Resins	Siam Chemical Industry (SCI)	BKK	12,000		12,000
Unsaturated Polyester	Siam Chemical Industry (SCI)	BKK	51,000		51,000
	Thai MITUI TOATSU	WGW	12,000		12,000
	Total	-	63,000		63,000
PO	Thai Petrochemical Industry (TPI)	MTP		20,000	20,000
PPG	Thai Petrochemical Industry (TPI)	TMP		25,000	25,000
Phthalic Anhydride	Eternal Petrochemical	BKK	30,000		30,000
Na-Alkylaryl Sulphonate	Lever Brothers Thailand	BKK	29,740		29,740
					0
SB Latex	Siam Synthetic Latex	MTP	20,000		20,000
Textile Agents	Siam Textile Chemical	SMP	4,500		4,500

(Note) Location: MTP = Map Ta Phut, RYG = Rayong, BKK = Bangkok, WGW = Well Grow Industrial Estate
SMP = Samut Prakan

(Source): UNICO's field database

Table 9.3-5 DEMAND/SUPPLY PROJECTION:COMMODITY PLASTICS

(Unit: 1,000 tons)

	1992 1/	1993	1994	1995	1996	1997
LDPE/LLDPE						
Capacity	130.0	130.0	150.0	150.0	150.0	150.0
Production	95.0	95.0	127.5	135.0	135.0	135.0
Demand	150.4	152.8	165.0	178.0	192.5	208.0
Balance	-55.4	-57.8	-37.5	-43.0	-57.5	-73.0
HDPE						
Capacity	185.0	315.0	515.0	515.0	515.0	515.0
Production	197.8	265.3	330.0	400.0	440.0	440.0
Demand	211.0	281.9	300.0	318.0	337.0	357.0
Balance	-13.2	-16.6	30.0	82.0	103.0	83.0
PVC						
Capacity	188.0	323.0	323.0	323.0	323.0	323.0
Production	169.8	275.0	280.0	293.0	295.0	295.0
Demand	228.2	236.0	258.0	282.0	309.0	338.0
Balance	-58.4	39.0	22.0	11.0	-14.0	-43.0
PS						
Capacity	125.0	154.0	154.0	154.0	154.0	154.0
Production	76.0	125.0	135.0	140.0	140.0	140.0
Demand	12.0	131.5	144.0	158.0	173.0	190.0
Balance	-44.0	-6.5	-9.0	-18.0	-33.0	-50.0
PP						
Capacity	280.0	300.0	400.0	400.0	400.0	400.0
Production	229.0	230.0	320.0	340.0	360.0	360.0
Demand	270.3	264.3	288.0	314.0	342.0	375.0
Balance	-41.3	34.3	32.0	26.0	18.0	-15.0
Total						
Capacity	908.0	1,222.0	1,542.0	1,542.0	1,542.0	1,542.0
Production	767.6	990.3	1,192.5	1,308.0	1,370.0	1,370.0
Demand	871.9	1,066.5	1,155.0	1,250.0	1,353.5	1,468.0
Balance	-212.3	-7.6	37.5	58.0	16.5	-98.0

Note: 1/ actual
Source: UNICO's database

Commodity resins are mainly used for interior trims, seats, instrument panels and console boxes in automotives as well as housings and frames in electric, electronic and OA equipment.

Engineering plastics are mainly used for automotive parts (such as pedals and wheel caps), electric equipment parts (such as heater fans, air-conditioner grills) and engine parts (such as cylinder head covers, radiator tanks) in automotives to minimize the weight of vehicles. They are also used for structures (such as chassis) and movable parts (such as gears, pulleys, etc.) in electric, electronic and OA equipment.

9.3.2 Supply and demand of plastics in Thailand

Table 9.3-3 gives the demands for the whole of commodity resins in Thailand for recent years. In 1992, the demand for PVC, PP and PS (major commodity resins used in automotive and electrical/electronic industries) exceeds the domestic production of these resins. Table 9.3-4 indicates the actual domestic production and projected production increase of each commodity resin by company. Table 9.3-5 gives the estimated annual demands for commodity resins in the period of 1994 to 1997, based upon the known production increase projects. From the data given in this table, it is forecasted that although the self-supply system is established for PVC, PP and PS in 1994, the growth of demand will exceed that of supply and require to rely on imports again in 1997, unless any additional project for increasing the production is realized.

Table 9.3-6 indicates the annual demands for engineering resins in Thailand for recent years. For the domestic productions of engineering resins, refer to Table 9.3-4. It should be noticed that ABS resin is classified in engineering resins here, PET resin is omitted in Table 9.3-6, because it is generally produced for bottles. Among engineering resins, only ABS resin is produced (by Thai ABS Co., Ltd., 18,000 tons/year) in Thailand.