

Master of Arts in Law and Diplomacy Thesis

**Development of Supporting Industries for Vietnam's
Industrialization:**

Increasing Positive Vertical Externalities through Collaborative Training

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Executive Summary

Vietnam opened up to the outside world in the early 1990s, and expected that the massive inflow of foreign direct investment (FDI) would accelerate economic growth. However, FDI inflow actually decreased after a small boom in the mid 1990s. While various external factors are responsible for this, internal factors have also affected the flow of FDI. In particular, the weakness of supporting industries is considered to be one of the primary factors responsible for this. Competitive supporting industries are required to attract more FDI into Vietnam, because multi-national corporations (MNCs) consider them to be an important factor in the decision to expand FDI, in addition to labor costs.

Moreover, the development of supporting industries is necessary for amplifying FDI's positive externalities in Vietnam. Although many developing countries are trying to attract FDI in order to accelerate economic growth, the net externalities of FDI for host countries seem ambiguous due to two conflicting effects. Entries of MNCs to the market may cause negative externalities for domestic competitors in the same sector, while they may improve the productivity of domestic suppliers through backward linkages. Therefore, a country will have more chances to exploit the net positive externalities from FDI if it has competitive supporting industries which can expand business deals with MNC assemblers.

However, the development of supporting industries in Vietnam is impeded by two types of barriers: the minimum efficient scale problem and information failure. In this situation, appropriate public policies may help domestic supporting industries overcome these obstacles, since the market has not been able to resolve those issues. They may help domestic supporting industries overcome the minimum efficient scale problem by upgrading their technology, while they may reduce information failures through promoting interactions with MNC assemblers.

Among various policy options, the establishment of a collaborative training program between MNCs and domestic supporting industries is highly recommended. It may promote technology transfer from MNCs to domestic suppliers. In order to establish an effective collaborative training system in Vietnam, it would be beneficial to learn from the success of the Penang Skill Development Center (PSDC). The participation of MNCs, the bottom-up and regional approaches, and support from the local and national government are key factors in establishing a successful collaborative training program. Furthermore, whether MNCs would actively participate in a collaborative training program depends on

the business architecture of the product and the degree of industrial agglomeration.

Currently, there are two projects related to the development of supporting industries in Vietnam: i) the HIC-JICA project as a general education program and ii) the TAC project as a vocational training program. The HIC-JICA project focuses on educating prospective production engineers, emphasizing practical training through actual manufacturing activities based on orders from foreign enterprises. On the other hand, the TAC project, which is still in the planning stage, aims to directly contribute to technology upgrading of domestic suppliers in a vocational training program.

Taking into account the lessons learned from PSDC, the TAC project may attract MNCs' participation in regions with high degrees of industrial agglomeration, such as Ho Chi Minh City, but it may not in regions with low degrees of industrial agglomeration such as Hanoi and Danang. In contrast, a general education program such as the HIC-JICA project may establish interactions with foreign enterprises even in regions with low degrees of industrial agglomeration, although its impacts may be more indirect for the development of supporting industries.

Therefore, the author recommends that policy makers select either a vocational training program or a general educational program, taking into consideration the degree of industrial agglomeration, the business architecture of products in major industries, and other local-specific demands in each region. The optimal combination of the above two policy options may effectively promote the development of supporting industries and thereby stimulate economic growth in Vietnam through industrialization.

1. Introduction

Vietnam opened up to the outside world in the early 1990s and expected that the massive inflow of foreign direct investment (FDI) would accelerate economic growth. However, FDI inflow actually decreased after a small boom in the mid 1990s. While various external factors are responsible for this, such as the recession in other East Asian countries, internal factors have also affected the flow of FDI. In particular, the weakness of supporting industries is considered to be one of the primary factors responsible for the decrease.

Given this situation, there seems to be a general consensus among Vietnamese officials, foreign and local enterprises, and foreign government agencies that the development of supporting industries is important. This was also stated in the Vietnam-Japan Joint Initiative to Improve Business Environment, which was agreed on December 2003 between the Vietnamese and Japanese governments.¹ However, there are still unresolved gaps regarding the definition, target area, and means to develop supporting industries. For instance, the Vietnamese government may regard production parts, machine tools, and raw material supply companies as “supporting industries,” while others may consider that only production parts and machine tools suppliers should be included in this category. Moreover, there is a persistent suspicion that the development of supporting industries, which may seem to be “low-tech,” may not really contribute to the economic growth of Vietnam.

Thus, my tasks in this paper are to define “supporting industries” and address the question: *What role can supporting industries play in promoting economic growth?* After the importance and effect of supporting industries are discussed, the question of how to develop supporting industries still remains. Therefore, my second question is: *how can supporting industries be developed?* Should the government play a role in correcting some imperfections in the market? If so, what kind of policy options does the government have?

¹ *Vietnam-Japan Joint Initiative to Improve Business Environment with View to Strengthen Vietnam's competitiveness.* (2003), 7 Available from: <http://www.mofa.go.jp/>

In order to answer the above research questions, the following section will explore the roles of supporting industries for economic growth in a developing country like Vietnam. Section 3 analyzes the current situation of supporting industries and obstacles to their development in Vietnam. In Section 4, the Penang Skill Development Center that has accelerated the development of supporting industries in Malaysia is examined as a good practice, in order to draw some lessons for Vietnam. Section 5 analyzes the HIC-JICA project in Vietnam, which has contributed to technology upgrading through a general educational program. Section 6 examines the TAC project in Vietnam, which is targeting the technology upgrading of domestic suppliers. Section 7 is the conclusion.

2. Economic Growth through Development of Supporting Industries

2.1. Introduction

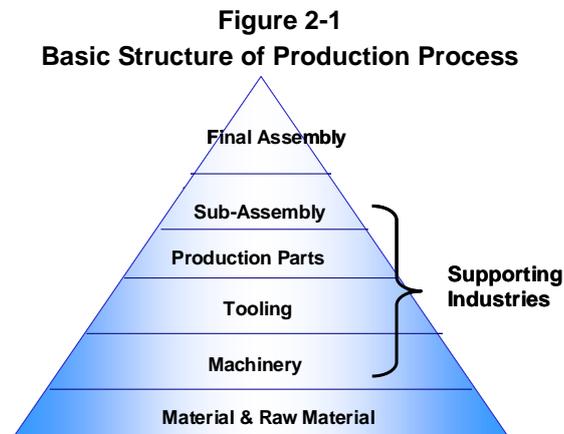
While the development of supporting industries is emphasized in Vietnam as stated in the Vietnam-Japan Joint Initiative to Improve Business Environment, its definition and impacts on economic growth are rather ambiguous. Policy-makers in Vietnam would not be convinced of the importance of supporting industries, until those become clearer. In this section, supporting industries are defined in economic and business terms. Then, their impacts on the economic growth through the backward linkage are examined, reviewing related literatures. Finally, the rationales of policy intervention for the development of supporting industries are discussed.

2.2. What is Supporting Industry?: Concept and Characteristics

The term “supporting industries” is widely used, especially in East Asia. However, its definition has not yet been made clear in either business or economic terms. In economic theory, supporting industries are defined as a group of producers of manufactured inputs. Finished goods are produced through multi-layer processes, which consist of the manufacturing and assembling processes of inputs. Supporting industries produce these inputs, more specifically, intermediate and capital goods. For example, in the manufacturing processes of consumer-electronics goods, production parts such as plastic

and metal parts are considered intermediate goods, while machinery and tooling to produce those intermediate goods are capital goods.

In the framework of business, supporting industries manufacture production parts as well as machinery and tooling to produce those production parts. The modern production system consists of multi-layer processes such as final assembly, sub-assembly, production parts, tooling, machinery, and materials and raw materials (refer to Figure 2-1). Taking the example of electronics goods such as TVs, oil is a raw material and polypropylene is a material used for plastic parts. In order to produce plastic parts, a plastic injection machine and a molding tool are required. An example of a sub-assembled component is the compact-disc (CD) mechanism of a Hi-Fi stereo. Then, all production parts and sub-assembled components are combined in the final assembly process. In this structure of the production process, supporting industries are usually referred to as the industries that manufacture high-quality production parts, tooling, and machinery, which directly “support” the final and sub-assembly processes.²



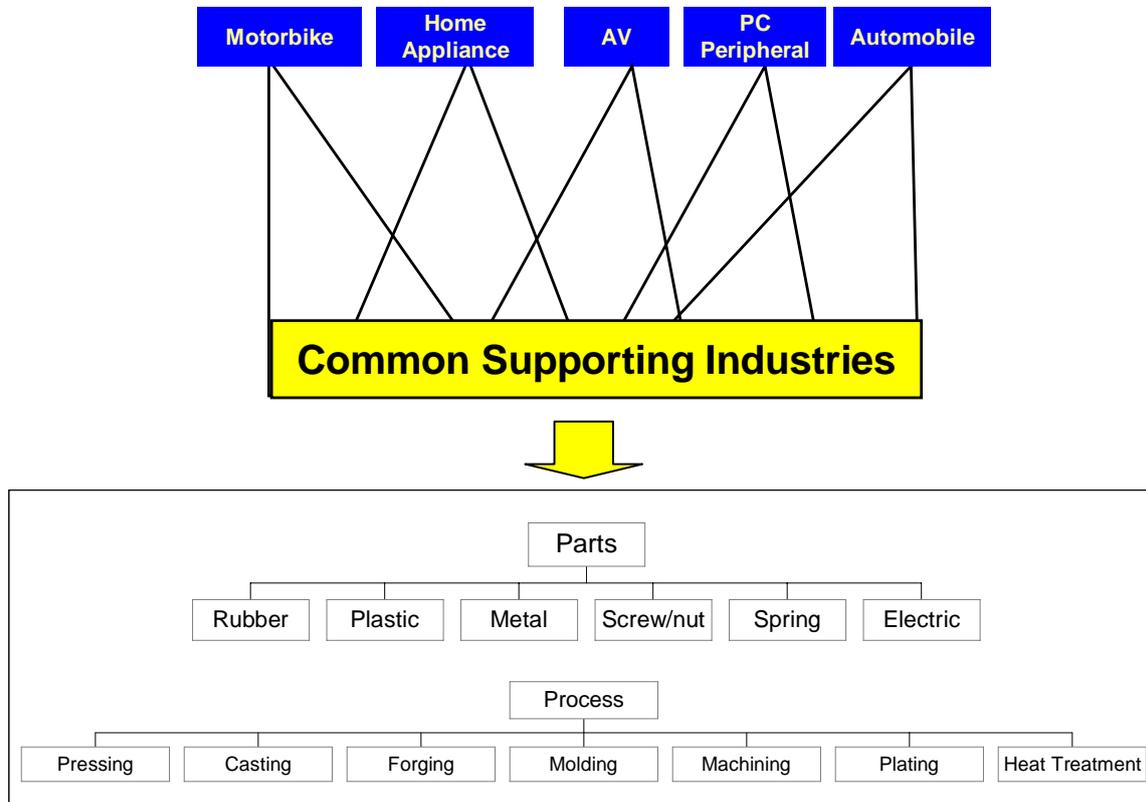
Regarding its business organization, supporting industries consist of three types of firms: i) parts and machine tool suppliers located in foreign countries (called “import” afterward), ii) the foreign parts and machine tool supplier located in the domestic market (called “foreign supplier” afterward), and iii) domestically-owned parts and machine tool suppliers (called “domestic supplier” afterward), which are usually small and medium size enterprises

² Sub-assemble processes can sometimes be done by supporting industries.

(SMEs). In addition, customers of supporting industries are domestic assemblers, foreign assemblers located in the domestic market, and foreign assemblers located in foreign countries. Foreign assemblers are often multi-national corporations (MNCs or called “MNC assembler” afterward).

Finally, supporting industries are capital-intensive and cover a broad range of manufacturing industries. Supporting industries are more capital-intensive than final assemblers, with high fixed costs and increasing returns of scale. While many workers are typically employed in the final assembly processes, production parts and tooling are manufactured by more machinery and fewer workers. Workers in supporting industries are mostly machine operators, quality controllers, technicians, and engineers. Due to this characteristic, supporting industries in developing countries tend to be less competitive. They may not have sufficient capital or skilled labor to elicit high performance from production equipment. For example, many plastic injection machines cost more than US\$100,000 on average and require a highly-skilled operator. SMEs in developing countries may not have sufficient capital to purchase machinery or hire technicians to operate it. Despite this fact, governments in developing countries often regard supporting industries as being “low-technology.” In reality, supporting industries are capital-intensive and require exclusive technology. Second, supporting industries cover a broad range of industries. In fact, electronics, motorbike, and automobile industries share common supporting industries such as plastic injection, metal pressing, and tooling (refer to [Figure 2-2](#)). For instance, both consumer-electronics products and motorbikes use plastic parts which are produced through a similar manufacturing process called injection molding. Metal pressing parts are used for electronics goods, motorbikes, and automobiles. Thus, supporting industries can be a source of competitiveness for various manufacturing industries.

Figure 2-2
Common basic supporting industries can cover many industries



Source: Junichi Mori and Kenichi Ohno. "Optimum Procurement Strategy: Determinants of Parts Localization under Regional Linkage and Competition" and Kyoshiro Ichikawa. "Building and Strengthening Supporting Industries in Vietnam: A Survey Report." *Improving Industrial Policy*. (Hanoi, Vietnam: Vietnam Development Forum, 2005)

2.3. What is the Role of Supporting Industries in FDI-Driven Growth?

It is thought that the ASEAN countries have achieved rapid export-oriented economic growth, taking advantage of the massive inflow of FDI since the 1980s. This has accelerated the adoption of an export-oriented strategy in other developing countries, attracting FDI with various incentives. In 1998, 103 countries offered tax concessions to foreign companies that set up production or administrative facilities within their borders.³ Many empirical studies support the theory that MNCs tend to have higher productivity than domestic firms in the same sector and thereby contribute to GDP growth in developing

³ Laura Alfaro and Andrez Rodriguez-Clare. "Multinationals and Linkages: An Empirical Investigation" (2003), 1.

countries.⁴ More importantly, it seems that developing countries expect that MNCs will have a positive impact on the productivity levels of domestic firms by generating positive externalities. However, the net externalities of FDI for host countries are ambiguous, because MNCs may cause two conflicting effects.

While the high productivity of MNCs contributes to the economic growth in host countries, they may also cause negative externalities for domestic assemblers in the same sector. After MNCs enter the market, the output level of domestic competitors may shrink, because their productivity tends to be lower than MNCs. Using data on 4,000 Venezuela manufacturing plants for the period 1976-1989, Aitken and Harrison (1999) find that productivity growth in domestic competitors is negatively correlated with the presence of foreign firms in the same sector (called “negative horizontal externalities” afterward).⁵

On the other hand, FDI may generate positive externalities for the productivity growth of domestic suppliers through business relationships with MNCs (called “backward linkages” afterward). The output and productivity of domestic supporting industries may increase, due to the additional demand and technology transfer caused by MNCs. If increasing FDI causes positive externalities for domestic suppliers and improves their productivity through backward linkages, national welfare in FDI host countries will also improve. Alfaro and Rodriguez-Clare (2003) show positive externalities in domestic supporting industries (called “positive vertical externalities” afterward), based on the large volume of firm-level panel data which covers 1997 through 2000 in Brazil, Venezuela, Mexico, and Chile.

In summary, the net externalities of FDI can be either positive or negative, depending on the size of horizontal externalities and vertical externalities. In other words, developing countries may improve national welfare by attracting FDI, if their supporting industries can obtain positive externalities that far exceed negative externalities for domestic assemblers. Therefore, it is important for developing countries to establish competitive supporting industries for FDI-driven economic growth.

⁴ Alfaro and Rodriguez-Clare (2003), 4.

⁵ Brian J. Aiken and Ann E. Harrison. “Do Domestic Firms Benefit from Direct Foreign Investment? Evidence from Venezuela.” *The American Economic Review*, Vo. 89 No. 3 (Jun., 1999), 605-618.

2.4. Tradable and Non-Tradable Inputs in MNCs' Optimum Procurement Strategy

The above empirical studies about backward linkages are based on the assumption that manufactured inputs are non-tradable. However, as Alfaro and Rodriguez-Clare (2003) recognize, in reality many manufactured inputs are tradable. Understanding which manufactured inputs are tradable or non-tradable (or less tradable) may give us a hint about the category of production parts that MNC assemblers intend to purchase from domestic supporting industries (called "local procurement" afterward).

It is thought that MNC assemblers and parts suppliers are internationally trading some manufactured inputs with large economy of scale in production and low transaction costs represented by transportation costs. Parts suppliers often prefer to concentrate the production of manufactured inputs with large economy of scale in one location and distribute products internationally. They need to consolidate manufacturing bases, in order to maximize profits in the condition of large minimum efficient scale, especially when producing parts with high fixed costs. In addition, MNC assemblers prefer to use imported parts, when they are cheaper than domestically-produced parts, even including transportation costs. A good example of a tradable part is an integrated circuit (IC), which is a small component but requires a huge investment in production facilities. In fact, advanced East Asian countries such as Taiwan and Singapore produce and distribute them for the global market.

On the other hand, MNC assemblers will prefer to source some manufactured inputs with high transaction costs from the domestic market. If transaction costs of imports are high due to their large size or heavy weight, imported parts will lose their competitiveness over domestically-produced parts. In this case, MNCs will choose domestically produced parts rather than imported parts. Moreover, parts suppliers do not have strong incentives to locate their factories in one place if the production of inputs has a small economy of scale. The economy of scale is low if the fixed costs occurred by initial and subsequent investments are relatively small or if parts suppliers need to customize products according to the requirements of each market. Typical examples of these non or less-tradable inputs are large plastic parts, heavy metal parts, instruction manuals, and carton boxes.

Based on the above proposition of import and local procurement, many MNCs structure an “optimum procurement strategy,” in order to minimize costs and maximize profit.⁶ An optimum procurement strategy refers to an enterprise’s decision to purchase various manufactured inputs from the most suitable suppliers at home or abroad, in order to enhance competitiveness. An appropriate combination of local procurement and imports is essential for reducing the parts and transaction costs with maintaining the high product quality. As explained, the optimum procurement strategy is determined by two main elements: economy of scale and transaction costs (refer to Figure 2-3).

Figure 2-3
Optimum Procurement Matrix: Case of Electronics Goods

		Low ← Economy of Scale → High	
		Locally Specific	Globally Common
Low ← Transaction Cost → High	Bulky & Heavy	Localization Plastic cabinet Metal parts Molding & pressing tools Packing material	Mechanical parts Plastic gears
	Compact & Light	Decorative parts (plate, seal) Users' Manual	Import Motor IC Semi-conductor Resistor

Source: Mori and Ohno (2005), 128

In general, MNC assemblers will aim to maximize the local procurement of less-tradable products, while they continuously import inputs with economy of scale and low transaction costs. Thus, even in a country where FDI has been incoming for a long time and significant industrial agglomeration has been realized, 100% local procurement is rarely seen. For instance, in the case of the Thai automobile industry, which boasts the largest agglomeration of that industry in ASEAN, roughly 30% of parts are still imported while the remaining 70% are domestically produced. Of this domestic procurement, about 45% are

⁶ For further details of optimum procurement strategy, refer to: Junichi Mori and Kenichi Ohno. “Optimum Procurement Strategy: Determinants of Parts Localization under Regional Linkage and Competition” Kenichi Ohno and Nguyen Van Thuong (eds.) *Improving Industrial Policy Formulation* (Hanoi, Vietnam: Vietnam Development Forum, 2005)

supplied by foreign-owned firms and about 25% are produced by local firms⁷.

2.5. Do Supporting Industries Accelerate the Agglomeration of FDI?

In addition to the role as an amplifier of positive externalities from FDI, which empirical studies have discussed, domestic supporting industries are increasing their importance as a factor to attract FDI as well, while there are other important factors for investment decision such as labor costs, domestic market size, and political stability. In fact, the factors contributing to the inflow of FDI have changed since the 1990s, along with the prevailing concept of Supply Chain Management (SCM), while massive FDI began to flow into Southeast Asia in the 1970s and 80s, mainly attracted by the lower labor costs. In short, the role of cheap raw labor is diminishing in importance: even labor-intensive activities often need to be combined with new technologies and advanced skills.⁸ Nowadays, when MNCs choose a location for FDI, they consider not only the advantage in labor costs but also the cost of other manufactured inputs such as production parts.

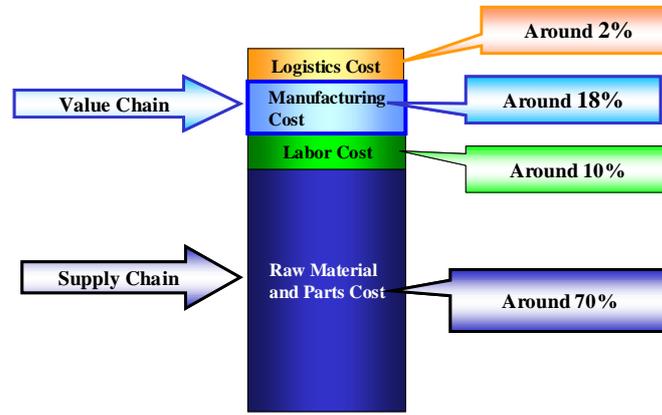
Taking consumer-electronics products as an example, labor costs usually account for only 10% or less of the total cost, while the cost of production parts accounts for around 70% (refer to Figure 2-4).⁹ Most MNC assemblers have realized that reducing the cost of production parts is more effective than reducing labor costs at producing electronics goods at more competitive prices. For example, assuming that Malaysia has a comparative disadvantage in labor costs over Vietnam, MNCs may still produce electronics goods at a cheaper price than in Vietnam, if competitive supporting industries would enable MNCs to reduce the cost of parts procurement by more than an increase in labor costs.

⁷ Information provided by the Nomura Research Institute in August 2004 based on its recent survey in the ASEAN countries.

⁸ UNCTAD emphasized that the location of MNC activity instead increasingly reflects three developments: policy liberalization, technical progress, and evolving corporate strategies. Refer to: United Nations Conference on Trade and Development (UNCTAD). *World Investment Report 2001: Promoting Linkages*. (Geneva, Switzerland: UNCTAD, 2001), xvii.

⁹ This figure is drafted according to author's interviews with MNCs in Malaysia and Vietnam in 2004 and 2005. Also refer to: Japan External Trade Organization (JETRO). "Japanese-Affiliated Manufacturers in Asia – ASEAN and India- (Survey 2004)" (Tokyo, Japan: JETRO, 2005), 18.

Figure 2-4
Basic Cost Structure of Electronics Goods



Drafted by the author

This change in factors contributing to the inflow of FDI can also be found in a survey conducted by the Japan Bank for International Cooperation (JBIC) in 2004. The results shows that in East Asia, Japanese MNCs seem to have better investment prospects in rank order of China, Thailand, Vietnam, Indonesia, Korea, Taiwan, and Malaysia respectively.¹⁰ Considering China and Thailand, which have remained in first and second place since 2000, it seems that China is attractive because of 1) the size of domestic market, 2) inexpensive labor, and 3) efficient domestic parts procurement, while Thailand is attractive for 1) inexpensive labor, 2) the size of domestic market, and 3) large parts procurement markets from the views points of parts suppliers. Both countries may have competitive supporting industries, represented by the high local procurement ratio of China at 55.9% in 2003 and Thailand at 47.9% in 2004.¹¹ On the other hand, the result of the survey indicates that cheaper labor costs may still attract FDI. For example, Vietnam raised its position from 8th in 2000 to 3rd in 2003, mainly because of: 1) inexpensive labor, 2) the size of domestic market, and 3) capability of workers. However, its domestic supporting industries seem to be less competitive, represented by a local procurement ratio of 22.6%.

Thus, MNCs will consider not only the advantage of cheaper labor costs but also the

¹⁰ Japan Bank for International Cooperation (JBIC). "Survey Report on Overseas Business Operations by Japanese Manufacturing Companies" (Tokyo, Japan: JBIC, 2004), 26.

¹¹ JETRO (2005), 18, and Ministry of Economy, Trade and Industry (METI). *General Survey of Activities of Overseas Japanese Companies (in Japanese)*. (Tokyo, Japan: METI, 2004), 73.

advantage in competitive supply of manufactured inputs in domestic markets in their decision to invest. In other words, the sustainability of FDI may be questioned, if the only advantage is cheaper labor costs. There may be many new entrants with much cheaper labor costs to attract restless FDI in the future.

2.6. Competitive Supporting Industries for the Long-Run Economic Growth

Policy makers may be concerned that MNCs' investment, especially in final assembly processes, are restless and quickly move to emerging economies with cheaper labor costs in the long run, although MNCs' entry through FDI is important for improving national welfare in the short run. In fact, some MNCs moved factories from advanced ASEAN countries to China in the 1990s, and this trend still continues. According to the JBIC survey (2004), 14 Japanese MNCs are planning to move their production bases to China, mainly from Hong Kong and Taiwan.¹² Therefore, one may question whether competitive supporting industries would promote long-run economic development or not, because MNC assemblers would still move out even if a country has developed competitive supporting industries.

MNC's assembly processes might move to a country with cheaper labor costs, but competitive supporting industries will continuously contribute to economic development and national welfare even in the long run. First, a country with competitive supporting industries can sustain FDI for final assembly processes relatively longer than a country without competitive supporting industries. Jones (2000) explains that the production base may remain in a country that has an absolute advantage in production of input even though it has a comparative disadvantage in labor costs by the "Augmented Ricardian Model."¹³ This theory makes sense intuitively on the assumption that domestically-produced inputs are non-tradable, because the production of inputs requires more sophisticated technology than a simple assembly operation. In short, emerging countries with cheaper labor costs could not obtain the technology to produce inputs at competitive price right away. Thus,

¹² JBIC (2004), 15

¹³ For further details, refer to: Ronald W. Jones. *Globalization and the Theory of Input Trade*. (Boston, MA: MIT Press, 2000), 17 and Richard E. Caves, Jeffrey A. Frankel, and Ronald W. Jones. "World Trade and Payment" (Boston, MA: Addison Wesley, 2002), 153.

MNC assemblers may stay in a country which is losing the advantage in labor costs, as long as the benefits from using competitive inputs offset increasing labor costs.

Second, a country with competitive supporting industries can export manufactured inputs to countries where the final assembly processes are transferred. Vernon's product cycle theory (1966) may still explain the current trend of global manufacturing.¹⁴ In East Asia, the production bases are being moved from developed countries such as Japan, Korea, and Taiwan to developing countries such as China and ASEAN members, according to the stages where the products are matured and standardized. However, the speed of the product cycle seems different between the final assembly process and the production of inputs. The product cycle theory can be perfectly applied to the movement of final assembly processes. For example, in the electronics industry, the final assembly process moved from Japan to Singapore in the 1970s-80s, from Singapore to Malaysia or Thailand in the 1980s-90s, and from Malaysia and Thailand to China and Vietnam in the 1990s-the 2000s. In contrast, the movement of input production seems slower in East Asia. For instance, advanced ASEAN countries still produce large volumes of manufactured inputs by specializing in the production and export of certain high-valued inputs, despite increasing labor costs. Singapore is the largest exporter of central processing units (CPU) in ASEAN.¹⁵ Malaysia is the largest exporter of cathode-ray tubes (CRT) in East Asia.¹⁶ Thailand has the largest export base for refrigerator's compressors.¹⁷ In addition, all of them are not only focusing on manufacturing processes but on expanding R&D functions.

Finally, the development of competitive supporting industries will cause the dynamic effect of promoting technological innovations, thereby improving national welfare. Porter (1990) stresses the importance of competitive supporting industries as a partner in MNCs' dynamic technology innovation, in addition to its role as the recipient of technology transfer from MNCs.¹⁸ In addition, domestic supporting industries take advantage of

¹⁴ Raymond Vernon. "International Investment and International Trade in the Product Cycle." *The Quarterly Journal of Economics*. Vo. 80, No.2 (May, 1966), 190-207.

¹⁵ CPU export from Singapore accounted for US\$273.5 million in 2004. Refer to: News Net Asia (NNA) *Beat China: The Manufacturing Sector in ASEAN (in Japanese)* (Tokyo, Japan: NNA, 2005),30.

¹⁶ Malaysia's CRT export accounted for US\$636.9 million in 2004. Refer to NNA (2005), 186.

¹⁷ Thailand's export of compressor accounted for US\$297.1 million. Refer to NNA (2005),178.

¹⁸ Michael E. Porter. "The Competitive Advantage of Nations" *Harvard Business Review* March-April 1990, 80.

geographical proximity with MNCs for speedy information flow and technical interchanges. Furthermore, Porter (1990) mentioned that the nation's companies will benefit most when the domestic supporting industries are globally competitive, although a nation does not need to be competitive in all supporting industries if it has specialized in certain areas.

In summary, the development of competitive supporting industries may sustain the positive impacts of FDI on national welfare and convert them into a comparative advantage by causing specialization in certain sectors in a static and dynamic framework.

2.7. Development Paths in Advanced ASEAN Countries, Difficulties in Vietnam

Assuming that the development of supporting industries may contribute to a country's economic development, the next question would be how can supporting industries be developed in a country such as Vietnam, which recently became part of the global production network. It may be possible to draw some lessons from the experiences of other countries such as advanced ASEAN members.

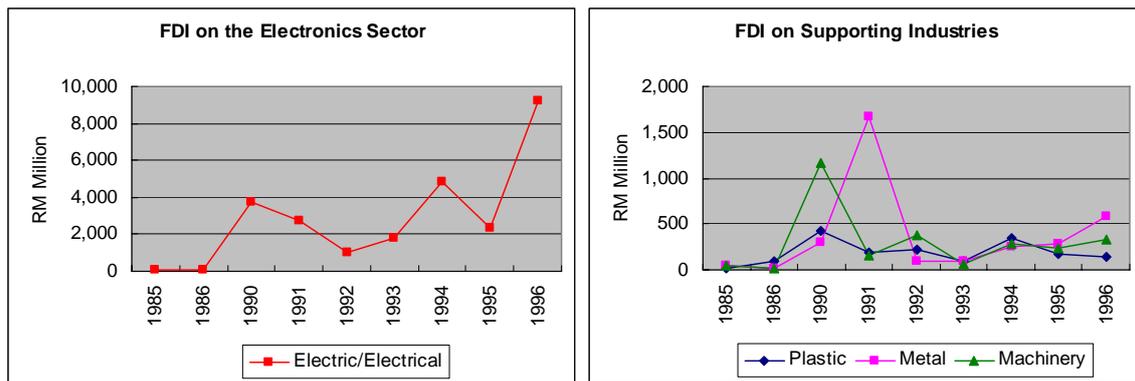
As a successful case in ASEAN, Malaysia has achieved economic development accelerated by the agglomeration of FDI and the development of supporting industries in the 1980s and the 90s. Considering that its consumer-electronics sector received 32% of total FDI from 1980 to 2004,¹⁹ there are three stages of development:²⁰ i) the agglomeration of MNC assemblers, ii) increasing FDI from foreign suppliers, attracted by the demand of MNC assemblers for local parts, and iii) the emergence of domestic suppliers, stimulated by MNCs' increasing demand for lower-price manufactured inputs. First, Malaysia began attracting FDI mainly from Japan between the middle of the 1980s and the early 1990s, by improving basic infrastructure and providing various tax incentives such as import duty exemptions in Free Trade Zones. Second, foreign suppliers have increased their investments in Malaysia since the early 1990s, attracted by the accumulation of MNC

¹⁹ Refer to JETRO website for statistics: <http://www.jetro.go.jp/>

²⁰ Takeshi Aoki. *Economic Development in Malaysia* (in Japanese). (Tokyo, Japan: Nihon Hyoron Sha, 1998), 75. Aoki explained by the second step, but not third step. This may be because domestic supporting industries have not been sufficiently developed yet in the late 1990s. However, according to the author's interview with a MNC in Penang in 2005, domestic supporting industries are capable of producing most production parts except for ICs.

assemblers (refer to Figure 2-5). Third, in the late 1990s, many MNCs began to further increase the local procurement of inputs, in order to reduce transaction costs and production lead-time along with the prevalence of SCM.²¹ At this stage, domestic suppliers had begun to play an important role as second tier suppliers by producing about the half of domestically-produced inputs, although foreign suppliers possess superior technology as first tier suppliers.²² Generally speaking, domestic suppliers tend to produce relatively low-end parts at a lower cost, taking advantage of their access and knowledge to local resources, while foreign suppliers focus on higher-end parts. Nonetheless, some domestic suppliers were competitive internationally through close interaction with MNCs.²³

Figure 2-5
FDI on Electronics Industry and Its Supporting Industries in Malaysia (1985-1996)



Source: Takeshi Aoki. *Economic Development in Malaysia* (in Japanese). (Tokyo, Japan: Nihon Hyoron Sha, 1998), 64.

In contrast, Vietnam may not follow the exact same path of Malaysia, mainly because it may not receive as large a volume of FDI as Malaysia received in a relatively short period. First, even if Vietnam implemented various tax incentives and established free trade zones under an export-oriented strategy, it is unlikely that those strategies would significantly differentiate Vietnam from other ASEAN countries, including Malaysia, Thailand, Indonesia, and the Philippines. This is because other ASEAN countries have already achieved most of the things that Vietnam is now trying to establish. Second, Vietnam will not experience a massive transfer of manufacturing bases from Japan, which occurred in

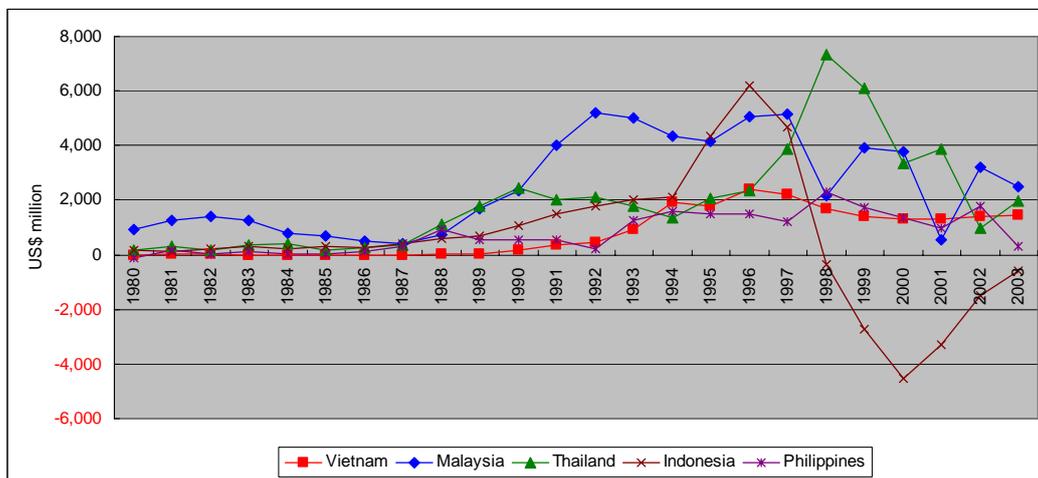
²¹ Aoki (1998), 75.

²² Mitchell Bernard and John Ravenhill. "Beyond Product Cycles and Flying Geese: Regionalization, Hierarchy, and the Industrialization of East Asia." *World Politics*, Vol. 47, No.2 (Jan., 1995), 197.

²³ UNCTAD (2001), 130. Refer to the Box of ENGTEK in Malaysia.

other ASEAN countries. In the 1980s and 90s, Japanese MNCs rapidly transferred manufacturing bases overseas, pushed by the sharp appreciation of Japanese Yen due to the Plaza Accord.²⁴ In contrast, FDI for Vietnam may be motivated by several factors such as rising labor costs in advanced ASEAN countries and the diversification of the “China Risk” due to recent political tension between Japan and China. Although those factors may gradually increase FDI for Vietnam, their impact is less than the Plaza Accord and other factors in the 1980s and the 90s. In fact, the inflow of FDI to Vietnam is smaller than Malaysia, Thailand, and Indonesia received, while its GDP is highly dependent on FDI (refer to Annex A). Also, after the small scale boom in the 1990s, the FDI inflow started to drop before it reached the peak that Malaysia, Thailand, and Indonesia experienced in the 1990s (refer to Figure 2-6). Finally, the MNCs’ decision-making factors regarding FDI have been changing, as explained in the optimum procurement strategy. They may not increase investment markedly in a country which only has cheaper labor costs as its sole cost advantage. Competitive supporting industries have become one of the conditions for MNCs to increase their investment in a developing country.

Figure 2-6
Net Inflow of FDI in ASEAN Countries (Value: 1980-2003)



Source: *World Development Indicator*, the World Bank (2004).

Therefore, it is difficult for Vietnam to take the step-by-step approach as “agglomerate

²⁴ This is called “Historic Japan Opportunity”. Refer to: Aoki (1998), 59.

MNC assemblers at first, and then develop supporting industries” to make its manufacturing sector competitive, because Vietnam may not attract as much FDI as advanced ASEAN countries have received by incentive policies and cheap labor costs. It is true that Vietnam is still one of the most attractive countries for FDI in East Asia, but Vietnam may need to acquire a comparative advantage in domestic supporting industries in advance, in order to attract a large inflow of FDI. In other words, Vietnam is required to take “parallel approaches” to attract FDI assemblers and develop supporting industries simultaneously, in order to improve national welfare through the accumulation of FDI. Thus, it is not easy for Vietnam to promote economic development through positive externalities from FDI, compared to other ASEAN countries' experiences.

2.8. Rationales for Policy Intervention: Two Types of Barriers

Basically, the development of supporting industries and investment from MNC assemblers should follow the market function. However, limited and appropriate policy intervention may be effective in Vietnam, because of market failures that hinder domestic supporting industries from expanding business deals with MNC assemblers.

In Vietnam, it is thought that one of the primary reasons that MNC assemblers have not drastically expanded investment is a lack of input supplies and uncompetitive supporting industries. According to a survey conducted by the Japan External Trade Organization (JETRO) in 2004, 68.6% of the Japanese manufacturers answered that the largest problem related to manufacturing operations in Vietnam is the difficulty to procure production parts and raw materials in the domestic market, compared with 40.1% in Thailand and 31.6% in Malaysia. In addition, 72.9% of Japanese manufacturers intend to increase local procurement in Vietnam.²⁵ Thus, the shortage of manufactured inputs is likely to reduce potential opportunities for cost reduction and incentives to expand investment by MNC assemblers. A question is: why do domestic supporting industries not increase the supply of manufactured inputs? It seems that two types of barriers impede domestic supporting industries from expanding their production capacity and business deals with MNCs: i) the problem of minimum efficient scale and ii) information failure (or gap).²⁶

²⁵ JETRO (2005), 29, 64.

²⁶ UNCTAD (2001), xxiii. It just mentioned “information gap” and “capability gap.” I added a problem of

First, insufficient business volume, which is less than the minimum efficient scale, may impede the development of supporting industries in Vietnam.²⁷ Supporting industries are mostly capital-intensive industries with high fixed costs and increasing returns of scale. They need a large amount of investment to purchase equipment, in order to expand production capacity. It seems that supporting industries in Vietnam do not have sufficient incentives to expand investment, because the business volume seems so small that they may not cover even the minimum average cost occurred in new investment. Since the productivity of domestic suppliers is considered to be lower than that of foreign suppliers, the problem of minimum efficient scale is more critical for domestic suppliers.

Second, information failure is disconnecting the potential parts and machine tool suppliers from MNC assemblers in Vietnam. This applies especially for domestic suppliers, since foreign suppliers tend to have better access to MNCs' demand information. Two types of information failures are likely to exist in Vietnam. First, basic information failure happens when MNCs and domestic suppliers are not aware of each other's demand and supply needs, even though the MNC assemblers want to localize production parts, and domestic suppliers are capable of producing them. The second is the quality standards information gap between MNC assemblers and domestic suppliers (called "the quality standard gap" afterward). Domestic suppliers may be conscious of the needs of MNC assemblers and even try to approach them, but they do not appropriately understand MNCs' requirements for product quality. This information gap becomes an obstacle to business expansion between MNCs and domestic suppliers.

Of course, domestic supporting industries must make an effort to overcome these barriers by themselves. In fact, the problem of minimum efficient scale may be mitigated by business expansion from one industry to another, as [Section 3.5](#) discusses. In addition, domestic suppliers may approach MNC assemblers, in order to have more interaction with

minimum efficient scale as the third major problem based on the result of research in Vietnam. The minimum efficient scale means the smallest output of a firm consistent with minimum average cost. In small countries, in some industries the level of demand in autarky is not sufficient to support minimum efficient scale. Refer to: Deardorff's Glossary of International Economics: <http://www-personal.umich.edu/>

²⁷ Rodrik called this problem as "coordination problem." He also explained "the cluster approach" is a narrow version of same idea. Refer to: Dani Rodrik. "Industrial Policy for the Twenty-First Century" (Cambridge, MA: Harvard University, 2004), 12.

them. However, domestic supporting industries have not acquired sufficient technology to expand their business across several industries. Furthermore, they have not had sufficient opportunities to learn about MNCs' quality standards or to get to know each other.

Thus, the cores of the problem are slow technology upgrading by domestic supporting industries as well as inactive information exchanges between MNC assemblers and domestic suppliers. Since the market has not effectively resolved these problems so far, there is a possibility that judicious policy intervention may contribute to the development of supporting industries.²⁸ These policies would reinforce an export-oriented growth strategy, promoting the agglomeration of FDI.²⁹ Competitive supporting industries will attract FDI, and the entry of MNC assemblers will in turn feed into the competitiveness and dynamism of the domestic supporting industries with positive vertical externalities through backward linkages.

2.9. Differences from the “Infant Industry” Theory in the Rationale and Target

One may make the argument that policy intervention to assist in the development of supporting industries is similar to the “infant industry” theory, which might justify protective measures until domestic industries acquire sufficient technological capability to compete with foreign firms. This theory may also lead to the “import substitution” strategy, which aims at replacing imports with domestic production through protective measures such as high import tariffs.

However, the policy needed for the development of supporting industries differs from the infant industry theory in its rationales for intervention. The infant industry theory is based on the underlying principle that domestic firms need a certain amount of time for the process of learning by doing.³⁰ Otherwise, they cannot compete in the international market and are likely to lose out to competing imports on both price and quality. This theory justifies putting up protective barriers until domestic industries learn essential

²⁸ UNCTAD (2001), 209.

²⁹ *Ibid.*, xix, UNCTAD calls this “the third generation of investment promotion policies.”

³⁰ Dwight H. Perkins, Steven Radelet, Donald R. Snodgrass, Malcom Gillis, and Michael Roemer. *Economics of Development*. (New York, NY: W.W. Norton & Company, 2001), 681.

technologies for surviving competition with foreign firms. In contrast, the policy for the development of supporting industries is based on the market failure that impedes technology upgrading by supporting industries and information exchange between MNC assemblers and domestic suppliers. Although it is similar to the infant industry theory in that it emphasizes the necessity of technological development, it does not require a protected period for learning technology as the infant industry theory does. Rather, FDI and international trade are important sources of foreign technology inflow to domestic supporting industries, because the core of the policy is the promotion of technology transfer and information exchange between foreign and domestic firms.

Moreover, the policy for development of supporting industries differs from the infant industry theory in its primary target. It does not aim to replace imports with domestic production by protective measures, but to encourage domestic supporting industries to specialize in the manufactured inputs demanded by MNC assemblers. This specialization would be promoted through market competition, whereby MNCs can import manufactured inputs at competitive prices through intra-industry and international trade. Although the infant industry theory is based on the assumption that imported inputs are substitutes for domestic products, imported inputs are often complementary to domestically-produced inputs. Thus, they may have positive impacts on the output and productivity of domestic supporting industries. For example, Lopez-de-Silanes, Markusen, and Rutherford (1994) find that a protective policy adversely affects national welfare, because imported inputs are often complements for domestic inputs.³¹ An analysis of the impact of the North American Free Trade Agreement (NAFTA) on the automobile industries in the US, Canada, and Mexico indicates that Mexico, which has weaker supporting industries, will increase output in both final assembly and parts-supplying sectors, because they are complements to imports.

Furthermore, the above proposition can apply to the current situation of supporting industries in advanced ASEAN countries, which specialize in producing some high-value inputs. Those countries are large importers of the inputs that they specialize in. For instance, the ratio of exports to imports of CPUs in Singapore is 1.45, while the ratio of

³¹ Florencio Lopez-de-Silanes, James R. Markusen, and Thomas F. Rutherford. "Complementarity and increasing returns in intermediate inputs." *Journal of Development Economics* Vol. 45 (1994), 101-119.

exports to imports of CRTs in Malaysia is 0.96 and the ratio of exports to imports of compressors in Thailand is 1.29. This result may imply the growth of import along with the export growth in the theory of “balanced trade” as well as increasing variety and segmentation happening in a category of manufactured inputs.

Therefore, the policy for the development of supporting industries differs from the infant industry theory in its rationale for intervention and its primary target. Its rationale for intervention is not related to the necessity of a protected learning process, but the impediments against technological development and information exchange between MNCs and domestic supporting industries. The role of public policies is to create a “knowledge infrastructure”, which becomes the foundation for closing the knowledge gap.³² Moreover, the target of the policy is to encourage supporting industries to specialize in the components which MNC assemblers intend to procure from the domestic market. In order to promote specialization, it is necessary to encourage competition through intra-industry and international trade as well as FDI.

3. Analyzing Supporting Industries in Vietnam: Possible Policy Recommendations to Reduce Market Failures

3.1. Introduction

The development of supporting industries is considered one of the most important and urgent issues which needs to be dealt with, in order to promote economic development in Vietnam. While supporting industries cover various industries, the analysis in this section focuses on the consumer-electronics sector (home appliances, audio-visual, and PC peripherals), in order to deeply analyze the current situation and consider concrete policy proposals. This section starts by examining the demand of MNC assemblers for production parts, and then explores supply side concerns in domestic supporting industries,

³² Joseph E. Stiglitz. “Knowledge as a Global Public Goods.” Inge Kaul, Isabelle Grunberg, and Marc A. Stern (eds.). *Global Public Goods: International Cooperation in the 21st Century*. (New York, NY: the United Nations Development Programme, 1999), 317.

in order to clarify market failures which impede the development of supporting industries.³³ Then, possible policy options that may reduce market failures are discussed.

3.2. MNCs' Small Demand for Local Procurement of Production Parts

MNCs are the main driving force in Vietnam's consumer-electronics sector, which is growing rapidly at the rate of 18% from 2002 to 2003. The output value of Vietnam's consumer-electronics sectors is about US\$2.4 billion, which accounts for 6.1% of total industrial output in 2003. MNC assemblers produced 63% of the total output value in 2003, while domestic assemblers, which are mainly state-owned enterprises, accounted for the rest (refer to Annex B). In addition, their domestic sales far exceed exports. In 2003, 83% of total output of consumer-electronics industries was sold in the domestic market.³⁴

Regarding the category of products, around 45% of the output consists of home appliance products such as TVs, washing machines, and refrigerators in 2003. Those commodities are mainly targeted at the domestic market, protected by high tariff barriers on imports.³⁵ Because of its large population, Vietnam is considered to have the third largest domestic market for home appliance products, next to Indonesia and Thailand.³⁶ In addition, due to rapid GDP growth (7.5% in 2004), Vietnam's domestic market for the above three goods is approaching that of Thailand (refer to Figure 3-1).

However, MNCs' total output volume in Vietnam's consumer-electronics industry is still smaller than in other ASEAN countries. The output value of Vietnam's consumer-electronics sectors was about US\$2.4 billion in 2003, while it was about US\$23

³³ "Production parts" is basically same as "manufactured inputs."

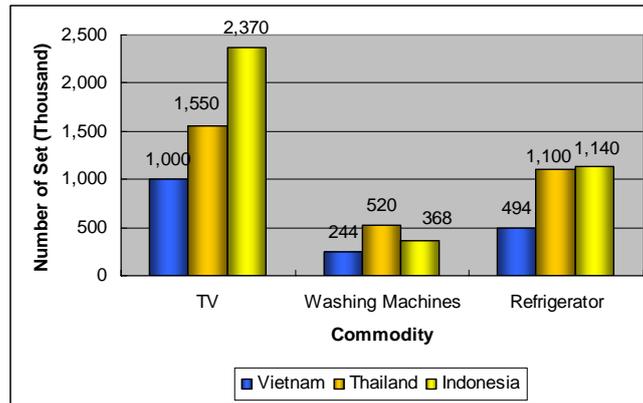
³⁴ This figure is calculated, based on JETRO's statistics about the export of electronics products (US\$406.8 million) and the figure from: General Statistics Office (GSO). *Statistical Yearbook 2004*. (Hanoi, Vietnam: Statistical Publishing House, 2005).

³⁵ For example, import tariff on TV is 50% in 2003. Refer to: Japan Overseas Development Corporation (JODC). "Preparatory Study on Formulation of Measure for Cultivation and Enforcement of the Electronic/Electrical Industry in Vietnam (in Japanese)." (Tokyo, Japan: JODC, 2003), 36. In addition, the Effective Rate of Protection (ERP) for home appliances is 44%, while the Nominal Rate of Protection (NRP) is about 21%. Refer to: Bui Trinh, Le Ha Thanh, and Pham Hong Chuong. "Measuring the level of protection for manufacturing industry in Vietnam: the Effective Rate of Protection (ERP) Approach" *Paper prepared for Ecomod 2005*. (Hanoi, Vietnam: 2005), 8.

³⁶ Referring to *World Development Indicator* (World Bank), Vietnam's population is 82 million in 2003.

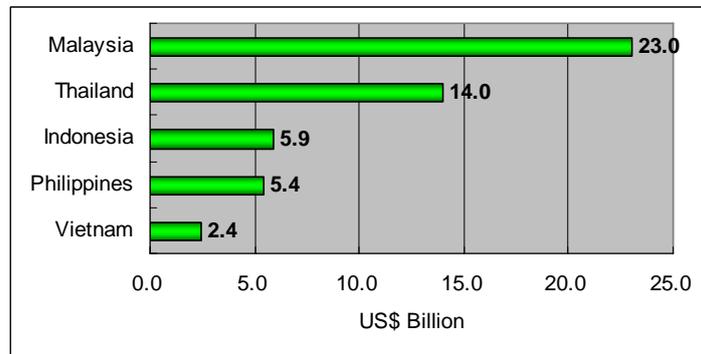
billion in Malaysia and US\$14 billion in Thailand (refer to Figure 3-2).³⁷

Figure 3-1
Domestic Sales of Main Consumer-Electronics Goods (2003)



Source: Japan International Cooperation Bank (JBIC) *Vietnam's Investment Climate* (Tokyo, Japan: JBIC, 2005), 74-75.

Figure 3-2
Output Value of Consumer-Electronics Products (2003)



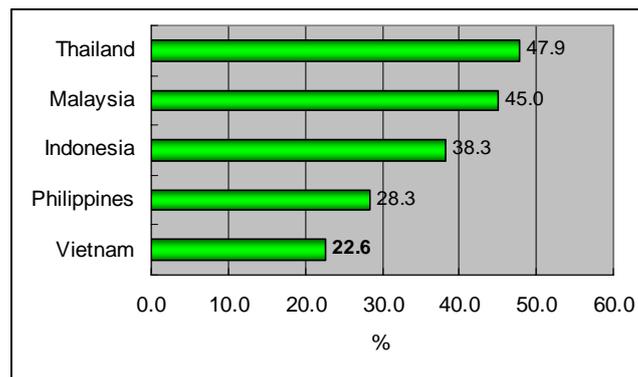
Source: Hisami Mitarai. "Issues in the ASEAN Electric and Electronic Industry and Implication for Vietnam." Kenichi Ohno and Nguyen Van Thuong (eds.) *Improving Industrial Policy Formulation*. (Hanoi, Vietnam: Vietnam Development Forum, 2005) and General Statistics Office. *Statistical Year Book 2004* (Hanoi, Vietnam: Statistical Publishing House, 2004).

Moreover, the share of production parts sourced locally is smaller in Vietnam than in other ASEAN countries. MNCs are currently not sourcing a large volume of production parts from domestic supporting industries, while they import the majority of them. For instance,

³⁷ Hisami Mitarai. "Issues in the ASEAN Electric and Electronic Industry and Implication for Vietnam." Kenichi Ohno and Nguyen Van Thuong (eds.) *Improving Industrial Policy Formulation*. (Hanoi, Vietnam: Vietnam Development Forum, 2005), 143, 154.

the average of local parts procurement ratios in all the manufacturing sectors is around 22.6% at the value base, which is lower than in other ASEAN countries (refer to Figure 3-3).³⁸ In the consumer-electronics sector, although the local procurement ratio should vary between MNCs, it seems to be around 20-40% in TVs and 5-12% in PC peripherals in general.³⁹ Currently, many MNC assemblers in the consumer-electronics sector are sourcing plastic parts, metal parts, transformers, and packing materials from domestic supporting industries.⁴⁰ The local procurement for washing machines and refrigerator seems to be 50% to 60% in some MNCs. Nonetheless, the ratio of production parts sourced from domestic supporting industries should be much smaller than 50-60%, because MNCs for washing machines and refrigerators tend to produce many plastic and metal parts by themselves.

Figure 3-3
Average Local Procurement Ratios in ASEAN (2003)



Source: Japan External Trade Organization (JETRO). *Japanese-Affiliated Manufacturers in Asia (ASEAN and India) – Survey 2004*. (Tokyo, Japan: JETRO, 2005), 18.

Despite their current small demand for production parts, it is highly possible that MNCs will increase local procurement in the near future. For one thing, the consumer-electronics sector is growing rapidly at the rate of 18% from 2002 to 2003 in the real term (refer to

³⁸ The local procurement ratio may not always accurately reflect the magnitude of backward linkages with domestic firms, because: i) it may count in-house production by foreign affiliates, ii) it includes the purchases from foreign parts suppliers located in the host country, and iii) it may include parts imported from a country with preferential trade agreement (e.g. AFTA). Refer to: UNCTAD (2001), 134.

³⁹ Author's interview with Japanese consumer-electronics manufactures in Vietnam in 2004 and 2005. Also refer to: Nomura Research Institute (NRI) "Report for the establishment of Technical Assistance Center for SMEs in Vietnam (in Japanese)." (Tokyo, Japan: NRI, 2002), 35, and JODC (2003),40.

⁴⁰ Author's interview with Japanese electronics manufactures in Vietnam in 2004 and 2005.

[Annex D](#)). The growth in the industry will automatically increase the demand for local procurement. Second, many MNCs are trying to increasing the local parts procurement ratio while decreasing the ratio of parts imports. According to JETRO's survey, 72.9% of Japanese manufacturers answered that they were planning to increase local procurement of production parts in Vietnam.⁴¹ For example, Panasonic AVC Networks Vietnam Co., Ltd. (Panasonic AVC Vietnam), one of the major Japanese electronics manufacturers in Ho Chi Minh City, mentioned that it hoped to increase the local procurement ratio to 65% in the future.⁴² Canon Vietnam Co., Ltd. (Canon Vietnam), the largest producer of PC printers in Vietnam, is also planning to increase the local procurement ratio of parts to 50% in the future.⁴³ Canon Vietnam expanded its factory in Hanoi and will increase the production quantity from 600 thousand to 1.2 million sets per month with a re-investment of US\$100million. In addition, it is now constructing the world's largest laser printer factory with an investment of US\$50million in Bac Ninh Province. This factory will produce 700 thousand sets per month after beginning operations in 2006. Thus, it is expected that the demand for production parts will increase in the Red River Delta including Hanoi.

In particular, it seems that MNCs intend to increasingly source plastic and metal parts from domestic supporting industries.⁴⁴ This is mainly because importing these parts incurs high transaction costs, while the prices of imported parts are not competitive due to low economy of scale of production ([refer to Section 2-4](#)). Thus, there are high potential for growth in plastic and metal parts industries.

3.3. Supply-Side Constraints: Barriers Which Hinder the Development of Supporting Industries

Despite MNCs' potential interest in local procurement, it seems that domestic supporting industries would not be capable of increasing the supply of production parts for MNC assemblers, as revealed in the data showing that Vietnam has the lowest ratio of local parts

⁴¹ JETRO (2005), 64. Also, 62.4% of firms answered that they were planning to increase purchase from ASEAN countries.

⁴² Author's interview with Panasonic AVC in August 2005.

⁴³ Author's interview with Canon Vietnam in July 2005.

⁴⁴ Author's interview with Japanese consumer-electronics manufactures in Vietnam in 2004 and 2005. Also refer to: Nomura Research Institute (NRI) "Report for the establishment of Technical Assistance Center for SMEs in Vietnam (in Japanese)." (Tokyo, Japan: NRI, 2002), 14.

procurement in ASEAN (refer to Figure 3-3). According to JETRO (2005), 68.6% of Japanese manufacturers surveyed answered that the largest problem in production operation in Vietnam is the difficulty in procuring production parts and raw materials in the domestic market, compared with 40.1% in Thailand, 31.6% in Malaysia, 48.4% in Indonesia, and 52.7% in the Philippines.⁴⁵

It seems that Vietnam faces two types of barriers to the development of supporting industries: i) problem of minimum efficient scale and ii) information failure (refer to Section 2.8). Further analysis of these problems may give us an idea of how domestic supporting industries can overcome market failures, supported by appropriate public policies that would reinforce domestic suppliers' efforts.

3.3.1. Problem of Minimum Efficient Scale: Demand Size Does Matter

In Vietnam's consumer-electronics sector, small demand for local parts procurement below minimum efficient scale may be discouraging domestic supporting industries from investing in business with MNC assemblers. Comprehensive data for the minimum scale of efficiency for supporting industries in the electronics sector are not available. Instead, it is possible to refer to data from the motorbike industry, because the consumer-electronics industry shares some common supporting industries with it. In the motorbike industry, the minimum efficient scale of parts suppliers is thought to be more than 500 thousand units per year in the production of plastic parts and metal pressing parts, while it will reach 1 million units in the case of highly capital-intensive parts such as electronic components and metal forging parts.⁴⁶ In the consumer-electronics sector, the total output volume of the whole industry is larger than the minimum efficient scale. For example, domestic sales of TVs reached about 1.6 million units in 2002.⁴⁷ However, it is less likely that many parts suppliers could obtain manufacturing orders for more than 500 thousand units per model. According to the simplified simulation in Figure 3-4, a parts supplier needs to acquire more than 30% of the market share across more than ten MNCs which assemble TVs in Vietnam

⁴⁵ JETRO (2005), 18.

⁴⁶ Kohei Mishima "Industrialization of Developing Countries and Motorbike Industry: Local Procurement Process of Japanese Manufacturers in Thailand (in Japanese)" *Unpublished Draft*, 6.

⁴⁷ General Statistics Office. *Socio-Economic Statistical Data of 64 Provinces and Cities*. (Hanoi, Vietnam: Statistical Publishing House, 2005). However, GSO (2004b) says that Vietnam produced 2.2millions sets.

in order to have enough orders to cover the minimum efficient scale. Thus, in Vietnam, it seems that only a few parts suppliers per product can obtain manufacturing orders which exceed the minimum efficient scale.

Figure 3-4
Simplified Simulation for Required Market Share
to Overcome Minimum Efficient Scale (MES)

		Plastic Injection Molding	Metal Pressing	Metal Forging	Electronic Components
Estimated MES (Unit)		500,000	500,000	1,000,000	1,000,000

Finished Goods	Market Volume (Unit)	Market Share to Cover MES (MES / Market Volume %)			
		Plastic Injection Molding	Metal Pressing	Metal Forging	Electronic Components
TV	1,600,000	31%	31%	63%	63%
Washing Machines	244,000	205%	205%	410%	410%
Refrigerator	494,000	101%	101%	202%	202%

Drafted by Author

Note: This simulation has several shortcomings. First, it does not consider that the specifications of components may differ by model. Second, the market volume for washing machines and refrigerators is based on domestic sales, not production. The production quantity is usually much larger than the sales quantity. Thus, the above calculation is made just to help readers get a sense of the minimum efficient scale problem in Vietnam.

Furthermore, domestic supporting industries cannot simply increase unit prices of parts to resolve the problem of minimum efficient scale, because MNC assemblers will increase the quantity of imported parts if domestic supporting industries do not maintain lower prices than those of imported parts. If an efficient parts production network had not been established in East Asia, MNC assemblers might have sourced production parts from domestic supporting industries at an even higher price. Nonetheless, the parts production network in East Asia is getting so efficient that MNC assemblers in Vietnam can import any component, if the prices of domestically-produced parts are not competitive.

Another aspect of minimum efficient scale problem is the negative impact on FDI from foreign suppliers. Foreign suppliers would choose to export production parts from existing manufacturing bases in other ASEAN countries to Vietnam, rather than taking the risk to invest in Vietnam whose demand size may not cover the minimum efficient scale. In fact, other advanced ASEAN countries have greater demand than Vietnam. For

instance, Malaysia produces 9.9 million TV sets including exports and domestic sales, Thailand produces 6.5 million sets, and Indonesia produces 5.6 million sets, compared to 1.6 million sets in Vietnam.⁴⁸ Thus, foreign parts suppliers would gain more profits by exporting from manufacturing bases in those countries to Vietnam than by investing in Vietnam.

3.3.2. Information Failures: Gaps of Quality Standard

It seems that basic information failure has not been significantly reduced yet, although the government has made efforts to increase opportunities for interaction between MNC assemblers and domestic suppliers. For example, the Vietnam Chamber of Commerce and Industry (VCCI) established an information database. However, some MNCs pointed out that they still need to get in contact with domestic suppliers and gather more detailed information, since the databases contain only basic company information such as contact address.⁴⁹

Moreover, the quality standard gap still hinders domestic suppliers from increasing businesses with MNCs. In fact, 90.6% of Japanese MNCs answered that the improvement of domestic parts suppliers' product quality was the most important factor in deciding to increase local procurement.⁵⁰ It is thought that this gap is mainly caused by the degree of exposure to the markets of developed countries. Generally speaking, the quality requirements for a developed country's market are considered to be higher than that for developing country's markets. This indicates that MNC assemblers and foreign suppliers are always exposed to the higher quality standard of markets in developed countries, while domestic suppliers have not been well connected to the global market and thereby tend to produce production parts based on the quality standard of the domestic market.

One may question that domestic suppliers should still sell MNC assemblers the parts for domestically-sold products in Vietnam, where quality standards are lower in general. However, MNCs usually apply the same quality standards to domestically-sold products as

⁴⁸ NNA (2005), 75.

⁴⁹ Author's interview with Japanese consumer-electronics manufactures in Vietnam in 2005.

⁵⁰ JETRO (2005), 65.

they do to those for developed countries' markets. They adopt unified quality standards for all markets, as confirmed in a recent case of an environmental standard tightened by the European Union (EU). The EU will implement the Restriction on Hazardous Substances (ROHS), which prohibits imports of all products including six harmful chemical materials (cadmium, lead, chrome, mercury, PBB, PBDE) from 2006. Although there is no such environmental restriction in Vietnam, MNC assemblers have decided to apply the same standard to all the products for domestically-sold products, even though it is much stricter than the domestic regulation.⁵¹ Thus, MNC assemblers will purchase only the production parts which satisfy the ROHS criteria, even in Vietnam.

3.4. How Can Public Policy Contribute to Removing Obstacles?

Appropriate public policies may help domestic supporting industries, especially domestic suppliers, overcome market failures in several ways.

First, public policies may contribute to reducing the minimum efficient scale problem by promoting technology upgrading of domestic supporting industries. Technology upgrading will strengthen the capacity of domestic supporting industries to expand their business from one industry to another, while minimizing the increase in average cost. For instance, domestic supporting industries may produce components for both the motorbike and consumer-electronics industries, if they can learn the technology required in both industries. [Section 3.5](#) discusses several types of possible business expansions in which domestic supporting industries can overcome the problem of minimum efficient scale. However, domestic supporting industries are facing difficulties in upgrading technology, despite opportunities for business expansion. Thus, public policies may play an important role in supporting their efforts for technology development.

Second, public policy may promote information exchange between MNC assemblers and domestic supporting industries. For example, updating a common database might reduce basic information failure. Japanese MNCs mentioned that they needed the following information in a database: i) quality of products ii) cost of products, iii) flexibility of

⁵¹ Author's interview with Japanese consumer-electronics manufactures in Vietnam in 2005.

delivery, iv) management policy, and v) production capacity.⁵² Including that information may reduce the transaction costs for MNCs of finding competitive parts suppliers and thereby reduce basic information failure to some extent. However, an improvement in common databases would not reduce quality standard gap. In particular, domestic suppliers may need opportunities to acquire in-depth knowledge of the quality requirement of MNC assemblers. Thus, it may be helpful to develop public policies to assist domestic suppliers in creating opportunities to meet MNCs face to face and learn their quality requirements directly.

There might be other policy options that would deal with the problems more directly, if the government can select the sectors most likely to achieve high growth. For example, the government may subsidize a certain sector of supporting industries, based on the theory of “coordination failure” or “big push.” However, this would increase the risk of government failure at the same time. In particular, business trends in the consumer-electronics sector are changing so fast that even MNCs are facing difficulties in deciding on the right direction for their businesses. Thus, it is better for public policies to focus on indirect but effective options represented by promoting technology upgrading and information exchange, in order to minimize the risk of government failures.

3.5. Upgrading Technology to Overcome the Minimum Efficient Scale Problem

Through technology upgrading supported by public policies, domestic supporting industries may gain sufficient business volume to overcome the minimum efficient scale problem. Total business volume may be expanded in three ways: i) horizontal business expansion, ii) vertical business expansion, and iii) increasing subcontracting business.

3.5.1. Horizontal Business Expansion to Increase Output Volume

Technology upgrading will enable domestic supporting industries to achieve horizontal business expansion, which may increase total business volume above the minimum efficient scale. Horizontal business expansion means increasing the variety of

⁵² Author's interviews with Japanese consumer-electronics manufactures in Vietnam in 2004 and 2005.

commodities across industries, taking advantage of the characteristics that cover several industrial sectors. For example, motorbike parts suppliers may enter the consumer-electronics industry because those two industries share common categories of components, such as plastic parts, metal pressing parts, and aluminum die-casting parts. Taking the plastic injection molding industry as an example, motorbike parts suppliers may also produce plastic parts for consumer-electronics products with the same equipment. Plastic parts are used as motorbike's exterior parts, which are produced by using 80-ton to 850-ton plastic injection molding machines. On the other hand, plastic parts are used for TV, washing machines, refrigerators, and PC printers. TV cabinets are produced by using plastic injection machines ranging from 850 to 1,300 tons. Covers and water tanks for washing machines are produced by injection machines ranging from 550 to 1,300 tons. Interior parts of refrigerators can be produced by machines ranging from 180 to 550 tons. Cabinets for PC printers may be produced by 850 ton injection machines. In short, some parts for consumer-electronics goods can be produced by plastic injection machines used for motorbike parts (refer to Figure 3-5).

Figure 3-5
Range of Plastic Injection Machines by Product

Product	Parts	0-500t	501-1,000t	1,001-1,500t
Motorbike	Exterior Parts	80-850t		
TV	Cabinet		850 -1,300t	
Washing Machines	Cover, Water Tank		550-1,300t	
Refrigerator	Interior Parts	150-550t		

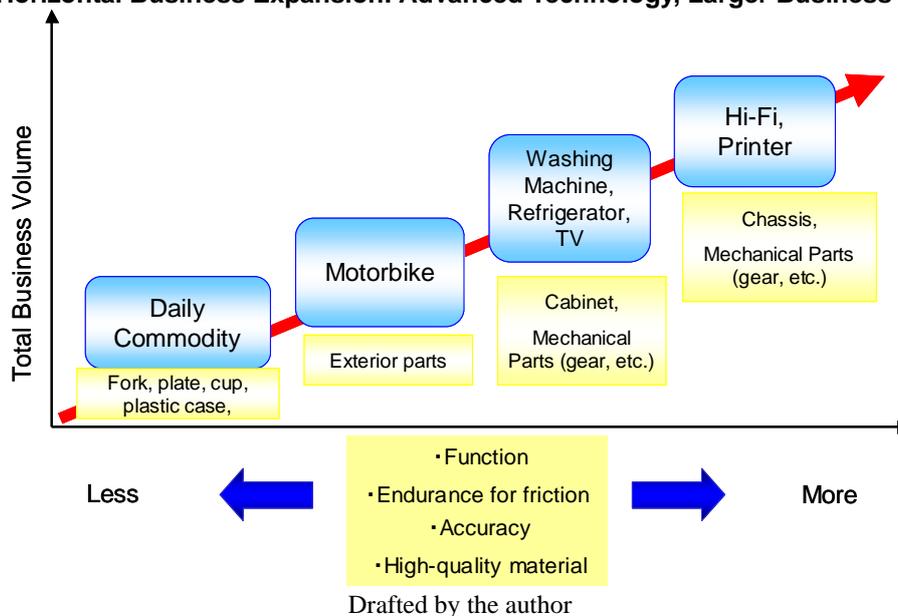
Drafted by Author

Thus, if a parts supplier has plastic injection machines for producing motorbike parts, they may produce the parts for consumer-electronics goods as well. This will increase business volume while reducing the average cost per part incurred by investing in machines.

However, motorbike parts suppliers need to upgrade their technology for horizontal business expansion, because plastic parts for consumer-electronics products require more sophisticated technology than those for motorbikes in several ways. First, consumer-electronics parts such as plastic cabinets require a higher-quality appearance than

those for motorbike parts. Second, plastic parts for consumer-electronics products require a lower tolerance rate than those for motorbikes. This is because the consumer-electronics parts are associated more with the mechanical function, while plastic parts for motorbikes are less related to mechanical function. For example, a plastic chassis for a PC printer is more difficult to produce than a body part for motorbike. The inside of the chassis is very delicately designed, because it will be directly connected with the mechanical function that should precisely move a paper in and out and be used for printing pictures in super-fine quality like a photograph. Additional examples of parts requiring more advanced technology are plastic parts for the zoom function of a digital camera and the rear panel of LCD display (refer to Figure 3-6).

Figure 3-6
Ideal Horizontal Business Expansion: Advanced Technology, Larger Business Volume



The performance of machines may account for the majority of product quality, but the rest will be affected by the quality of production management and production engineering, including the skills to repair and adjust molding tools. First, technicians who operate the injection machines should be capable of finding problems with production processes and immediately implementing countermeasures. Second, a high level of quality control, including the ability to operate 3-D measurement machines, is required to manufacture components for consumer-electronics products. For example, plastic chassis for PC printers should be measured in 1,000 spots. Finally, the maintenance skills required for

molding tools enhance the quality of the parts. As the required tolerance rate becomes lower, plastic parts suppliers may frequently need to make minor repairs or adjustments to molding tools. This is because the precision of molding tools significantly affects the quality of plastic parts. Without the technology to maintain molding tools, it may be difficult to resolve the quality problems immediately, since a parts supplier may need to send the tools to a specialized manufacturer for adjustment. This transaction cost, including the long lead-time, would lessen the competitiveness of parts suppliers.

Although this technical difference may determine only a small portion of product quality, it represents the technological gap between foreign suppliers and domestic suppliers. Currently, some Japanese suppliers are manufacturing components for both motorbikes and electronics goods. For example, Daiwa Plastic Thang Long (Daiwa), which was established through a joint venture between Japanese firms and Vietnamese firms in Hanoi, supplies high-quality industrial plastic parts for motorbikes, which accounts for about 50% of its total sales. Daiwa also produces parts for PC printers, which account for around 40% of its total sales.⁵³ Another example is Showpla Vietnam Co., Ltd. (Showpla Vietnam), which is a wholly-owned subsidiary of a Japanese plastic parts supplier and operates two factories in Hanoi and Ho Chi Minh City. Showpla Vietnam produces motorbike parts, accounting for around 30% of total monthly sales, as well as parts for consumer-electronics products such as TVs, washing machines, refrigerators, and PC printers, which accounts for 60% of sales.⁵⁴

In contrast, few domestic parts suppliers have succeeded in expanding business from motorbikes or other industries to the consumer-electronics industry. Cat Thai Manufacturing & Trading Co., Ltd. (Cat Thai) is a rare case of success. While in the past it supplied a small amount of motorbike parts, Cat Thai currently supplies plastic parts for washing machines, refrigerators, and TVs, which account for about 35% of its annual sales, while manufacturing daily commodities that account for 40% of its sales.⁵⁵ Cat Thai's production capacity and annual sales are rapidly growing, although its size is still much smaller than foreign parts suppliers. However, it is difficult to find a successful case

⁵³ Mori and Ohno (2005), 133.

⁵⁴ Author's interview with Showpla Vietnam. in August 2005.

⁵⁵ Mori and Ohno (2005), 133, and author's interview with Cat Thai. in August 2005.

except for Cat Thai. This may imply that domestic suppliers are much slower to upgrade their technology than foreign suppliers.

3.5.2. Vertical Business Expansion to Increase Value-Added Activities

Technology upgrading will enable domestic supporting industries to vertically expand their business and increase sales volumes above the minimum efficient scale. Vertical business expansion means enlarging specialized processes, while horizontal business expansion is increasing the variety of commodities. Parts suppliers will increase value-added activities and the unit price of production parts through vertical business expansion.

Taking plastic parts as an example again, parts suppliers may add production or designing of molding tools to the parts manufacturing operation, as one option for vertical business expansion (Refer to Figure 2-1). An MNC assembler will either pay additional costs for molding tools or increase the unit purchase price of production parts to include the cost of molding tools. In either case, a parts supplier will increase its sales value, but fixed costs may also increase because production and design of molding tools will need special equipment. Furthermore, a plastic parts supplier needs to educate technicians in molding tool production, which requires completely different technology than plastic injection molding. Thus, a parts supplier may overcome the minimum efficient scale problem, if it can attract enough new business to cover the increasing average costs due to new equipment and technicians.

One successful case of vertical business expansion is Muto Vietnam Co., Ltd. (Muto Vietnam), which is a leading Japanese plastic parts and molding tool supplier.⁵⁶ Muto Vietnam produces both plastic parts and molding tools for digital cameras and camcorders under the license of Export Processing Enterprise (EPE), which allows foreign firms to import parts and raw material without import duties, but forces them to export 100% of products. Muto Vietnam is one of a few companies that have comprehensive production systems, from designing molding tools to the production of plastic parts. It is very hard to find a domestic supplier which has such a comprehensive production system in Vietnam.

⁵⁶ Author's interview with Muto Vietnam in August 2005.

Thus, it is thought that technology gap between foreign suppliers and domestic suppliers in molding tool production may be even larger than in plastic injection molding.

Another direction of vertical business expansion is to step into sub-assembly processes (Refer to Figure 2-1). For example, a plastic parts supplier can start getting involved in the sub-assembly process by assembling TV plastic cabinets with speaker nets, buttons, or circuit boards. This will enable a parts supplier to add more value to their products, which will increase the unit price of parts as well as total sales values. In this way of expansion, the average cost would not significantly increase, because sub-assembly is not a capital-intensive but a labor-intensive process that requires more unskilled workers.⁵⁷ Parts suppliers need to learn new technology, such as production control of sub-assembly processes, but the cost of new investment for fixed assets seems to be lower than starting molding tools production in this type of vertical business expansion. Moreover, Vietnam may have a comparative advantage in assembly process, because it has sufficient number of workers who are hardworking, dexterous, and cheap. In practice, Showpla Vietnam and Muto Vietnam are successfully increasing value-added activities by becoming involved in the sub-assembly processes.

3.5.3. Increase of Subcontracting Business: Expanding Business with Learning

For overcoming the problem of minimum efficient scale, technology upgrading will allow domestic suppliers to make use of the third option. Even if domestic suppliers cannot obtain direct business contracts with MNC assemblers for some reason, they may alternatively increase subcontracting business with foreign suppliers as the second tier suppliers. Through the sub-contracting business, domestic parts suppliers may increase total business volume, while they can learn foreign suppliers' technology which meets the cost and quality of the MNC standard.

Foreign parts suppliers may also intend to subcontract with domestic suppliers, even though they can be a competitor, in order to cope with the fluctuation in MNCs' demand in the short and long run. First, foreign parts suppliers may intend to use domestic parts

⁵⁷ Author's interview with Japanese consumer-electronics manufactures in Vietnam in 2005.

suppliers as a buffer, because of seasonal demand fluctuations of MNC assemblers' demand in the consumer-electronics sector. For example, MNCs' production would usually reach the peak in the two to three months before Christmas, while it may sharply drop in February. Thus, it seems reasonable that foreign suppliers would contract out the excessive volume in peak seasons to domestic suppliers, in order to save the cost of additional investment. In particular, Japanese parts suppliers in Vietnam pointed out this possibility for subcontracting, since they may prefer to minimize increases in fixed cost. In fact, some Japanese parts suppliers have contracted out some business to domestic suppliers in peak season.⁵⁸ However, it seems that they are not very satisfied with the performance of domestic suppliers, particularly due to their lower product quality.

Another incentive for foreign parts suppliers to subcontract may be the hope of a fixed cost reduction in the long run, on the assumption that Vietnam's consumer-electronics industries will continue to grow rapidly. If foreign parts suppliers expanded their production facilities in order to accommodate the higher demand of MNC assemblers, they would reduce the flexibility of business operations, because of increasing fixed costs. Therefore, foreign parts suppliers may be interested in using subcontractors for long-term risk management. This would particularly be the case for Taiwanese parts suppliers, which tend to expand the facilities more aggressively than Japanese parts suppliers. In fact, it seems that Taiwanese parts suppliers tend to subcontract more business to domestic parts suppliers than Japanese suppliers. For example, Vietnam Precision Industrial Co., Ltd. (VPIC) is a leading Taiwanese supplier of metal precision parts. VPIC is rapidly expanding its business to consumer-electronics parts and others, although motorbike components still account for the majority of their sales. In order to avoid sharp increase in fixed costs, VPIC is using more than 10 domestic suppliers as subcontractors. Also, VPIC is interested in adding more subcontractors, dependent on business prospects.⁵⁹

3.6. Policy Recommendation: Promoting Collaborative Training Programs

Among various policy options for promoting technology upgrading and information flow, it may be recommended to develop the mechanism of collaborative technical and

⁵⁸ Author's interview with Japanese suppliers in Vietnam in 2005.

⁵⁹ Author's interview with VPIC in August 2005.

management training between MNCs and domestic supporting industries (called “collaborative training” afterward) in Vietnam. While conventional vocational training programs in developing countries tend to focus on educating domestic firms only under government control, a collaborative training program consists of members from both MNCs and domestic firms. In addition, it is desirable to have a collaborative training program managed by member companies, not by public organizations, so that training curriculums will be updated based on market demand.

It is thought that promoting a collaborative training mechanism would benefit Vietnam's supporting industries by providing them with opportunities to access various resources owned by MNCs. For domestic suppliers, one of the most efficient ways to upgrade technology may be to increase business contacts with MNC assemblers, but most domestic suppliers are not capable of obtaining business contracts with MNCs. Those uncompetitive suppliers may have fewer opportunities to conduct business with MNCs even in the future, because their technology level is not adequate to produce high-quality parts at competitive prices for MNCs.

In this situation, collaborative training programs may provide those uncompetitive domestic suppliers with opportunities to learn MNCs' technology and quality standards in several practical ways. First, collaborative training programs may contribute to technology upgrading of domestic parts suppliers, with promoting technology transfer from MNCs to domestic parts suppliers. In these programs, MNC assemblers and domestic parts suppliers participate in courses in engineering or management skill development together, while employees of MNCs may be either participants or instructors. Second, collaborative training programs may reduce basic information failure, because the MNC assembler and domestic parts supplier will meet each other face to face in the programs. Third, quality standard gap may be lessened by collaborative training programs where instructors from MNCs would teach employees of domestic parts suppliers. In lectures and class discussions, it is possible for employees of domestic parts suppliers to acquire a deep understanding of MNCs' cost, quality, and delivery requirements, as well as their way of thinking. Finally, the collaborative training programs may function additionally as a place for informal business matching. MNCs may find some competitive suppliers through these programs, carefully examining their technology levels.

However, there might be a few concerns about promoting collaborative training programs. One may argue that collaborative training programs would benefit MNCs more than domestic firms. It may be true that collaborative training programs will benefit employees of MNCs as well, while it is ambiguous whether MNCs or domestic firms would receive larger benefits from the programs. However, the net effects of technology upgrading for domestic firms are likely to be larger in collaborative training programs than in the programs focused on domestic firms. Collaborative training programs may cause technology transfer from MNCs to domestic firms, either formally through courses or informally outside of courses. In contrast, the programs focused on domestic firms would not directly promote technology transfer from MNCs to domestic firms. Another concern may be that management by firms may reduce transparency of projects. Certainly, the transparency of projects might be improved if the government gets involved in the management of projects, while there may be a trade-off between government intervention and active leadership by corporations. Thus, with promoting management by member firms, the government may be better off maintaining the status of supervisor.

3.7. Toward More Concrete Policy Proposals

In order to develop the mechanism of collaborative training in Vietnam, it may be beneficial to learn from predecessors, such as advanced ASEAN countries, while analyzing relevant projects in Vietnam. In particular, Malaysia's experiments for collaborative training programs may provide valuable lessons for Vietnam. The Penang Skill Development Center (PSDC) in Malaysia is widely recognized as a good practice, which has contributed to upgrading the technology of domestic supporting industries in cooperation with MNCs. In addition, PSDC has been successfully reducing information failures through the Global Suppliers Program (GSP), which was established by combining collaborative training courses and the business match-making program between MNCs and domestic parts suppliers.

The factors of PSDC's successes in collaborative training may be applied to on-going technology upgrading programs in Vietnam, while remembering that Vietnam is in a very different situation from Malaysia in the 1980s and 90s. Aiming to enhance economic

development through technology upgrading, Vietnam has already implemented some projects that may directly or indirectly contribute to developing supporting industries. One case is Hanoi Industrial College (HIC) and the Japan International Cooperation Agency (JICA) Project. This project was implemented to upgrade the production-engineering skills of high school graduates. Another is the Technical Assistance Center (TAC) Project, which the Ministry of Planning and Investment (MPI) and JICA are planning to establish in the near future. This project will mainly target the skill development of Vietnamese SMEs.

All of the above three projects in Malaysia and Vietnam are similar in the sense that they try to promote technology upgrading, but there are also sharp contrasts in the structure of the projects. In the projects for the development of supporting industries, there are four choices of core components in general: i) whether a project should take the form of general education or vocational training, ii) whether a project should involve MNCs in the programs and management, iii) whether a project should have the function of reducing information failure, and iv) whether the local and national governments should play active or supportive roles.

The above three projects have some similarities and differences in terms of those choices. First, PSDC was established as a collaborative training project under MNCs' active leadership. In addition, PSDC is promoting information exchange between MNCs and domestic SMEs through training courses and business match-making programs. Furthermore, the local government basically plays the role of supervisor and catalyst between MNCs and domestic firms, while the federal government provides the funding and reflects PSDC's activities onto national strategies.

Second, the HIC-JICA project aims to enhance the quality of general engineering education. MNCs do not directly involve the programs or management, but HIC-JICA project indirectly tries to reduce information failure by promoting the business with MNCs. In the HIC-JICA project, the national government supervises the program, but the local government does not get actively involved in the project.

Finally, TAC is a vocational training project that focuses only on domestic SMEs, which are

mainly parts suppliers. In contrast to PSDC, MNCs will not get involved in its planning and management. In addition, it seems that TAC will concentrate on upgrading technology, while not having a plan to cope with information failures. Furthermore, the national government agency is the counter part of project in the TAC project, while the local government does not play a significant role.

In Sections 4, 5, and 6, the successes and challenges of those three projects are examined further, considering how the choice of core components would affect the efficiency of projects to promote technology upgrading and information flow for the development of supporting industries.

4. A Good Practice for Collaborative Training: The Penang Skill Development Center in Malaysia

4.1. Learning from a Good Practice in Malaysia

In order to understand the benefits of collaborative training programs, examining a more concrete case may be helpful for policy makers. This section introduces a good practice that has contributed to the development of supporting industries in the electronics sector, paying special attention to the Penang Skill Development Center (PSDC) in Malaysia.

The electronics sector is the core industry in Penang, which accounted for 18-20% of GDP and 55% of the employment in 2003.⁶⁰ It seems that PSDC has played a significant role in the development of Penang's electronics sector by promoting technology upgrading and information exchange. Under MNCs' active leadership, PSDC provided unique technology upgrading programs for company employees and non-employees such as high-school graduates. It has also initiated the Global Suppliers Program (GSP), which has reduced information failures between MNCs and domestic parts suppliers.

It could be difficult to apply the whole program to Vietnam or other countries, but it is still

⁶⁰ JODC (2003), 48.

possible to learn some valuable lessons from its success. The purpose of learning a good practice is not to merely transfer it from one place from another but to learn the essence of success. In particular, it is beneficial to examine the following points: i) the benefits of collaborative training programs, ii) the mechanism by which collaborative training programs function, iii) reasons that MNCs are attracted to PSDC, iv) conditions in which collaborative trainings attract MNCs, v) roles of local and national governments, and vi) shortcomings of PSDC. In addition, it should be remembered that those points are not completely applicable to Vietnam without customization of programs.

4.2. Establishment of the Penang Skill Development Center

The Penang Skill Development Center (PSDC) was established as a non-profit organization in 1989. Its primary objective is to increase the supply of skilled labor for manufacturing firms in Penang, especially for MNCs. In addition, the government hoped to attract more foreign direct investment (FDI) by improving Penang's investment climate through this program and to further accelerate economic growth.

The initial movement toward the establishment of PSDC occurred around the late 1980s. Malaysia successfully developed its electronics industries in the 1980s and 1990s, attracting a large volume of FDI. In particular, Penang has the oldest history of attracting FDI since the early 1970s. Most of the MNCs were semiconductor manufacturers including Advanced Micro Devices (AMD), Intel, and Motorola from the United States. When massive FDI flowed into Penang, many MNCs faced labor shortages, especially for skilled labor like technicians who could maintain and improve the production line.⁶¹ Then, MNCs started to pinch skilled labor off of each other by offering higher salaries, which resulted in increased labor costs. In order to resolve this problem, MNCs worked together to establish a training center that could provide sufficient skilled labor for them as well as enable them to retain trained workers so that their investment in training would not be lost. At the same time, MNCs hoped to reduce training costs by outsourcing basic training to a public entity funded by the government. The Penang state government quickly responded to the MNCs' request and established PSDC in 1989.

⁶¹ The shortage of skilled labor was pointed out during the business seminar organized by American Business Council in 1987. Refer to PSDC's website: <http://www.psdc.com.my/>

The establishment of PSDC has been supported by both the state and federal government. The state government provided the land and building, which were located in the center of Bayan Lepas Industrial Park. The federal government provided the set-up grant, which was US\$15,800 per year from 1989 to 1991 and US\$31,600 per year from 1992 to 1999. Second, PSDC has received an equipment grant from the federal government under the Malaysia Plan, which is a five-year master plan for industrial development. The grant amounted to US\$1.5 million under the 6th Malaysia Plan (1989-1994), US\$2.2 million under the 7th Malaysia Plan (1995-2000), and US\$4.2 million under the 8th Malaysia Plan (2001-2006). Moreover, PSDC is earning a reasonable profit from tuition fees.

4.3. Structure of PSDC's Training Programs

PSDC's programs for technology upgrading can be roughly divided into two categories: i) training programs for engineers who are working in private firms and ii) education programs for unskilled people who have just graduated from a school (mainly high school).

The training programs in the first category, as self-targeted vocational training programs, aim to enhance technical skills in all member and non-member companies through trainings for both hard and soft skills. Company employees usually participate in various short-term courses from one day to four months, financially supported by employers. The course fees range roughly from US\$50 to US\$1,300, depending on the contents and duration of courses (from 1 day to 12 months). Employees of PSDC's member companies will receive a special discount on training fees, while employees in non member companies can still participate in the program, but without a discount.⁶² Also, both member and non-member companies can be reimbursed by the Human Resources Development Fund (HRDF) for the training costs.⁶³

⁶² Employees of member companies may gain 10-15% discount on average. Refer to: PSDC's several brochures.

⁶³ HRDF operates on the basis of a levy/grant system. Employers who have paid the levy will qualify for training grants from the fund to defray or subsidize training costs for their Malaysian employees. Manufacturing companies that employs more than 50 workers should contribute 1% of employee's monthly wage to this fund. Refer to: Malaysian Industrial Development Authority (MIDA). *The Costs of Doing Business in Malaysia*. (KL, Malaysia: MIDA, 2005), 6.

The training programs in the second category, as general training programs, teach students more basic engineering knowledge and skills than in the first category. Instructors for this program tend to have an academic background. The establishment of the program is closely related to economic conditions in the 2000s. Although Malaysia has stable GDP growth, there are signs of an economic downturn. For example, some MNCs are shrinking or moving their production facilities to China. Thus, many companies have begun to hesitate to employ and educate unskilled workers who have just graduated from high school. In this situation, PSDC is trying to provide education opportunities for them at a reasonable cost. PSDC is offering three year diploma courses in Engineering/Science for them, cooperating with domestic universities and foreign universities in the UK. This program also benefits private firms since they can hire skilled workers without bearing the costs of basic skill training.

4.4. The Global Suppliers Program (GSP): Strengthening Backward linkages

In 1998, PSDC established the Global Suppliers Program (GSP). It aims to develop backward linkages through upgrading the technology of domestic suppliers as well as by reducing information failures between MNCs and domestic suppliers. GSP aims to turn domestic suppliers into be world-class suppliers for MNCs through both training programs and actual businesses deals, while MNCs expect to find potential suppliers through this program.

Although technology transfers were promoted through PSDC's activities, backward linkages between MNCs and domestic firms were still weak in Penang as well as in overall Malaysia. When FDI began increasing at a reasonable pace, the weak backward linkages did not receive so much attention. However, in the late 1990s, complex economic factors such as China's increasing economic power, the Asian Currency Crisis, as well as the prevalence of Supply Chain Management, made Malaysia aware of the importance of backward linkages and competitive domestic supporting industries. Especially after FDI for Malaysia began to decrease after 1997 (refer to [Figure 2-6](#)), backward linkages and the development of domestic supporting industries became a more serious issue.⁶⁴ Thus, in

⁶⁴ The importance of SMEs was firstly emphasized in 7th Malaysian Plan (1995-2000), and followed up by the 2nd Industrial Master Plan (IMP2: 1996-2005).

order to nurture world-class suppliers in Penang, PSDC's management council initiated the Global Suppliers Program (GSP) in 1998. The GSP consists of two initiatives: 1) training courses, which aim to upgrade the technology of domestic suppliers, as well as reduce information failures between MNCs and domestic suppliers, and 2) actual business contracts between MNCs and domestic suppliers, which promote technology upgrading in more practical ways.

The first initiative contains three-stage programs: i) Core Competencies (CoreCom 1), ii) Intermediate Systems (IS2), and iii) Advanced Systems (AS3).⁶⁵ First, CoreCom 1 provides 76 hours of training in 4 months. It covers 13 entry-level trainings such as customer service, quality control, and business administration. Second, IS2 involves 68 hours of training in 4 months. As a follow-up course to CoreCom 1, IS2 offers intermediate-level training in more advanced quality control management. Third, AS3 teaches advanced design skills as well as advanced analytical skills. Basically, all the courses are taught by instructors from MNCs. All domestic suppliers in Penang can apply for the first initiative, but non-employees cannot. Although the course fees are high, government subsidies are available in various forms. For example, CoreCom1 costs around US\$500 per person, and IS2 costs around US\$395 per person, but Small and Medium Industries Development Corporation (SMIDEC) gives a 50% rebate on CoreCom course fee and 80% on the IS 2 course fee for entitled SMEs.⁶⁶

After successfully completing the training in the first initiative, domestic suppliers can proceed to the second initiative and start actual business deals with MNCs. This program promotes technology transfer from MNCs to domestic suppliers by close monitoring of progress. Nonetheless, while the second initiative officially declares an agreement to expand business between MNCs and domestic suppliers, there is no business volume requirement because it should depend on the actual performance of the domestic suppliers.

⁶⁵ Referred to PSDC website: <http://www.psd.com.my/>

⁶⁶ SMEs are defined as the firm with annual sales turnover not exceeding RM25 million or full-time employees not exceeding 150. Refer to: Small and Medium Industries Development Corporation (SMIDEC). *SMI Development Plan (2001-2005) Executive Summary*. (KL, Malaysia: SMIDEC, 2001), 5.

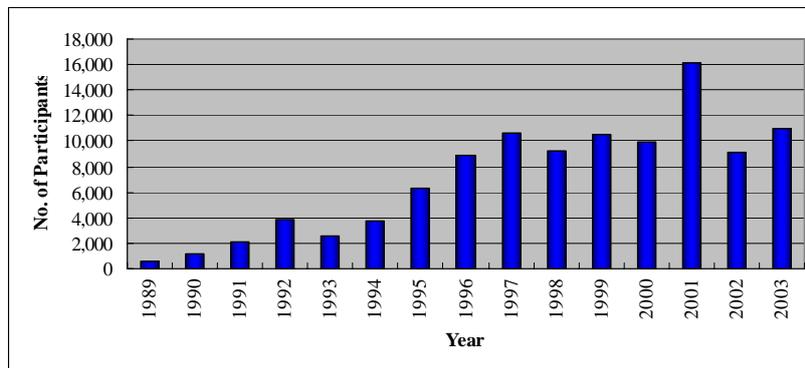
4.5. PSDC's Contribution to the Development of Supporting Industries

It is likely that PSDC has contributed to the development of supporting industries in three ways: i) training large number of participants, ii) providing practical and up-to-date technology for domestic suppliers, and iii) promoting interaction between MNCs and domestic suppliers.

4.5.1. Training Significant Number of Participants

The large capacity of PSDC has increased opportunities for domestic suppliers to upgrade their technology. PSDC has provided training courses in engineering and business administration for a significant number of company employees as well as high school graduates. PSDC started from small facilities and expanded its programs as the demand for training programs increased. While it offered just 32 courses for 559 participants in 1989, it managed to train 10,921 total participants in 580 courses in 2003 (refer to Figure 4-1). The total participants from 1989 to 2003 reached 105,505, while the annual average is 7,034. In addition, while PSDC accepts a huge number of students, the average number of trainees per course is 19.3 people, which seems to be a reasonable size for an instructor to manage.⁶⁷ Furthermore, out of 105 member companies, 52 are domestic suppliers (refer to Figure 4-2). Thus, it is thought that domestic suppliers have benefited from PSDC's large capacity.

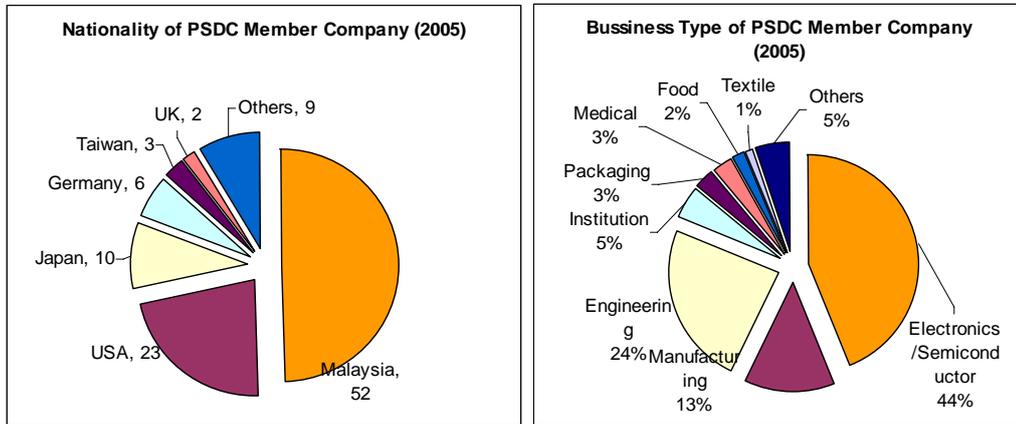
Figure 4-1
Gross Participants in PSDC (1989-2003)



Source: PSDC's presentation on June 13th 2005

⁶⁷ Calculated from PSDC's presentation material given on June 13th 2005

Figure 4-2
Structure of Member Companies in PSDC



Source: PSDC's presentation on June 13th 2005

4.5.2. *Providing Practical and Up-to-date Technology*

Practical and up-to-date technology provided by PSDC has benefited domestic supporting industries. For example, PSDC offers comprehensive programs in hard and soft skill training for company employees who are working in private firms. Training programs in hard skills consist of applied engineering such as machining, automation technology, electrical/electronic engineering, quality/productivity control, and RF/communication technology. Training programs in soft skills include business management, information technology, and foreign language courses. Course instructors usually have considerable experience working in the private sector. As another example, GSP provides more specified knowledge, represented by QS9000 and Failure Mode and Effect Analysis (FMEA) for quality control and Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM) for engineering designing. Those techniques are taught by MNC employees.

Moreover, PSDC has the dynamism to continuously update its curriculum according to market trends. For one thing, the general direction of PSDC's programs is decided by its management council, which consists mainly of member companies' top management (refer to Figure 4-3). The chairman of the council is elected from the member companies

bi-annually. As for the management of PSDC, government agencies only play supportive roles like supervision. Moreover, the details of training programs at PSDC are structured and periodically reviewed by the training committee, which consists of experienced staff in member companies' training departments. This system enables PSDC to provide up-to-date engineering and management skills for trainees, in synchronized with market demand.

Figure 4-3
PSDC Management Council 2005-2006

Position	Title	Company Name
Chairman	Managing Director	Advanced Micro Devices Export (M)
Deputy Chairman	Managing Director	Fairchild Semiconductor (M)
Vice Chairman	Site GM	Intel Malaysia
	Managing Director	Bosch Malaysia
Committee members (2005-2006)	President	Agilent Technologies
	CEO	ENG Teknologi
	Managing Director	Motorola Malaysia
	Managing Director	Seagate
Committee members (2004-2005)	Managing Director	Komag
	Management	Leong Bee & Soo Bee Sdn. Bhd
	FC	OSRAM

Source: PSDC's presentation on June 13th 2005

These high-quality training opportunities for PSDC member companies, which account for more than 50% of employees in Penang's manufacturing sector, may have positive impacts on value-added activities and skill intensity in Penang.⁶⁸ First, the annual manufacturing value-added in Penang grew steadily at an average of 8.7% between 1992 and 2000.⁶⁹ Analyzing firm-level data of domestic suppliers, Rasiah (2002) finds that Penang's machine tool suppliers generated more value added than suppliers in the Klan Valley, which is another center of electronics industry in Malaysia, due to the effect of a better government-business relationship.⁷⁰ Second, the skills intensity of Penang's

⁶⁸ Makoto Anasawa. "Strengthening the Backward Linkages between Foreign and Domestic firms: Case of Malaysia" in Toyojiro Maruya (eds.) *Restructuring the International Division of Labor in Asia and the Role of Foreign Direct Investment*. (Tokyo, Japan: IDE-JETRO, 2000), 16.

⁶⁹ Anna Ong Cheng Imm. "Penang's Manufacturing Competitiveness" *Briefing Paper to the Penang State Government* (Penang, Malaysia: Socio-Economic and Environmental Research Institute (SERI), 2000), 4

⁷⁰ Rajah Rasiah. "Government-business coordination and small enterprise performance in machine tools sector in Malaysia" *Small Business Economics* 18 (Maastricht, Netherlands: Kluwer Academic Publishers, 2002), 177-195.

manufacturing labor force has risen from 0.13 in 1980 to 0.23 in 1998,⁷¹ while the ratio of production workers in the total manufacturing workforce decreased from 74.3% in 1990 to 67.1% in 1998.⁷² Rasiah (2002) exhibited in his survey that machine tool suppliers in Penang owned better precision tolerance level in grinding, milling, and stamping.⁷³ This may be a result of increasing skill intensity in Penang.

4.5.3. Promoting Interaction between MNCs and Domestic Suppliers

PSDC has provided a place where MNCs and domestic suppliers meet each other face to face and exchange information either formally or informally through technical training courses. Increasing domestic suppliers' participation may indicate that the original member companies have benefited from PSDC's programs and the benefits have attracted new members. PSDC started with 31 member companies in 1989, 6 of which were domestic suppliers and 25 MNCs. In 2003, PSDC had 105 members, which consisted of 52 domestic suppliers and 56 MNCs and (refer to Figure 4-2).

Furthermore, particularly in GSP, domestic suppliers have gained opportunities to learn about MNCs' quality requirements directly from their employees. The program benefits not only domestic suppliers which hope to increase business with MNCs, but also those which have not yet obtained a business contract with MNCs. By October 2004, 385 domestic suppliers, which is much more than the number of member companies, were participating in the first initiative of GSP (refer to Figure 4-4-1), while 8 MNCs and 9 domestic suppliers are participating in the second initiative (refer to Figure 4-4-2).⁷⁴

⁷¹ Skills intensity is calculated based on the ratio of management & technical staff over the total employed. Refer to: Imm (2000), 11.

⁷² Imm (2000), 11.

⁷³ Rasiah (2002), 190.

⁷⁴ Referred to PSDC website: <http://www.psd.com.my/>

Figure 4-4-1: SME's Participation in GSP (2005)

Program	No. of Participants	No. of SMEs
CoreCom 1	910	239
IS2	106	29
AS3	502	117
Total	1,518	385

Source: PSDC's presentation on June 13th 2005

Figure 4-4-2: Participation in GSP 2nd Initiative

MNCs	SMEs
Advanced Micro Devices	Watas Holdings
Agilent Technology	Prestige Dynamics Industry
Fairchild Semiconductor	Industri Presawat Jaya
Intel Technology	Newtechco Engineering
Komag	Unimould Engineering
Motorola	AKN Technology
Robert Bosch	Leong Bee & Soo Bee
Unico Technology	ClassA Technology
	Mechwira Technology

Source: PSDC's website: <http://www.psd.com.my/>

Due to the combined effects of technology upgrading and the reduction of information failures, PSDC's activities have contributed to the development of backward linkages. Penang's average local procurement ratio was 10 to 15% in the early 1980s and rose to 20% in the late 1980s.⁷⁵ The regional average after the 1980s is not available, but it is thought to have increased in the 1990s, due to the development of domestic supporting industries. For example, Sony EMCS (Malaysia) Sdn. Bhd. (Sony Malaysia), which is a large consumer-electronics manufacturer in Penang, mentioned that the local procurement ratio might be about 30 % to 40 % on average, although it varies in the broad range, highly dependent on the value of semiconductors, which are mostly imported.⁷⁶ In short, a product with a high-value semiconductor may have a local procurement ratio of less than 30% while one with low-valued semiconductor may have a local procurement ratio of more than 30%. On the other hand, Sony Malaysia mentioned that most plastic, metal and mechanical parts were increasingly procured from local markets. Sony Malaysia used to purchase those parts from foreign parts suppliers, but it currently procures most of the parts from local suppliers. Furthermore, the local procurement ratio of 30 to 40 % is very close to the world average of the local procurement ratio of Japanese electronics manufacturers, which was 40.3% in 2003 (refer to Annex E).

⁷⁵ Anasawa (2000), 24.

⁷⁶ Author's interview with Sony Malaysia in June 2005.

4.6. Primary Factors for PSDC's Success

It seems that PSDC has built up this successful collaborative training system thanks to three primary factors: i) MNC's active participation, ii) effective regional information linkages among MNCs, domestic suppliers, and the government, and iii) the bottom-up approach based on market demand.

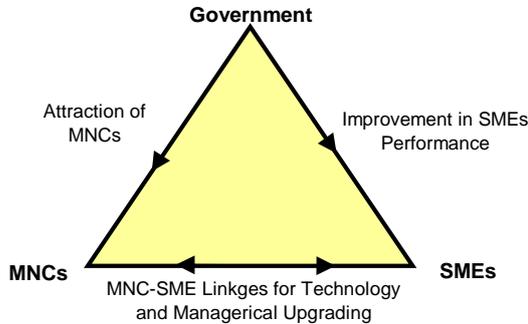
The first key to PSDC's success may be an active participation by MNCs. By attracting MNCs, PSDC contributed to building the partnership between MNCs, domestic suppliers, and the government. This partnership promotes the agglomeration of FDI, technology transfer from MNCs to domestic suppliers, and the enhancement of backward linkages through technology upgrading programs and information exchange. UNCTAD (2000) describes this partnership as the linkage triangle, which PSDC has successfully developed (refer to Figure 4-5-1).⁷⁷ In contrast, vocational training programs in developing countries tend to focus on domestic suppliers in general. This kind of program may lack a mechanism to promote technology transfer from MNCs to domestic suppliers.

Second, PSDC's character as a regional program accelerates information exchange among three parties. A regional-level linkage triangle seems more effective, due to the speed and accuracy of circulating demand and supply information (refer to Figure 4-5-2)⁷⁸. Moreover, the active participation of MNCs and domestic suppliers enables PSDC to function as a "one-stop agency," which pools the up-to-date information among the three parties and any of them can gain access to necessary information at once.

⁷⁷ United Nations Conference on Trade and Development (UNCTAD). "Enhancing the competitiveness of SMEs through linkage" *UNCTAD background papers*. (Geneva, Switzerland: UNCTAD, 2000).

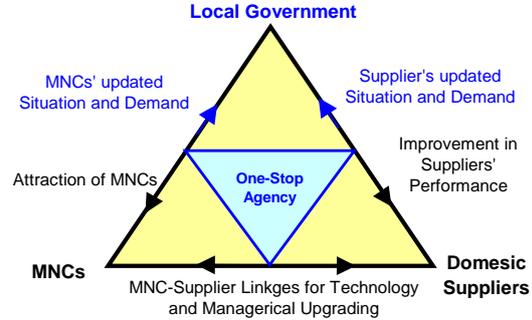
⁷⁸ UNCTAD stated the importance of regional linkage in other words: "In particular, interventionist policies to enhance linkage and spillovers between TNCs and local SMEs should always respect the principal of subsidiarity according to which responsibility is best exercised closest to a given situation." Refer to UNCTAD (2000), 11.

Figure 4-5-1: The Linkage Triangle



Source: UNCTAD. "Enhancing the Competitiveness of SMEs Through Linkages" *UNCTAD background paper*. (Geneva, Switzerland: UNCTAD, 2000)

Figure 4-5-2: The Regional Linkage Triangle



Drafted by Author

The final key is the bottom-up approach by which PSDC was established and its programs are managed. PSDC was established because of MNCs' requests, not because of government initiative. Moreover, the center is managed by MNCs, under supervision of the government. While the bottom-up approach is linked with market demand, most programs based on the top-down approach tend to focus excessively on the supply side. Lack of "skilled workers" is a common problem in developing countries, but the kind of skilled workers needed really depends on regional demand. For example, the government could establish a training center to educate "product designers," while MNCs' really need production engineers. In this case, MNCs would have little incentive to participate in the programs. If MNCs did not participate in it, domestic suppliers would not participate in the programs either, because they could not expect technology transfer from MNCs. If neither MNCs nor domestic suppliers participate, a training center will not pool the precise information of demand and supply through these activities. Thus, it is desirable that the government plays a supportive role in responding to the demands of MNCs or domestic suppliers, as the Penang state government and federal government did in establishing of PSDC.

Therefore, MNCs' active participation is the key to establishing a collaborative training system. Then, management based on the bottom-up approach and regional cooperation between three parties will enable the system to work effectively to reduce information failures and promote technology upgrading, based on market demand.

4.7. What are MNCs' Incentives to Participate in PSDC?

While MNCs' active participation in PSDC contributes to the development of supporting industries, they also receive some benefits from PSDC's program. If this were not the case, MNCs may not have been inclined to participate in PSDC. In general, MNCs seem to have three main incentives to participate in PSDC: i) reducing training costs and learning about other companies' technology, ii) finding and developing competitive domestic suppliers, and iii) achieving a good reputation by contributing to regional economic development.

First, MNCs can reduce training costs for employees by participating in PSDC's programs, while learning about other companies' technology. Since PSDC is subsidized by the government, MNCs may reduce training costs even if they pay membership fees and training fees. For example, Motorola recently moved its training facility to PSDC with all its equipment, in order to reduce in-house training costs by utilizing PSDC.⁷⁹ In addition, MNCs can absorb other companies' technology through collaborative training either formally or informally. In short, PSDC offers a place for information exchange to speed up the rate of innovation, which is the core of dynamic competitive advantage.⁸⁰ However, MNCs will not reveal their core technology to competitors at the PSDC. What they share with competitors are basic to intermediate technologies. This issue is discussed further in [Section 4.8](#).

Second, MNCs may find or develop domestic suppliers, especially in GSP, and increase local procurement of production parts. Labor costs in Malaysia have risen relative to other East Asian countries. The average monthly wage is now US\$198, which is the second highest in ASEAN and China ([refer to Annex F](#)). Thus, the development of backward linkages and the increase in the local procurement ratio has become a critical issue for MNCs in Malaysia, with regard to maintaining the cost competitiveness of their products. Although it is often costly for MNCs to find or educate domestic suppliers, GSP enables MNCs to find or educate domestic suppliers with low costs. In GSP, the training costs are borne by domestic suppliers, partially supported by government funding. Furthermore,

⁷⁹ Author's interview with PSDC in June 2005.

⁸⁰ Porter (1990), 81.

MNCs can efficiently select competitive suppliers before they start business deals through mid-term training courses. This will reduce the uncertainty about supplier's abilities.

Finally, MNCs can gain a good reputation among the regional society by participating in PSDC programs. This may have a positive impact on MNCs' businesses such as increased job applications and expansion of sales in domestic markets. Moreover, MNCs might intend to contribute to the regional society, irrespective of their business interests. Many top management members in Penang MNCs are Malaysian. Thus, it may be natural that they feel responsible for contributing to social and economic development by increasing the number of skilled workers through PSDC programs.

Thus, PSDC functions, because of reciprocal benefits for both MNCs and domestic suppliers. MNCs actively participate in PSDC, attracted by the above benefits. In turn, MNCs' participation contributes to technology upgrading of domestic suppliers.

4.8. Conditions that MNCs Prefer Collaborative Training Programs

MNCs may not always be eager to participate in a collaborative training program as much as they did in Penang, even though they could suffer from lack of skilled workers or weak backward linkages. MNCs' preference for collaborative training as opposed to in-house training or others may also depend on several conditions: i) whether the business architecture of products is an *open-modular* type or a *closed-integral* type and ii) whether a certain industry has been agglomerated or not.

4.8.1. Business Architecture of Products Affect MNC's Preference for Collaborative Training

A type of business architecture may affect MNC's preference for collaborative training programs. Put simply, the business architecture of products mean the concepts of product and process design concerning how to divide components and production processes, what kind of product function is put in each component or production processes, and how to

make or adjust the interfaces between each component or production processes.⁸¹ In this theory, the business architecture of product can be roughly divided into two categories: an open-modular type and a closed-integral type.

An open-modular type of product tends to have one product function in one component or processes. Thus, it may have more standardized interfaces between components or processes and it is easier to separate each component or process into an independent module. A typical example of an open-modular type of product is a bicycle. Each component is produced by specialized suppliers, and it is relatively easy to assemble all the components without many adjustments, since each component has an independent function and most of their interfaces are standardized.

On the other hand, the relationship between product functions and components or processes are more complicated in a closed-integral type of product. It tends to have more than one product function per component or processes and thereby has less standardized interfaces. In other words, one function consists of more than one component or process. Thus, it is often difficult to divide components or production processes into a module in a closed-integral type of product. It may require assemblers to coordinate and adjust when they combine all the components. In addition, the skills of coordination or adjustment are considered important for assemblers. A typical example of a closed-integral type of product is an automobile. For example, vibration or noise from automobiles cannot be reduced by improving the quality of one component, but the coordination and adjustment among various components and processes such as tires, suspension, and shock-absorbers are required. Thus, while automobile manufacturers source many components to parts suppliers, they still need some special skills to combine all the components.

Referring to this business architecture theory, it seems that MNCs who manufacture an open-modular type product may participate more actively in a collaborative training program than those who produce closed-integral products for several reasons. First, they may separate the process or technology to share with competitors in collaborative training.

⁸¹ Details of business architecture theory are defined in: Takahiro Fujimoto, Akira Takeishi, and Yaichi Aoshima. *Business Architecture: Strategic Design of Products, Organizations, and Processes*. (Tokyo, Japan: Yuhikaku, 2001).

In other words, they can separate the non core processes, which they can reveal to competitors, from the core processes which involve important technology which they cannot open to competitors, more clearly than MNCs who produce closed-integral products. Second, a collaborative training program would benefit producers of open-modular products more than those of closed-integral products, because they have more standardized interfaces in processes. For example, a standardized interface means that many manufacturers commonly use a similar type of machine in each production process. Thus, manufacturers of open-modular products may gain economy of scale in terms of training costs through a collaborative training program, while developing the operation skills of machines through interaction in the program. Finally, makers of open-modular products may share similar quality requirements for suppliers, because of standardized interfaces. For all of those reasons, producers of open-modular products may prefer to participate in a collaborative training program more actively than those of closed-integral products.

4.8.2. Degree of Industrial Agglomeration Affects MNC's Preference for Collaborative Training

In addition to the business architecture of products, MNCs' preference for collaborative training programs may depend on the degree of industrial agglomeration in the region. Industrial agglomeration here can be defined as the congregation of specific industries in the region. The more specific industries agglomerate in a certain area, the more chance MNCs can have of finding firms to share technology for innovation.

The degree of industrial agglomeration may affect MNCs' choice of training method, as a combined element with business architecture of product. For example, MNCs which manufacture an open-modular product may prefer a collaborative training program, in spite of a low degree of industrial agglomeration. However, as an extreme example, a MNC cannot organize a collaborative training program if it is the only firm from a certain industry in the region. On the other hand, a MNC which manufactures a closed-integral product may prefer an in-house or other independent training method to a collaborative training program in general, mainly because it tends to have an interface of processes or components which differs even in the same industry. Nonetheless, a producer of a

closed-integral product may start participating in a collaborative training program if there is a high degree of industrial agglomeration in the region. This is because the chance of finding a company with similar interfaces would rise as the number of firms in the same industry increases.

Thus, it may depend on the combined factors of industrial agglomeration and business architecture whether MNCs choose a collaborative training program or other independent training program.

4.8.3. Why do MNCs in Penang Prefer a Collaborative Training Program?

The reasons that MNCs prefer collaborative training in Penang may be explained by their business architectures and the degree of industrial agglomeration in Penang. In fact, many leading PSDC member companies are semiconductor manufacturers such as AMD (Malaysia), Intel Malaysia, Motorola Malaysia, Fairchild Semiconductor. There is high agglomeration of semiconductor manufacturers in Penang. Moreover, the semiconductor can be considered an open-modular type of product. In practice, many semiconductor production manufacturing processes have been standardized. For example, a lot of them are using common machinery and common design software.⁸² Thus, MNCs in the semiconductor industry tend to prefer to actively participate in PSDC and lead its activities, due to their open-modular products and high degree of agglomeration.

In contrast, MNCs which produce a closed-integral product or those in the less agglomerated sector do not seem to be active in participating in PSDC's program, compared to MNCs in the semiconductor sector.⁸³ For example, MNCs in the consumer-electronics sector do not participate as actively in PSDC as those in the semiconductor sector. This may be because consumer-electronics goods are considered to be a closed-integral type of product. Moreover, the agglomeration of the consumer electronics industry is not as high as in the semiconductor industry. In these conditions, it

⁸² According to author's interview with MNCs in Penang in June 2005, it seems many semiconductor manufacturers use machines made by Shinkwa Ltd. Japan. In addition, famous design software (called EDA: Electronic Design Automation) are Calma, Applicon, Computer Vision, Mentor, Daisy, Valid, Cadence, and Synopsys. However, their products share common interface under the open-frame concept.

⁸³ Author's interview with Japanese consumer-electronics manufactures in Penang in 2005.

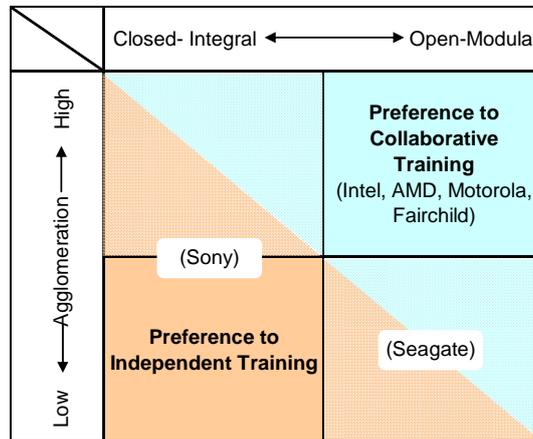
may be difficult for MNCs in the consumer-electronics sector to find firms that might share similar interfaces of components and processes. In fact, Sony Malaysia seems to prefer in-house training to collaborative training programs at this moment, although it is interested in sharing basic training with other companies.⁸⁴ As another example, Penang Seagate Industry (Malaysia) Sdn. Bhd. (Seagate Malaysia) may not benefit as much as MNCs in the semiconductor sector do.⁸⁵ Seagate Malaysia produces a hard disk device, which is an open-modular product, but it is only one manufacturer in the hard-disk industry around Penang. Therefore, it cannot benefit significantly from a collaborative training program, although their type of business architecture is suitable for the program.

The mechanism of preference to collaborating or independent training can be summarized as the following matrix, taking the degree of industrial agglomeration as the vertical axis and the open-modular business architecture as the horizontal axis (refer to Figure 4-6). MNCs may benefit from a collaborative training program, if they produce an open-modular type of product or if they belong to the highly agglomerated sector in the region (in the upper right box of Figure 4-6). In fact, MNCs in the semiconductor sector such as AMD, Intel Malaysia, Motorola Malaysia, and Fairchild can be included in this category. On the other hand, MNCs may prefer an independent training program such as in-house training, if they produce a closed-integral type of product and if there is less agglomeration of the sector (in the lower left box of Figure 4-6). The consumer-electronics industry, represented by Sony Malaysia, seems to be located in the middle of upper and lower left box, since its products are closed-integral while the degree of industrial agglomeration is intermediate. The hard disk industry represented by Seagate Malaysia should be located in the lower right box, because its products are open-modular type, but there is no industrial agglomeration of the hard-disk sector.

⁸⁴ Author's interview with Sony Malaysia in June 2005.

⁸⁵ Author's interview with Seagate Malaysia in June 2005.

Figure 4-6
Business Architecture, Industrial Agglomeration,
and Collaborative training: Case of Penang



Drafted by author

4.9. Roles of the State and Federal Governments to Support PSDC

PSDC's success is mainly due to the active leadership of MNCs, but the regional and national governments have also played important roles in supporting PSDC's activities.

4.9.1. *The State Government as a Facilitator of PSDC*

At the regional level, the Penang State government responded very quickly to the demands of MNCs in the late 1980s and provided them with facilities and land, in cooperation with the federal government. In fact, a top management member of MNC, which leads PSDC, mentioned that they did not intend to bear all the cost incurred from establishing a collaborative training program, while they were eager to participate in it.⁸⁶ This indicates that, without support of the state and federal governments, PSDC would not have been established.

In addition, the role of the state government as a supervisor may be effective in maintaining the transparency of PSDC's activities. For example, this function may prevent MNCs

⁸⁶ Author's interviews to MNCs in Penang in June 2005.

from colluding to maintain low wages or from providing exclusive benefits for favored groups of domestic suppliers.

4.9.2. *The Federal Government Reflects a Good Practice in National Policies*

While the state government facilitates PSDC, the Malaysian federal government has focused on synchronizing local-level programs with national-level policies in four ways. First, the federal government established 15 more skill development centers in the country by allocating RM87.4 million (about US\$2.3 million) in the 1990s, aiming to transfer PSDC's programs to other states.⁸⁷

Second, the Small and Medium Industries Development Corporation (SMIDEC) and the Malaysian Industrial Development Authority (MIDA) implemented the Industrial Linkage Program (ILP) in 1997. ILP was established to develop backward linkages between domestic suppliers and MNCs, in order to enable domestic suppliers to be integrated into the global supply chain network of MNCs. The concept of ILP is synchronized with GSP and they are complementary to each other. While GSP facilitates the development of backward linkages between MNCs and domestic suppliers through various training programs, ILP provides tax incentives for both MNCs and domestic suppliers to expand their businesses for the development of backward linkages. In ILP, qualified domestic suppliers are eligible for pioneer status with a 100 % exemption on statutory income for five years, or 60 % Investment Tax Allowance (ITA) on qualifying capital expenditures incurred within a five-year period, with a 100 % exemption on statutory income. MNCs that participate in ILP are allowed to deduct the expenditures incurred in i) training of employees, ii) product development, and iii) testing and factory auditing to ensure the quality of vendors' products from the computation of income tax.⁸⁸ By 2000, 128 domestic suppliers joined the program and 35 of them established an actual business contract with MNCs (refer to Figure 4-7).⁸⁹

⁸⁷ Economic Planning Unit, Malaysia (EPU) *The Mid-Term Review of 8th Malaysia Plan*. (KL, Malaysia: EPU, 2003), 215, 241.

⁸⁸ Referring a brochure of ILP, issued by SMIDEC.

⁸⁹ Ministry of International Trade and Industry (MITI). *Malaysia International Trade and Industry Report 2001*. (KL, Malaysia: MITI, 2001), 198.

Figure 4-7
Number and Increased Sales of Domestic Companies in the ILP (by 2000)

Unit: Company: Number, Amount: RM million

	Electronic & Electronics		Machine Engineering		Resource-based		Transportation Equipment		Total	
	Company	Amount	Company	Amount	Company	Amount	Company	Amount	Company	Amount
Confirmed Sales	17	16.80	2	0.80	5	2.50	11	7.70	35	27.8
Under Negotiation	16	9.40	9	10.50	7	8.40	2	2.80	34	31.1
Sales Prospect	27	23.88	15	14.60	12	11.90	5	4.30	59	54.68
Total	60	50.08	26	25.90	24	22.80	18	14.80	128	113.58

Source: Ministry of International Trade and Industry (MITI). *Malaysia International Trade and Industry Report 2001*. (KL, Malaysia: MITI, 2001), 198

Third, the federal government drafted the 8th Malaysia Plan that emphasized the importance of SMEs and backward linkages, considering GSP as a part of the national scheme for SME development.⁹⁰ Under the 8th Malaysia Plan, RM1,120 million (about US\$295 million) was allocated for SME development, which equals approximately 39% of total funding for industrial development (refer to Figure 4-8).⁹¹

Figure 4-8
Development Resource Allocation for Industrial Development (2001-2005)

(RM Million)

Program	8 MP Allocation	%
Industrial Estates Development	230.2	8%
Development of Industrial Infrastructure	100.0	3%
SME Development	1,120.1	39%
Domestic Investment Fund	670.0	23%
Rural Industries	164.5	6%
Training & Consultancy Services	519.3	18%
Investment in Heavy Industries	24.2	1%
Implementation of Action Plan for Industrial Technology Development	78.5	3%
Total	2,906.8	100%

Source: *8th Malaysia Plan* (KL, Malaysia: 2001), 236

Finally, the 8th Malaysia Plan was linked with the Small and Medium Industry Development Plan (SMIDP), which was drafted by SMIDEC. While the 8th Master Plan covered all the key industries, SMIDP is more focused on the development of SMEs in 5-year term. The SMIDP can be regarded as an implementation plan to develop SMEs

⁹⁰ Economic Planning Unit, Malaysia (EPU) *8th Malaysia Plan*. (KL, Malaysia: EPU, 2001), 246. 8th Malaysia Plan is 5 years industrial master plan from 2001 to 2006. It is also under 15-year-plan, named 2nd Industrial Master Plan (IMP2) from 1996 to 2005

⁹¹ EPU (2001), 236.

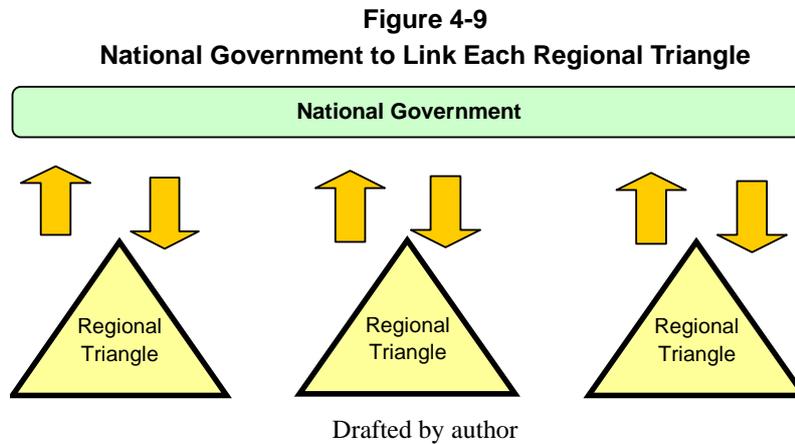
and the backward linkages between MNCs and SMEs as domestic suppliers.

However, the federal government has also faced difficulty, particularly in disseminating a good practice to other states. For example, newly-established skill development centers in 15 states do not always function as effectively as PSDC does. For example, two centers in other industrialized states, Selangor and Johor, have contrasting results. The Selangor Human Resource Development Center (SHRDC) has attracted the participation of MNCs such as Panasonic, Motorola, Denso, and Texas Instruments.⁹² In contrast, it is unlikely that the Johor Skills Development Center (PUSPATRI) will have active MNC participation.⁹³ This may imply that what is a good practice in one region would not necessarily function well in other regions. Demand for skilled workers and local procurement, the characteristics of MNC's business architecture, and the degree of industrial agglomeration can vary considerably, depending on regions. Thus, each program should be customized, depending on regional demand. For instance, in some regions, direct subsidies to engineering education in the school might be more effective than establishing a skill development center. A program should be carefully customized when being applied to other states.

In summary, the state government facilitated the development of PSDC, while the federal government absorbed PSDC's success, included it in national-level strategies, and transferred a good practice from Penang to other regions. In other words, the state government facilitates the intra-regional linkages, while the federal government plays a role in connecting each regional linkage and drafting national-level strategies (refer to Figure 4-9). However, it is emphasized that a good practice in one region might not always work in another region. Thus, a program should be customized when it is transferred to other regions.

⁹² Refer to: SHRDC's website: <http://www.shrdc.org.my/>

⁹³ Refer to PUSPATRI's website: <http://www.puspatri.edu.my>



4.10. Shortcomings of PSDC's Programs

PSDC is considered a successful project for the development of supporting industries, but it also has some shortcomings. First, it is likely that the majority of benefits from PSDC's activities are distributed to MNCs and domestic suppliers in the semiconductor industry. MNCs and domestic suppliers in other industries do seem to participate very actively in PSDC's programs, either due to the characteristics of their closed-integral products or because of the lower degree of agglomeration in the industrial sector.

Second, GSP is an innovative program, but it has not covered the majority of domestic suppliers in Penang yet. According to PSDC, some domestic suppliers have not fully recognized the benefit of GSP. It is said that many domestic suppliers are still skeptical about the effect of collaborative training and they have not fully understood the importance of world-standard quality of products and management.⁹⁴ From the view point of domestic suppliers, the tuition fee in PSDC per person might not be affordable for them, although various government supports are available.

Finally, the process for entering the second initiatives in GSP is not very transparent. In fact, the number of companies participating in the second initiatives has not increased since 1998. Domestic suppliers would see little benefit from participating in GSP, if they cannot proceed to the second stage and gain opportunities to expand business with MNCs. Thus,

⁹⁴ Author's interview with PSDC in June 2005.

this uncertainty may reduce the incentive for domestic suppliers to participate in the program.

While PSDC has significantly contributed to the development of supporting industries, the above shortcomings should be recognized, in order to improve the project and to share PSDC's success in other regions or countries.

4.11. How to Apply Lessons from PSDC in Vietnam

In considering the implementation of a collaborative training program for the development of supporting industries, Vietnam can draw valuable lessons from PSDC's success and shortcomings, as well as the role of state and federal governments.

First, MNCs' participation is the key to promoting technology upgrading and reducing information failures between MNCs and domestic suppliers. An impressive aspect of the establishment of the PSDC is that the federal and Penang state governments became aware of the needs of MNCs in a timely fashion and immediately supported the establishment of PSDC.

Second, PSDC functions effectively because of its bottom-up and regional mechanism, in addition to MNC's active leadership. This system has accelerated the circulation of accurate information among the three parties.

Third, MNCs' preference for collaborative training programs may depend on their business architecture and the degree of industrial agglomeration of industries. PSDC's success is based on the highly agglomerated semiconductor industry, which manufactures an open-modular type of product.

Fourth, the Penang state government has played a significant role in facilitating PSDC, while the active participation of the private sector is a more fundamental factor for success. On the other hand, the Malaysian federal government has absorbed a good practice in Penang, supported it through national-level strategies, and transferred it to other states.

Finally, a good practice in Penang might not necessarily function in other states. Since each region has different characteristics, a good practice should be customized carefully when it is transferred to other regions.

All of these lessons are beneficial for Vietnam in considering the potential benefits and drawbacks of a collaborative training program. However, as stated, the customization of a good practice is necessary, based on the analysis of demand and supply in Vietnam. It is not even necessary to establish a vocational training center to achieving successful collaborative training, as discussed in [Section 5](#).

5. Project Analysis in Vietnam (A) :

The Project for Strengthening the Training Capabilities of Technical Workers at Hanoi Industrial College

5.1. Introduction

With technical assistance from the Japan International Cooperation Agency (JICA), the Project for Strengthening Training Capabilities of Technical Workers at Hanoi Industrial College (called the “HIC-JICA project” afterward) has enabled prospective engineers to upgrade their technological knowledge and skills. It is considered that the HIC-JICA project also contains some different elements of collaborative training from PSDC. This section starts by describing the background and structure of the HIC-JICA Project. Then, it discusses the benefits, the involvement of MNCs, and makes a comparison to PSDC. Finally, a policy option for improvement is explored.

5.2. Establishment of the HIC-JICA Project

The HIC-JICA project was implemented to increase skilled labor as well as the number of competent instructors.⁹⁵ As FDI from MNCs has increased, the shortage of skilled labor has gradually become an important issue in Vietnam. In particular, many MNCs are

⁹⁵ This project was completed in March 2005. The program continues as the name of “Vietnam Japan Technology Center” since April 2005.

looking for production engineers who can innovate and maintain production processes in their factories. Although some universities provide engineering education for students, there is a reputation that students who graduated from those universities usually do not have practical skills in production engineering. In addition, it is often said that engineers who graduated from those universities would prefer not to work in manufacturing sites: they prefer more “clean” work such as product designing to “dirty” work in a factory.

In order to bridge the above gap between demand and supply of production engineers, the HIC-JICA project was implemented in 2000 as a five-year technical assistance project. JICA did not select a university but an industrial college as a partner, in order to increase the number of production engineers who can work in manufacturing sites.⁹⁶ By 2004, JICA provided an equipment grant for 40 machines which cost JPY367 million (about US\$3.11 million), JPY98 million (about US\$0.83 million) for administration expenses, and 39 Japanese experts in total, while the Vietnamese government provided 21 machines, land, building services, and VND3.74 billion (about US\$0.02million) for administration expenses.⁹⁷

5.3. Structure of Educational Programs in the HIC-JICA Project

The HIC-JICA project consists of two main programs: i) engineering education courses for HIC students and ii) short-term technical training programs for outside company employees.

In the first program, the project provides HIC students with a two-year engineering education in the three courses: a) machining processing, b) metal processing, and c) electric control. Students who hold a high school diploma and hope to participate in the project need to apply and take the entrance exam, which are different from those needed for other HIC courses. In addition, the tuition fee is \$200 per year, which is \$80 higher than other HIC programs. In particular, this program emphasizes practical training. 60 to 70% of

⁹⁶ Although the project was implemented in 2000, the short-term courses started from 2001 and the long-term courses (2 years) started from 2002.

⁹⁷ Japan International Cooperation Agency (JICA) “Evaluation Report on the Project for Strengthening Training Capability for Technical Workers in Hanoi Industrial College (in Japanese)” (Tokyo, Japan: JICA, 2004), 3-2.

the total course hours are allocated for practical training, while 30 to 40% is allocated for academic lectures (refer to Figure 5-1). In practical training classes, as well as the basic laboratory workshop, HIC students produce spare parts and equipment which are ordered by foreign and domestic firms. So far, the project has produced parts and equipment for more than 60 companies.

Figure 5-1
Time Allocation of HIC-JICA Project (2002-2003)

Unit: hour

	Machine Processing	%	Metal Processing	%	Electric Control	%
Lecture	985	38%	806	31%	780	33%
Practical Training	1,640	62%	1,819	69%	1,560	67%
Total	2,625		2,625		2,340	

Source: Japan International Cooperation Agency (JICA) "Evaluation Report on the Project for Strengthening Training Capability for Technical Workers in Hanoi Industrial College (in Japanese)" (Tokyo, Japan: JICA, 2004), 3-4

In order to administer three courses, a total of 29 instructors worked in this program. Out of 29 instructors, 6 are specialized in machining processes, 7 in metal processing, and 7 in electric control. They were supervised by and cooperated with Japanese experts. In addition, 23 of them were sent to Japan for intensive training, while 2 more of them would be sent by 2005. The turnover rate of the instructors is 6%, because 2 instructors left by 2004.

The second program provides one to two days of short-term training courses in machine processing, metal processing, and electric control for company employees and instructors of other vocational training institutes. Basically, anyone can attend short-term training courses without an entrance examination. By 2004, around 1,300 people had participated in a total of 74 short term courses. 840 of them were company employees, while 460 were instructors of other vocational training and educational institutes. In addition, the project held open seminars in machine processing, metal processing, vocational training systems, and work safety and sanitation. 545 people attended those seminars. Furthermore, the project also organized technical competitions twice, in which 155 people participated.

5.4. How Does the HIC-JICA Project Contribute to the Development of Supporting Industries?

It seems that the HIC-JICA project indirectly contributes to the development of supporting industries by upgrading the technological skills of prospective engineers in three ways: i) providing intensive engineering education, ii) teaching the skills demanded by supporting industries, iii) upgrading technology and reducing information gaps through business arrangements with MNCs, iv) supplying production engineers to domestic supporting industries, and v) causing positive spillover effects on other educational institutes.

5.4.1. Providing Intensive Engineering Education

The HIC-JICA project has provided intensive engineering education at a small capacity. The basic annual capacity of the project is 240 students, including 80 students in each of three courses. The actual enrollment in 2002 was 237 students and 253 in 2003, which is only 5% of the total number of students at HIC.⁹⁸ The small capacity has made enrollment very competitive. This is the case because the applicants to the project exceeded the enrollment limit in 2002 (757 applicants) and 2003 (1,354 applicants).

However, the capacity of the project may need to be small in order to maintain good quality and enable intensive education. For example, on average one instructor supervises only 11-13 students. This may be why the drop-out rate of students, at 3%, is very low. HIC is currently considering increasing the capacity of the project from 240 students to 360 students per year. This may further contribute to technology upgrading by domestic supporting industries and the development of backward linkages. However, expanding the capacity of the project may need to be considered carefully, because it may reduce the quality of the program since the project has a limited number of experienced instructors.

⁹⁸ HIC had 17,739 students in total in 2003: i) full-time students are 8,782, ii) short-term courses for employees have 7,367, iii) IT and Accounting course (Collaborated with Australia University) has 1,100 students, and iv) HIC-JICA program trained 490 students. Refer to: JICA (2004).

5.4.2. Teaching the Skills Demanded by Supporting Industries

The curriculum of the HIC-JICA project matches the current labor demand of supporting industries. Among the three main courses, skills in machining processing and metal processing may be beneficial for the development of supporting industries, because plastic and metal parts are in high demand by MNC assemblers, especially in the consumer electronics industry. Supervised by Japanese experts and trained Vietnamese instructors, students have upgraded their engineering skills through lectures and laboratory work. According to the project's management, most students have acquired skills equivalent to intermediate-level technical skill certification of lathe turning machines and milling machines in Japan after two years of education.

5.4.3. Upgrading Technology and Reducing the Information Gap through Business Arrangements with MNCs

The project has offered unique practical training, which combines academic laboratory work with actual manufacturing activities, based on manufacturing orders from MNC assemblers and domestic suppliers. This program not only upgrades the skills of the students but also contribute to reducing information failures between MNCs and domestic suppliers, for whom students in the project would work in the future. Under the supervision of experts and instructors, students have produced jigs such as motor control machines and cutting machines, as well as spare parts such as motorbike cylinders. This activity enables students to learn the practical skills in design and production, which are applicable to their jobs after being hired by firms. In particular, manufacturing activities based on orders from MNCs give students opportunities to learn the up-to-date technologies directly, because those technologies are usually innovated by MNCs in Vietnam. In addition, both students and instructors may understand MNCs' quality requirements through this activity. This would promote the awareness of high quality and on-time delivery at the international standards.

5.4.4. Supplying Production Engineers to Domestic Supporting Industries

The project has increased the supply of competent production engineers to the market,

although the number of students is still small. The project had the first graduates in September 2004. It was predicted that most students would get a job immediately after graduation, because the projects had received two times more job offers from both MNCs and domestic supporting industries than the number of graduates.⁹⁹ This seems to be a good achievement, considering the fact that Vietnam's urban unemployment rate in the Red River Delta is 6.38% in 2003.¹⁰⁰ In further details, students in the mechanical processing course are most popular with a job offered rate of 2.5,¹⁰¹ while the ratios for students in metal processing and electric control are 1.78. More than half of the job offers are from the project's customers, which ordered spare parts and jigs. This reflects the effect of practical training through actual manufacturing activities as well as a high demand for HIC-JICA Project students.

Furthermore, it is likely that many project graduates will work for domestic supporting industries. According to the project's management staff, job offers from foreign and domestic suppliers tend to be more attractive than those from MNC assemblers in terms of salaries, although the project also received job offers from MNC assemblers.¹⁰² Taking advantage of these graduates, those foreign and domestic suppliers might expand business deals with MNCs in the future.

5.4.5. Positive Spillover Effects on Other Educational Institutes

The HIC-JICA project has caused positive spillover effects on other educational or vocational training institutes through its short-term training programs or seminars for their instructors.¹⁰³ For example, the Hanoi University of Technology has recently initiated a program similar to the HIC-JICA project, utilizing the most up-to-date machining center donated by a Japanese supplier.¹⁰⁴ Led by an instructor who earned a degree in Japan, the program started to produce proto-type and spare parts for motorbikes, in order to enhance the practical engineering skills of students. Thus, it is considered that the HIC-JICA

⁹⁹ Author's interview with the HIC-JICA project in August 2004.

¹⁰⁰ GSO (2005b), 59.

¹⁰¹ Job offered ratio = Number of job offer / total number of students.

¹⁰² Author's interview with HIC-JICA project in March 2005.

¹⁰³ According to JICA (2005), the spillovers for HIC's other program are very limited.

¹⁰⁴ Author's interview with Hanoi University of Technology in August 2005.

project has contributed to improving programs in other educational or vocational training institutes, showing a way to collaborate with MNCs and domestic supporting industries.

5.5. What Attracts MNCs and Domestic Supporting Industries to Participate in the HIC-JICA project?

It seems that both MNC assemblers and domestic supporting industries are interested in collaborating with the HIC-JICA project for two primary reasons: i) to purchase good-quality jigs and spare parts at reasonable prices and ii) to employ competent production engineers.

First, MNC assemblers and domestic supporting industries can purchase good-quality jigs and spare parts at reasonable prices.¹⁰⁵ Currently, few domestic suppliers can produce high-quality jigs and spare parts especially in the area around Hanoi. Although its production capacity is small, the project can still supply these items, taking advantage of technology transfer from Japanese experts. In addition, it is thought that it may produce them at reasonable price, because the project has financial assistance from JICA and it aims to gain up-to-date technology from firms rather than earning more profits from its business.

Second, domestic supporting industries will cultivate a good relationship with the HIC-JICA project, in order to employ high-potential engineers from its ranks. While large MNC assemblers may be capable of educating engineers through in-house training, foreign and domestic suppliers may prefer to hire experienced engineers, minimizing education costs. However, it is difficult to find experienced engineers particularly in the area around Hanoi. Thus, the project can be a resource for high-potential engineers. By building formal and informal relationships instead of giving manufacturing orders, firms may secure capable engineers who have already understand the basic production processes and quality requirements of firms.

Therefore, with the above two incentives, the HIC-JICA project has succeeded in establishing collaboration with MNC assemblers and domestic supporting industries,

¹⁰⁵ JICA (2005), Annex.

although its scale is still small and it generates more indirect effects on the development of supporting industries and backward linkages than collaborative training in the form of a vocational training program.

5.6. Comparison to PSDC: Collaborative Training in a General Education Program

While both the HIC-JICA project and PSDC collaborate with MNC assemblers and foreign suppliers (called “foreign investment enterprises” afterward), they go about it differently. The HIC-JICA project collaborates with foreign investment enterprises through business deals, while PSDC directly involves them in its training program. The method taken by the HIC-JICA project is a good lesson on establishing collaborative training in today’s Vietnam, because the project has overcome difficult circumstances with a low degree of industrial agglomeration. PSDC’s success cannot be directly applied to many regions in Vietnam, due to less industrial agglomeration. In contrast, the method adopted by the HIC-JICA project may apply to the regions with lower degrees of industrial agglomeration. The impact of the HIC-JICA project on the development of supporting industries may be more indirect than PSDC, since it does not directly target employees of domestic supporting industries. Nonetheless, the project proposes a general education program as an alternative method of establishing collaborative training in regions with less industrial agglomeration.

On the other hand, the HIC-JICA project has a different organizational character from PSDC. With regard to PSDC, the establishment of effective regional linkages between MNCs, domestic suppliers, and the local government is one of the key elements that enable a collaborative training program to fully function. However, it seems that the local government is not closely involved in the HIC-JICA project, while the national government is supervising the project. Currently, several government bureaus such as the Ministry of Labor, Invalids and Social Affairs (MOLISA) and the Ministry of Education and Training (MOET) have played supportive roles. On the other hand, it is hard to detect any significant contribution from local government. It seems that even the budget of HIC is directly controlled by the national government. Not having the contribution of local government might reduce the speed of information circulation between the government, foreign investment enterprises, and domestic suppliers.

In summary, the HIC-JICA project is considered to be a meaningful experiment in establishing collaborative training with foreign investment enterprises in a general education program. The project demonstrates an alternative to collaborative training in a region with less agglomeration, although the lack of support from the local government might diminish its impact.

5.7. Costs and Benefits for the Involvement of Local Government

It is thought that the HIC-JICA lacks support from local government, which is a key factor in regional information linkage (refer to [Section 4.6.](#)). It is likely that least involvement of local government has reduced the speed and accuracy of regional demand and supply information. Moreover, the national government may have reduced the resources allocated for making national-level strategies, due to involvement in a regional project.

Increasing involvement of the local government may lubricate the information flow. For example, the local government may indirectly support the marketing of the project in terms of funding or research. In addition, the participation of the local government may enable the national government to concentrate their resources on developing national-level strategies for Vietnam's industrialization. For instance, accelerating the formulation of the Supporting Industry Master Plan, which is being drafted by the Ministry of Industry, may have a positive impact on the investment sentiment for MNC assemblers and domestic supporting industries.

However, the involvement of the local government in regional projects might have some costs. For example, it might make the distribution of authority between the national and local governments unclear in the short run. In addition, it may increase the amount of administrative work for the project, such as periodical reporting. Thus, the costs and benefits of change should be carefully examined before reforming the delegation of authority between the national and local governments.

6. Project Analysis in Vietnam (B) : The Technical Assistance Center Project¹⁰⁶

6.1. Introduction

Currently, the Ministry of Planning and Investment (MPI) is planning to establish three technical assistance centers (TAC) in Vietnam, funded by JICA. TAC takes the form of a vocational training center similar to PSDC. However, it seems that the TAC project does not have a plan to establish a collaborative training program with MNCs at this moment. Beginning with a brief description of TAC, this section examines the expected benefits of TAC, a comparison to PSDC, policy options for improvement, and a proposal for the optimal combination between a vocational training program and a general education program.

6.2. Establishment of the TAC Project

The TAC project was agreed to on February 2005 between the Vietnamese and Japanese governments as a five-year technical assistance project. In Vietnam, the weakness of supporting industries, in which SMEs play major roles, is often pointed out by MNCs. In particular, they emphasize that weak supporting industries reduce Vietnam's competitiveness as a manufacturing base, as stressed in the Vietnam Japan Joint Initiative. Responding to this request, the TAC project has been implemented with JICA's technical assistance. The project is now at the stage of planning and preliminary survey.

The main objective of the TAC project is to upgrade the engineering and management skills of domestic SMEs through a vocational training program. In addition, this project aims to have a positive impact on the development of backward linkages between MNCs and domestic suppliers. Under this project, three training centers will be built in Hanoi, Danang, and Ho Chi Minh City. In addition, similar to the HIC-JICA project, the national government is playing a significant role in the TAC project, while the local government is

¹⁰⁶ Information related to the TAC project is based on author's interview with MPI and JICA Vietnam in August 2005.

not involved. Currently, MPI is directly operating the TAC project with JICA's support.

6.3. Expected Benefits of TAC's Training Programs

The details of the program are still under discussion, but the TAC project may consist of two main programs. First, it is planning to provide technical training such as machine processing for employees of SMEs. On the other hand, non-SME employees, such as MNC employees and high school graduates, are, for the most part, not eligible to apply to TAC's courses.

Second, TAC is planning to offer a visiting consulting-service to SMEs which cannot participate in the programs for various reasons. It is possible that some SMEs would not send their employees to the training, due to the physical distance from the centers. Others may not be able to afford to send employees to the centers, since they may not undertake production operations in the absence of managers or engineers during training. In those cases, a visiting consulting-service may be helpful for SMEs.

Through these two main programs, the TAC project is expected to promote technology upgrading of SMEs, which would contribute to the development of supporting industries in Vietnam.

6.4. Comparison to PSDC: Lack of Collaborative Training

The TAC project takes the form of a vocational training program, as PSDC does. However, the structures of the two programs are different in several aspects, in the sense that the TAC does not collaborate with foreign investment firms. A primary difference is that the targeted group of participants is much narrower in the TAC project than PSDC. The project only focuses on domestic SMEs and does not involve foreign investment enterprises.

The above feature of the TAC project raises several concerns about whether it could significantly promote technology upgrading and reduce information failures by domestic supporting industries. First, TAC might not recruit a sufficient number of experienced

instructors. This type of project may work in developed countries with an abundant supply of experienced instructors. Nonetheless, it may be difficult for TAC to hire experienced engineering teachers without cooperation from foreign investment enterprises, since most of the highly-skilled engineers seem to be working for them in Vietnam. Second, it may be difficult for TAC to reduce basic information failures and the quality standard gap without the involvement of MNC assemblers. This is because domestic suppliers will have little opportunity to meet with MNC assemblers or to learn about MNCs' quality standards in TAC.

Moreover, TAC's organizational structure is likely to be different from PSDC. PSDC was established according to a bottom-up approach based on regional demand. MNCs have managed its operation since its establishment. In addition, the local government has financially supported and supervised it. In contrast, the TAC project was established according to a top-down approach under the central government's initiative. Although MNC assemblers hope for the development of supporting industries, they involve neither the establishment nor management of TAC. Furthermore, it does not seem that the local government has contributed to the project. As a result, the project may tend to organize its activities, based more on the central government's intention than local market demand. As a symbolic example, the TAC project will build vocational training centers of uniform structure in three regions. Nonetheless, each region will have different demands and backgrounds. A program needs to be customized based on regional demand and characteristics, learning from the unsatisfying results after the Malaysian federal government transferred the PSDC model to other states.

Therefore, it is uncertain whether the TAC project will effectively contribute to the development of supporting industries, compared to PSDC's success. Its impacts would be smaller than those generated by PSDC, because of less access to the foreign technology as well as local-specific market demand.

6.5. Policy Options for Adding Collaborative Training

There may be several policy options by which TAC may add collaborative training to its programs. One policy option is to involve foreign investment enterprises' employees as

participants or instructors at TAC. Their participation will have positive effects on both technology upgrading and information exchange either formally or informally. In addition, this may encourage domestic SMEs to participate in training courses at TAC, because they can learn the up-to-date technology as well as gain opportunities to meet with potential customers.

Another option is to promote collaboration with existing in-house or independent training programs run by foreign investment enterprises. For example, the TAC project may allow MNCs to use its facilities for their independent training, requesting the participation of TAC's instructors in their training instead. In this policy option, technology transfer from MNCs to domestic suppliers may be smaller and more indirect than in the first option, because there may be less chances that domestic suppliers would interact with MNCs. However, this option may be still useful, in case TAC can not afford to invite foreign investment enterprises to become members for some reason, such as scarce budget resources.

6.6. Optimal Combination of Vocational Training and General Education

Adding collaborative training may benefit the TAC project, but it is difficult to attract the active participation of foreign investment enterprises in all the three regions. As explained in [Section 4.8](#), the participation of MNCs would depend on the business architecture of the product as well as the degree of industrial agglomeration in the region. Taking the consumer-electronics industry as an example, it seems that the TAC project has higher possibility of establishing a collaborative training program in Ho Chi Minh City than in Hanoi and Danang.

Since the consumer-electronics industry manufactures closed-integral products, a high degree of agglomeration is preferable for attracting the participation of MNCs to a collaborative training program. In Ho Chi Minh City, the level of agglomeration in the consumer-electronics sector may be sufficiently high to attract the participation of MNCs to a vocational training program. The production of consumer-electronics goods is concentrated in the South East region including Ho Chi Minh City. For example, 84.3% of TVs were produced in Ho Chi Minh City in 2002 ([refer to Annex H](#)). In fact, several

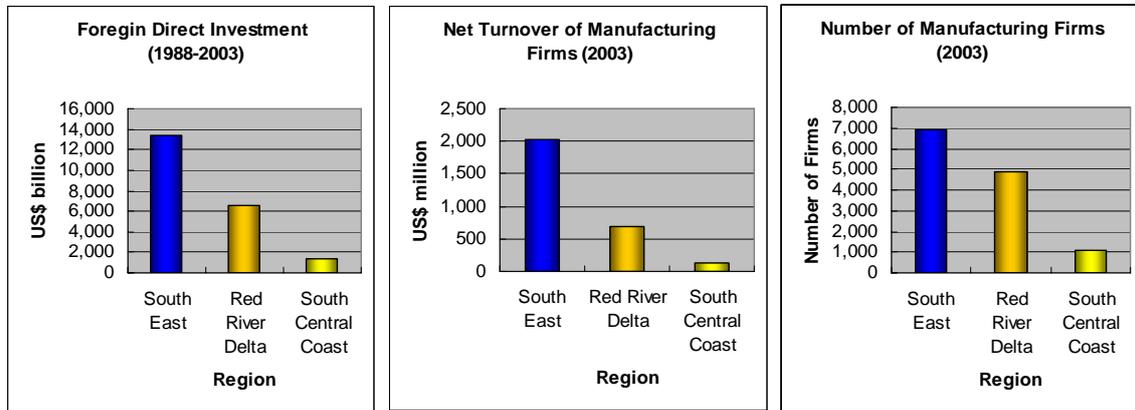
vocational training centers have already started to cooperate with MNCs. For example, the Vietnam Singapore Technical Training Center (VSTTC) provides technical training programs for employees of MNCs in the Vietnam Singapore Industrial Park (VSIP) in Binh Duong Province. VSTTC was established in 1997, supported by official development aid (ODA) from Singapore. It has already provided many production engineers to MNCs in VSIP.

Moreover, TAC may interact with MNCs' independent training programs around Ho Chi Minh City. For instance, Muto Vietnam opened the Muto Engineering College in 1998, which has educated its employees in the engineering and designing of molding tools.¹⁰⁷ In addition, Panasonic AVC Vietnam is hosting an open vocational training for business management and production control, in corporation with VCCI and the Vietnam-Japan Human Resources Cooperation Center (VJCC). Thus, even in the case the project cannot invite foreign investment enterprises as members, it is highly possible for TAC to build partnerships for technical training with foreign investment enterprises in Ho Chi Minh City.

In contrast, TAC may face difficulties in establishing a collaborative training program in Hanoi and Danang. Hanoi, in the Red River Delta, and Danang, in the South Central Coast, are less industrialized than Ho Chi Minh City in the South East, although they are growing rapidly these days. For example, the aggregate value of FDI and the net turnover of manufacturing firms in the Red River Delta and the South Central Coast are much smaller than those in the South East (refer to Figure 6-1). Thus, MNCs around Hanoi and Danang may have fewer incentives to participate in a collaborative training program. In fact, it is hard to find the instances such as VSTTC or MNCs' independent training programs around Hanoi and Danang, which have already been initiated in the region around Ho Chi Minh City. Therefore, it seems difficult that TAC establishes collaboration with foreign investment enterprises in Hanoi and Danang.

¹⁰⁷ Author's interview with Muto Vietnam in August 2005.

Figure 6-1
FDI and Turnover of Manufacturing Firms by Region

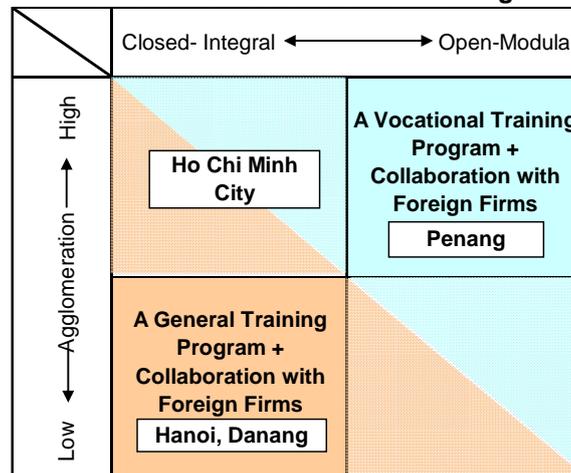


Source: General Statistics Office. *The Real Situation of Enterprises: 2002-2004*. (Hanoi, Vietnam: Statistical Publishing House, 2005)

Instead, promoting collaboration with MNCs in a general education program may be more effective in Hanoi and Danang, as demonstrated by the success of the HIC-JICA project. Even though collaboration with MNCs in general education may have a rather indirect impact on the development of supporting industries, its effect would be still larger than establishing vocational training programs without the participation of foreign investment enterprises.

Thus, the efficacy of vocational training programs will differ by region. It can attract the participation of foreign investment enterprises in some regions, while a general education program is a more effective option in others. Thus, in order to build close collaboration with foreign investment enterprises, it is important to consider an optimal combination of a vocational training program and a general education program. The efficacy of those programs in attracting the participation of foreign investment enterprises may differ based on the business architecture of product, the degree of industrial agglomeration, and characteristics of local demand in each region. In Vietnam, Ho Chi Minh City has higher possibility of building collaborations with foreign investment enterprises in a vocational training program, while it may be more effective to promote collaboration in a general education program in Hanoi and Danang (refer to Figure 6-2).

Figure 6-2
Effective Choices of Vocational Training and General Education
To Establish Collaborative Training



Drafted by author

7. Conclusion

Developing supporting industries will accelerate economic growth in Vietnam by taking advantage of positive vertical externalities from FDI. In addition, competitive supporting industries may function to attract more FDI into Vietnam, because MNCs consider them to be an important factor for expanding FDI as well as labor costs. However, Vietnam is currently facing difficulties developing supporting industries. While advanced ASEAN countries such as Malaysia have developed supporting industries after attracting massive FDI, Vietnam may not follow the same way. Even if Vietnam has cheaper labor costs and offers various tax incentives for MNCs, FDI would not drastically increase in Vietnam. In order to stimulate FDI inflow, Vietnam may need to acquire a comparative advantage in supporting industries before the agglomeration of MNC assemblers.

The development of supporting industries seems to be impeded by two types of barriers: the minimum efficient scale problem and information failure, even though MNC assemblers intend to increase local parts procurement in Vietnam. The minimum efficient scale problem is caused by the small size of industrial output in Vietnam, while information

failure occurs because of less interaction between MNCs and domestic suppliers. In this situation, limited and appropriate public policies may help domestic supporting industries overcome these obstacles. They may enable domestic supporting industries to overcome the minimum efficient scale problem by expanding their business volumes with upgraded technology and reduce information failure through the interaction with MNC assemblers. In particular, a collaborative training program between MNCs and domestic supporting industries is highly recommended. It may promote technology transfer from MNCs to domestic suppliers. Its impacts may be indirect, but the risk of government failure is lower than for policies based on the theory of “coordination failure” or “big push.”

In order to establish an effective collaborative training system in Vietnam, it would be beneficial to learn from the success in the Penang Skill Development Center (PSDC). The participation of MNCs, the bottom-up and regional approach, and support from the local and national government are key factors in establishing a successful collaborative training program. Furthermore, whether MNCs would actively participate in a collaborative training program depends on the business architecture of product and the degree of industrial agglomeration.

Currently, there are two projects related to the development of supporting industries in Vietnam: i) the HIC-JICA project as a general education program and ii) the TAC project as a vocational training program. The HIC-JICA project focuses on educating prospective production engineers, emphasizing practical training through actual manufacturing activities based on orders from foreign investment enterprises. On the other hand, the TAC project, which is still in the planning stage, aims to directly contribute to technology upgrading of domestic suppliers in a vocational training program.

Taking into account the lessons learned from PSDC, the TAC project may attract MNCs' participation in regions with high degrees of industrial agglomeration such as Ho Chi Minh City, but it may not in regions with low degrees of industrial agglomeration such as Hanoi and Danang. In contrast, a general education program such as the HIC-JICA project may establish interactions with foreign investment enterprises even in regions with low degrees of industrial agglomeration, although its impacts may be more indirect for the development of supporting industries.

Therefore, the author recommends that policy makers select either a vocational training program or a general educational program, taking into consideration the degree of industrial agglomeration, the business architecture of products in major industries, and local-specific demand in each region. The optimal combination of the above two policy options may effectively promote the development of supporting industries and thereby stimulate economic growth in Vietnam through industrialization.

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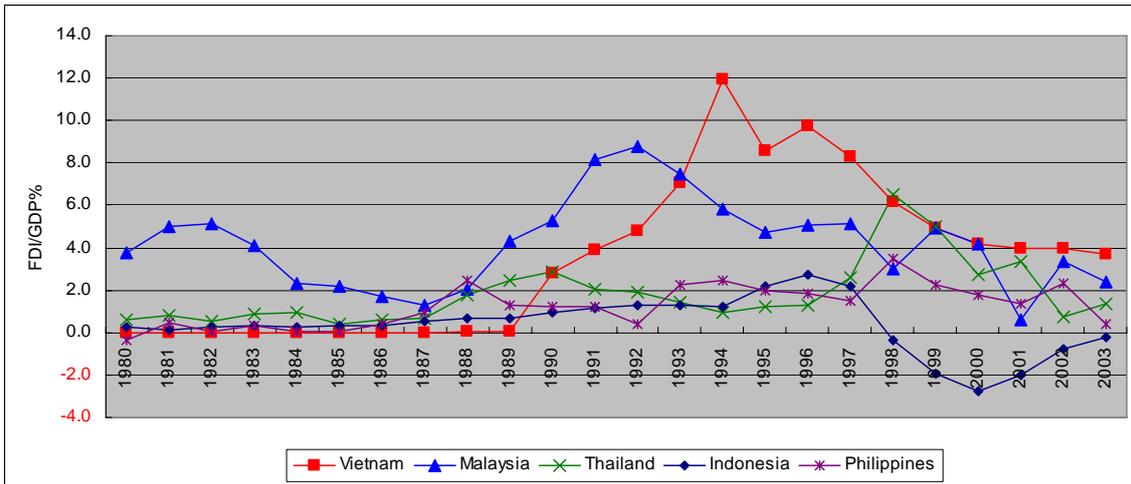
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Annex

Annex A FDI in ASEAN Countries (% of GDP: 1980-2003)



Source: World Development Indicator, the World Bank (2004).

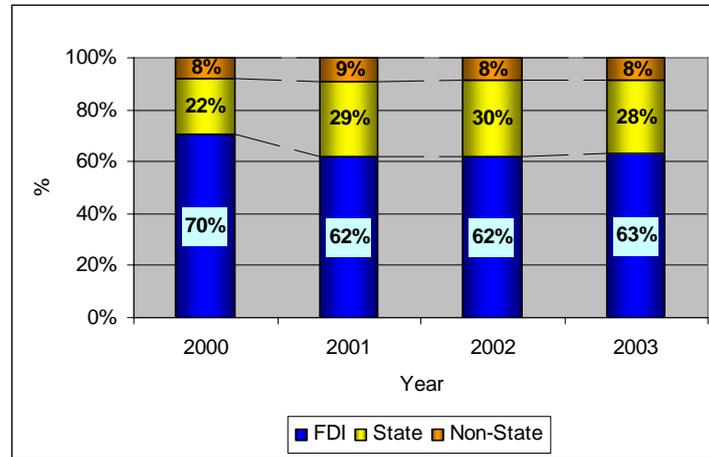
Annex B Output Value of Electronics Related Industries (at Current Price)

Category	2000	2001	2002	2003
Office, accounting, and computing machinery	1,736.5	2,989.0	4,006.6	6,721.4
Electrical machinery and apparatus	7,699.3	11,287.0	13,777.7	17,205.7
Radio and communication equipment and apparatus	7,370.1	8,411.8	11,063.6	14,089.3
A) Sub Total (VND)	16,806	22,688	28,848	38,016
A) Sub Total (US\$)	1.1	1.4	1.8	2.4
Annual Growth Rate (%)	-	35%	27%	32%
B) Total Industrial Output (VND)	336,100.3	395,809.2	476,350.0	620,067.7
B) Total Industrial Output (US\$)	21.4	25.1	30.3	39.4
A)/B) %	5.0%	5.7%	6.1%	6.1%

Note: @US\$1.00 = VND157,400

Source: General Statistics Office. *Statistical Year Book 2004* (Hanoi, Vietnam: Statistical Publishing House, 2004)

Annex C
Shares of Electronics Output by Sector



Source: General Statistics Office. *Statistical Year Book 2004* (Hanoi, Vietnam: Statistical Publishing House, 2004)

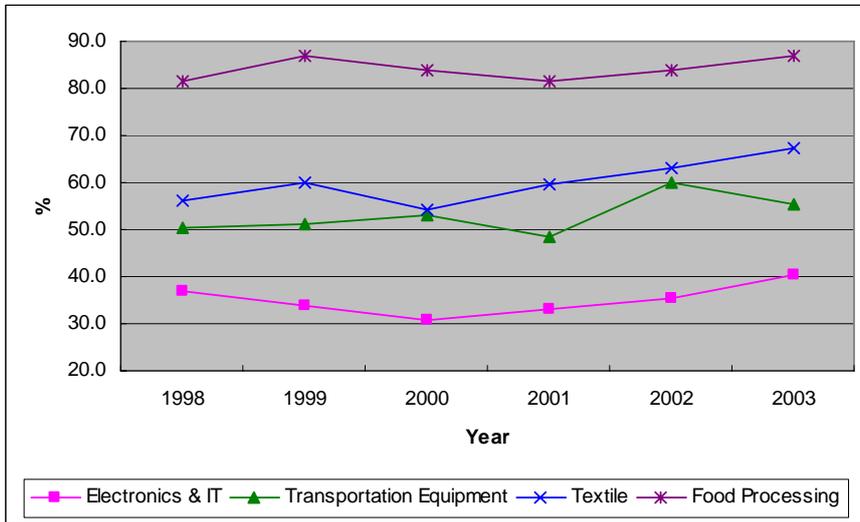
Annex D
Output Value of Electronics Related Industries (at constant 1994 prices)

Unit: Billion

Category	Sector	2000	2001	2002	2003
Office, accounting, and computing machinery	State	0.0	0.0	0.0	0.0
	Non-State	23.2	32.2	50.5	20.1
	FDI	1,272.0	944.5	952.4	1,518.3
Sub Total		1,295.2	976.7	1,002.9	1,538.4
Electrical machinery and apparatus	State	1,174.9	2,292.0	2,783.3	3,203.7
	Non-State	567.2	614.6	868.7	956.5
	FDI	1,280.1	2,265.0	2,867.7	3,301.7
Sub Total		3,022.2	5,171.6	6,519.7	7,461.9
Radio and communication equipment and apparatus	State	717.6	1,080.0	1,257.5	1,374.5
	Non-State	104.3	390.7	218.7	389.8
	FDI	3,573.4	3,936.3	4,692.4	5,397.9
Sub Total		4,395.3	5,407.0	6,168.6	7,162.2
A) Total (VND)		8,713	11,555	13,691	16,163
Annual Growth Rate (%)			33%	18%	18%
B) Total Industrial Output (VND)		82,897.0	93,434.4	105,119.4	117,636.7
A)/B) %		10.5%	12.4%	13.0%	13.7%

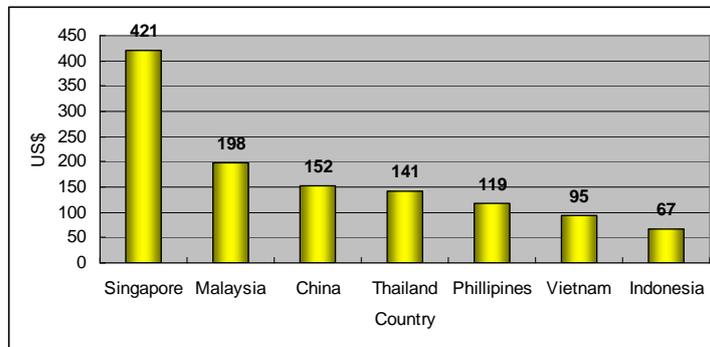
Source: General Statistics Office. *Statistical Year Book 2004* (Hanoi, Vietnam: Statistical Publishing House, 2004)

Annex E
Local procurement Ratios of Japanese Manufacturers (Industry-wise)



Source: Ministry of Economy, Trade and Industry (METI). “Basic Survey of Activities of Overseas Japanese Companies” (from 1998-2003). (Tokyo, Japan: METI)

Annex F
Average Monthly Wage in East Asian Countries



Source: Yumiko Okamoto. “Electric/Electronics Industries: Challenges for attracting FDI” in Kenichi Ohno and Nozomi Kawabata (eds). *Vietnam's Industrial Strategy* (Tokyo, Japan: Nihon Hyoron Sha, 2003), 99.

Annex G
HIC's Income Source

Unit: VND Mil.

	2000	2001	2002	2003	2004
A) Tuition Fee	8,962	18,000	30,000	33,837	36,000
B) Subsidy	7,594	7,909	8,100	8,874	9,000
C) Total	16,556	25,909	38,100	42,711	45,000
B) / C) %	45.9%	30.5%	21.3%	20.8%	20.0%

Source: Japan International Cooperation Agency (JICA). *Final Evaluation Report of HIC Project*. (Tokyo, Japan: JICA, 2004)

Annex H
TV Assembly in Vietnam

Unit: Thousand pcs

Location	1995	2000	2001	2002
A) HCMC	571.0	773.0	1,009.0	1,347.0
B) Whole Country	770.0	1,013.1	1,125.6	1,597.3
A)/B) %	74.2%	76.3%	89.6%	84.3%

Source: General Statistics Office. *Socio-Economic Statistical Data of 64 Provinces and Cities*. (Hanoi, Vietnam: Statistical Publishing House, 2005)