

Foreign Direct Investments and Development: The Malaysian Electronics Sector

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1 Introduction

The Malaysian economy has always been dependent on foreign direct investment (FDI). This is unlike certain other East Asian countries such as Korea, Taiwan and Japan whose economies have been powered essentially by locally owned corporations. As a result, whereas these countries have been able to produce large, internationally-known and technologically advanced corporations, this is not the case with Malaysia. Therefore, questions can be raised as to whether Malaysia's reliance on foreign corporations has stifled the process of developing indigenous technological capabilities.

This paper will present findings of a research project financed by CMI. The objectives of the project were as follows:

- a) To investigate the structure of FDI in Malaysia
- b) To investigate the significance of FDI in the Malaysian electronics industry in terms of employment and exports.
- c) To investigate the contribution of FDI in the process of enhancing Malaysia's technological capabilities.

Data was largely obtained from published sources. In addition, interviews were also carried out with the managers of four foreign multinational corporations in the electronics industry (two American companies and two Japanese companies).

2 Pattern of FDI Flows into Malaysia.

For the past two decades, Malaysia has been receiving a lot of foreign direct investments. Even though total foreign investments have generally increased over the years, however, since the early 1990s, there have been several periods of slowdowns. In 1993 FDI dropped drastically due to a slowdown in investments from two main sources of investments for Malaysia - Japan and Taiwan. One of the main reasons for this slowdown is the rise in wage rates in Malaysia relative to other Southeast Asian countries (such as Vietnam and Indonesia). Investments from the USA were relatively stable because some of the investments were in the petroleum and petroleum products sector which were not affected by increases in wages in the manufacturing sector. The currency crisis of 1997 that affected almost all of the countries in Southeast Asia also served to reduce investments into Malaysia. However, investments from USA are also largely unaffected. Moreover the drastic depreciation of the Malaysian Ringgit vis-à-vis the US Dollar also resulted in an increase in the value of those investments. The FDI figures are presented in Table 1.

Table 1: FDI (flow) in Malaysia from selected countries (RM million) (in current value)

Country/Year	1980	1990	1993	1996	1999
US	105.3	567.3	1,757.7	2,893.2	5,158.9
Japan	94.3	4,212.6	1,661.2	4,607.3	1,002.7
Taiwan	23.8	6,339.1	894.2	775.7	267
Singapore	117.3	895.3	521.9	4,765.5	902.3
Total	2320.7	14,004.3	6,828	15,037.7	9,329.9
Total FDI in Malaysia	729.5	17,629.1	6,287.2	17,056.5	12,268.5

Source: MIDA

2.1 Structure of FDI in Malaysia

In terms of industry, the major recipients of FDI over the last 10 years are chemical and chemical products, petroleum products, electrical and electronics, paper printing and publishing, and textiles and textile products (see Table 2). The largest have, however, consistently been the electrical and electronics industry. It received more than RM9 billion foreign investments during the peak year of 1996. The financial crisis of 1997 slowed the inward flow considerably in 1998. However, it picked up again in 1999 by almost four-fold. It is worthwhile to note that the petroleum products sector was not drastically affected by the currency crisis of 1997. This is possibly due to the fact that unlike the electronics sector where components are largely imported and thereby vulnerable to currency depreciation, petroleum products sector only imports capital equipment.

FDI in the textile and textile products industry peaked in 1994. Since then, it has slowed down drastically. This is partly due to the fact that investments in this labor-intensive sector have been discouraged by increasing wage rates in Malaysia, especially in comparison to wage rates in other countries such as Cambodia and China.

FDI in chemicals jumped in 1998 when a number of European firms such as BASF set up factories in the country to cater for Malaysian and Southeast Asian markets. The depreciation of the Ringgit also magnified the size of the investment.

Table 2: FDI in Malaysia in Selected Sectors (RM million – current prices)

Sector/year	1990	1994	1996	1998	1999
Chemical	1,727.3	649.0	218.3	4,149.9	262.6
Petroleum products	2,703.0	709.9	2,510.8	2,151.5	3,147.8
Electrical & Electronics	3,773.2	4,825.5	9,239.5	1,905.7	5,943.2
Paper Printing and Publishing	373.6	84.9	1,571.9	286.7	1,071.5
Textiles & Textile Products	874.2	1,218.7	344.1	624.1	60.6

Source: MIDA

3 The Electronics Industry in Malaysia's Economic Development

Total FDI in the electronics industry peaked in 1996 when it received more than RM11 billion. Even when FDI slowed down in 1999, the sector received more than RM5 billion. The role of FDI in the Malaysian electronics sector is very significant. As can be seen from Table 3, in some years FDI constitute 86% of total capital investments in the sector. However, there is a tendency for FDI in this sector to be volatile in nature. This is partly due to the nature of the global semiconductor industry, which is characterized by price fluctuations caused by periodic occasions of oversupplies and shortages. The fluctuating FDI pattern in the Malaysian electrical and electronics sector is presented in Table 3.

Table 3: FDI in Electronics Sector (RM bill.)

	Total FDI in Electronics Sector	Total Capital Investments in Electronics Sector	FDI as % of Total Capital Investments in Electronics Sector
1991	1.94	2.255	86.0
1992	0.563	0.885	63.6
1993	1.588	1.919	82.8
1994	4.473	5.555	80.5
1995	2.282	2.759	82.7
1996	8.995	11.816	76.1
1997	2.730	5.392	50.6
1998	1.422	1.653	86.0
1999	5.755	6.764	85.1

Source: MIDA

The performance of the sector in terms of output and exports is also very impressive as can be seen from Table 4. The sector has been growing every year in terms of output, employment and export (except for a decrease in employment in 1998 following the severe financial crisis of 1997). The contribution of the sector in terms of balance of payments has been very significant as evidenced by the impressive growth in exports – from RM85 billion in 1995 to RM178.4 billion in 1999.

Table 4: Output and Exports in the Malaysian Electronics Industry

Year	Output		Exports (in current prices)	
	RMbn	% Growth	RMbn	% Growth
1995	71.0	25.9	85.0	28.0
1996	76.0	7.0	91.7	7.9
1997	85.6	12.6	107.3	17.0
1998	103.5	20.9	146.1	36.2
1999	129.8	25.4	178.4	22.1

Source: Malaysian Industrial Digest (Quoted in Business Times, June 16, 2000)

The electronics industry can be argued to be the main engine that powers the country's economy. It is the main contributor to the country's exports of manufactured products. As can be seen from Table 5, the sector has consistently contributed more than 50% of Malaysian exports of manufactures.

Table 5: Gross Exports of Malaysian Manufactures in 1988, 1993 and 1999 (Jan –Aug)

Sector	1988	%	1993	%	1999	%
Electrical and Electronics Machinery, appliances and parts	20,743	56.6	50	58.8	123.6	71.4
Transport Equipment	1,235	3.3	n.a.	n.a.	3.2	1.9
Food	1,716	4.7	n.a.	n.a.	3.6	2.1
Beverages and Tobacco	80	0.2	n.a.	n.a.	3.6	2.1
Textiles, Clothing and Footwear	3,074	8.4	n.a.	n.a.	6.2	3.6
Wood and Wood Products	1,074	2.9	n.a.	n.a.	6.4	3.7
Rubber Products	1,170	3.2	n.a.	n.a.	3.5	2.0
Petroleum products	1,051	2.9	n.a.	n.a.	2.8	1.6
Chemical and Chemical products	1,408	3.8	n.a.	n.a.	7.7	4.4
Non-metallic and mineral products	658	1.8	n.a.	n.a.	1.5	0.9
Manufactures of metals	1,454	4.0	n.a.	n.a.	5.2	3.0
Other manufactures	2,998	8.2	29,000	34	9.5	5.4
Total	36,661	100.0	85,000	100	173.2	100

Source: Malaysian Economic Reports 1998, 1993, 1999.

The sector also dominates all other sector in terms of employment, paid-up-capital and total fixed assets as can be seen from Table 6. In terms of employment, in 1998 the sector was the biggest employer with 332,297 workers. In term of paid-up-capital the sector was the biggest with more than RM9 billion. Finally in terms of fixed assets, the sector was also the biggest with RM20.5 billion.

Therefore, an analysis of the process of technological development in the electrical and electronics industry will give us as very good picture of the role of FDI in the development of Malaysia's economy.

Table 6: Employment and Capital Structure by Industries in Companies in Production as at Dec 31, 1998.

Sector	Employment	Paid-up-capital (RM'000)	Total Fixed Asset (RM'000)
Food Manufacturing	57,975	4,406,123	5,594,317
Beverage And Tobacco	5,256	880,614	890,057
Textiles products	90,310	3,202,087	6,492,169
Leather products	3,391	51,562	94,846
Wood Products	81,847	2,976,507	5,239,641
Furniture	22,911	347,886	964,405
Paper, Printing and Publishing	29,609	3,977,365	5,252,621
Chemical and Chemical Products	21,055	3,117,964	5,701,260
Petroleum and coal	7,894	3,930,318	14,485,406
Rubber products	53,911	1,714,435	3,336,069
Plastic products	35,261	1,474,644	2,739,798
Non-metallic products	34,861	4,205,170	7,900,151
Basic Metal Products	20,924	3,398,691	8,670,368
Fabricated Metal Products	34,189	2,346,669	3,495,194
Machinery manufacturing	27,277	1,663,369	1,792,932
Electrical and Electronics	332,297	9,513,775	20,526,743
Transport Equipment	38,636	2,461,920	5,033,591
Scientific Equipment	25,935	777,026	1,113,378
Misc.	22,433	301,877	714,841
Total	945,972	50,748,002	100,037,787

Source: MIDA

3.1 Technological Development in Malaysian Electronics Industry

The electronics industry can be divided into two main categories – consumer electronics sub-sector and components sub-sectors. Consumer electronics sub-sector includes products such as televisions, CD players, radio-cassette players etc. Due to the fact that many electrical appliances (such as air-conditioners, washing-machines etc.) now incorporate a lot of electronic control devices, they are also sometimes categorized as consumer electronic products. The components sub-sector includes products such as Integrated Circuits or ICs (memories and microprocessors), connectors, diodes etc. The

growth of the component electronics sub-sector is on the whole associated with the growth in production and demand for ICs which is in turn due to advancements made in the field of information and communication technology which is constantly requiring ICs which can store more data and process them more quickly.

The Malaysian electrical and electronics industry started in the early 1970s when a number of American component electronics manufacturers (including Fairchild and Intel) set up factories in Penang to assemble ICs. The main motive for investing in Malaysia was to capitalize on availability of plentiful supply of cheap labor, which is needed for the labor-intensive assembly process¹. Over the years, other locational factors were also considered such as a market-oriented economy, young and fairly educated workforce, relatively good infrastructure and a stable government committed to maintaining a business-friendly environment.

MNCs from other countries such as Japan, South Korea, Taiwan and Europe also subsequently came to Malaysia. It has to be pointed out that whereas almost all of the American MNCs are component manufacturers whose core activities are assembly operations, MNCs from other countries also include consumer electronics manufacturers producing a wide range of products including air-conditioners, TVs, Electronic Organizers etc.

¹ The manufacturing process of ICs can be divided into three main phases – fabrication, assembly and tests. Fabrication involves the slicing of silicon rods and etching circuits onto the silicon slices to produce wafers. The process is largely done in America until today. Assembly involves the cutting up of the silicon wafers to produce the tiny `chips' which is the most important part of ICs. The chips are then connected to gold wires, mounted on lead-frames and packed in plastic or ceramic packages. The ICs are then tested for their reliability under different conditions using sophisticated testing methods.

The products manufactured by the companies have also increased in complexity reflecting the increase in technological capabilities of the Malaysian workforce. In the semiconductor industry the American IC manufacturers are assembling the latest products. Intersil, a subsidiary of Harris based in Kuala Lumpur assembles the latest line of memory chips using the latest technology. Another example, Western Digital produces the latest line of hard-drives for personal computers. In fact, Western Digital's Malaysian plant is the only assembly plant in the world for the company. Therefore, all its products, including the very latest one are assembled here.

Fujitsu are producing mainly flash memories in its Malaysian plants, transferring the lower value-added products such as analog ICs to China in 1996. In fact production of less sophisticated linear devices were completely stopped by Fujitsu in 1995. It also stopped production of Static Random Access Memory (SRAM) ICs in 1997. The production of flash memories account for about 90% of Fujitsu's total production. In 1999 it began a very complicated assembly production process called 'C' Bending-Small-Outline-Package (CSOP) for flash memories.

Production of the latest products implies an upgrading of the production and manufacturing technologies employed. The competitive advantage of locating in Malaysia is no longer associated with the presence of low-skilled and cheap workers. As the managing director of Intersil (an American company IC manufacturer) stated: " If cheap labor is the most important consideration, we would have shifted to Vietnam or

The three distinct phases are however, not applicable to the manufacturing process of consumer electronic products.

China”. According to him, assembly process for ICs is now very complex. Engineers have to understand the product technology very well in order to design a manufacturing process that results in zero defects. Moreover, the testing procedures are also very complex and technology-intensive. As such the ratio of production operators to engineers has decreased from 10:1 in the 1970s to 2:1 now. Labor cost account for less than 10% of total cost. Moreover, he is of the opinion that the country is one of the top three locations in the world for assembly processes (the others being Taiwan and Korea).

A senior director of Western Digital, an American manufacturer of disk drives, echoed this. According to him, there are many aspects of manufacturing and assembly, which makes it difficult for Western Digital to ever consider relocating to another less developed country. Such aspects include production planning, purchasing and procurements, warehousing and logistics, production engineering and quality systems. In addition the supporting activities such as the information system support to implement their Trace-ability System (which allows them to track defects) are not available outside the country.

One factor that contributes to the above situation is the tendency among electronics manufacturers to out-source the assembly process to other companies. Many major American IC manufacturers now concentrate their efforts on fabricating the chips and outsourcing the assembly process to other companies. This is partly due to the rapid technological development process occurring along the value-chain, including the assembly activities. As a result there is hardly any assembly expertise in the US.

Therefore it is no longer feasible for firms to transfer the assembly activities back to their home countries.

Another factor that discourages electronics manufacturers from relocating out of Malaysia is the extensive supplier networks that have been developed in the country. This is especially for consumer electronics manufacturers. For example a significant amount of components are now purchased locally rather than imported. They include precision metal and plastic parts. Some of these local suppliers are foreign companies based in Malaysia. However, many of them include Malaysian owned companies. For example, Malaysian companies such as Dynacraft and AKN now also supply lead frames, a very essential component for the manufacture of ICs. They were previously completely imported from overseas. In addition many firms also purchase chemicals and toolings from locally owned suppliers. Moreover, some technologically advanced companies (such as Eng Engineering based in Penang) are now supplying complete equipment. These include Molds, Trim and Form Machines and automated packing machines. The technological capabilities of these firms were developed from the many years of interactions with the MNCs as suppliers.

The advancement in the technical skills of the locals is also reflected by the tendency for some companies to set up R&D facilities. The best example of a full-fledged R&D activities taking place in Malaysia is by Matsushita which set up three companies – Matsushita Air-Conditioning R&D Centre Sdn Bhd, Matsushita Compressor and Motor R&D Centre Sdn. Bhd and Matsushita Home Appliance R&D Centre Sdn. Bhd. The

setting up of these companies was a natural progression of activities in this aspect beginning in early 1990s. Now a total of 130 employees are engaged in R&D activities, of which only 20 are Japanese.

R&D activities among American semi-conductor manufacturers based in Malaysia are not so widespread. Nevertheless members of Malaysian American Electronics Industry (MAEI) invested nearly RM150 million in R&D in 1998. This represents a significant increase over 1997 of 61%. By the year 2001, MAEI companies expect to invest over RM200 million annually in local R&D. R&D facilities in MAEI companies include advanced automation technology, product development, process tooling, electrical design analysis, software simulation applications, and embedded microprocessor design. Future plans include wafer/wafer/die design for small signal technology, analogy packaging design and testing, and board design development.

The upgrading of local personnel is also another means by which MNCs have helped the process of transferring technologies to Malaysia. This is most evidenced in American MNCs. For example Malaysian managing directors run at least 11 of the 17 American companies, which are members of the American Malaysian Chamber of Commerce (AMCHAM). At Intersil, only two people out of its total workforce of several thousands are foreigners. What has happened is that over the years, local managers in American MNCs were able to acquire all the skills needed to run the entire operation of the subsidiaries. In addition there have been many cases of some of the senior managers of American MNCs leaving the subsidiaries to set up companies in the electronics industry.

For example a number of local engineers in Harris Semiconductor left to manage or to set up companies to manufacture plastic components, or to set up tooling shops or to perform sub-contracting assembly activities for the MNCs. In the case of the latter, American MNCs such as Intel, Motorola or National Semiconductor formally employed many of the managers of Malaysian-owned semiconductor assembly sub-contractors such as Carsem and Unisem.

The process of upgrading the technical capabilities of locals is also present at Japanese MNCs, albeit at a much slower pace. For example, so far, a Malaysian managing director runs none of the Japanese electronics companies based in Malaysia. At Fujitsu out of its total workforce of 765, almost all of the senior management team is Japanese. Only two Malaysian are in the management team – the Production Manager and the Quality Assurance and Reliability Manager. Previously, Japanese held these two posts. At Matsushita, the largest Japanese group of companies (23 companies altogether) the story is more positive. Out of the total 31,000 employees, only 300 (or less than 1%) are Japanese. Even though none of the managing directors is Malaysian, however over the last five years, the group has appointed a number of Malaysian deputy managing directors. In addition, more than ten have been appointed to the senior post of general managers.

The differences in terms of extent of technology transfer practices between American and Japanese multinationals are very apparent. The differences are still evident when a straight comparison is made between firms in the same sub-sector. For example, the top

management team at Fujitsu, which assembles memory ICs in Malaysia, is still completely composed of Japanese nationals even though the company has been operating in Malaysia since 1988. This is in contrast to Intersil, the American firm that also assembles memory ICs, which is completely managed by Malaysian nationals.

4 Conclusion

Foreign direct investment has continued to play a significant role in the Malaysian economy. This is especially obvious in the electronics industry. However, the role that has been played is very positive as far as the country's economic development process is concerned. In addition to creating jobs and generating exports, the foreign multinationals have also contributed to the development of the technical capabilities of the locals. This is through the process of technology transfer. The main methods by which this process take place is via the linkages established between the multinationals and locally-owned suppliers and via the process of developing the skills of Malaysians working in the multinationals. The setting up of locally owned companies performing ICs assembly activities that were previously undertaken by foreign multinationals is a very strong proof of the existence of the process of technology transfer. The pattern of technology transfer process is significantly advanced in American multinationals compared to Japanese multinationals. This is highly likely due to differences in certain organizational culture aspects of firms from these two countries. However a detailed examination of this aspect is beyond the scope of this research project.

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Summary

This paper presents recent data on foreign direct investment (FDI) in Malaysia, focusing on the electronics industry. It is found that FDI accounts for about 80 percent of total investment in the electronics sector during the 1990s, and the sector accounts for about half of Malaysia's manufactured exports. Technology transfers from the foreign multinationals are studied, and it is found that over time the foreign companies have upgraded the technology, local supplier networks have been established, Malaysians have filled increasingly senior positions in the foreign companies, and expenditure on R&D in Malaysian foreign companies has increased substantially. While low-cost, reasonably skilled labor together with a business-friendly government policy were the main determinants for attracting foreign investment during the 1970s and 1980s, technological capacity is more important during the 1990s, while lower value added activities have been relocated to lower-cost countries in the region. Finally, US multinationals appear to have a more significant impact on the development of local technological capacity than the Japanese multinationals.