EXECUTIVE SUMMARY

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1. INTENSION AND AIM

The formation and strengthening of industrial bases are one of the conditions for developing countries to achieve economic development and poverty reduction. But even after virtuous cycles for industrial agglomeration are provoked in an industrial region, the region can face serious cost competitions with other regions with ample low-wage labors. To remain in the competition, it is necessary for the region to seize fully the prospected benefits from the on-going regional integration and to upgrade its industrial structure to an innovative industrial cluster where companies conduct a range of research and development (R&D) activities, or collaborate to transfer knowledge and technologies. Nevertheless, mechanisms of forming and upgrading industrial clusters and networking them have not necessarily been empirically examined enough.

The objectives of the research project are to conduct comprehensive studies on: current conditions of industrial agglomerations; impacts of the regional economic integration on industrial organizations in Asia; the characteristics of the existing production networks of industrial agglomerations; and industrial policies including foreign direct investment (FDI) promotion and science and technology (S&T) development.

The research project, in the initial phase, explored policy measures to facilitate industrial developments and establish complementary relations between industrial agglomerations in ASEAN and East Asia. In other words, the main focus of the project was on prioritizing policy measures for industrial clustering to suggest practical strategies for developing industrial clusters, taking into account industrial development stages and types of industry, and in the light of the on-going regional trade and investment liberalization initiatives as well as the accelerating pace of production

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networking.

2. RESEACH METHODS

Research activities of the project are largely twofold: case study and mail survey. Case studies are based on fact finding from literature surveys, official reports and statistics, and in-depth interviews with companies and organizations related to industrial and trade promotion. Mail surveys are aimed at collecting primary data information not found in existing statistics but indispensable for distinguishing the key drivers that significantly contributing to industrial agglomeration, upgrading and innovation from various potentially influential factors by applying econometric methods.

The questionnaire was designed as simple as possible to make it user-friendly. Single and multiple-choice questions were posed to the respondents, facilitating them to fill up with ease, so as to increase the number of valid responses. But this simplification enables only to sketch out the current situation of industrial development, and to identify factors that influence investment decisions of companies and policies executed by governments. The case study component complements the mail survey with additional insights.

Mail surveys were organized in major industrial areas in the following five ASEAN countries: Indonesia, Malaysia, the Philippines, Thailand and Vietnam. A standardized questionnaire was used in all these countries except the Philippines where some modifications were made to suit local conditions. Econometric methods were applied to individual data and pooled data composed of all countries, except in the case of Malaysia where sufficient number of valid responses could not be collected. Nevertheless, rigorous comparative studies could be done based on common analytical approaches. In addition, case studies were conducted in Cambodia, China, India, South Korea and Singapore, based on secondary data and face-to-face interviews.

The results of these studies were taken fully into account in identifying factors that promote the formation and development of industrial clusters and to derive policy implications.

3. FINDINGS AND CONCLUSIONS

There are well-established and emerging industrial clusters in ASEAN and East Asia. These clusters consist of various types of industries such as traditional artisanal, labor-intensive manufacturing, and knowledge-intensive service sectors. Their developments are based on a mixture of local, national and international factors promoting industrial agglomeration and clustering. In addition, the development of clusters in the region influences one another as the result of the economic integration that facilitates trades and investments, and intensifies competition among firms and industrial areas. These phenomena are reinforced by technological as well as managerial changes such as "modulization" and "fragmentation" observed typically in the automobile and electronic sectors.

3.1. Factors Encouraging Industrial Clustering Observed from Case Studies

Although various factors are associated with clustering, conducive business environment is a fundamental prerequisite for triggering industrial agglomeration, because agglomeration and clustering are driven by the private sector and market forces with appropriate supports of the public sector which include both national and local conditions that influence decisions on investments by local entrepreneurs and foreign investors.

At the country level, **stable macroeconomic environment and government institutional infrastructure**, including the **legal system,** are indispensable for industrial agglomeration. These influence entrepreneurship in local companies by reducing costs of financing, opening new operations, collaboration with other firms, and access to cutting-edge technologies, information and know-how. These also affect choices of country hosting FDIs by multinational companies (MNCs).

Local conditions have larger influences on companies' decision-making on choosing specific locations. **Infrastructure** including roads, ports and utilities and **size of local markets** are notably important. The existence of **supporting industries** including suppliers of raw materials and parts, banking, legal consulting, and other business services that support business developments are crucial, since these

developments are related to infrastructure and local markets mentioned above. The establishment of MNCs' production bases contributes to the expansion of local markets.

Liberal trade policies and **investment incentives** have been the key policy instruments enticing the MNCs, which provide the driving force for industrial development. Liberal trade policies are essential to overcome constraints such as limited size of local markets and weakness of supporting industries. Investment incentives focus not only on MNCs but also on local companies to promote the development of SMEs and supporting industries. These policies are needed to introduce, modify, and restructure in a "timely" way, in accordance with stages of industrial development and the degree of market competition.

All countries and local governments do not necessarily develop capabilities to meet all of the conditions and introduce policies mentioned above. The policy to develop industrial zones and special economic zones (EPZs) by targeting specific geographic areas is cost-effective to economies under severe fiscal and institutional constraints.

3.2. Obstacles to Industrial Clustering Observed from Case Studies

Main obstacles to industrial clustering found from the most of the surveyed countries are largely related to upgrading existing industries in the surveyed regions in comparison with the result of successful industrial development. The shortage of low-cost labor is typical. More serious problems are the shortage of skilled labor and professionals that hinder industrial upgrading and innovations. Another constraint is the lack of upgrading physical and institutional infrastructure such as road, customs procedures, intellectual property rights, legal systems and legislations, in the absence of which it will be difficult to raise value-added of products and to improve logistics, production methods, and innovative activities.

Coordination failures are one of the most serious key policy issues differentiating the performance of industrial cluster policies. An issue related to this is missing linkages between firms, business associations, public and private research and development institutes, universities, and national as well as local governments. The roles of local governments, business organizations, or key persons in regions are also crucial for success in organizing public-private partnerships to unify all local initiatives into clustering.

For less developed countries, clustering is a new concept, and is not sufficiently reflected in regional and national policies in these countries, which result in insufficient linkages among related parties.

3.3. Factors Promoting Industrial Agglomerations Verified by Econometric Analyses

Econometric methods were applied to data collected by mail surveys. To summarize the findings from the econometric analyses, the results of the estimations based on the pooled data are presented in what follows.

According to the results of the estimations, at the beginning of industrial agglomeration, companies started which production is labor-intensive, aiming at local markets rather in the closed economy. As mentioned in the case studies, factors such as institutional infrastructure and proximity to suppliers/subcontractors are important for the first movers to the surveyed areas. As ASEAN economies became increasingly open, firms tended to be more export-oriented, facing serious cost competitions. Consequently, factors such as low-cost labor, and the protection of intellectual property rights (IPR) emerged important for firms (latecomer) to open offices there, as they became more and more capital intensive, with business activity shifting to the production of components and parts.

Although investment incentives, liberal trade policies, and variables related infrastructures are not statistically significant, the coefficients on these variables do suggest that investment incentives are important for first movers, while liberal trade policy are essential for latecomers. In addition, first movers seem to attach importance to physical infrastructure including roads and ports, while latecomers seem to be more concerned with utilities and telecommunications infrastructure. These imply that it is necessary to shift policy in accordance with the stage of industrial development.

3.4. Factors Promoting Industrial Upgrading Verified by Econometric Analyses

To verify factors promoting industrial upgrading, we developed econometric models with four types of upgrading carried out by respondents in last three years, which are selected as a dependent variable (Y). The independent variables (Xs) include characteristics of firms and levels of "satisfaction" with 20 factors that were the same as

the above-mentioned models of industrial agglomeration. We categorized upgrading into the following four types: (a) introduction of a new good; (b) adoption of a new method of production; (c) opening of a new market; and (d) acquisition of new supply of inputs.

In order to strengthen the analysis of industrial upgrading, we developed another model of upgrading that includes **"D-score" analysis**. D-score is defined as a simple difference between "importance" and "satisfaction" attached to each of the 20 factors. Larger D-score for a specific business condition implies more dissatisfaction with it.

A key finding from the D-score models is that legal system has negative impacts on most of the innovation types carried out by MNCs. It is difficult, however, to identify a common factor which is applicable for four types of upgrading. For example, estimated signs of the coefficients in the econometric model that includes the level of satisfactions with respect to 20 factors as independent variable suggest that promoting factors depend on the type of upgrading. As for the introduction of a new good, **liberal trade policy** is an encouraging factor, while **utilities** and **access to export markets** discouraging.

3.5. Source of New Technologies and Information Verified by Econometric Analyses

From the analyses on the sources of new technologies and information based on the D-score model, MNCs tend to be transferred technologies from other MNCs and have less technical cooperation or assistance from local governments in comparison with local companies. MNCs which are not satisfied with local financial system tend to receive technical assistance from foreign agencies including official development assistance (ODA). But those who have problems with physical infrastructure tend to depend on technical cooperation or assistance from local business organizations which are familiar with local situations.

On the other hand, local firms that face problems with infrastructure and financial system acquire technologies and information through technical assistance from foreign agencies. But well-designed government institutional infrastructure is an important factor for non-MNCs to encourage firms to receive technical assistances from foreign agencies. Technical cooperation or assistance from local universities, or R&D institutes is also important for firms unsatisfied with financial system.

These findings partly reflect the present situation, with MNCs and non-MNCs having different networks to obtain new technologies and information. In other words, MNCs are carefully observing capabilities of local firms in deciding whether or not to establish closer linkages with local firms.

3.6. Implications from Econometric Analyses

Clustering policies should be determined according to policy priorities and adjusted them timely to business environments. Even though there are no standardized policy packages applicable to all stages of industrial development and all types of innovation, it is imperative to promote interactions among businesses, universities, local governments, other public authorities and other organizations which seek full benefits from clustering.

But above-mentioned networks, particularly between MNCs and local firms, do not necessarily exist at the beginning, although they represent the key channel of technology diffusion in developing countries. Local firms and business associations are required to consolidate their footholds for absorbing new technologies with the support of local and central governments.

Governments are required to harmonize all local efforts for improving the quality of infrastructure, human resources, and institutional frameworks. Developing these R&D capabilities is considered as "public goods" which contribute not only to industrial agglomeration but also to knowledge and technology transfers and innovations.

4. POLICY IMPLICATIONS AND RECOMMENDATIONS

As countries begin to industrialize, there is a tendency for industries to concentrate initially in areas where physical infrastructure is readily available and subsequently for related industries to gravitate closer together, thereby taking advantage of inherent synergies. In the process, industry clusters are formed, with each geographical area specializing in certain activities, leading to spatial diffusion of industries. This is the case not only for early movers like Malaysia and Thailand but also for the latecomers like Cambodia and Vietnam. It is important to underscore that this process is essentially

a private-sector phenomenon, driven by market forces and aided by government support.

As industrial agglomeration and clustering contribute significantly to economic growth and development through increased competitiveness, there is certainly a case for policies that promote cluster formations. The current focus on physical infrastructure and logistics, liberal trade and investment regimes, economic reforms aimed at privatization and deregulations, practiced in many countries in the region, must continue with increased vigor. The small and medium enterprises, which play an important role as ancillary industries, need much help, as they are best with problems of sorts, ranging from lack of market information, bank credit and technical know-how, to acute shortage of skilled manpower. The local SMEs are heavily dependent on domestic markets, showing no or little interest in exporting. All this calls for policy initiatives at the national level that would provide easier access to factors of production, raw materials, market information and other inputs that would help reduce the cost of doing business for these firms.

Regional initiatives can complement national initiatives in alleviating some of the problems faced by industrial clusters especially in the emerging economies. It is in this spirit that the following three concrete proposals are put forward.

The first proposal is to establish East Asian Centers for Standards and Testing for a number of key industries (e.g. electronics, automobiles, machinery, furniture, footwear). This will facilitate harmonization of standards, in addition to certification of standards for all market destinations. The centralized facility for a given industry catering to the whole region will reduce cost, thanks to economies of scale and scope. This will also enable products to move more freely within the region once the standards are tested and certified. This will lead to greater intra-regional specialization and increased intra-industry trade flows, with more and more inputs being sourced externally, which would render the region's industrial products internationally competitive.

The second proposal relates to the establishment of East Asian Resource Centers for selected industries, which will serve not only as a repository of information relating to the focus industry, but also as "intelligence centers" that would gather and disseminate vital information to all the stakeholders and as "alert centers" that would draw the attention of the industry players to new threats, challenges and opportunities. Events,

policies, technologies, pronouncements and initiatives in the major markets that would impinge upon the industry will be analyzed by the Resource Center and disseminated quickly for the industry and the relevant ministry to act upon. The timely flow of pertinent information is crucial for strategic planning at the firm level and policy adjustments at the ministry level.

The third proposal calls for the formation of East Asia-wide Industry Clubs for the major industries. These industry associations would enable firms to interact and network with one another and act as lobby groups to influence national, regional and global policies that would impact on the industry interests. The industry clubs can also help the members overcome the problem of acute shortage of skilled workers by promoting skill development. Instead of setting up "regional" technical training facilities to meet the industry needs, it would be cost-effective to make use of existing facilities in the region through mutual accreditation and recognition. The industry clubs can help identify the various training facilities and training programs available in the region. In addition, the industry clubs can mount schemes that would enable its members to send their technicians for hands-on training experience in the work place of other member firms.

East Asia-wide Industry Clubs are likely to work well, as it provides the "critical mass", given the extensive regional production network in the EAS region, especially if the EAS can provide an avenue for their concerns and views to be heard by policy makers.

The above three proposals are doable. As the first two proposal would entail large investments, it is suggested that they are financed on a PPP (private-public partnership) basis with both industry and government contributions. The third proposal is envisaged as an entirely private sector affair, albeit recognized and endorsed by the East Asian governments. The latter may help set up such associations, with commercial attaches in embassies playing initially a catalytic and subsequently a facilitating role.

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The Determinants of Industrial Agglomeration in Indonesia

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Abstract

The Indonesian manufacturing sector transformed rapidly in the past 30 years leading up to the crisis and had become an important source of growth by the mid 1990s. Some part of this rapid industrial development could be attributed to the industrial agglomeration in the country. This study examined industrial agglomeration in Indonesia. A review of previous studies on this subject informed us that industrial agglomeration in Indonesia is located mainly in Java and caused by natural market forces and infrastructures. In addition, the role of small and medium enterprises (SMEs) was also important in accelerating industrial development. Descriptive analysis, meanwhile, suggested some early evidence on the extent of industrial agglomeration in the three regions covered by the survey. Among the findings, and perhaps the most important one, is that all kind of infrastructures and supporting activities, the availability of skilled labour and professionals, and the size of domestic markets, are the important factors for establishing business. This finding supports the "flowchart approach" of industrial agglomeration. The results, however, did not find the size of export markets to be an important factor for establishing business. The results also indicate incentive for investment as another important factor. This finding might be related to the worsening situation of investment climate in Indonesia after the 1997/98 economic crisis. Most of the findings from the descriptive analysis were supported by the findings from the econometric analysis. Among others, the econometric analysis found that variables that can be categorized as incentives for investment were found to have significantly affected the establishment of the "first movers" in a region, which are definitely important for stimulating the development of industrial clusters and promoting technology spillovers. The econometric analysis also found some evidence of

the technology transfer that happened from the industrial agglomeration process. All in all, the study documented in this paper supported the theory of industrial agglomeration and provided some support for its existence to promote industrial development in Indonesia.

INTRODUCTION

The Indonesian manufacturing sector transformed rapidly in the past 30 years leading up to the crisis and had become an important source of growth by the mid 1990s. The share of the sector in Gross Domestic Product (GDP) increased from 12 percent in 1975 to 24 percent in 1995. Some other features of industrialization also accompanied this rapid structural change. The share of manufacturing exports in total exports increased significantly from the 1980s to the 1990s and reached about 50 percent at beginning of the 1990s.

Part of this rapid industrial development could be attributed to the industrial agglomeration in the country. As noted in the literature on industrialization, industrial agglomeration is an important process for promoting industrial and economic development. This paper examines this subject for Indonesia.[i]

The study reported in this paper attempted to find the determinants of the industrial agglomeration process in Indonesia. While some studies for this particular subject have been done as reviewed in the next section of this paper, this study gives another value added to the literature by adopting the framework of 'the flowchart approach' (Kuchiki 2005). The analysis of the paper made use of the results of a firm-level mail-survey conducted for the study.

The rest of this paper is organized in the following manner. Section 1 reviews the literature on the development of the industrial agglomeration process in Indonesia. This section aims to derive some stylized facts about the process. Section 2 provides the descriptive statistic analysis of the mail-survey results. Section 3 presents an econometric analysis of the determinants of industrial agglomeration in Indonesia. Section 4 finally summarizes and outlines some policy implications derived from the results.

1. INDUSTRIAL AGGLOMERATION IN INDONESIA: A LITERATURE REVIEW

There have many studies discussing the industrial agglomeration process in Indonesia. To organize the discussion, this paper reviews the literature according to some major topics within the subject. These are (1) geographical concentration; (2) the dynamics and causes for industrial agglomeration; (3) the role of infrastructure in agglomeration; and (4) the role of SMEs in the agglomeration.

1.1. Geographical Concentration of Industrial Agglomeration in Indonesia

Industrial agglomeration in Indonesia was unevenly distributed. Majority of the manufacturing firms were located on Java and Sumatera, two of the five major islands in Indonesia. The other main islands in Indonesia, especially those on the eastern part, played only minor roles in the manufacturing sector,.

Diechmann *et al*. (2005) showed that the formal manufacturing industry in Indonesia is highly concentrated. The simple Gini coefficient calculated in the study reported that about half of all manufacturing employment was located in just 15 districts, while 65 percent of these districts accounted for just 10 percent of the total manufacturing workforce. Figure 1 shows that all manufacturing employment in the footwear industry was located in Java, and the other main islands played only a minor role in the manufacturing sector.

It is interesting to elaborate on the characteristic of industrial agglomeration in Java, given the high concentration of manufacturing operations on this island. The key point is that Java's industrial agglomeration indicates a bipolar pattern, that is, the western (Jakarta and Bandung Greater) and eastern (Surabaya Greater) sides (Hidayati and Kuncoro 2004).

Figure 1: Distribution of Manufacturing Employment in Footwear and Food Products Sector
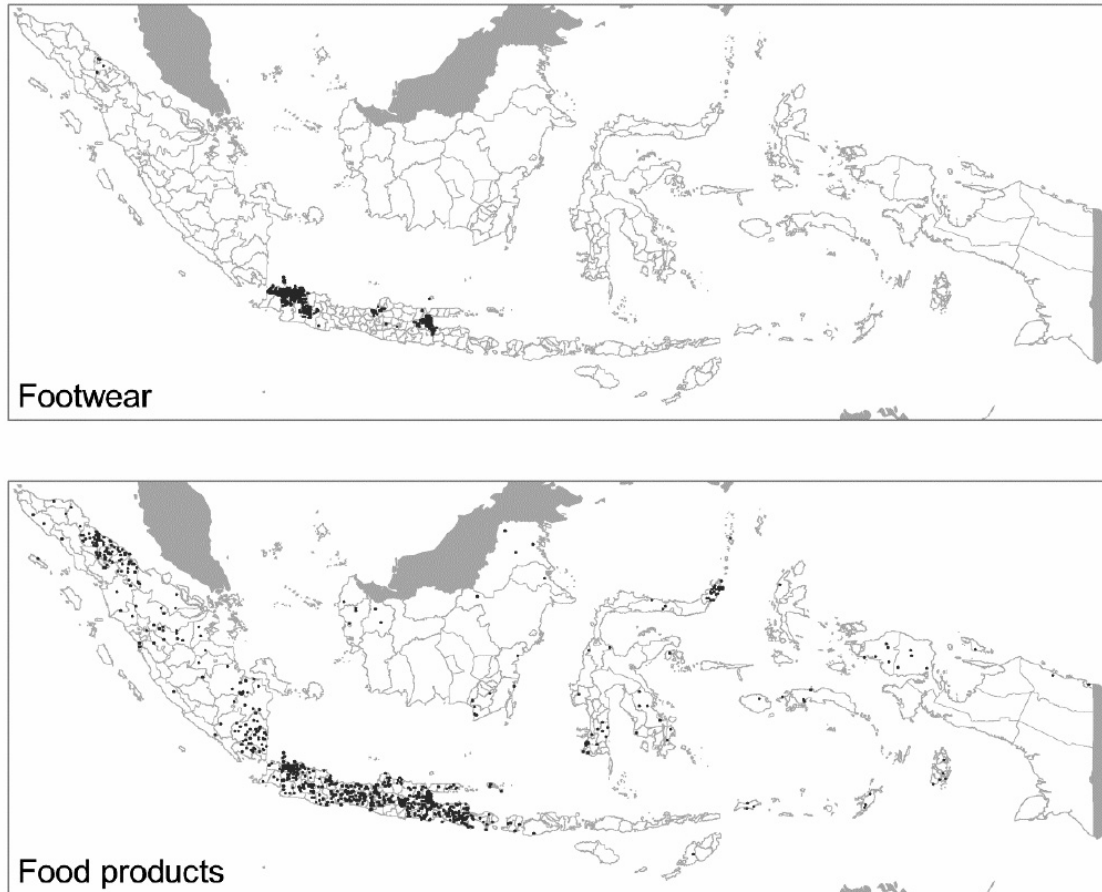
Note: Each dot is randomly placed within a district and represents 500 employees and the data source is Economic Census and Survey of Industry, 1996.
Source: Deichmann, *et al*., 2005.

Hidayati and Kuncoro (2004) provided additional details on this bipolar industrial agglomeration using the Geographic Information System (GIS). One such detailed piece of information concerns the rapid expansion of industrial agglomeration areas (see Figure 2 and Table 1). In 1980, the agglomeration area was located primarily in Jakarta, but a decade later, the area in the western part of Java island expanded to Greater Jakarta and Bandung. The former includes Bogor, Bekasi, Tangerang, while the latter includes both city and municipals (or *kabupaten*) in the Greater Bandung area. In 2000, both the Greater Jakarta and Bandung areas expanded more and created a network of cities.

Figure 2: Industrial Agglomeration in Western Polar, 1980, 1990 and 2000

Agglomeration Area in 1980
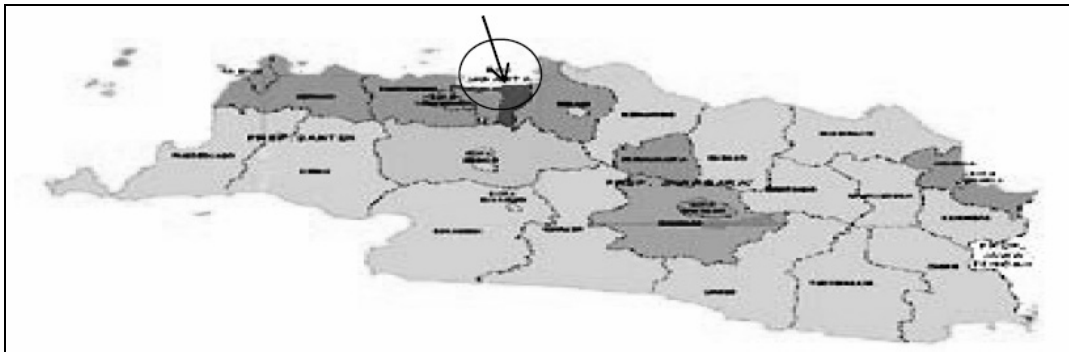
Agglomeration Area in 1990
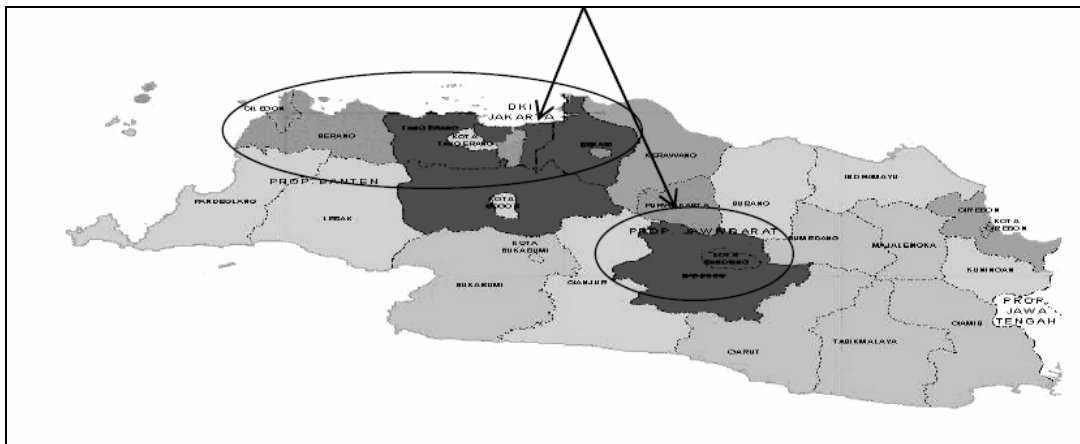
Agglomeration Area in 2000
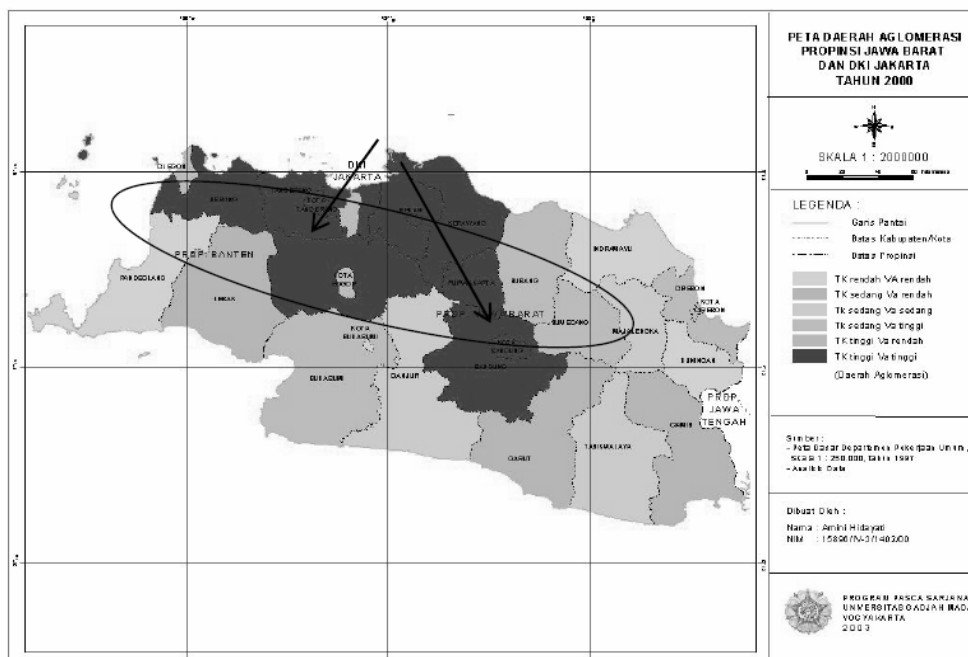
Source: Hidayati (2004).

Table 1: Industrial Agglomeration in DKI Jakarta and West Java

Year	New Industrial Agglomeration Area	Total Industrial Agglomeration Area
1980	North Jakarta East Jakarta	North Jakarta East Jakarta
1990	West Jakarta Bogor Bekasi Tangerang Bandung Bandung*	North Jakarta East Jakarta West Jakarta Bogor Bekasi Tangerang Bandung Bandung City
2000	Bekasi Tangerang Kerawang Purwakarta Serang	North Jakarta East Jakarta West Jakarta Bogor Bekasi Tangerang Bandung Bandung City Bekasi Tangerang Kerawang Purwakarta Serang

Notes: *: city.
Source: Hidayati and Kuncoro (2004).

1.2. Causes of Industrial Agglomeration in Indonesia: Previous Studies

Kuncoro and Downing (forthcoming) studied the dynamics and causes of industrial agglomeration in Java. They adopted the framework of a new economic geography and new trade theory on agglomeration.

Their study suggested that spatial concentration in metropolitan areas is led by market forces, both from the supply and demand side. The supply side includes import content, export orientation, scale economies, and labor costs. High coefficients for import content and export orientation, which they found from their econometric exercise, implied that most specialized industries in Java benefited in terms of vertical integration with foreign suppliers and therefore had more access to the global market. The positive and significant coefficient of scale economies means that the manufacturing industry in

Java experience localization economies.

For the demand side, size of market seems to explain spatial concentration in the manufacturing industry. Most firms are likely to be located in densely populated areas because such areas serve as the source of their labor input and the market for their products. Moreover, Java's imperfect competition seems to have caused firms to concentrate geographically in order to optimize the benefit of agglomeration.

Kuncoro and Downing's study also gave empirical evidence on the path dependency hypothesis of Fujita *et al*. (1999). The positive and significant coefficients for firm age across various specifications support the hypothesis, which points to the importance of the history of the firm.   Moreover, the specialized industries in Java have better access to infrastructure. This, however, was more important for firms in Greater Jabotabek and Surabaya metropolitan regions, which have superior infrastructure facilities.

Another study which discussed the determinant of industrial agglomeration in Indonesia was conducted by Diechmann, *et al*. (2005). They examined the aggregate and sectoral geographic concentration of Indonesia's manufacturing firms and estimated the impact of factors influencing the decision to locate a firm in a particular area. They differentiated the factors between the natural advantage and production externalities. Natural advantage includes infrastructure endowment, wage rates, and natural resource endowments. These factors are central to the "New Economic Geography" models, where firms tend to locate in areas that have a high demand for the goods they produce and where market access is facilitated by a good transport infrastructure (Krugman 1991a; Krugman 1991b; Fujita and Krugman 1995; and Fujita *et al*. 1999, as cited by Diechmann *et al*. 2005). On the other hand, production externalities are the results of the colocation of firms in the same or complementary industries to benefit from the spill over of technology and information.

Some of the findings from this study are similar to the findings of a study by Kuncoro and Downing where for most sectors, proximity to buyers and suppliers influence location decision at the firm level. Locating a firm in a region with good access to markets will increase demand for the firm's products. One particular factor observed by Diechmann *et.al.* is the impact of predatory local government regulations to the decisions on selecting a firm's location. A negative coefficient on local

government regulations suggested that firms are reluctant to locate their firms in the region. This could be because local governments often apply predatory or nuisance taxation.

1.3. The Role of Infrastructure in the Agglomeration Process

Diechmann *et al*. (2005) found the importance of transportation infrastructure in the industrial agglomeration process in Indonesia. They measured this using two variables: (1) the ease by which goods and people can move locally; and (2) the ease by which goods and people can move to export hubs. The first variable was measured by road density in each municipality while the second variable was measured using the travel time from the firm to the nearest export hub, such as an international sea port or airport. Diechmann *et al*. found that these two variables were positive and statistically significant for many industrial sectors, with large elasticities found in the textiles–and-garment and furniture sector.

Diechmann *et al*. also conducted a simulation by increasing road density in six regions: (i) Greater Jakarta Metropolitan area (100 km belt around DKI Jakarta); (ii) Greater Jakarta Metropolitan area (excluding DKI Jakarta); (iii) municipalities in East Java; (iv) all districts in East Java; (v) municipalities in East Kalimantan and South Sulawesi (Eastern Indonesia); and (vi) all districts in East Kalimantan and South Sulawesi (Eastern Indonesia). Meanwhile, East Kalimantan and South Sulawesi were grouped as one region because these areas were considered as the center of eastern Indonesia's industrial areas. The simulations were based on the assumption that improvements in transport will enhance the attractiveness of the region which, in turn, will increase the profit of existing firms in the region. The super normal profit will attract other companies to relocate their firms to that region until the optimal number of firms in that location is achieved. The movement of firms will cease when congestion costs, such as increases in land and labor costs, are high enough to offset net benefits from industry relocation and the system gets back into equilibrium.

Simulation results show different patterns between eastern Indonesia and other regions. Some firms relocated to peripheral areas after transport improvements. They found that where agglomeration economies are strong, the scope of industry relocations to peripheral areas was much lower than when the agglomeration economies are weak.

Surprisingly, transport improvements only had a small impact on industry relocation, especially to the peripheral areas. This might be because the sectors were already well distributed and, at the same time, served local markets.

However, for eastern Indonesia, which was considered a lagging region, improvements in transport have only limited payoffs in terms of improving regional attractiveness. Firms from other leading regions, particularly in major sectors that have already concentrated, were not interested in relocating their firms.

1.4. The Role of Small and Medium Enterprises (SMEs) in the Industrial Agglomeration

SMEs have an important role in industrial agglomeration in Indonesia. The clustering of SMEs is not only for the development of SMEs in the cluster, but also for the development of villages/towns in Indonesia. More importantly, strengthening SMEs promotes the growth of the manufacturing industry because a lot of subcontracting activities emerge within the clusters.

Clusters in Indonesia can be classified into four types, according to their level of development. Each of these has their own characteristics (Sandee and Wingel 2002):

1) "Artisinal:" mainly micro enterprises (MIIs); low productivity and wages; stagnated (no market expansion); increased investment and production; improved production methods; management, organization and production development; local market (low-income consumers) orientation; use primitive or obsolete tools and equipment; many producers are illiterate and passive in marketing (i.e., producers have no idea about their market); the role of middlemen/traders is dominant (i.e., producers are fully dependent on middlemen or traders for marketing); low degree of interfirm cooperation and specialization (i.e., no vertical cooperation among enterprises); no external networks with supporting organizations.

2) "Active;" use higher-skilled workers and better technology; supply national and export markets; active in marketing; high degree of internal and external networks

3) "Dynamic:" extensive overseas trade networks; pronounced internal heterogeneity within clusters in terms of size, technology, and served markets; leading/pioneering firms played a decisive role

4) "Advanced:" the degree of interfirm specialization and cooperation is high; business networks between enterprises with suppliers of raw materials, components, equipment and other inputs; providers of business services, traders, distributors, and banks are well developed; cooperation with local, regional, or even national government as well as with specialized training and research institutions such as universities is good; many firms are export-oriented (mainly through trading houses or exporting companies)

The fourth type is more developed and complex than those in the third type. Advanced clusters often overlap and interlink with other clusters in the same region. Such cluster agglomerations or industrial districts (the Italian term) are the most complex form of clustering where different sectors or subsectors mutually depend on, and benefit from, each other. One example of this type of cluster agglomeration is the Yogyakarta–Solo area (Central Java), where tourism, furniture and interior decoration, metal processing, leather goods, and textile/clothing clusters are all mutually benefiting from one other.

However, in general, the performance of SME clusters in Indonesia is still far below the performance of SME clusters in developed countries. Most of the SME clusters in Indonesia are "artisinal" clusters characterized by low productivity and very small size or self-employments units. They produce inferior goods meant only for local markets and do not have linkages with large domestic enterprises or large international enterprises. Many of these clusters have been in existence for a long time, but they can not improve their performance in terms of productivity, technology, and market expansion.

This situation is related to problems faced by the SMEs in less developed countries, which can be categorized into three groups: infrastructure, institution, and economic issues. Infrastructure does not only cover the lack of infrastructure, but also the low quality of existing infrastructure. Institution relates to the lack of access to formal training and financial system, excessive government regulation on business licensing, lack of price and market information, and noncompliance with international standards.

The 2003 survey on Small and Medium Enterprises from the Central Bureau of Statistics (BPS) Indonesia mentioned that the main problems faced by the majority of SMEs are the lack of capital and marketing skills. Although the government has provided various government-sponsored SME credit schemes, most of the SMEs, especially in rural/backward areas, never received any credits from banks or other financial institutions. They are heavily dependent on their own savings.

2. DESCRIPTIVE ANALYSIS OF THE FIRM-LEVEL MAIL SURVEY.

This section and the one after this both report and analyze the results of the firm-level mail-survey. As previously noted, this study conducted the survey to derive some basic facts and conduct an analysis on the determinants of industrial agglomeration in Indonesia.

The questions formulated in the survey adopted the flowchart approach of industrial agglomeration (Kuchiki 2005). The questions were categorized into four groups: (a) current profile of business operation in the area targeted for the survey; (b) factors that influenced the firm's decision to establish its production; (c) some details about the firm's current operation and plans for future operation; and (d) the profile of the parent companies of the respondent firm.

The questionnaires were sent to about 1,000 firms in greater Jakarta, Bandung, and Surabaya in November 2007. As previously noted, there is a large concentration of industrial agglomeration activities in these three areas. The survey received 121 valid responses, making for a 12.1 percent response rate (see Table 2).

Table 2: Basic Information about the Valid Responses

Dispatch	Valid Response	Respond Rate
1,000	121	12.1%

Source: Author.

2.1. The Characteristics of the Respondents

Table 3 provides the distribution of respondents by the year of establishment. About

60 percent of the respondents were established during the 1990s and early 2000s. This likely reflects the policy and major economic events in Indonesia during that period.[ii] As noted, the 1990s was a period of rapid trade liberalization during which many deregulation packages were introduced. The 2000s was characterized by strong growth due to recovery from the 1997/98 crisis.[iii]

Table 3: Number of Respondents by Year of Establishment

	#	% of total
Before 1970	17	14.0
1970 - 1974	8	6.6
1975 - 1979	6	5.0
1980 - 1984	7	5.8
1985 - 1989	12	9.9
1990 - 1994	20	16.5
1995 - 1999	14	11.6
2000 - 2004	29	24.0
2005 - 2007	7	5.8
not answering	1	0.8
Total	121	100.0

Source: Author.

In terms of ownership, about 76 percent of the respondents are local firms while about 20 and 4 percent of the respondents constitute joint-venture firms and wholly foreign firms, respectively. This is indicated by the distribution of the respondents by type of ownership given in Table 4.

The distribution is also consistent with the policy episodes in Indonesia, indicated by the rather large number of joint venture firms. The deregulation of ownership rule in the 1990s indeed encouraged more foreign presence in a firm's ownership structure. The government gradually removed the restriction of equity and the rule for divestment over the period 1986 to 1995 and, in addition to this, also undertook quite extreme reforms to respond to the perceived decline in the investment climate in Indonesia (Pangestu 1996).

The number of wholly foreign firms, however, is rather small for Indonesia. For example, the number of wholly foreign firms in Indonesian manufacturing is about 9 percent, on average, during the early 2000s. Again, this is considering a quite liberal investment policy in the 1990s. Nonetheless, this might simply reflect a weakness of the mail survey whereby the extent of valid responses were much smaller for the group of

wholly foreign firms compared to that for the group of local and joint venture firms.

Table 4: Ownership Structure of the Respondents

	#	% of total
Local	92	76.0
Foreign	5	4.1
Joint-venture	24	19.8
Total	121	100.0

Source: Author.

As for size, the bulk of the respondents can be categorized as small-to-medium-sized firms. This is when size was measured by the number of employees, as shown by Table 5a for the distribution of current size. Only about 10 percent of the respondents fall into the group of large firms.

Table 5: Size of the Respondents, by Number of Employees

(a) Size at the Year of Survey (i.e. 2007)		
Groups	#	% of total
1. 1-49 persons	62	51.2
2. 50-99 persons	15	12.4
3. 100-199 persons	14	11.6
4. 200-299 persons	5	4.1
5. 300-399 persons	1	0.8
6. 400-499 persons	5	4.1
7. 500-999 persons	10	8.3
8. 1,000-1,499 persons	6	5.0
9. 1,500-1,999 persons	3	2.5
10. 2,000 persons and above	0	0.0
Not responding	0	0.0
Total	121	100.0

Source: Author.

An interesting – but rather surprising result – can be derived by comparing Table 5a with Table 5b, which is the distribution of size by initial size at the time of the firm's establishment. The key point is that the respondents did not seem to grow that fast. The distribution did not really change when moving from Table 5b to Table 5a (i.e., from the initial to the current size). Reading the information from Table 5a, only about 10 percent of the respondents 'graduated' from small-medium to large firms over the course of the

respondent-firms' life. Nevertheless, this finding is consistent with the situation after the 1997/98 economic crisis. Aswicahyono *et al*. (2007), for example, indicated that the growth of manufacturing firms in Indonesia had been much slower during the period after the crisis compared to the period before the crisis. This finding, however, does not really agree with the situation before the crisis where the growth of firms in Indonesia tended to be very high.

Table 5: Size of the Respondents, by Number of Employees

(b) Size at the Initial Year of Establishment		
Groups	#	% of total
1. 1-49 persons	81	66.9
2. 50-99 persons	17	14.0
3. 100-199 persons	10	8.3
4. 200-299 persons	4	3.3
5. 300-399 persons	1	0.8
6. 400-499 persons	1	0.8
7. 500-999 persons	2	1.7
8. 1,000-1,499 persons	0	0.0
9. 1,500-1,999 persons	1	0.8
10. 2,000 persons and above	0	0.0
Not responding	4	3.3
Total	121	100.0

Source: Author.

Meanwhile, the distribution of size based on other measurements (i.e., assets and capital) also show a similar picture and even show a quite large degree of persistency in the size over the course of life of the respondents (see Tables 6 and 7).

Table 6: Size of the Respondents, by Number of Assets

(a) Size at the Year of Survey (i.e. 2007)

Groups	#	% of total
1. Less than 10,000	36	29.8
2. 10,000-24,999	14	11.6
3. 25,000-49,999	6	5.0
4. 50,000-74,999	6	5.0
5. 75,000-99,999	3	2.5
6. 100,000-499,999	17	14.0
7. 500,000-999,999	9	7.4
8. 1-4.9 million	14	11.6
9. 5-9.9 million	9	7.4
10. 10 million and above	0	0.0
Not responding	7	5.8
Total	121	100.0

(b) Size at the Initial Year of Establishment

Groups	#	% of total
1. Less than 10,000	41	33.9
2. 10,000-24,999	11	9.1
3. 25,000-49,999	8	6.6
4. 50,000-74,999	8	6.6
5. 75,000-99,999	5	4.1
6. 100,000-499,999	13	10.7
7. 500,000-999,999	7	5.8
8. 1-4.9 million	11	9.1
9. 5-9.9 million	5	4.1
10. 10 million and above	0	0.0
Not responding	12	9.9
Total	121	100.0

Source: Author.

Table 7: Size of the Respondents, by Number of Capital

(a) Size at the Year of Survey (i.e. 2007)

Groups	#	% of total
1. Less than 10,000	35	28.9
2. 10,000-24,999	12	9.9
3. 25,000-49,999	10	8.3
4. 50,000-74,999	6	5.0
5. 75,000-99,999	6	5.0
6. 100,000-499,999	13	10.7
7. 500,000-999,999	7	5.8
8. 1-4.9 million	12	9.9
9. 5-9.9 million	4	3.3
10. 10 million and above	0	0.0
Not responding	16	13.2
Total	121	100.0

(b) Size at the Initial Year of Establishment

Groups	#	% of total
1. Less than 10,000	43	35.5
2. 10,000-24,999	15	12.4
3. 25,000-49,999	7	5.8
4. 50,000-74,999	6	5.0
5. 75,000-99,999	5	4.1
6. 100,000-499,999	9	7.4
7. 500,000-999,999	4	3.3
8. 1-4.9 million	10	8.3
9. 5-9.9 million	4	3.3
10. 10 million and above	0	0.0
Not responding	18	14.9
Total	121	100.0

Source: Author.

The survey indicated that most of the respondents are in manufacturing. Table 8 shows that about 40 percent of the respondents are categorized under the manufacturing sector. The respondents in the services sector, notably in finance and insurance, hotel and restaurants, IT and software, and construction, are also quite big. Those in the finance and insurance sectors, in particular, made up about 20 percent of the total respondents. This finding provides some early evidence of the extent of industrial agglomeration in the three regions covered by the survey. In particular, it may suggest that quite a number of financial firms in the surveyed areas were actually created to fulfill the demand of the rapidly growing manufacturing sector. As in theory, these

financial firms are likely to act as intermediaries of (public) funds, which the manufacturing firms need to undertake investments.

Table 8: Main Business Activities of the Respondents

Groups	#	% of total
1. Manufacturing	47	38.8
2. Primary products	1	0.8
3. Utilities	0	0.0
4. Construction	7	5.8
5. Wholesale	4	3.3
6. Retail	6	5.0
7. Hotels, Restaurants	9	7.4
8. Transportation	4	3.3
9. Telecommunications	2	1.7
10. Finance, Insurance	23	19.0
11. Real estate	0	0.0
12. IT services, Software	5	4.1
13. Other business services	6	5.0
14. Personal services	2	1.7
15. Other	5	4.1
Total	121	100.0

Source: Author.

A rather skewed distribution is also presented in Table 9, which show the distribution of activities of respondents that operate in manufacturing sector. A large number of respondents operate in textile and garments, food and beverages, paper and paper products, and the automotive and auto parts sectors.

While it is not the focus of this subsection, it is worth mentioning here that the number of respondents from the automotive and auto parts sector provide another support for the incidence of industrial agglomeration. This sector can rely quite heavily on subcontracting arrangement, either in the automotive assembly industry or auto part industries, and the fact of this high dependency obviously could trigger the proliferation of many subcontractors in a region with some big automotive assemblies or auto parts companies. For example, it is well known that there are clusters of medium-sized auto parts companies in the greater Bandung and West Java area. Many of these companies supply their output to either assembly plants—there are quite many in the area, including greater Jakarta, which is quite close to the greater Bandung region--or to other

auto parts companies that produce higher-level and -quality automotive parts and components. Companies that produce these kinds of products also export them.[iv]

Table 9: Main Products of Manufacturing Companies

	#	% of total
Food, beverages, tobacco	5	10.0
Textiles, apparel, leather	13	26.0
Wood, wood products	4	8.0
Paper, paper products, printing	6	12.0
Chemicals, chemical and plastic products, rubber	4	8.0
Iron, steel	1	2.0
Metal products	2	4.0
Other electronics, electronic components	1	2.0
Automobile, auto parts	8	16.0
Other	6	12.0
Total	50	100.0

Source: Author.

Target market of respondents does not appear to vary so much. As presented in Table 10, many of the respondents, that is, about 80 percent, sell their output to the domestic market. As for the export market, respondents seem more focused on the Asian market rather than U.S. and European markets. In total, 12.4 percent of respondents sell their output to the ASEAN member countries and other Asian countries, which is higher than the number of respondents that export to the U.S. and European markets (i.e., only 4 percent of the total respondents).

This finding could be attributed to the fact that many of the respondents are small-to-medium-sized firms. Presumably, this is also because the competitive pressure in terms of product quality is less for the Asian region than it is for the U.S. and European markets. And because firms that are able to meet the more rigorous quality requirements for the U.S. and European markets are likely to be large or very large firms, it is not surprising that the result was heavily skewed in favor of the domestic market as the main target market for the respondents. Large firms are able to compete in a more exacting global market because of their efficient operations, which stem from economies of scale.

All in all, this finding as well as the possible explanation for the finding jibes with the "self-selection hypothesis," which postulates that only the most productive firms are

able to survive in the highly competitive global market. According to Bernard and Jensen (1999), this hypothesis is based on the presumption that there are additional costs for participating in export, and because these costs are usually very high, only very efficient firms, and hence large firms, are able to compete. Given the finding from the survey, we can thus infer that small- and medium-sized firms in Indonesia are "selected" to be able to compete in the Asian market. On the other hand, large Indonesian firms, or perhaps Indonesian joint-venture firms, are "selected" to compete in U.S. and European markets, which are presumed to be more competitive than the Asian market.

While further investigation of this argument is clearly needed, other studies have established the relationship between size and the ability to compete in terms of quality in the global market. For example, Sjoholm and Takii (2003) observed that exporting plants in the Indonesian manufacturing sector are larger and more productive than nonexporting plants.

Table 10: Main Target Market of Respondents

	#	% of total
1. Domestic	97	80.2
2. ASEAN	6	5.0
4. Other Asia	9	7.4
5. United States	3	2.5
6. Europe	2	1.7
7. Other	1	0.8
Not answering	3	2.5
Total	121	100.0

Source: Author.

Approximately 78 percent of the total number of respondents (see Table 11) buy their inputs from domestic sources. Meanwhile, for importing inputs, the respondents do not seem to acquire much of their inputs from U.S. and European sources compared to Asian sources (i.e., sources from the ASEAN and other Asian countries). This bears a very strong similarity to the picture painted by the previous finding except that now the subject is input instead of output. We, therefore, infer that the high level of skewness in Table 11 could be attributed to the fact that most of the respondents were small-to-medium-sized firms.

Table 11: Main Sources of Inputs of Respondents

	#	% of total
1. Domestic	94	77.7
2. ASEAN	4	3.3
3. China	2	1.7
4. Other Asia	10	8.3
5. United States	1	0.8
6. Europe	2	1.7
7. Other	1	0.8
Not answering	7	5.8
Total	121	100.0

Source: Author.

Meanwhile, the role of the respondents in the cluster areas did not seem to change much during the year of the survey when compared to their role during the year of the firms' establishment. About 30 percent of the respondents produce the final product while about 20 percent are suppliers of raw materials. Therefore, about half of the respondents undertake a production role in the cluster areas; the other half operate in the services sectors. The respondents that undertake logistic operations are quite large--about 15 percent of the total respondents. This indicates a quite active industrial agglomeration process in the areas covered by the survey. The relatively high number of respondents that operate in consulting services and human-resource development, which amounted to about 17 percent of the total number of respondents, also supports the inference about active industrial agglomeration activities.

Table 12: Functions Carried Out in the Cluster

(a) At the Year of Survey (i.e. 2007)

	#	% of total
1. Retail/ Wholesale trade	28	19.9
2. Production (raw-material processing)	22	15.6
3. Production (components and parts)	6	4.3
4. Production (final products)	41	29.1
5. Purchasing/ Procurement/ Logistics	20	14.2
6. R&D/ Consulting	14	9.9
7. Human resources development	10	7.1
Total	141	100.0

	(b) At the Initial Year of Establishment		
		#	% of total
	1. Retail/ Wholesale trade	25	19.7
	2. Production (raw-material processing)	21	16.5
	3. Production (components and parts)	8	6.3
	4. Production (final products)	36	28.3
	5. Purchasing/ Procurement/ Logistics	16	12.6
	6. R&D/ Consulting	13	10.2
	7. Human resources development	8	6.3
	Total	127	100.0

Source: Author.

2.2. Some Early Evidence of Industrial Agglomeration

This section continues the presentation of the survey results. It aims to find some indication of the extent of the agglomeration process.

There seems to be early evidence of the industrial agglomeration process in the areas covered by the survey. This is indicated by the list of important factors for establishing business according to the respondents (see Table 13). In particular, according to the table, the respondents consider the following factors as the most important factors:

a. all kinds of infrastructures and supporting activities, including the "hard/physical" infrastructures (e.g., roads, ports, telecommunication, and utilities) and "soft" infrastructures (e.g., financial and legal system, living condition)

b. the availability of skilled labour and professionals

c. size of domestic markets

30

Table 13: Important Factors for Establishing Business

Groups	#	% of total
1) Investment incentives including tax incentives	79	65.3
2) Liberal trade policy	46	38.0
3) Customs procedures	40	33.1
4) Local content requirements, rule of origin	62	51.2
5) Physical infrastructure (roads, highways, ports, airports, etc.)	105	86.8
6) Infrastructure (telecommunications, IT)	111	91.7
7) Infrastructure (electricity, water supply, other utilities)	109	90.1
8) Government institutional infrastructure	86	71.1
9) Financial system	109	90.1
10) Legal system	99	81.8
11) Protection of intellectual property rights	78	64.5
12) Size of local markets	97	80.2
13) Access to export markets	57	47.1
14) Proximity to suppliers/subcontractors	73	60.3
15) Request by large/related company	78	64.5
16) Availability of low-cost labor	75	62.0
17) Availability of skilled labor and professionals	103	85.1
18) Other companies from the same country are located here (synergy)	50	41.3
19) Access to cutting-edge technology and information	95	78.5
20) Living conditions	102	84.3
Average of the frequency		68.3

Note: the frequencies were computed based on the answer of "somewhat important" and "very important."
Source: Author.

The information shown in Table 13 indicates the important factors for all respondents at the time of their establishment. Table 14, meanwhile, reflects the respondents' views on the important factors at the time of the survey. The survey results show an almost identical list of factors. The only difference is that the respondents consider incentive for investment as another important factor at the time of survey. This finding could be related to the worsening investment climate in Indonesia after the 1997/98 economic crisis. Nonetheless, the high degree of similarity of the factors, which also implies persistency, provides a robustness check for the support of the flowchart approach.

Table 14: The Important Factors for Establishing Business, Present Time

Groups	#	% of total
1) Investment incentives including tax incentives	90	74.4
2) Liberal trade policy	65	53.7
3) Customs procedures	66	54.5
4) Local content requirements, rule of origin	60	49.6
5) Physical infrastructure (roads, highways, ports, airports, etc.)	109	90.1
6) Infrastructure (telecommunications, IT)	111	91.7
7) Infrastructure (electricity, water supply, other utilities)	112	92.6
8) Government institutional infrastructure	94	77.7
9) Financial system	106	87.6
10) Legal system	104	86.0
11) Protection of intellectual property rights	83	68.6
12) Size of local markets	99	81.8
13) Access to export markets	65	53.7
14) Proximity to suppliers/subcontractors	82	67.8
15) Request by large/related company	87	71.9
16) Availability of low-cost labor	81	66.9
17) Availability of skilled labor and professionals	106	87.6
18) Other companies from the same country are located here (synergy)	62	51.2
19) Access to cutting-edge technology and information	107	88.4
20) Living conditions	107	88.4
Average of the frequency		74.2

Source: Author.

Detailing Table 13, Table 15 provides the ranking, the first to the third in ascending order, of the importance of the factors. The results show that infrastructures are the most important factor. The legal system was also considered as a substantially important factor. Meanwhile, the size of market and availability of labour input are considered less important by the respondents. This finding is rather surprising considering that it is rather difficult for an industrial agglomeration to exist without economies of scale as well as the situation of increasing return to scale (Fujita *et al*. 1999).

Table 15: The Three most Important Factors for Establishing Business

Groups	1st #	1st % of total	2nd #	2nd % of total	3rd #	3rd % of total
1) Investment incentives including tax incentives	9	7.4	1	0.8	6	5.0
2) Liberal trade policy	1	0.8	2	1.7	1	0.8
3) Customs procedures	4	3.3	7	5.8	1	0.8
4) Local content requirements, rule of origin	0	0.0	1	0.8	0	0.0
5) Physical infrastructure (roads, highways, ports, airports, etc.)	23	19.0	8	6.6	10	8.3
6) Infrastructure (telecommunications, IT)	10	8.3	13	10.7	6	5.0
7) Infrastructure (electricity, water supply, other utilities)	2	1.7	6	5.0	9	7.4
8) Government institutional infrastructure	1	0.8	5	4.1	0	0.0
9) Financial system	12	9.9	7	5.8	7	5.8
10) Legal system	7	5.8	10	8.3	11	9.1
11) Protection of intellectual property rights	1	0.8	8	6.6	3	2.5
12) Size of local markets	9	7.4	8	6.6	11	9.1
13) Access to export markets	4	3.3	3	2.5	4	3.3
14) Proximity to suppliers/subcontractors	2	1.7	4	3.3	6	5.0
15) Request by large/related company	5	4.1	2	1.7	2	1.7
16) Availability of low-cost labor	4	3.3	4	3.3	6	5.0
17) Availability of skilled labor and professionals	4	3.3	8	6.6	14	11.6
18) Other companies from the same country are located here (synergy)	3	2.5	5	4.1	0	0.0
19) Access to cutting-edge technology and information	3	2.5	6	5.0	9	7.4
20) Living conditions	11	9.1	7	5.8	8	6.6
Not answering	6	5.0	6	5.0	7	5.8
Total	121	100.0	121	100.0	121	100.0

Source: Author.

All in all, Tables 13 to 15 provide support for the flowchart approach of industrial agglomeration (Kuchiki 2005). The factors for establishing business that were chosen by the respondents accord to two of the three groups of determinants of industrial agglomeration according to the flowchart approach; namely, domestic demand and capacity building (e.g., infrastructures, availability of human resources, and social factors—including living conditions). The survey results, however, do not support the export variable of the industrial agglomeration determinant. The analysis of the subsequent tables provides some insight on why the results do not support the export determinant.

Different from the previous three tables, Table 16 lists the factors that restrain the growth of the respondent-firms. According to the respondents, these factors are mainly all kind of infrastructures, the legal system, protection of intellectual rights, financial

system, size of the local market, access to export, availability of skilled labour and professionals, access to information and technology, living condition, and incentives for investment. While it might be too early to infer, this finding is consistent with many studies that reflect the weakening real sector in Indonesia and, in particular, the worsening situation of the general investment climate in Indonesia.

It is important to note here that the lack of access to export markets is one of the respondents' complaints. This might explain the earlier finding of the lack of export markets' importance. Thus, the earlier finding does not necessarily mean that the size of the market, including here the size of export markets, is not an important determinant of industrial agglomeration. In fact, the size of the market and the export market might be important. It might be the case that that the importance of market size did not come out as an important factor in the survey because it was eclipsed by some problem in the infrastructure and other supporting facilities for the firms' exporting activities.

Table 16: The most Problematic Factors for Establishing Business

Groups	#	% of total
1) Investment incentives including tax incentives	79	65.3
2) Liberal trade policy	46	38.0
3) Customs procedures	40	33.1
4) Local content requirements, rule of origin	62	51.2
5) Physical infrastructure (roads, highways, ports, airports, etc.)	105	86.8
6) Infrastructure (telecommunications, IT)	111	91.7
7) Infrastructure (electricity, water supply, other utilities)	109	90.1
8) Government institutional infrastructure	86	71.1
9) Financial system	109	90.1
10) Legal system	99	81.8
11) Protection of intellectual property rights	78	64.5
12) Size of local markets	97	80.2
13) Access to export markets	57	47.1
14) Proximity to suppliers/subcontractors	73	60.3
15) Request by large/related company	78	64.5
16) Availability of low-cost labor	75	62.0
17) Availability of skilled labor and professionals	103	85.1
18) Other companies from the same country are located here (synergy)	50	41.3
19) Access to cutting-edge technology and information	95	78.5
20) Living conditions	102	84.3
Average of the frequency		68.3

Source: Author.

Nonetheless, as showed by Table 16, the lesser importance of the export determinant in the flowchart approach might also be caused by very weak infrastructures. As noted in the literature on firm-exporting behaviour, the role of infrastructures is very important for firms to access export markets (Aitken *et al*. 1997). The significant constraint imposed by weak infrastructures is consistent with the situation that currently exists in Indonesia and is not a surprise. After the 1997/98 economic crisis, public investment in physical infrastructures declined substantially, compared to the period before the crisis (Soesastro and Atje 2005).

It is also interesting to note that the financial system is another important constraint according to the respondents. This might suggest some problem in the intermediary function played by financial institutions. However, this inference is rather counterintuitive given the fact that we have already seen earlier the important role of financial institutions in the business activities of firms in the areas covered by the survey. This is shown by the large number of financial institutions in the respondent-firms, which could reflect the true situation in the population of firms. Nonetheless, the suggestion could actually also reflect the real situation given that most of the respondents are small-to-medium-sized firms. It is well known that small firms usually do not have good access to banks mainly because the financial system of small- and medium-sized firms is not modernized enough to meet banks' requirements for loans.

Table 17 shows the type of activities that the respondents considered for their expansion in the past and for their expansion plans in near future. For those who have expanded, demand was the most important driver for the expansion. About 67 percent of the respondents chose the "introduction of new goods" and "opening of new markets" as the activities they did in their expansion (see Table 17a). This picture does not change when we move to the activities the respondents plan to undertake for expansion in the next three years after the survey. The only difference is that quite many of the respondents now include "adoption of new method of production." This finding indicates a potentially quite active technological upgrading that will be done by the respondents. Again, this provides some support for the incidence of industrial agglomeration and suggests that the process of industrial agglomeration should be sustainable at least for a short period of time in the future.

Table 17: Activities and Plans for Upgrading

(a) Respondents who Upgraded in the Last Three Years

	Yes		No	
	#	% of total	#	% of total
1. Introduction of new goods	80	66.1	38	31.4
2. Adoption of a new method of production	59	48.8	59	48.8
3. Opening of a new market	80	66.1	38	31.4
4. Acquisition of a new source of supply of raw materials	39	32.2	79	65.3

(b) Respondents who Plan to Upgrade in the Next Three Years

	Yes		No	
	#	% of total	#	% of total
1. Introduction of new goods	90	74.4	24	19.8
2. Adoption of a new method of production	76	62.8	38	31.4
3. Opening of a new market	90	74.4	25	20.7
4. Acquisition of a new source of supply of raw materials	51	42.1	63	52.1

Source: Author.

Table 18 details the method used by firms who expanded or plan to expand in the near future. The decision of the respondents in choosing the method provides some more support for the extent of the agglomeration process. This inference, in particular, was derived from the fact that quite many of the respondents chose to upgrade by transferring technology from companies that had already been established in the area where the respondents operate. The transfer of technology does not only come from local companies, but also from foreign companies. The table shows that about 50 percent of the respondents did or will transfer technology from multinational companies. This strengthens the support for industrial agglomeration process. It is well documented in the literature on foreign ownership (e.g., Dunning 1993) that technology spillover from foreign firms do happen.

Table 18 also points to the important role played by either local government or local business organizations (e.g., local office of business associations) in moderating industrial agglomeration. About 45 and 60 percent of the respondents mentioned the importance of local government and business organizations, respectively, for their upgrading plan and activities.

Table 18: The Methods Used by Firms for Upgrading

	Yes		No	
	#	% of total	#	% of total
1. Technology transfer from multinational companies	59	48.8	42	34.7
2. Technical assistance from foreign agencies (including ODA)	43	35.5	57	47.1
3. Technical cooperation with (or assistance from) local government	55	45.5	46	38.0
4. Technical cooperation with (or assistance from) local business organization	75	62.0	26	21.5
5. Technical cooperation with (or assistance from) local university or R&D institutes	50	41.3	51	42.1
6. Technology transfer from or cooperation with local companies	73	60.3	27	22.3

Source: Author.

Tables 19 to 22 describe the decision of the respondents in expanding their business. The big picture is more or less positive. Many of the respondents planned to expand. As shown in Table 19, about 85 percent of the respondents planned to expand their business in the same area or in the cluster that they are operating now. Meanwhile, Table 20 indicates that about half or 53 percent of the respondents plan to expand their business out of the region that they are operating in at the moment.

It is worth noting that the big picture rather contradicts the popular belief of weak and unsupportive investment climate in Indonesia as noted earlier. Here we propose at least two possible explanations for this. First, the big picture might be somewhat misleading because, as shown, most of the respondents are firms which are small or medium in size. According to the literature on firm size, small- and medium-sized firms have some benefit that make them quite "nimble," and hence, less likely to be affected by factors that create a weak investment climate. For example, small- and medium-sized firms do not have to produce large output and tend to have much smaller cost than large firms in undertaking expansion.

The other possible explanation is that many of the respondents rely on domestic markets, and this is quite a sensible argument given that most of respondents are small- and medium-sized firms which presumably do not export much. In addition, the Indonesian economy actually has performed quite well in the past three years or so, with about 5 to 6 percent of annual economic growth. It could also be the case that many of the respondents might also operate in sectors with a very large domestic demand. This is

clearly true for food and beverage and garment industries, which are the sectors that quite many of the respondents operate in.

Table 19: Plan to Expand Business in the Cluster

	#	% of total
Yes	103	85.1
Not sure	18	14.9
Total	121	100.0

Note: "Yes" refers to the answers of "Yes" and "Probably Yes." "Not sure" refers to the answers of "Not sure," "Probably Not," and "Not."
Source: Author.

Table 20: Plan to Start New Operations Somewhere else in Indonesia

	#	% of total
1. Yes	64	52.9
2. Not	35	28.9
3. Not sure	22	18.2
Total	121	100.0

Source: Author.

The two alternative explanations above are consistent with the picture given in Table 21, where only about 15 percent of the respondents planned to expand in other countries. While further investigation is needed, it could be the case that these respondents are large firms. It is worth noting, however, that there are many respondents that are not sure whether to expand in Indonesia or other countries. This, perhaps, reflects the weak investment climate that most analysts believe to be happening in Indonesia at the moment.

Table 21: Plan to Start New Operations in Countries Other than Indonesia

	#	% of total
1. Yes	19	15.7
2. Not	71	58.7
3. Not sure	28	23.1
Not answering	3	2.5
Total	121	100.0

Source: Author.

For the respondents that do plan to expand to other countries, Asian countries are the favourite destination for expansion. This, of course, is somewhat predictable. Indonesia has been ranked much lower than other neighboring countries for investment destination and this, in fact, supports the situation of a weak investment climate. This matches the finding of Aswicahyono *et al*. (2007) who found from their fieldwork that firms in Indonesia tend to choose other countries if they have to make a greenfield investment. Firms in Indonesia still consider investing in Indonesia, but only for the expansion of the current operating plants. It is also worth noting that the fieldwork done by Aswicahyono *et al*. indicate that it is only big firms who can afford to invest in other countries, which support some of the arguments and analysis from the result of the survey done by this study.

Table 22: Likely Location of the New Operations outside Indonesia

	#	% of total
1. ASEAN outside CLMV	5	26.3
2. CLMV	2	10.5
3. China	0	0.0
4. Other Asia	4	21.1
5. Others	1	5.3
Not answering	7	36.8
Total	19	100.0

Source: Author.

3. THE DETERMINANTS OF INDUSTRIAL AGGLOMERATION: AN ECONOMETRIC ANALYSIS

This subsection presents an econometric analysis to gauge the determinants of industrial agglomeration in Indonesia. The analysis focuses on factors such as policy measures and the economic environment which contribute to, or are required for, agglomeration and innovation. The econometric analysis used the data from the response of the mail-survey.

3.1. Factors of Agglomeration

Before presenting the econometric results, we first identified factors that attract

firms to particular areas. Question 1 in the questionnaires asks the year of the company's establishment in each country. For analytical simplicity, we focused on the accumulated number of established companies in Indonesia, shown in Figure 3. Since firms have different reasons for establishing offices in each country, the year of establishment is also different among firms. For simplicity, we divided the whole period into three, according to the trend in accumulation.[v] The following three periods in the trend can be identified: (1) before 1989; (2) 1990-2001; and (3) after 2002. The year of establishment of the firm or business activities was taken as a dependent variable. The firms established in the earlier period are referred to as "first movers," and those that came in the later period as "latecomers." Independent variables, on the other hand, which explain why they were attracted to these regions, are selected from among the questionnaires from the following characteristics: (1) firm size; (2) attracting factors; and (3) functions of offices when they were established.

Figure 3: Accumulated Number of Offices Established in Indonesia
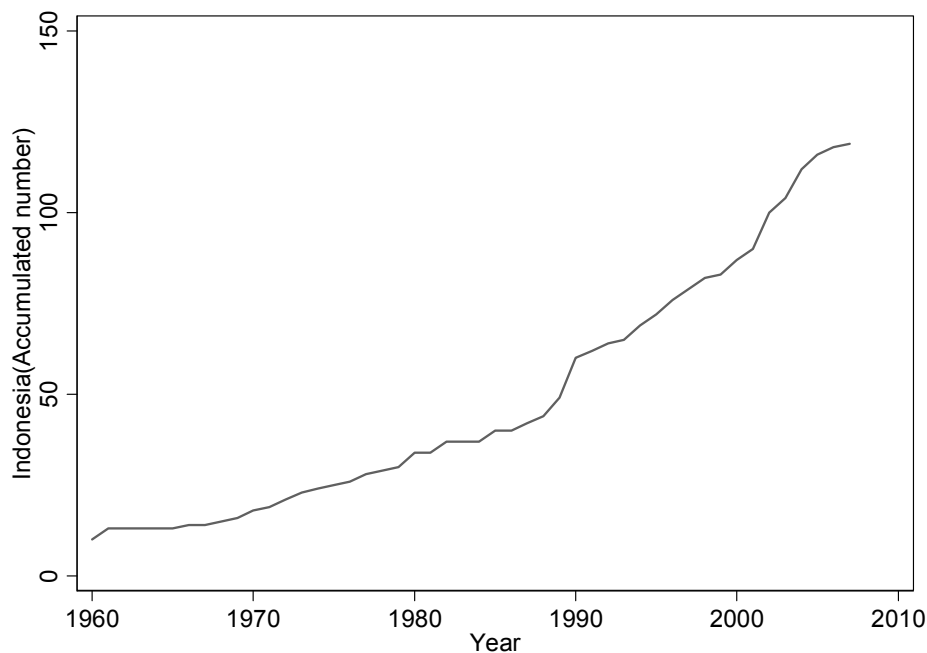
Source: Author.

As for firm size, the relationship between the year of establishment and the size of firms was examined. That is, whether the agglomeration is triggered by large or small

firms, either local or foreign. This is related to the "flowchart approach," Kuchiki (2007), Kuchiki and Tsuji (2005), (2008), and Tsuji *et al* (2006).[vi] Three categories of firm size are asked in Question 3, namely, (i) number of full-time employees; (ii) total assets; and (iii) paid-up capital. Three models were used to follow these definitions.

The attracting factors of establishing offices are asked in Question 7, which consist of 20 items that influenced the company decision to establish operations in each country at the time the operation was begun, as shown in Table 23. Finally, there is no need to explain (3). The summary statistics are presented in Table 23.

Table 23 : Summary Statistics

Variable				Obs	Mean	Std. Dev.	Min	Max
Dependent Variable								
Q1)		Agglomeration		119	0.832	0.795	0	2
Q9)		Innovation : Goods		116	0.681	0.468	0	1
		Methods		116	0.509	0.502	0	1
		Markets		116	0.681	0.468	0	1
		Suppliers		116	0.328	0.471	0	1
Independent Variable								
Q1)		Establishment Year		119	1975.104167	28.5703	1859	2007
Q3)	1)	Full-time Employees :	50 – 99	119	0.134	0.343	0	1
			100 - 199	119	0.084	0.279	0	1
			200 - 299	119	0.034	0.181	0	1
			300 - 399	119	0.008	0.092	0	1
			400 - 499	119	0.008	0.092	0	1
			500 - 999	119	0.017	0.129	0	1
			1,000 - 1,499	119	0.000	0.000	0	0
			1,500 - 1,999	119	0.008	0.092	0	1
			2,000 & above	119	0.000	0.000	0	0
Q3)	1)	Total Assets (US$) :	10,000-24,999	119	0.092	0.291	0	1
			25,000-49,999	119	0.067	0.251	0	1
			50,000-74,999	119	0.067	0.251	0	1
			75,000-99,999	119	0.042	0.201	0	1
			100,000-499,999	119	0.109	0.313	0	1
			500,000-999,999	119	0.059	0.236	0	1
			1 million-4.9 million	119	0.084	0.279	0	1
			5 million-9.9 million	119	0.042	0.201	0	1
			10million & above	119	0	0	0	0
Q3)	1)	Paid-UP Capital (US$) :	10,000-24,999	119	0.126	0.333	0	1
			25,000-49,999	119	0.059	0.236	0	1
			50,000-74,999	119	0.050	0.220	0	1
			75,000-99,999	119	0.042	0.201	0	1
			100,000-499,999	119	0.076	0.266	0	1
			500,000-999,999	119	0.034	0.181	0	1
			1 million-4.9 million	119	0.084	0.279	0	1
			5 million-9.9 million	119	0.034	0.181	0	1
			10million & above	119	0	0	0	0
Q6)	1	Retail/ Wholesale trade		112	0.214	0.412	0	1
	2	Production (raw-material processing)		112	0.179	0.385	0	1
	3	Production (components and parts)		112	0.063	0.243	0	1
	4	Production (final products)		112	0.321	0.469	0	1
	5	Purchasing/ Procurement/ Logistics		112	0.143	0.351	0	1
	6	R&D/ Consulting		112	0.116	0.322	0	1
	7	Human resources development		112	0.071	0.259	0	1

		Variable	Obs	Mean	Std. Dev.	Min	Max
Q7)	1)	Investment incentives including tax incentives	117	3.718	1.082	1	5
	2)	Liberal trade policy	115	2.852	1.384	1	5
	3)	Customs procedures	117	2.624	1.437	1	5
	4)	Local content requirements, rule of origin	115	3.409	1.304	1	5
	5)	Physical infrastructure (roads, highways, ports, airports, etc.)	116	4.345	0.952	1	5
	6)	Infrastructure (telecommunications, IT)	116	4.474	0.774	1	5
	7)	Infrastructure (electricity, water supply, other utilities)	117	4.504	0.827	1	5
	8)	Government institutional infrastructure	117	3.897	1.062	1	5
	9)	Financial system	118	4.322	0.886	1	5
	10)	Legal system	118	4.161	1.004	1	5
	11)	Protection of intellectual property rights	114	3.860	1.104	1	5
	12)	Size of local markets	117	4.103	1.102	1	5
	13)	Access to export markets	116	3.129	1.282	1	5
	14)	Proximity to suppliers/subcontractors	114	3.544	1.198	1	5
	15)	Request by large/related company	111	3.811	1.195	1	5
	16)	Availability of low-cost labor	115	3.730	1.062	1	5
	17)	Availability of skilled labor and professionals	115	4.383	0.874	1	5
	18)	Other companies from the same country are located here (synergy)	115	3.174	1.194	1	5
	19)	Access to cutting-edge technology and information	116	4.164	1.087	1	5
	20)	Living conditions	115	4.304	0.797	2	5
Q8)	1)	Investment incentives including tax incentives	110	3.036	0.995	1	5
	2)	Liberal trade policy	109	3.028	0.833	1	5
	3)	Customs procedures	112	2.857	1.003	1	5
	4)	Local content requirements, rule of origin	109	3.211	0.851	1	5
	5)	Physical infrastructure (roads, highways, ports, airports, etc.)	112	2.884	1.137	1	5
	6)	Infrastructure (telecommunications, IT)	111	3.541	1.085	1	5
	7)	Infrastructure (electricity, water supply, other utilities)	111	3.351	1.050	1	5
	8)	Government institutional infrastructure	111	2.883	1.007	1	5
	9)	Financial system	109	3.468	0.939	1	5
	10)	Legal system	110	2.745	1.096	1	5
	11)	Protection of intellectual property rights	109	2.908	0.996	1	5
	12)	Size of local markets	111	3.495	0.952	1	5
	13)	Access to export markets	112	3.009	0.885	1	5
	14)	Proximity to suppliers/subcontractors	109	3.367	0.868	1	5
	15)	Request by large/related company	109	3.450	0.855	1	5
	16)	Availability of low-cost labor	112	3.268	0.977	1	5
	17)	Availability of skilled labor and professionals	110	3.473	1.002	1	5
	18)	Other companies from the same country are located here (synergy)	111	3.171	0.841	1	4
	19)	Access to cutting-edge technology and information	109	3.541	0.967	1	5
	20)	Living conditions	112	3.393	1.043	1	5

3.2. Estimation Results: Agglomeration

After determining the dependent and independent variables, three models were estimated according to the definition of firm size. The method of Ordered Logit Estimation was adopted, and we estimated the full and the selected model. The former took all variables into account while the latter selected variables which are considered to influence the dependent variables.[vii] A summary of estimations is provided in Table 24, which shows the signs of estimated coefficients and their significance levels.

3.2.1. Estimation of Full-time Employees Model

It should be noted that in these Ordered Logit Models, latecomers were taken to be standard by the normalization and, accordingly, a positive (negative) sign of estimated coefficients indicated that they influence only latecomers (first movers).

Let us summarize the results, beginning with the estimation using the number of full-time employees as the variable which presents the firm size. In the full model, which utilizes all dependent variables in the estimation, firms with 100 to 199 employees represent the only significance level, and there is no other significant firm size. It can be said that these smaller companies are first movers, but in general there was no significant relationship between firm size and the year of business establishment.

Regarding factors which attracted firms to come to Indonesia, "Investment incentives including tax incentives," "Government institutional infrastructure," and "Size of local markets," have negative signs and are at the 5 percent significance level. "Access to cutting-edge technology and information" is also negative and at the 10 percent significance level. These four factors influenced first movers to agglomerate in Indonesia. On the other hand, "Availability of skilled labor and professionals" and "Infrastructure (electricity, water supply, other utilities)" are positive and at the 10 percent significance level, which implies that these factors influenced latecomers.

Regarding the function of offices in Indonesia, "Production (final products)" and "Production (raw-material processing)" have negative signs, but the former is at the 5 percent significance level while the latter is at 10 percent. These two influenced first movers. "Retail/wholesale trade" and "R&D/Consulting" have positive sign with 5 percent significance level, which exerted influence on latecomers. These results for Indonesia are consistent with the situation in recent years, namely, that agglomerates

form in particular regions for R&D activities and skilled labor.

In sum, first movers were influenced by investment incentives, physical and government institutional infrastructures, size of local market, and access to new technology and information, while latecomers were influenced by infrastructure related to utilities and skilled labor and professionals. The latecomers' activities are R&D/consulting, and they are interested in skilled labor. This is consistent with the reality of Indonesia.

In Table 24, we also show the results of the Selected Model, in which the number of independent variables is reduced by eliminating irrelevant ones in order to increase the accuracy of the estimation in terms of log likelihood, for instance. There is no essential difference between the two models, but "Size of local market" has become not significant, whereas "Protection of intellectual property rights" is more significant.

Table 24: Results of Estimations: Agglomeration

			Employees		Assets		Capital	
			Full model	Selected model	Full model	Selected model	Full model	Selected model
Q3)	2	50 - 99persons/10,000-24,999(US$)/10,000-24,999 (US$)	[+]				+	*
	3	100 - 199/25,000-49,999/25,000-49,999	[*]	[*]				
	4	200 - 299/50,000-74,999/50,000-74,999			+			
	5	300 - 399/75,000-99,999/75,000-99,999			+		+	+
	6	400 - 499/100,000-499,999/100,000-499,999			**	**	**	**
	7	500 - 999/500,000-999,999/500,000-999,999			+			
	8	1,000 - 1,499/1 M-4.9M/1M-4.9M			[**]	[*]	[**]	[*]
	9	1,500 - 1,999/5M-9.9 M/5M-9.9M						
	10	2,000 & above/10M & above/10M & above						
Q7)	1	Investment incentives including tax incentives	[**]	[**]	[**]	[**]	[**]	[**]
	2	Liberal trade policy						
	3	Customs procedures						
	4	Local content requirements, rule of origin			[+]			
	5	Physical infrastructure (roads, highways, ports, airports, etc.)			[**]		[+]	
	6	Infrastructure (telecommunications, IT)						
	7	Infrastructure (electricity, water supply, other utilities)	*		+		+	
	8	Government institutional infrastructure	[**]	[**]	[**]	[**]	[**]	[**]
	9	Financial system					*	+
	10	Legal system						
	11	Protection of intellectual property rights		[*]				[*]
	12	Size of local markets	[**]		[**]		[**]	
	13	Access to export markets						
	14	Proximity to suppliers/subcontractors						
	15	Request by large/related company						
	16	Availability of low-cost labor						
	17	Availability of skilled labor and professionals	*	**	**	**	**	**
	18	Other companies from the same country are located here (synergy)						
	19	Access to cutting-edge technology and information	[*]	[*]	[**]	[**]	[*]	[*]
	20	Living conditions						
Q6)	1	Retail/ Wholesale trade	**	**	**	**	**	**
	2	Production (raw-material processing)	[*]	[+]	[**]	[**]	[**]	[**]
	3	Production (components and parts)					*	
	4	Production (final products)	[**]	[**]	[**]	[**]	[**]	[**]
	5	Purchasing/ Procurement/ Logistics						
	6	R&D/ Consulting	**	**	**	**	**	**
	7	Human resources development	[+]	[*]	[**]	[+]	[*]	[**]
Nob			102	106	102	107	102	107
Log likelihood			-80.656	-92.56	-68.979	-86.948	-69.048	-86.948
Pseudo R2			0.269	0.195	0.375	0.251	0.374	0.251

3.2.2. Estimation of Total Assets and Paid-up Capital Model

Let us examine the factors of agglomeration by taking the amount of total assets and capital as representing the firm size. Since these two models have the almost same results, we present them together. The results are summarized according to four categories of factors, as follows:

(a) Firm size

Firm size 8, which represents US$1-4.9 million as the amount of assets and capital, had only a negative sign with a 5 percent significance level. In contrast, firms of size 6, with $100-499 thousand, were positive with a 5 percent significance level. It can be said that larger (smaller) firms tend to have negative (positive) signs, and this implies that large (small) firms come first (late). This result for Indonesia was consistent with that obtained by the Flowchart Approach.

(b) Attracting factors

The results in Table 24 indicated that "Investment incentives including tax incentives," "Government institutional infrastructure," and "Size of local markets," had negative signs and were at the 5 percent significance level. "Access to cutting-edge technology and information" is also negative and is at the 10 percent significance level. These four factors influenced first movers to agglomerate in Indonesia. On the other hand, "Availability of skilled labor and professionals" is positive and at the 5 percent significance level, and "financial systems" is also positive with 10 percent, which influenced latecomers.

(c) Function(s) of offices in Indonesia

"Production (final products)," "Production (raw-material processing)," and "Human resources development" had negative signs with the 5 percent significance level. "Retail/Wholesale trade" and "R&D/Consulting" had positive signs with a 5 percent significance level, which exerted influence on the latecomers. These findings indicate that the major objectives of first movers are the production of final and raw materials while wholesale/retail and R&D are the latecomers' objectives.

The above results for the Full Models of these two were basically the same as those for the employment model. The same comparison is applicable to the results of the Full and Selected Models.

3.3. Result of Estimation II: Industrial Upgrading and Innovation

Here, we examined the current situation of industrial upgrading and innovation in Indonesia. As a result of agglomeration, technology and know-how have been transferred to local firms from large and advanced firms such as multinational corporations (MNCs). Likewise, the flow of denser information among them and the nurturing of human resources have created endogenous forces of industry upgrading and the innovation process for all firms in the region. In order to examine this industry upgrading or innovation, four categories of upgrading or innovation are defined according to Schumpeter's concepts, namely, (1) introduction of new goods; (2) adoption of a new technology; (3) opening a new market; and (4) acquisition of a new source of raw materials. Question 9 was included and asks "*What upgrades has your company carried out in the last 3 years, and what upgrades do you intend to achieve in the next 3 years?*" Respondents are asked to reply either "yes" or "no." We estimated these four models by taking the replies of "yes" or "no" to Q9 as dependent variables, while the independent variables consisted of (1) satisfaction with Indonesian economic circumstances such as policy measures and economic conditions, as enquired about in Q8[viii]; (2) function(s) carried out at the time of establishment of the first office, as enquired about in Q6; and (3) year of establishment of offices, as enquired about in Q1. These variables are shown in the summary statistics of Table 23. The results of four estimations were presented in Table 25 in the same way as in Table 24. Let us now discuss factors promoting upgrading or innovation in each model.

3.4. Estimation of New Goods Model

Let us first examine the New Goods Model in the Full Model. In the same way as in Table 24, only significant variables are indicated, with stars indicating significance levels, and variables having a negative (positive) sign written with (without) brackets. It should be noted that factors with positive (negative) signs indicate that they encourage (discourage) innovation.[ix] Table 3 shows that "Liberal trade policy" (10 percent significance level)," "Legal system (5 percent)," "Proximity to suppliers/subcontractors (10 percent)," "Investment incentives including tax incentives (20 percent)," and "Other companies from same countries are located here (synergy) (20 percent)," are positive,

and accordingly encourage industry upgrading and innovation. On the other hand, "Physical infrastructure (roads, highways, ports, airports, etc.)" (5 percent)," "Financial system (5 percent)," and "Access to export markets (5 percent)" are negative signs, which discourage upgrading and innovation; that is, they are obstacles to upgrading and innovation. Regarding functions at the time they opened, no significant variables are found. Further, functions of offices and the year of establishment do not influence upgrading and the innovation of new goods.

The Selected Model provides closely similar results, and raises the significance level of "Proximity to suppliers/subcontractors," but lowers that of "Finance system."

3.5. Estimation of New Technology Model

Here, we examine the model of the adoption of a new technology. Only a few factors are identified, namely "Legal system (5 percent significance level)" and "Request by large/related company (10 percent)." These variables are positive and thus encourage innovations. On the other hand, "Availability of skilled labor (10 percent)" has a negative sign, and thus discourages innovation.

Regarding the functions of the offices at the time they were established, "Production (raw-material processing) (5 percent)" and "Purchasing/Procurement/Logistics" encourage innovation in Indonesia.

The Selected Model shows closely similar results, but it raises the significance level of "Production (components and part)" and "R&D/consulting" while reducing that of "Availability of skilled labor and professionals."

In sum, innovation in Indonesia was promoted by the legal system and by clustering, but is discouraged by the shortage of skilled labor.

3.6. Estimation of New Market Model

Here, we examine the model of the opening of a new market. According to Table 25, factors encouraging upgrading or innovation in Indonesia are "Government institutional infrastructure (5 percent significance level)" and "Legal system (5 percent)," whereas those which discourage upgrading are "Customs procedures (5 percent)" and "Access to export market (5 percent)." As for the functions of offices, "Purchasing/Procurement/Logistics (5 percent)" and "R&D consulting (20 percent)"

have less relationship with upgrading and innovation. The negative result regarding "Purchasing/Procurement/Logistics" is clearly related to obstacles to upgrading such as customs procedures and access to export markets.

The Selected Model identifies new two factors, namely "Availability of skilled labor and professionals (10 percent)" and "Access to cutting-edge technology and information (10 percent). The former encourages the opening of new markets while the latter is an obstacle to it. This model also finds that "When did your company establish its first office? (5 percent)" has a negative sign, which implies that firms established at the early stage of agglomeration tend to be more positive to the opening of the new market.

In sum, industrial upgrading related to the opening of new markets in Indonesia was promoted by the legal system and government institutional infrastructure. However, customs procedures and access to export markets are obstacles to such opening of new markets.

Table 25: Results of Estimations: Upgrading and Innovation

			New goods		New method		New market		New input	
			Full model	Selected model	Full model	Selected model	Full model	Selected model	Full model	Selected model
Q8)	1	Investment incentives including tax incentives	+						**	**
	2	Liberal trade policy	*	*						
	3	Customs procedures					[**]	[**]		
	4	Local content requirements, rule of origin								
	5	Physical infrastructure (roads, highways, ports, airports, etc.)	[**]	[**]					**	**
	6	Infrastructure(telecommunications, IT)							[+]	
	7	Infrastructure (electricity, water supply, other utilities)							[+]	[**]
	8	Government institutional infrastructure					**	**	[*]	[*]
	9	Financial system	[**]	[*]						
	10	Legal system	**	**	**	**	*	*	[+]	[**]
	11	Protection of intellectual property rights								
	12	Size of local markets								
	13	Access to export markets	[**]	[**]			[**]	[**]		
	14	Proximity to suppliers/ subcontractors	*	**						
	15	Request by large/ related company			*	*			*	**
	16	Availability of low-cost labor			+					
	17	Availability of skilled labor and professionals			[*]			*	[+]	
	18	Other companies from the same country are located here (synergy)	[+]							
	19	Access to cutting-edge technology and information						[*]	[**]	[**]
	20	Living conditions								
Q6)	1	Retail/ Wholesale trade								
	2	Production (raw-material processing)			**	**			**	**
	3	Production (components and parts)				**				**
	4	Production (final products)							+	**
	5	Purchasing/ Procurement/ Logistics			*	*	[**]	[**]	**	**
	6	R&D/ Consulting			+	**	[+]		*	**
	7	Human resources development					+		*	+
Q1)		When did your company establish its first office?						[**]		
		_cons				[**]		**		
Obs			87	94	92	103	92	100	92	100
Log likelihood			-29.367	-44.711	-32.894	-50.736	-34.975	-48.445	-27.024	-32.342
Pseudo R2			0.455	0.25	0.484	0.289	0.412	0.244	0.55	0.505

3.7. Estimation of New Input Model

In this section, we examine the model of the acquisition of a new source of supply of raw material. Table 25 identifies the following factors with positive signs: "Investment incentives including tax incentives (5 percent)"; "Physical infrastructure (roads, highways, ports, airports, etc.) (5 percent)"; and "Request by large/related company (10 percent)." Thus, these promoted upgrading and innovation related to new input in Indonesia. On the other hand, "Infrastructure (electricity, water supply, other utilities) (5 percent)," "Government institutional infrastructure (10 percent), "Legal system (20 percent)," and "Access to cutting-edge technology and information (5 percent)" are obstacles to industrial upgrading. In this upgrading category, Indonesia has more obstacles requiring improvement. Finally, the acquisition of input innovation is more actively conducted by firms such as those in "Production (raw-material processing) (5 percent)," "Purchasing/Procurement/Logistics (10 percent)," and "Human resources development (5 percent)."

In this category of upgrading, the Selected Model identifies more factors to be significant, namely, "Infrastructure (electricity, water supplies and other utilities) (5 percent)" and "Legal system (5 percent)." It also raises the significance level of "Request by large/related company" from 10 percent to 5 percent. This model also finds functions such as "Production (components and parts) (5 percent)" and "(final products) (5 percent)" which are related to upgrading of new input. It raises the significance level of "R&D/consulting" but lowers that of "Human resources development."

3.8. Summary of the Econometric Results

3.8.1. Agglomeration

With regard to firm size, no clear results are found, but larger firms in terms of assets and capital tend to be first movers and smaller ones to be latecomers, which is consistent with the "Flowchart Approach." For first movers, factors attracting firms to establish offices in Indonesia are those such as investment incentives, government institutional infrastructures, and access to the cutting-edge technology and information. The size of the local market, which is thought to be important, is found significant only in the Full model. As for latecomers, the availability of skilled labor is identified as an attracting factor by all models. As for the functions of operation, first movers are

involved in production related to raw-material processing and final products, and human resources development, while latecomers are firms involved in wholesale/retail and R&D/consulting.

The agglomeration process in Indonesia can be described in such a way that since Indonesia possesses rich natural resources such as petroleum, metals, and timber, larger firms related to raw materials as well as to final products were established at the early stage, attracted by tax incentives for investment, institutional infrastructures, new technology and information. The size of the local market and large population are other factors among first movers. Smaller firms related to the distribution sector, such as retail/wholesale, as well as purchasing/procurement/logistics are attracted by skilled labor.

3.8.2. Upgrading and Innovation

Factors related to industrial upgrading are different among the different categories of upgrading; moreover, some are encouraging in one category but discouraging in another, and thus it is rather difficult to derive a unified conclusion. Nevertheless, no conflict with upgrading categories is seen regarding encouraging factors such as investment incentives, liberal trade policy, and request by related companies. The legal system is a positive factor, except with regard to upgrading related to new supply. It can be said that these contribute to upgrading. The identified obstacles, on the other hand, are access to export markets, customs procedures, access to cutting-edge technology and information, and infrastructure related to utilities and telecommunications. Policy measures should be promulgated with a focus on overcoming these problems.

4. SUMMARY AND POLICY IMPLICATIONS.

Industrial agglomeration in Indonesia is mainly located in the Java island and led by natural market forces. Infrastructures is one important factor in the agglomeration process. In addition, the role of the small and medium enterprises is important to accelerate industrial development. However, the dynamics of agglomeration in the eastern part of Indonesia is different where the availability of good infrastructure is not

enough to attract agglomeration to that region.

Therefore, the government should carefully formulate a policy to improve industrial development in Indonesia, taking into account the difference between:

1. the western and eastern part of Indonesia
2. level of development of SME clusters existing in a particular area
3. level of integration between Indonesia's industry and the international market

Although the government has prepared the National Strategy for Industrial Development, the strategy is still far from perfect, and many issues and concerns are still not discussed in the strategy.

Therefore, this study recommends some policies that should be taken by the government to improve industrial agglomeration in Indonesia as follows:

1. For the western part of Indonesia, including Sumatera, Java, and Bali region: improving the infrastructure is necessary to attract agglomeration to a particular area. Therefore, the government should take measures to improve public infrastructure, such as road, electricity, water supply, and ports.
2. However, for the eastern part of Indonesia, the policy to improve both supply and demand side will have a bigger impact than improving infrastructure. Therefore, improving the labor condition, domestic distribution, and local government regulations is a priority.
3. To develop the SME cluster, government intervention for SMEs should be carefully formulated. Government should carefully select the SME cluster to be assisted with some criteria, such as their potential for increasing their output markets domestically or overseas and a secure supply of raw materials and other necessary inputs.

In order to support the ASEAN Economic Community which shall establish the ASEAN as a single market and production base, the government of each ASEAN member-country should have same paradigm on the issues. Diversity of character of the ASEAN industrial clusters should be used as an opportunity by each ASEAN country to find its niche in the global production network.

The ASEAN has adopted a Common Effective Preferential Tariff (CEPT) since

1992, which scheduled the elimination of all tariffs among ASEAN countries by 2010. However a study conducted by Rosengarden *et al*. (2006) showed that the implementation of CEPT is not effective since the CEPT tariff is not beneficial for importers. The cost of obtaining the CEPT is higher than the Marginal of Preference (difference between the preferential tariff and MFN tariff).

Some policy recommendations for the development of industrial clusters in the ASEAN countries to achieve one single market and production base are:

1. The elimination of tariff barriers among ASEAN countries should be conducted sooner rather than later to stimulate freer flows of goods especially input goods among the ASEAN countries. The freer flow of goods will then stimulate the formation of industrial agglomeration in several countries.

2. Freer flows among the ASEAN countries are not only for goods but also for services and investment. Therefore, the ASEAN countries should expedite trade liberalization in service sectors and simplify their investment procedures to attract more investment to each country.

3. To increase the involvement of small and medium enterprises in industrial agglomeration – not only in one country but across countries – capacity building for small and medium enterprises is key. Exchange of skilled labor between the ASEAN countries is one way to improve capacity building in addition to the dispatch of experts from anchor firms' headquarters in developed countries such as Japan, U.S., and EU to the ASEAN countries.

4. As suggested in the Flowchart Approach, the industrial cluster policy should be in line with the value chain management. Therefore, each ASEAN country should involve private sector as the decision maker of the value chain management in formulating the industrial cluster policy.

5. Networking among private sectors in the ASEAN countries is also important as a medium of information and knowledge exchanges among them which, in turn, will improve the quality of industrial cluster in each country.

The quantitative analysis based on the results from the mail survey provides some indication on the existence of the industrial agglomeration phenomenon. At the same time, it also provides some support for the flowchart approach of industrial

agglomeration. These inferences, however, need to be confirmed by more results from the econometric exercise.

There are a couple of points worth highlighting from the quantitative results, and this is for the purpose of giving policy recommendations. Among others, few of the most important points can be listed as follows:

- Improvement in the infrastructure and legal system, including the protection of intellectual rights, is really necessary for furthering industrial agglomeration. Improvement in infrastructure, particularly physical infrastructure and utilities, is important to boost firm expansion in export markets. Earlier, the results show that based on the respondents' responses, export demand was not an important determinant in Indonesia.

- Infrastructure improvement seems to be the most important policy action that Indonesia needs to undertake, and this is to bring back the high-growth era in the 1990s which was mainly contributed by exports of manufacturing products. The main justification for the improvement is that both the descriptive and econometric analysis indicated that access to export facilities/infrastructure is one of the reasons why the size of export markets did not promote industrial agglomeration.

- Improving investment climate is also another important policy action that needs to be immediately undertaken by the Indonesian government. The econometric analysis clearly indicated this, where a group of variables that can be categorized as investment incentives proved to affect the establishment of first-mover companies, which promote the development of industrial clustering or activities in a region.

- The government might need to provide some fiscal incentives to promote investment. This policy suggestion, however, needs to be implemented with great caution. This is because giving incentives without careful consideration could create misallocation of resources and, as a result, it could result in net loss – instead of net benefit – in terms of industrial agglomeration for promoting economic development. In other words, giving incentives for investment has to be 'right' in the sense that it can promote industrial

agglomeration, and hence the overall economic development, with very minimal loss for the economy.

NOTES

  i. It is part of a big study on the subject for the country in East Asian Economies, commissioned by ERIA and sponsored by IDE-JETRO, Japan.

 ii. See, for example, Hill (1996) for an exposition of the major policy episode in Indonesia before the crisis, and Thee (2006) for the economic policy after the crisis.

iii. It is important to note that unlike what usually happens in a country in deep recession, the number of firms in Indonesia does not seem to have changed much. See Narjoko (2006) for this.

 iv. It is worth mentioning here that Indonesian export performance of auto parts has actually been quite well. As documented in SENADA (2007, p.6), Indonesian auto parts exports to Asian countries (e.g., Japan, Malaysia, and Thailand) grew more than 30 percent over the 2004 to 2005 period.

  v. In order to identify the years of transformation, the stepwise Chou test is usually utilized.

 vi. The Flowchart Approach captures the nature of the East Asian model of agglomeration, which asserts that large MNCs are established first in special economic zones and then smaller firms follow to be near them. This process eventually leads to industrial clusters.

vii. The variable used for estimation is usually selected by making use of the Akaike Information Criterion [AIC] in the OLS estimation. Here, however, the ordered Logit model is used and the above method cannot be utilized. In this paper, we selected variables one by one according to significance level.

viii. Q8 asks respondents' degree of satisfaction with each question, accordingly it does not directly relate to factors of upgrading and innovation. It can be interpreted to mean however, that since the dependent variable is whether they experienced upgrading or not, firms with affirmative replies to factors are considered to be promoting, or supportive of, upgrading and innovation.

 ix. In this estimation, the Ordered Logit Model is also used, and normalization results in replies of "yes" being taken as standard.

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APPENDIX

Here detailed results of estimation are presented. Table 26 and 27 are those of agglomeration, and Table 28 and 29 are upgrading and innovation.

Table A1: Estimation of Agglomeration (Indonesia): Full Model

		Full-time Employees		Total Assets		Paid-UP Capital	
		Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Q3)	2 50 - 99persons/10,000-24,999 (US$)/10,000-24,999 (US$)	-1.158	-1.48 +	-0.294	-0.34	1.22	1.29 +
	3 100 - 199/25,000-49,999/25,000-49,999	-2.285	-1.75 *	-0.016	-0.02	-1.19	-0.94
	4 200 - 299/50,000-74,999/50,000-74,999	0.328	0.25	1.582	1.42 +	0.739	0.63
	5 300 - 399/75,000-99,999/75,000-99,999			2.384	1.49 +	1.792	1.34 +
	6 400 - 499/100,000-499,999/100,000-499,999			3.112	2.91 **	4.254	2.61 **
	7 500 - 999/500,000-999,999/500,000-999,999			-2.288	-1.49 +	-0.569	-0.32
	8 1,000 - 1,499/1 million-4.9 million/1 million-4.9 million			-3.613	-2.69 **	-4.045	-2.76 **
	9 1,500 - 1,999/5 million-9.9 million/5 million-9.9 million			-1.361	-1.06	-1.663	-1.22
	10 2,000 and above/10million and above/10million and above						
Q7)	1) Investment incentives including tax incentives	-0.658	-2.45 **	-0.821	-2.37 **	-1.048	-3.21 **
	2) Liberal trade policy	0.088	0.34	-0.045	-0.17	-0.004	-0.01
	3) Customs procedures	-0.159	-0.62	-0.097	-0.32	-0.301	-1.00
	4) Local content requirements, rule of origin	-0.17	-0.68	-0.393	-1.31 +	-0.282	-1.12
	5) Physical infrastructure (roads, highways, ports, airports, etc.)	-0.189	-0.6	-0.812	-2 **	-0.533	-1.40 +
	6) Infrastructure (telecommunications, IT)	-0.219	-0.5	0.056	0.11	0.043	0.08
	7) Infrastructure (electricity, water supply, other utilities)	0.833	1.88 *	0.755	1.55 +	0.71	1.54 +
	8) Government institutional infrastructure	-0.691	-2.27 **	-1.338	-3.7 **	-0.894	-2.50 **
	9) Financial system	0.276	0.68	0.087	0.18	0.881	1.83 *
	10) Legal system	0.028	0.08	0.512	1.19	0.024	0.05
	11) Protection of intellectual property rights	-0.345	-1.04	-0.03	-0.08	-0.258	-0.69
	12) Size of local markets	-0.54	-2.07 **	-0.786	-2.54 **	-0.862	-2.79 **
	13) Access to export markets	-0.224	-0.8	-0.322	-1.13	-0.189	-0.67
	14) Proximity to suppliers/subcontractors	0.171	0.58	0.231	0.75	0.373	1.16
	15) Request by large/related company	0.127	0.47	0.068	0.25	0.079	0.29
	16) Availability of low-cost labor	0.234	0.88	-0.018	-0.06	0.157	0.54
	17) Availability of skilled labor and professionals	0.799	1.96 *	1.399	2.68 **	0.976	2.04 **
	18) Other companies from the same country are located here (synergy)	-0.071	-0.3	-0.058	-0.21	0.068	0.26
	19) Access to cutting-edge technology and information	-0.587	-1.67 *	-0.814	-1.99 **	-0.676	-1.72 *
	20) Living conditions	0.124	0.37	0.166	0.41	-0.098	-0.26
Q6)	1) Retail/ Wholesale trade	1.396	2.1 **	1.701	2.27 **	1.462	2.03 **
	2) Production (raw-material processing)	-1.245	-1.8 *	-1.995	-2.45 **	-1.925	-2.36 **
	3) Production (components and parts)	0.358	0.32	0.554	0.5	1.969	1.76 *
	4) Production (final products)	-1.663	-2.64 **	-2.022	-2.87 **	-1.759	-2.36 **
	5) Purchasing/ Procurement/ Logistics	-0.01	-0.01	0.489	0.65	0.33	0.40
	6) R&D/ Consulting	1.751	2.15 **	3.682	3.34 **	2.781	2.99 **
	7) Human resources development	-1.677	-1.56 +	-2.763	-1.97 **	-2.238	-1.74 *
	/cut1	-4.877		-8.405		-6.814	
	/cut2	-2.521		-5.613		-3.905	
	Number of observations	102		102		102	
	Log likelihood	-80.656		-68.979		-69.048	
	Pseudo R2	0.269		0.375		0.374	

Note 1: **, * and + indicates that coefficient is at the 5, 10 and 20% significant level, respectively.

Table A2: Estimation of Agglomeration (Indonesia): Selected Model

		Full-time Employees		Total Assets		Paid-UP Capital	
		Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Q3)	2 50 - 99persons/10,000-24,999 (US$)/10,000-24,999 (US$)	-1.441	-1.65 *			1.166	1.8 *
	3 100 - 199/25,000-49,999/25,000-49,999						
	4 200 - 299/50,000-74,999/50,000-74,999						
	5 300 - 399/75,000-99,999/75,000-99,999					1.48	1.39 +
	6 400 - 499/100,000-499,999/100,000-499,999			2.656	3.6 **	3.814	3.35 **
	7 500 - 999/500,000-999,999/500,000-999,999						
	8 1,000 - 1,499/1 million-4.9 million/1 million-4.9 million			-1.517	-1.73 *	-1.589922	-1.68 *
	9 1,500 - 1,999/5 million-9.9 million/5 million-9.9 million						
	10 2,000 and above/10million and above/10million and above						
Q7)	1) Investment incentives including tax incentives	-0.514	-2.4 **	-0.475	-2.23 **	-0.75	-3.18 **
	2) Liberal trade policy						
	3) Customs procedures						
	4) Local content requirements, rule of origin						
	5) Physical infrastructure (roads, highways, ports, airports, etc.)						
	6) Infrastructure (telecommunications, IT)						
	7) Infrastructure (electricity, water supply, other utilities)						
	8) Government institutional infrastructure	-0.499	-2.05 **	-0.779	-3.16 **	-0.612	-2.37 **
	9) Financial system					0.496	1.39 +
	10) Legal system						
	11) Protection of intellectual property rights	-0.396	-1.67 *			-0.427	-1.77 *
	12) Size of local markets						
	13) Access to export markets						
	14) Proximity to suppliers/subcontractors						
	15) Request by large/related company						
	16) Availability of low-cost labor						
	17) Availability of skilled labor and professionals	0.901	2.73 **	0.891	2.78 **	0.714	2.25 **
	18) Other companies from the same country are located here (synergy)						
	19) Access to cutting-edge technology and information	-0.445	-1.7 *	-0.563	-2.16 **	-0.531	-1.9 *
	20) Living conditions						
Q6)	1) Retail/ Wholesale trade	1.16	2.09 **	1.366	2.43 **	1.271	2.24 **
	2) Production (raw-material processing)	-0.882	-1.59 +	-1.233	-2.16 **	-1.338	-2.23 **
	3) Production (components and parts)						
	4) Production (final products)	-1.041	-2.13 **	-1.414	-2.77 **	-1.125	-2.17 **
	5) Purchasing/ Procurement/ Logistics						
	6) R&D/ Consulting	1.821	2.74 **	2.063	2.97 **	2.437	3.28 **
	7) Human resources development	-1.527	-1.9 *	-1.136	-1.4 +	-1.918	-2.26 **
	/cut1	-4.184		-4.062		-4.538	
	/cut2	-2.158		-1.764		-2.145	
	Number of observations	106		107		107	
	Log likelihood	-92.56		-86.948		-85.119	
	Pseudo R2	0.195		0.251		0.267	

Note: **, * and + indicates that coefficient is at the 5, 10 and 20% significant level, respectively.

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Table A3: Results of Industrial Upgrading and Innovation (Indonesia): Full Model

	New goods Coefficient	New goods t-value	New method Coefficient	New method t-value	New market Coefficient	New market t-value	New input Coefficient	New input t-value
Q8) 1) Investment incentives including tax incentives	1.074	1.45 +	-0.043	-0.08	-0.12	-0.25	2.398	2.27 **
2) Liberal trade policy	1.146	1.68 *	0.101	0.17	0.343	0.67	-0.383	-0.48
3) Customs procedures	-0.552	-1.02	0.38	0.66	-1.196	-2.16 **	0.085	0.14
4) Local content requirements, rule of origin	0.722	1.11	0.189	0.29	0.44	0.75	0.45	0.44
5) Physical infrastructure (roads, highways, ports, airports, etc.)	-2.394	-2.87 **	0.588	1.08	-0.621	-1.06	2.471	2.47 **
6) Infrastructure (telecommunications, IT)	0.246	0.41	0.341	0.61	0.258	0.51	-1.102	-1.49 +
7) Infrastructure (electricity, water supply, other utilities)	0.722	1.02	-0.222	-0.36	-0.482	-0.9	-0.996	-1.6 +
8) Government institutional infrastructure	-0.683	-1.07	-0.624	-1.23	1.408	2.73 **	-1.54	-1.96 *
9) Financial system	-1.657	-2.2 **	0.767	1.2	-0.393	-0.84	-0.231	-0.33
10) Legal system	1.678	2.59 **	1.157	1.99 **	0.854	1.96 *	-1.039	-1.55 +
11) Protection of intellectual property rights	0.294	0.54	-0.562	-1.12	0.327	0.79	-0.57	-0.82
12) Size of local markets	0.289	0.55	0.111	0.2	0.253	0.5	0.118	0.13
13) Access to export markets	-1.644	-1.99 **	-0.409	-0.53	-1.757	-2.34 **	0.836	0.79
14) Proximity to suppliers/subcontractors	1.336	1.89 *	-0.237	-0.32	0.184	0.29	-0.742	-0.81
15) Request by large/related company	0.565	0.92	1.138	1.77 *	0.39	0.54	2.514	1.89 *
16) Availability of low-cost labor	0.189	0.38	0.75	1.5 +	0.193	0.45	-0.381	-0.57
17) Availability of skilled labor and professionals	0.129	0.23	-0.928	-1.79 *	0.526	1.2	-0.829	-1.37 +
18) Other companies from the same country are located here (synergy)	-1.125	-1.41 +	-0.184	-0.33	0.337	0.59	-0.843	-0.76
19) Access to cutting-edge technology and information	0.057	0.08	0.48	0.85	-0.735	-1.2	-2.053	-2.29 **
20) Living conditions	-0.036	-0.05	-0.518	-0.92	-0.193	-0.35	0.272	0.38
Q6) 1 Retail/ Wholesale trade	0.618	0.52	-1.589	-1.27	-0.5	-0.5	0.594	0.38
2 Production (raw-material processing)	1.683	1.02	6.145	3.01 **	-0.434	-0.38	7.548	3.03 **
3 Production (components and parts)			2.781	1.49	-1.325	-0.86	5.272	1.94
4 Production (final products)	1.067	1.05	-0.754	-0.83	0.554	0.59	2.149	1.51 +
5 Purchasing/ Procurement/ Logistics	-0.751	-0.69	2.238	1.85 *	-3.164	-2.61 **	3.917	2.32 **
6 R&D/ Consulting	-1.676	-0.88	2.297	1.3 +	-2.232	-1.42 +	3.601	1.68 *
7 Human resources development	1.88	1.05	0.656	0.36	2.769	1.34 +	4.11	1.92 *
Q1) When did your company establish its first office?	-0.006	-0.25	-0.036	-1.25	-0.014	-0.53	-0.021	-0.84
constant	11.007	0.22	62.135	1.08	28.616	0.56	41.524	0.84
Number of observations	87		92		92		92	
Log likelihood	-29.367		-32.894		-34.975		-27.024	
Pseudo R2	0.455		0.484		0.412		0.55	

Note: **, * and + indicates that coefficient is at the 5, 10 and 20% significant level, respectively.

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Table A4: Results of Industrial Upgrading and Innovation (Indonesia): Selected Model

		New goods		New method		New market		New input	
		Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Q8)	1) Investment incentives including tax incentives	0.661	1.75 *					1.427	2.52 **
	2) Liberal trade policy					-0.647	-1.99 **		
	3) Customs procedures								
	4) Local content requirements, rule of origin								
	5) Physical infrastructure (roads, highways, ports, airports, etc.)	-0.977	-3.4 **					1.345	2.58 **
	6) Infrastructure (telecommunications, IT)								
	7) Infrastructure (electricity, water supply, other utilities)							-0.99	-2.19 **
	8) Government institutional infrastructure					0.798	2.53 **	-0.848	-1.79 *
	9) Financial system	-0.598	-1.79 *						
	10) Legal system	0.89	2.9 **	0.592	2.45 **	0.609	1.95 *	-1.023	-2.03 **
	11) Protection of intellectual property rights								
	12) Size of local markets								
	13) Access to export markets	-1.2	-2.82 **			-0.738	-2.03 **		
	14) Proximity to suppliers/subcontractors	0.933	2.44 **						
	15) Request by large/related company			0.511	1.65 *			1.129	2.05 **
	16) Availability of low-cost labor								
	17) Availability of skilled labor and professionals					0.6	1.93 *		
	18) Other companies from the same country are located here								
	19) Access to cutting-edge technology and information					-0.65	-1.91 *	-1.804	-3.29 **
	20) Living conditions								
Q6)	1) Retail/ Wholesale trade								
	2) Production (raw-material processing)			3.273	3.84 **			5.512	4.06 **
	3) Production (components and parts)			2.364	1.99 **			4.829	3.02 **
	4) Production (final products)							2.181	2.26 **
	5) Purchasing/ Procurement/ Logistics			1.312	1.81 *	-1.398	-2.08 **	2.824	2.65 **
	6) R&D/ Consulting			2.151	2.66 **			3.113	2.33 **
	7) Human resources development							2.397	1.61 +
Q1)	When did your company establish its first office?					-0.041	-2.13 **		
	constant	1.828	1.04	-4.398	-3.39 **	83.45	2.15 **	-1.663	-0.73
	Number of observations	94		103		100		100	
	Log likelihood	-44.711		-50.736		-48.445		-32.342	
	Pseudo R2	0.25		0.289		0.244		0.505	

Note: **, * and + indicates that coefficient is at the 5, 10 and 20% significant level, respectively.

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Industrial Agglomeration in the Philippines

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Abstract

The economic reform process in the Philippines was accelerated in the 1980s and 1990s. The reforms were found to have yielded positive results in terms of the nature of industrial agglomeration in the country as this was found to have occurred in the 1990s based on the results of the survey and econometrics analyses. The latter also identified the factors that influenced firms to agglomerate in the country, referring to economic fundamentals and deliberate policy and public action by government. However, industrial upgrading and innovation in the country was found to be weak. Expenditures on R&D are low and linkages between stakeholders are not strong. There are firms that have undergone upgrading in terms of introduction of new goods, upgrading of machineries, and opening of new markets but they tended to rely more on their in-house capabilities probably due to inadequate support from the government's institutional infrastructure and financial system, which came out from the estimation results. The agglomeration strategies that are currently being pursued in the Philippines – establishment of economic zones and industry clustering – have the potential to address some of the issues and problems identified.

INTRODUCTION

Deepening international economic integration or globalization, started to gain impetus in the last two to three decades of the twentieth century. In fact, analysts point to the years between 1970 and 1995 as the period when greater economic harmonization among nations of the world economy became remarkable. They point to 1995 as the

year when the global economic system we now know has emerged, that is, via the World Trade Organization. Nevertheless, increasing economic relations between and among countries, primarily in the form of international trade and direct investments, were found to have accelerated throughout the 1970s and the 1980s (Sachs and Warner, 1995). Participation to this type of trade regime necessitated the institution of trade liberalization and investment reforms as key policy areas. Many developing countries adopted an outward orientation in order to participate in this prevailing global order and reap the benefits of economic integration. This is consistent with the hypothesis of endogenous growth models that claims, international trade and foreign investment are determinants of self-sustaining growth. These two factors bring about greater access to foreign markets and new technology. If successful in penetrating the international market and technology is absorbed, technological progress within a nation is assumed to accelerate leading to increased levels of productivity spawning economic growth (Yap, 2002).

In recent years, an emerging body of ideas has pointed to the importance of selected regions as hubs of economic activities in influencing the economic development of the nation as a whole. In particular, the role of those regions, which serve as hosts to industries engaged in extensive international networks of production. Loosely termed "new economic geography," scholars have and continue to explore the relationship between industrial agglomeration and economic performance, particularly in the developing world.[i]

In the Asian context, a large body of work has been started by, among others, Fujita, Krugman and Venables (1999) in their book on spatial economy, Fujita and Thisse (2002) in their exploration of the economics of agglomeration, Kuchiki (2005) in relation to his development of a theory of a flowchart approach in industrial cluster policy, and Tsuji, et al (2007) in the most recent book they edited compiling relevant examples of industrial agglomeration in Asia, Italy and the Americas. Indeed, the pragmatic examples of the booming Information Technology (IT) industry concentration in Bangalore affecting the positive growth of the Indian economy or the well-touted automobile industry in Thailand show that industrial clusters can be considered drivers of regional and consequently national economic growth. However, this aspect can be facilitated more aggressively if these industrial clusters, whether concentrated by

geography or by specific industry, could attract not only huge domestic investments but foreign capital as well. The literature abounds with discussions on centripetal forces that influence decisions of firms to locate in the cluster, while there are also centrifugal forces that act as deterrent. These opposing forces lead to a "spatial structure of an economy that is a result of a tug-of-war between external economies and diseconomies, between the linkages and information spillovers that foster concentration, and between congestion and other diseconomies that discourage it" (Fujita et al, 1999 as cited in Tsuji et al, 2007, p. 3).

The fundamental question therefore in the development of industrial agglomerations relates to the factors that influence firms to cluster or locate in a specific area. The answers to this question would allow decision makers to make informed policies and programs that could promote these factors while at the same time, addressing those issues that deter and cause these firms to divert and set up shop in other places instead. In addition, there is a need to identify the elements leading to the success of industrial agglomerations. Intuitively, one can point to the overall economic environment in a country that makes it conducive for firms to agglomerate in and sustain or even expand operations. Such environment could pertain to economic fundamentals that attracts investments and to industrial policies that not only serve as magnets for firms to cluster but allow them to thrive via an enabling framework that helps them to maximize the opportunities available in industrial agglomerations.

Trade liberalization is only one of the many policy actions of the government for its economy to face head on the challenges posed by globalization. Other policy areas may be in terms of liberalization, privatization, deregulation, and social protection to those that will be adversely affected. Attractive incentive structures to lure in foreign direct investments (FDIs) are also part of the policy package as well as export oriented strategies. These are a few of the policy fundamentals that contributed to the growth of the so-called East Asian miracle economies.

Compared to its Asian neighbors, notably other ASEAN[ii] countries such as Malaysia, Thailand and Singapore, the levels of FDIs and exports in the Philippines remain miniscule. Its exports, though fast growing in the decades of the 1980s, 1990s and 2000s have seemed to have fallen behind these three countries.[iii] This implies that there are still numerous issues that need to be addressed in order to allow the nation to

latch onto the globalization bandwagon and plausibly reap its benefits. Not least of its concerns is the requisite to ensure the competitiveness of its economy.

1. PHILIPPINE INDUSTRIAL DEVELOPMENT: POLICY PERSPECTIVE

1.1. Trade Liberalization

Even before globalization fully took effect, there was already recognition on the part of Philippine policy makers that three decades of protectionist regime starting in the 1950s, via high tariffs was hurting the economy and that it is not aligned with the country's development aspirations. Official policy then shifted from import substitution to an outward-oriented, export promotion policy. The structural adjustment program that was instituted in the 1980s aimed at pursuing a more efficient and internationally competitive economy and one of the main instruments that were utilized was the so-called Tariff Reform Program.

Since 1981, four Tariff Reform Programs had been implemented, with each one staged on a five-year period (except TRP-IV) to cushion the impact of the changes in the tariff structure. These Tariff Reform Programs were rationalized by the objectives of liberalizing the trade environment, improving access to essential inputs, making available more choices of goods for the consumers, enhancing competitiveness of local industries in the domestic and export markets, and simplifying the tariff structure for ease of customs administration, among others.

As member of the ASEAN Free Trade Area (AFTA), this move of the Philippines towards greater openness is aligned (or at least runs parallel) with its international commitments, which in this case relate to accelerating the liberalization of intra-ASEAN trade and investment through the Common Effective Preferential Tariff Scheme (ASEAN Secretariat, 2008). This example indicates that trade liberalization has indeed become a matter of utmost policy manifested by both unilateral initiative and in compliance with vital international commitments.

The top trading partners of the Philippines are the U.S., Japan, Hong Kong, Taiwan, Malaysia, China, Netherlands, and Singapore. In 2004, the top 3 trading partners were

the United States (U.S.), Japan and Singapore but in 2005 and 2006, the latter was dislodged by China. It may also be noted that the country had deficits with the U.S. and Japan in 2004 and 2005 but by 2006; the Philippines had more exports than imports in these countries. Meanwhile, the country continued to enjoy a fairly large surplus with China.[iv]

1.2. Privatization

Also during the decades of reforms, a three-pronged policy of privatization, liberalization and deregulation was implemented aggressively starting in 1994. This is in line with the objectives of continued economic openness; divestment of state owned and operated enterprises that are most likely being run inefficiently; removal of the hold of monopolies in vital utilities in the country; and promotion of competition to maximize consumer welfare. Republic Act 7721 or the Foreign Bank Liberalization Act authorized the entry of 10 foreign banks in the country subject to three different modes of entry.

In 1995, three major policies were instituted to liberalize three sectors of the economy: telecommunications, water and power. Each is backed by a legal framework manifesting the country's commitments towards pursuing these reforms. For instance, Republic Act 7925 or the Public Telecommunications Policy Act of the Philippines, was enacted in March 1995 highlighting the policy agenda that telecommunications services will be provided by private enterprises to foster a healthy competitive environment. In June 1995, Republic Act 8041 otherwise known as the National Water Crisis Act of 1995 was enacted that led to the privatization of state-run water facilities. In 2001, another vital legislation was passed, Republic Act 9136, also known as the Electric Power Industry Reform Act of 2001 called for key reforms in the sector.

1.3. Foreign Direct Investment Policies

Another major component of the market-oriented reforms that were implemented in accelerated fashion in the 1980s through the 1990s was foreign investment liberalization. The Foreign Investments Act of 1991 or Republic Act 7042 allowed foreign equity participation of up to 100 percent in all areas, whether catering to the domestic or export markets, except those that are included in the Foreign Investment

Negative List (FINL). Prior to this law, participation of 100 percent foreign equity was subject to the discretion of the Board of Investments (BOI) as the prevailing law then allows for only up to 40 percent foreign ownership in general. In 1996 however, the FINL was significantly reduced to allow for greater foreign participation in previously prohibited sectors.

Data shows that from 1980 to 1989, average percentage growth rate of FDI inflows in the country was only 0.2 percent, while the average for 1990 to 1999 was a high 29 percent. This coincides with the period when liberalization policies were taking place. Figures for the last three years had shown marked improvement after significant contractions were experienced in 2001 and 2003. In terms of FDI as percentage of Gross Domestic Product (GDP), it was observed that the highest level was achieved in 2000 at almost 3 percent. Meanwhile, average FDI inflows increased by 1.1 percent of GDP in the 1990s as compared to 0.59 percent in the 1980s. Performance has been looking up in the current decade with the increase in FDI inflows as percentage of GDP averaging 1.47 percent.[v]

1.4. Investment Incentives

The current Philippine investment incentives program is primarily drawn from Executive Order 226 (EO 226) or the Omnibus Investments Code of 1987. A host of incentives have been made available through this law to registered investments and outlines the systematic procedures on how to avail of these incentives. Such incentives are applicable to both Filipino owned and foreign owned investments.

In particular, the Code provides access to fiscal and non-fiscal incentives to preferred areas of investments, categorized as either pioneer or non-pioneer, and to export production as well as to rehabilitation or expansion of existing operations. Pioneer enterprises are registered enterprises engaged in the manufacture and processing of products or raw materials that are not yet produced in the Philippines in large volume. It also involves the design, formula or system applied as well as agricultural, forestry and mining activities, the services and energy sectors. Non-pioneer enterprises refer to all registered producer enterprises not included in the pioneer enterprise list.

Qualified investments, depending on their category, are granted with incentives that include income tax holidays, tax credits, tax and duty exemption for imported raw

materials and equipment, hiring of foreign labor, exemption from contractors' tax, simplified customs procedure, and other tax incentives. Also provided for under the law are incentives to multinational companies (MNCs) establishing regional or area headquarters, regional operating headquarters and regional warehouses in the country.

There is a number of investment regimes in the country, foremost of which is the BOI. Others are the Philippine Export Zone Authority (PEZA), Subic Bay Metropolitan Authority (SBMA) and Clark Development Corporation (CDC), which will be discussed in more detail in the coming sections.

The performance of the different investment agencies based on data on total approved FDIs by agency, from the late 1990s to 2006, and by nationality is insightful. From 1998 to 2003, total approved investments by these promotion agencies had decreased from 375.1 billion pesos to about 63.8 billion pesos. However, investment inflows started to pick up in 2004 and have steadily increased until 2006. The BOI had approved the most amounts of investments in the aggregate particularly in the years 1998, 2001, 2004 to 2006. The agency mainly approved investments from Filipinos. On the other hand, PEZA had overtaken BOI in terms of value of approved investments in the periods 1999 to 2000, and 2002 to 2003. In contrast to the BOI but not surprising, PEZA had approved the most foreign investments. Meanwhile, the distinction for having approved the most foreign investments in 2006 went to the SBMA at a value of 68.9 billion pesos.[vi]

1.5. Export Promotion Strategy

Export orientation as a national strategy for sustainable agro-industrial development received a boost with the enactment of Republic Act (RA) 7844, otherwise known as Export Development Act of 1994. In its policy declaration, this law situates the private sector as lead in the effort to promote exports and as partner of the government in the concerted effort to increase the country's share in the export market by promoting leading industries or the so-called export champions. The law likewise calls upon the Department of Trade and Industry (DTI) to prepare a three-year Philippine Export Development Plan (PEDP), the implementation of which shall be overseen by the Export Development Council (EDC). Said Council is comprised of representatives of relevant government agencies and 9 representatives of the private

sector indicating that the pursuit of export development is essentially a public-private partnership. The granting of incentives were likewise provided for in the law taking various forms such as tax and duty exemptions, tax credits and availability of credit facilities from government financial institutions for purposes of plant and equipment expansion, among others.

1.6. Industrial Clustering in the Philippines

To be sure, the Philippines has been attracting investments from foreign sources based on its comparative and competitive advantages. The policy reforms and programs implemented that opened up the economy to investors did increase the level of investments and attracted a more diverse country composition of investors. The main question here is on whether the prevailing policy environment was able to sustain this level of investments. Recent FDI figures do not support an affirmative response to this question, particularly when compared with the performance of other ASEAN countries. As a response, deliberate efforts to increase the attraction of the country to domestic and foreign investments alike continue to be implemented. Two such policies and programs being pursued by the government and in parallel to each other is the formation of industrial zones across the country and industry clustering. In the Philippine configuration, both relate to the export promotion program as the industrial zones include special economic zones dedicated to exporting firms, while industry clusters are tied to the so called export revenue streams or industry champions of the country and are being pursued actively by the National Cluster Management Team (NCMT) of the Export Development Council. The formation and promotion of these industrial zones is also a mechanism to disperse industrialization to other parts of the country to stimulate economic growth, while clustering is hoped to spur the growth of small and medium enterprises across the country in partnership with other government agencies, the private sector and local governments.

1.6.1. Industrial Zones in the Philippines

In 1995, the Special Economic Zone Act was passed under RA 7916, which reiterated the objective of accelerating a sound and balanced industrial, economic and social development of the country through the establishment of special economic zones

(ecozones) in strategic locations and through mechanisms that would attract foreign investments. Moreover, under this legislation, firms are no longer required to be either wholly export-oriented or engaged only in industries being promoted. All firms can then choose to locate in these industrial parks regardless of market orientation, while a distinct group of export processing zones (EPZs) will continue to be predominantly oriented to export production while being considered virtually located outside customs territory.

Governance of the special ecozones rests with the Philippine Economic Zone Authority (PEZA). It is notable that the Special Economic Zone Act called for greater private sector participation in zone development and management through incentive offerings to private zone developers and operators. Meanwhile, the local government units are being encouraged to participate more actively in the development and sustenance of specially designated economic zones.

In terms of performance, the PEZA declared that as of July 2007, there are: four public economic zones with 423 operating firms combined; forty-five private economic zones located all over the country but many of them found in Laguna and Cavite, with 528 operating firms; seventy IT parks/centers/buildings mostly situated in Metro Manila, catering to 265 operating firms; and, five tourism economic zones with equal number of operating firms.

There are two other major special economic zones culled out from former U.S. military bases in the country, namely the Subic Bay Freeport Zone and the Clark Freeport Zone. To manage and implement these special ecozones, primarily transforming them from military bases to investment havens, the Subic Bay Metropolitan Authority was created in 1992 and the Clark Development Corporation in 1993.

1.6.2. Industry Clustering Strategy

The National Science and Technology Plan for 2001-2020 has elucidated the clustering approach together with the concept of product niching as a way of linking science and technology (S&T) policy to industrial policy. Soon after, clustering became one of the key elements of the Philippine Export Development Plan since 2002. In fact, the NCMT under the EDC was created specifically to sustain this program (Export

Development Council, 2007).

The 2002-2004 PEDP defined the roles of relevant government agencies in bringing the clustering strategy into fruition and called for closer coordination among them, highlighting the fact that this initiative is not the sole responsibility of the DTI. It espoused for the involvement of the private sector, particularly as champions for forming and sustaining the clusters.

Meanwhile, the latest PEDP spanning the years 2005-2007 called for sustaining the clustering approach to industry development with special emphasis on regions and provinces with export-oriented cities/municipalities covered by the One-Town, One-Product (OTOP) initiative.

As stated in this latest incarnation of the Plan, national clusters shall be created and promoted to serve as models of this strategy. Since the criteria for their selection included impact on the economy in terms of revenue and employment generation, the industries considered as national clusters come from the so-called export revenue streams of the PEDP. The NCMT under the EDC currently monitors the performance of the national priority clusters. The Team's role is to harmonize and complement all interventions needed by the clusters and to influence relevant agencies to align their programs with the clusters. Currently, the national clusters are electronics; information and technology services; automotive; minerals; food and marine products; organics; design driven products and services (home furnishings, giftware, holiday décor, and wearables); construction services and materials; logistics services; health and wellness; and tourism.

Supplementing these national clusters are regional and provincial clusters, which were identified as a result of a participatory approach led by the NCMT in collaboration with DTI-EDC. Composite teams went around the country to conduct seminars of industry clustering and consultations with various stakeholders, such as those that represent business and industry, academic and research institutions, relevant government agencies, local government units, and non-government organizations.

As a result of these activities undertaken between 2001 to 2002, the following priority sectors where clustering will be promoted were identified: at the regional level – palm oil, rubber, coffee, fiber-based industries, fruit production and processing, high-value vegetables, seaweeds and carrageenan, meat processing, marine, furniture, and

bamboo-based industries. At the provincial level, the following came out as priority industries: lime, muscovado sugar, cassava, horticulture, corn-feed livestock, cattle, fine jewelry, fashion accessories, handmade paper, and metalworking and engineering.

The clustering strategy is also being linked to the government's One-Town, One-Product program but only in terms of industries or products that can be considered as export ready as far as the EDC is concerned. The OTOP-Philippines is a flagship program of President Arroyo as the development strategy that would promote entrepreneurship and jobs creation in the countryside.

2. INDUSTRIAL AGGLOMERATION AND INNOVATION IN GREATER MANILA AREA

2.1. Industrial Concentration in Greater Manila Area

The primacy of Metro Manila can be traced back in history and despite the rising of other metropolises in the country; its importance to the economic and social fabric of the Philippines remains. Over the years, with the unchecked population explosion and other host of problems attendant to urban areas, regions in the immediate periphery of what is also known as the National Capital Region became the choice location for expansion of residential, social and economic activities. Industrial areas in Laguna, Cavite and Batangas in the south and Bulacan and Pampanga in the north and Rizal in the east sprouted and have become extensions of the prime metropolis.

Not a few urban experts have opined that practically, the legal basis defining the geographical jurisdiction of Metro Manila is no longer applicable as the demarcation line defining the metropolis has blurred and indeed, already covers the immediate industrial areas of Cavite, Laguna and Bulacan. In order to capture this reality, this paper expanded the legally defined geographical coverage as case study for determining industrial agglomeration in Metro Manila to encompass the industrial areas of at least, Cavite and Laguna to form what is dubbed as Greater Manila Area (GMA).

Industry-wise, the 2000 Census of Establishments provided details on the composition of industrial concentration in Metro Manila. In terms of manufacturing establishments, we find that the top five activities dominating the Metro Manila

economic landscape (in terms of number of establishments) are the production of ready-made garments; plastic products; printing and service activities related to printing; manufacture of other chemical products; and, production of basic iron and steel. Those engaged in metal products and metal working; manufacture of pulp, paper and paperboard; manufacture of structural metal products, tanks, reservoirs, and steam generators; food products; and bakery products round up the top ten industries concentrating in the metropolis (National Statistics Office, 2004).

There are 70 industrial zones scattered over Metro Manila. These industrial zones fall under the purview of the PEZA but are mainly private sector led industrial agglomerations. These are mostly technology parks as 57 out of 70 have explicitly indicated preference for IT-enabled industries. A few are intended for the electronics industry, aviation, solar panel fabrication, or mixed use. This implies that as manufacturing production are moved by companies in areas in the periphery of Metro Manila, higher forms of industrial activities – knowledge based, technology based industries – are getting concentrated in the metropolis. These IT-enabled industries mainly take the form of business process outsourcing such as call centers, data centers, medical transcriptions, and software development. Among the local government units (LGUs) in Metro Manila, Makati City hosts many of the technology parks/centers/buildings. Meanwhile, a university-based technology park has recently been established with funding support coming from a private company. There are actually two locations of the University of the Philippines Science and Technology Park, one in the North and the other, in the South. Figure 1 presents a mapping of the concentrations of these industrial zones, not only in Metro Manila but including Laguna and Cavite as well.

Figure 1: Mapping of Industrial Concentration in Greater Manila Area

Source: Philippine Economic Zone Authority 2007, Mapping by PIDS.

As one of the provinces contiguous to Metro Manila, Laguna province has benefited from the spread of industrialization outside of the metropolis. It serves as hosts to 17 special economic zones under the purview of PEZA but all are being developed and managed by private zone operators. There are different types of ecozones in Laguna indicating the specific industrial concentration preferred or being promoted, if not already in existence. The Allegis IT Park, Carmelray International Business Park and Sta. Rosa Commercial IT Park were formed specifically to accommodate IT-enabled industries. The Carmelray Industrial Park (I and II) are for mixed manufacturing activities but mainly for electronics and semi-conductors. Also host to mixed industries and mainly for manufacturing activities are the Laguna International Industrial Park, the four Laguna Technopark, and the two Light Industry and Science Parks. The Filinvest Technology Park and the Calamba Premiere International Park is for light to medium scale, non-polluting industries. Meanwhile, there are industry specific zones like the Greenfield Automotive Park for firms engaged in automotive manufacturing; Toyota Sta. Rosa Special Economic Zone for automotive parts and YTMI Realty Special Economic Zone for automotive wiring harness. In the Laguna area,

Figure 1 indicates that the ecozones are concentrating in Biñan, Sta. Rosa and Calamba cities.

Meanwhile, industrial agglomeration in Cavite province can be found in its 13 economic zones. The Cavite Economic Zone, which is host to manufacturing industries engaged in the production of a diverse mix of products, is the only publicly owned industrial estate in the province. The same type of activities could be found in Fil-Estate Industrial Park, First Cavite Industrial Estate and People's Technology Complex. Meanwhile, those that prefer light to medium scale, non-pollutant industries are the Cavite Eco-Industrial Estate, EMI Special Economic Zone and Golden Mile Business Park. Those that are engaged in the production of electronics, semiconductors and similar products are the Cavite Productivity and Economic Zone and Gateway Business Park. Daiichi Industrial Park is host to mixed production but mainly related to plastic products, design of equipment for automation and energy conservation. Cavite is also host of one tourism zone, the Island Cove Tourism Economic Zone that features the resort facilities in the area. SM City Bacoor, a mall, is also considered as an ecozone, while Filoil Special Economic Zone did not specify preferred or existing industries. Referring back to Figure 1, it can be noted that the ecozones are more scattered unlike in Laguna but still concentrated in the areas nearest to Metro Manila cities such as Bacoor, Imus, Rosario, and General Trias.

2.2. Stylized Facts from the Industrial Clustering Survey of Philippine Business and Industry in Greater Manila Area

The results presented in this section are derived from the 2007 Industrial Clustering Survey of Philippine Business and Industry undertaken in the last quarter of 2007 focusing on Greater Manila Area as survey domain. The National Statistics Office (NSO) was commissioned to conduct this survey on behalf of the Philippine Institute for Development Studies. In particular, the survey would help determine the current structure and conditions of industrial agglomerations in the case study area; identify the nature and characteristics of the existing production networks of industrial agglomerations; pinpoint the factors that influence the location decision of firms; and, determine types and sources of technological innovation undertaken by firms, among others.

The formulation of the sampling frame and the distribution of the survey instrument were likewise undertaken by the NSO. This decision was made in consideration of the NSO's established and long standing relationship with the firms in various industries in the country by virtue of their regular conduct of census of establishments and industry surveys. .

The total number of firms surveyed including replacements was 516, out of which, 505 were considered valid responses. Over three out of five (61%) are located in the National Capital Region. One-fifth is situated in Cavite while roughly another fifth (19.6%) is in Laguna.

Table 1: Surveyed Firms by Location

Location	Number	Percent
Cavite	97	19.2%
Laguna	99	19.6%
NCR	308	61.0%
No response	1	0.2%
Total	505	100.0%

2.2.1. Year of Business Establishment

Table 2 shows the number and proportion of firms established at various periods. The largest proportion of firms (39%) was established in the 1990s, when the economic liberalization efforts were in full swing. The current decade hosts the second largest number of firms established (14%), and this is likely to rise further until the decade's end. The 1970s and the 1980s have roughly the same proportion of firms established; over a quarter of the firms were established during both periods. One out of eleven firms was established in the 1960s. Only one out of twenty was established in the 1950s while the same number was established during the first half of the last century, prior to 1950. Interestingly, a few were established as early as the 19th century.

The results of the survey in terms of the period when firms started to converge in GMA seem to bear out the finding that the economic reforms instituted in the 1980s towards the 1990s and onto the 2000s led to positive gains in terms of increasing investments.

Table 2: Year of Establishment

Period	Number	Percent
1850-1899	2	0.4%
1900-1949	25	5.0%
1950-1959	25	5.0%
1960-1969	44	8.7%
1970-1979	67	13.3%
1980-1989	72	14.3%
1990-1999	199	39.5%
2000-2006	70	13.9%
Total	504	100.0%

2.2.2. Capital Structure

The majority of the firms surveyed (54%) are wholly Filipino-owned. Over a quarter (26%) is wholly Foreign-owned while one fifth (20%) are Joint Ventures.

Among the foreign investors, Japan is the largest, having shares in 40 percent of firms not owned completely by Filipinos. The second largest foreign investor is the United States, having shares in 15 percent of the firms, followed by Europe with shares in 13 percent of the firms. Together, the ASEAN countries have shares in 9 percent of firms. China has interest in 7 percent of the firms while South Korea has in 6 percent. Other Asian countries have stake in 3 percent of the companies and similarly, other countries have stake in 3 percent.

Table 3: Capital Structure, by Area

Location	Capital Structure		
	100% Filipino	100% Foreign	Joint Venture
Cavite	31	52	14
Laguna	40	37	22
NCR	199	44	64

With mainly Japanese and U.S. investors in its industrial structure, the Philippines gets adversely affected whenever these economies experience economic difficulties. This presents the need to further aggressively pursue investments from other developed and developing countries to reduce this seeming dependency to a few markets. Given increasing intra-ASEAN trade, the Philippines should be able to latch on to this opportunity. Said to be the main driver of the increasing pace of intra-ASEAN trade, intra-industry growth accrues for 75 percent of total trade growth in East Asia between the years 1996 and 2000. This implies that the regional production networks in the

region are strong and opportunities for more linkages are available.

2.2.3. Company Size

Employment

Table 4 provides indication of the size of firms by the number of full-time employees during the start-up period and as of December 2006 (to represent current period). We find a general trend of expansion in terms of the number of employees. Whereas during the start-up, the largest number of firms had less than 50 employees, as of 2006, the largest proportion of firms had over a hundred employees. Overall, there was a reduction in the proportion of firms employing less than a hundred personnel and an increase in the shares of various categories above 100 employees. The largest increases were those above 200 and above 500 employees. The results imply that the survey captured enterprises in the medium and large-scale categories.

Table 4: Share of Firms by Number of Full-time Employees, during Start-up and As of December 2006

Number of Employees	Initial	As of December 2006
1-49	45%	13%
50-99	20%	13%
100-199	12%	18%
200-299	4%	13%
300-399	3%	9%
400-499	1%	6%
500-999	4%	13%
1000-1499	2%	6%
1500-1999	0.40%	2%
2000 and above	1%	7%

Assets

Table 5 shows the proportion of firms by the amount of assets during the start-up period and as of December 2006. The largest proportion of firms had less than one million pesos in total assets during their start-up. This was followed by those with assets of between 1 million pesos and then by firms with assets worth between 100 million and 500 million. As of 2006, the largest proportion of firms had total assets over a billion pesos, followed by those with assets between 100 million and 500 million. The number of firms that started with this range of assets certainly jumped significantly after some

periods had passed, same with those in the billion range.

Table 5: Share of Firms by Total Assets, during Start-up and As of December 2006

Total Assets	Initial		As of December 2006	
Philippine currency	Number	Percent	Number	Percent
Less than 1M	108	21%	15	3%
1M - less than 5M	69	14%	35	7%
5M - less than 10M	45	9%	27	5%
10M - less than 15M	29	6%	12	2%
15M - less than 20M	20	4%	17	3%
20M - less than 50M	42	8%	39	8%
50M - less than 100M	35	7%	53	10%
100M- less than 500M	55	11%	111	22%
500M - less than 1B	19	4%	56	11%
1B and above	28	6%	132	26%
NR/Missing	55	11%	7	1%
Total	505	100%	505	100%

Paid-Up Capital

The largest proportion of firms (27%) had a paid-up capital of less than 1 million pesos during their start-up. In 2006, however, the largest proportion of firms (19%) had paid-up capital of over 100 million. Most firms (53%) had less than 10 million in paid-up capital during their start-up. In 2006, most firms (59%) have over 20 million in paid-up capital. Table 6 shows the complete breakdown of firms by paid-up capital during start-up and as of December 2006.

Table 6: Number and Proportion of Firms by Paid-Up Capital, during Start-up and as of December

Paid-Up Capital	Initial		As of December 2006	
Philippine currency	Number	Percent	Number	Percent
Less than 1M	134	27%	33	7%
1M - less than 5M	90	18%	68	13%
5M - less than 10M	46	9%	35	7%
10M - less than 15M	28	6%	32	6%
15M - less than 20M	16	3%	26	5%
20M - less than 50M	48	10%	49	10%
50M - less than 100M	22	4%	57	11%
100M- less than 500M	37	7%	97	19%
500M - less than 1B	10	2%	37	7%
1B and above	14	3%	55	11%
NR/Missing	60	12%	16	3%
Total	505	100%	505	100%

2.2.4. Main Business Activity

Majority (51%) of the surveyed firms are engaged in manufacturing. Each of the other industries has less than 10 percent representation. For instance, 9 percent of the firms undertake wholesale trade while 8 percent engage in retail trade. There are 7 percent of surveyed firms in transportation while 5 percent are into hotels and restaurants and another 5 percent are into banking and finance. Construction is being undertaken by 4 percent of firms, while 3 percent are involved in telecommunications. Meanwhile, 2 percent of the firms are engaged in insurance and 1 percent maintains utilities. Another 2 percent are classified elsewhere.

Table 7: Main Business Activity

Main Business Activity	Number	Percent
Manufacturing	256	50.7%
Utilities	5	1.0%
Construction	18	3.6%
Wholesale trade	45	8.9%
Retail trade	38	7.5%
Hotels and Restaurants	26	5.1%
Transportation	33	6.5%
Telecommunications	17	3.4%
Banking and Finance	23	4.6%
Insurance	9	1.8%
Others	12	2.4%
No Response	23	4.6%
Total	505	100.0%

2.2.5. Products

Five (5) products dominate the production of the 265 manufacturing firms, each one engaging over 10 percent of firms, and together 60 percent of the firms. These are electronics and electronics equipment (produced by 14% of total manufacturing firms), textiles, wearing apparel and leather (13%) and chemicals, chemical and plastic products, and rubber (12%), automobiles and automobile parts (11%) and food, beverages and tobacco (11%). The Census of Philippine Business and Industry in 2000 actually indicates that the agglomeration of firms in terms of products manufactured in Metro Manila alone was dominated by ready-made garments and plastic products, among others. The findings in the survey meanwhile highlighting electronics as the

slightly more dominant one may have something to do with the inclusion of the provinces of Laguna and Cavite in the domain of the survey wherein the electronics industry are actually clustering. The inclusion of automobiles and automobile parts may have something to do with this as well.

Table 8: Major Products of Surveyed Firms

	Number	Percent
Food, beverages and tobacco	29	11.0%
Textiles, wearing apparel and leather	34	13.0%
Wood and wood products	7	3.0%
Paper, paper products, printing and publishing	11	4.0%
Coke and refined petroleum	4	2.0%
Chemicals, chemical and plastic products, and rubber	31	12.0%
Other non-metallic mineral products	11	4.0%
Iron and steel	11	4.0%
Non-ferrous metals	3	1.0%
Fabricated metal products	22	8.0%
Machinery, equipment and tools	13	5.0%
Computer and computer parts	13	5.0%
Other electronics and electronics equipment	36	14.0%
Precision instruments	6	2.0%
Automobile and autoparts	29	11.0%
Other transportation equipment and parts	5	2.0%
Total	265	100%

Incidentally, the five products that dominate the manufacturing sector in GMA represent the export champions of the Philippines and the ones being promoted in its Investment Priorities Plans (IPP). Most of them are also promoted as national clusters under the country's clustering strategy. While the IPP is being reexamined every three years, there may be case for doing an annual evaluation of priorities in light of rapid developments in the country and the region. Should these products continue to define the industrial strength of the country, and then strategies for their further development should be implemented such as the continued promotion of SME participation via the industry cluster approach and the OTOP, and increasing their linkages with research and development (R&D) institutions for the pursuit of efficiency enhancing technologies and higher value added in production. Meanwhile, nascent industries like those in information and communications technology (ICT), i.e. business process outsourcing and animation processes, are growing in the country driving the growth of the services

sector. Opportunities in this area should be further explored. More frequent evaluation of priority industries may augur well for stimulating these industries to perform better lest the support of government and the private sector gets reduced, if not withdrawn, particularly as these incentives and other types of support would be contingent on performance.

2.2.6. Target Markets

The main market of most (44%) of the firms is the domestic market. The two other larger main markets are Japan (to which 11% of the products are mainly sold) and the United States (11%). Europe hosts the main market for 8 percent of the firms while the Chinese market is catered to by 6 percent. The other international markets targeted by firms in GMA are South Korea (4%), Singapore (4%), and Malaysia (3%).

Table 9: Target Markets

	Philippines	Malaysia	Singapore	Other ASEAN countries	China	Japan	South Korea	Other Asian countries	Europe	United States	Total
Manufacturing	170	16	20	26	35	85	21	20	44	69	506
Utilities	5	0	0	1	0	0	0	0	0	0	6
Construction	18	0	0	0	0	0	0	0	0	0	18
Wholesale trade	41	0	2	0	1	3	0	1	2	2	52
Retail trade	38	1	1	1	1	1	1	2	1	1	48
Hotels and Restaurants	25	6	6	5	8	7	5	4	7	8	81
Transportation	32	2	3	3	4	4	2	2	2	3	57
Telecommunications	15	3	3	3	2	4	2	3	2	2	39
Banking and Finance	22	0	0	0	1	0	0	1	1	1	26
Insurance	9	0	1	1	1	0	0	0	0	0	12
Others	11	0	0	0	0	0	0	2	0	1	14
NR	21	1	2	1	2	2	1	2	1	2	35
Total	407	29	38	41	55	106	32	37	60	89	894
Percent	46%	3%	4%	5%	6%	12%	4%	4%	7%	10%	100%

2.2.7. Sources of Raw Materials

Across industries, most firms (38%) source their raw materials locally. Japan is the largest external source of raw materials, providing for 14 percent of firms, followed by China (11%). The United States is the main source of raw materials for 8 percent of firms, Europe for 7 percent and Singapore for another 7 percent. Malaysia, South Korea, other ASEAN countries, and other Asian countries each mainly provide for 4 percent of firms.

Table 10: Source of Raw Materials

	Philippines	Malaysia	Singapore	Other ASEAN countries	China	Japan	South Korea	Other Asian countries	Europe	United States	Total
Manufacturing	156	31	41	30	66	101	30	26	37	48	566
Utilities	5	0	0	0	0	0	0	0	0	0	5
Construction	17	0	2	0	2	1	0	0	0	0	22
Wholesale trade	34	2	5	2	7	9	3	4	7	5	78
Retail trade	32	1	2	2	3	5	1	1	3	5	55
Hotels and Restaurants	25	1	1	0	4	2	2	2	2	4	43
Transportation	24	0	3	0	2	5	0	0	6	3	43
Telecommunications	6	1	0	0	4	2	0	1	3	4	21
Banking and Finance	15	0	0	0	0	0	0	0	0	0	15
Insurance	6	0	0	0	0	0	0	0	0	0	6
Others	10	1	1	0	1	0	0	1	1	0	15
Total	330	37	55	34	89	125	36	35	59	69	869
Percent	38%	4%	6%	4%	10%	14%	4%	4%	7%	8%	100%

Though survey results indicate that the domestic supply chain remains the main source of raw materials for firms in the country, there are assertions that many establishments particularly export oriented ones, have tendency to be dependent on foreign sources for intermediate inputs. Developing and strengthening domestic backward linkages may be an important strategy to lessen this reliance. This again, has implications on developing the countries' SMEs to assume this role.

2.2.8. Important Factors for Locating in Greater Manila Area

The firms were first asked to identify the level of importance of at least 20 factors that had influenced the decision of the firms to locate their operations in the region. Afterwards, they were requested to indicate the three most important factors out of the 20. Survey results show that respondent firms found the following as the topmost important factors, size of local markets, investment incentives (including tax incentives), and physical infrastructure (roads, highways, ports, airports, etc.). The market size and physical infrastructure has traditionally been an important determinant of foreign investments. On the other hand, based on some empirical studies in the past, investment incentives were not found to be significantly affecting the location decision of firms. However, the results of this survey disprove this contention to some extent.

These factors primarily regarded by investors as the main stimulants in the firms' decision to locate their operations in GMA are consistent with the earlier discussion that

given the critical role of GMA as center for economic, social, political, and administrative activities, Metro Manila and its contiguous areas have a market size relatively large when compared to other regions of the country. Their combined gross regional domestic product would account for a big chunk of the national total gross domestic product, representing another indicator of market size. In addition, more modern and advanced physical infrastructure could also be found in the core region comprising GMA.

Investment incentives were found to be influential in the decision making of firms and may be construed as generally having positive effects to investment inflows. It should be noted however, that the incentives being offered by the Philippines are similar to those offered by the other countries and so this advantage may not be sustained in the long term if other aspects, such as fiscal structure is not addressed. For instance, the corporate tax rate of the country is still at a high 35%. Meanwhile, there have been issues within the incentive structure that had been highlighted pertaining to loss of revenues, costly and cumbersome procedures of availment, and confusion arising from the numerous investment regimes. All these would have to be sorted out and the proposal currently pending in Congress to rationalize the investment structures, particularly the fiscal kind, is logical and necessary in order to come up with a uniform system that would reduce complexities.

Meanwhile, those factors that are regarded as second most important include availability of skilled labor and professionals, other infrastructure (electricity, water supply, other utilities), and ICT infrastructure (telecommunications, IT).

Among the factors identified as the third most important is , availability of low cost labor.

In sum, it can be regarded that the most important factors influencing firms to locate in GMA are market size; investment incentives; infrastructures whether physical, utility support or ICT; and availability of low cost as well as skilled labor and professionals. The status of the banking system and financial structure has also been well regarded. Interestingly, government institutional infrastructure did not enter the list of more important factors.

Table 11: Number and Share of Firms by Most Important Factors for Locating in GMA

Factors	First		Second		Third	
	Number	Percent	Number	Percent	Number	Percent
Investment incentives including tax incentives	105	21%	31	6%	31	6%
Liberal trade policy	17	3%	25	5%	23	5%
Customs procedure	5	1%	14	3%	11	2%
Local content requirements, rules of origin	7	1%	6	1%	6	1%
Physical infrastructure (roads, highways, ports, airports, etc.)	53	11%	57	11%	54	11%
Infrastructure (telecommunications, IT)	19	4%	46	9%	36	7%
Infrastructure (electricity, water supply, other utilities)	28	6%	51	10%	53	11%
Government institutional infrastructure	8	2%	7	1%	12	2%
Financial structure/Banking system	31	6%	28	6%	26	5%
Legal system	0	0%	6	1%	0	0%
Protection of intellectual property rights	4	1%		0%	9	2%
Size of local markets	111	22%	40	8%	32	6%
Access to export markets	11	2%	20	4%	16	3%
Proximity to suppliers/subcontractor	16	3%	32	6%	23	5%
Request by large/related company	7	1%	8	2%	14	3%
Availability of low cost labor	24	5%	35	7%	42	8%
Availability of skilled labor and professionals	20	4%	56	11%	64	13%
Presence of other companies from the same country as this company (synergy)	5	1%	9	2%	10	2%
Access to high value technology and information	5	1%	16	3%	20	4%
Living conditions	0	0%	0	0%	0	0%
Others	15	3%	2	0%	1	0%
No response	11	2%	13	3%	17	3%
Total	502	100%	502	100%	500	100%

2.2.9. Innovations

Among the top three innovations undertaken by the firms during the last 3 years were the introduction of new products and services (18%), upgrading of machineries and equipment (17%), and opening of a new market (15%). These innovations are also among those that were claimed to being planned to be undertaken in the next three years: upgrading of machineries and equipment (17%) followed by introduction of new products and services (16%) and opening of a new market (15%).

A slightly different pattern however, can be observed among the types of innovation undertaken by major business activity. Those firms which have undergone the most innovations are those engaged in manufacturing, wholesale trade, retail trade, hotels and restaurant, and transportation. While firms engaged in manufacturing have mostly introduced new products and services, upgrading of machineries and equipment, adoption of new method of production, and acquisition of a new source of supply of raw materials and supplies, those into wholesale trade introduced new products and services, opened up new markets, upgraded machineries and equipment, and marketed products

and services or purchased materials and supplies thru Internet. Firms engaged in retail trading followed the same pattern as the former. This information manifests that technological upgrading efforts are driven by the function or industrial orientation of the firm and/or as a means to take advantage of accessible technology such as marketing through the Internet.

Table 12: Share of Firms by Innovation in the last 3 Years and the Next 3 Years

Innovations	Last 3 Years		Next 3 Years	
	Number	Percent	Number	Percent
1 Introduction of new products and services	389	18%	387	16%
2 Adoption of new method of production	277	13%	294	12%
3 Opening of a new market	314	15%	355	15%
4 Acquisition of a new source of supply of raw materials and supplies	283	13%	302	13%
5 Outsourcing a major production activity that was previously conducted in-house	141	7%	175	7%
6 In-house major production activity that was previously or currently outsourced	121	6%	146	6%
7 Upgrading of machineries and equipment	363	17%	398	17%
8 Marketing of products and services/ purchase of materials and supplies thru internet	224	11%	297	13%
Total	2,112	100%	2,354	100%

2.2.10. Source of Technology

Survey results show that the main source of technology is the firms themselves (22%). This is followed by the technology transferred from MNCs (14%) presumably arising from their linkages with them. Apart from these, technical cooperation and assistance from local companies such as business organizations, other local companies and from foreign agencies are also important sources of information and technology. It will be noted though that there are relatively lesser degrees of technological linkages with other local institutions, namely, local government, academic institutions and R&D agencies.

The weak linkages of industry with R&D generating institutions (higher education institutions, government agencies and private institutions) are evident in the survey results, indicating that the firms are mainly relying on their in-house capabilities. Though some firms may find it prudent to safeguard their new discoveries and thus, limit the sharing of information, their dependence on internal know-how poses limitations as well as they tend to assume the costs and attendant risks involved alone rather than spread them around to minimize exposure. Though larger firms could afford

to internalize the costs and risks involved, the smaller and medium scale enterprises would have to rely more on the linkages with R&D producing institutions. Thus, S&T plans must be translated into action, while R&D institutions should have a more active interaction with industry players to elucidate their actual technological needs. Higher education institutions may choose to devote resources in developing their S&T curriculum in order to produce more scientists in the country.

Table 13: Share of Technology Source as Percentage of Total

Source of Technology	Number	Percent
1 Developed by own company	359	22.5%
2 Technology transfer from multinational companies	231	14.5%
3 Technical cooperation with (or assistance from) local business organization	209	13.1%
4 Technology transfer from or cooperation with local companies	201	12.6%
5 Technical assistance from foreign agencies	194	12.1%
6 Technical cooperation with (or assistance from) local government	131	8.2%
7 Joint Venture	108	6.8%
8 Technical cooperation with (or assistance from) local university or R&D institutes	86	5.4%
9 Technical cooperation with (or assistance from) foreign university or R&D institutes	78	4.9%
Total	1,597	100.0%

2.2.11. Expansion Plan in GMA

About a quarter of the firms revealed their plans to expand their operations in GMA in the next 3 years (24%). Meanwhile, over a fifth expressed the likelihood of expansion. However, 9 percent of the firms are not likely to expand in the near future, while 37 percent are still uncertain when it comes to their expansion plans.

Table14: Share of Firms by Probability of Expansion

	Number	Percent
Yes	122	24.2%
Probably Yes	108	21.4%
Not Sure	186	36.8%
Probably Not	45	8.9%
Not at all	37	7.3%
No Response	7	1.4%
Total	505	100.0%

2.2.12. Important Factors for continued operation / expansion in GMA

The firms were asked to identify the three most important factors that would serve as determinants of their future decision to continue their operations in GMA or to expand. Among those identified as the primary factors, size of local markets is considered by the greatest number (31% of firms) to be most important. Investment incentives (including tax incentives) are considered by 19 percent to be most important while 13 percent of firms identified physical infrastructure (roads, highways, ports, airports, etc.) in the same weight. It will be noted that these factors generally follows the pattern from the factors considered most important by the surveyed firms that have influenced their decision to locate their operations in GMA.

Table 15: Share of Firms by Most Important Factors for Continuation of Operation/ Expansion

Factors	First		Second		Third	
	Number	Percent	Number	Percent	Number	Percent
Investment incentives including tax incentives	55	19%	13	5%	16	6%
Liberal trade policy	4	1%	10	3%	4	1%
Customs procedures	4	1%	6	2%	9	3%
Local content requirements, rules of origin	5	2%	4	1%	2	1%
Physical infrastructure (roads, highways	36	13%	31	11%	36	13%
Infrastructure (telecommunications, IT)	7	2%	24	8%	24	9%
Infrastructure (electricity, water supply)	15	5%	36	13%	21	8%
Government institutional infrastructure	6	2%	4	1%	5	2%
Financial structure/banking system	15	5%	24	8%	20	7%
Legal system	4	1%	6	2%	5	2%
Protection of intellectual property rights	2	1%	3	1%	2	1%
Size of local markets	90	31%	19	7%	18	6%
Access to export markets	6	2%	12	4%	3	1%
Proximity to suppliers/subcontractors	2	1%	11	4%	14	5%
Request by large/related company	4	1%	3	1%	9	3%
Availability of low cost labor	12	4%	22	8%	19	7%
Availability of skilled labor and professionals	8	3%	33	12%	46	17%
Presence of other companies from the same country as this company (synergy)	2	1%	9	3%	4	1%
Access to high value technology and information	2	1%	5	2%	6	2%
Standard of living	3	1%	9	3%	14	5%
Others	6	2%	2	1%	1	0%
Total	288	100%	286	100%	278	100%

Among the second most important factors identified, infrastructure (electricity, water supply and other utilities) was considered by 13 percent of the firms. Among those that provided responses, 12 percent pointed to the availability of skilled labor and professionals as an important consideration, while 11 percent of the firms identified

physical infrastructure (roads, highways, ports, airports, etc.) as part of the group regarded as second most important.

As for the third most important factor, availability of skilled labor and professionals was identified by 17 percent of the firms while physical infrastructure (roads, highways, ports, airports, etc.) was identified 13 percent. Also, ICT infrastructure was also given this weight of importance by 9 percent of the firms.

To summarize, the surveyed firms consider the size of the local markets as the top most factor that would influence their continuation and expansion plans, followed by infrastructure in terms of utilities, categorized as second most important, and finally, availability of skilled labor and professionals as third most crucial factor.

2.2.13. Level of Satisfaction with Factors for Continuation/Expansion of Operations

The respondents were also asked to indicate their level of satisfaction with the same set of factors considered to affect location decisions of firms. The results are fairly spread out among the twenty factors particularly found to be very satisfactory by the firms. Nevertheless, the top four factors where the firms are very satisfied with are the financial sector/banking system prevailing, the availability of skilled labor and professionals, size of local markets, and existence of infrastructure for utilities. The top factors where the firms are only somewhat satisfied include proximity to suppliers/subcontractors, the financial structure/banking system and those that pertain to infrastructures such as physical infrastructure, telecommunications, and utilities. Living conditions was also adjudged as somewhat satisfactory. Meanwhile, firms are unsure whether they are satisfied or not with factors namely local content requirements, request by large/related company and presence of other companies from the same country. This could be due to lack of familiarity of the concepts behind the factors or non-applicability of the particular factor to their context. Firms also could not make up their mind if they are satisfied or not with liberal trade policy and customs procedure. Interestingly, there are more firms that are only somewhat satisfied with investment incentives prompting the question of whether this is due to inadequacy of the incentives or difficulty in availing them.

Table16: Satisfaction Level

	Very Satisfied		Somewhat Satisfied		Not Sure	
	Number	Percent	Number	Percent	Number	Percent
Investment incentives including tax incentives	48	4.5%	110	4.5%	57	5.2%
Liberal trade policy	30	2.8%	97	4.0%	80	7.3%
Customs procedure	29	2.7%	90	3.7%	73	6.6%
Local content requirements, rules of origin	32	3.0%	100	4.1%	89	8.1%
Physical infrastructure (roads, highways, ports, airports, etc.)	60	5.6%	141	5.8%	25	2.3%
Infrastructure (telecommunications, IT)	70	6.5%	143	5.8%	33	3.0%
Infrastructure (electricity, water supply, other utilities)	80	7.5%	141	5.8%	26	2.4%
Government institutional infrastructure	45	4.2%	124	5.1%	61	5.6%
Financial structure/Banking system	84	7.9%	143	5.8%	30	2.7%
Legal system	38	3.6%	125	5.1%	66	6.0%
Protection of intellectual property rights	51	4.8%	111	4.5%	68	6.2%
Size of local markets	80	7.5%	124	5.1%	42	3.8%
Access to export markets	50	4.7%	114	4.6%	60	5.5%
Proximity to suppliers/subcontractor	58	5.4%	155	6.3%	36	3.3%
Request by large/related company	38	3.6%	100	4.1%	88	8.0%
Availability of low cost labor	52	4.9%	133	5.4%	46	4.2%
Availability of skilled labor and professionals	81	7.6%	136	5.5%	33	3.0%
Presence of other companies from the same country as this company (synergy)	39	3.6%	97	4.0%	86	7.8%
Access to high value technology and information	53	5.0%	131	5.3%	54	4.9%
Living conditions	51	4.8%	137	5.6%	46	4.2%
Total	1,069	100.0%	2,452	100.0%	1,099	100.0%

The most important factors that influenced firms, among those surveyed, to locate in GMA represent the need to have strong and stable economic fundamentals (size of market and physical infrastructure) and conducive policies (investment incentives) to entice and develop industrial agglomerations in the country. Though much has been done especially since the 1980s, and there were indeed gains arising from these reforms and policies, the country's performance in terms of total foreign trade, FDI inflows, and exports performance, as well as overall competitiveness, viz-a-viz its ASEAN neighbours indicate that there are still major barriers and bottlenecks that have to be addressed. Not least of these are low investments in infrastructure, low productivity, political instability, unstable regulatory and contract enforcement, high cost of doing business, and corruption.

These stylized facts derived from the survey provided useful inputs in determining the characteristics of firms that have agglomerated in Greater Manila Area: the types of

business activities they undertake and the products they manufacture; the most important factors that influenced or attracted them to locate their business in the region; the types of innovations they have conducted and their sources indicating their desire to continue or expand operations; and their satisfaction to the conditions that drew them to establish their business in the region. However, to derive richer information as to the nature and characteristics of industrial agglomeration and industrial upgrading or innovation processes in the country, a more rigorous method utilizing the data set collected from the survey will have to be done. It will place particular focus on the policy measures and the economic environment that has so far influenced these firms to agglomerate and those that may be required for future agglomeration and upgrading. The next section provides insights on the results of the econometrics analysis undertaken by the Japanese team of experts who are also part of this study's mother project.

3. INDUSTRIAL AGGLOMERATION AND INNOVATION IN THE PHILIPPINES: ECONOMETRICS ANALYSIS

The econometrics component of this analysis on the Philippines focuses on two major aspects: industrial agglomeration and innovation. In particular, the objectives of this rigorous statistical method are: to determine the nature of industrial agglomeration in the country; distinguish between first movers and latecomers in the agglomeration context; and identify the characteristics of each category in terms of size of the firms involved, the functions for which they established presence in the region, and the factors that attracted them in the first place to locate in the area.

On the innovation aspect, the purpose of the study is to find out the factors that promote innovation and determine the differences between firms that have propensity to innovate and those firms that may be considered non-innovative.

Simply put, the econometric analysis will be based on the framework that the establishment of new business is a function of three major factors, (1) market conditions, (2) policy demand, based on the importance and satisfaction being attributed to it, and (3) firm characteristics. The same rough framework can be used for explaining the

process of innovation (Tsuji, et al, 2008).

The data used for econometrics analysis are from the 2007 Industrial Clustering Survey of Philippine Business and Industry conducted from October to December 2007 using the Greater Manila Area as domain of said survey. The total valid responses considered in the estimations was 504.

3.1. Nature of Industrial Agglomeration in the Philippines

The nature of industrial agglomeration refers to the periods in the country's history when firms have established their presence. For analytical simplicity, the focus was on the accumulated number of firms established in the Philippines, dividing the entire period into three according to the trend in accumulation starting from the year the earliest firm was established to the year the latest firm came about. These three key periods are: (1) before 1986; (2) 1987-1994; and (3) after 1995. The year of establishment of firm or business activities in the Philippines is taken as a dependent variable in the econometric analysis. The firms established in the earlier period are referred to as "first movers," and those that came in the later period as "latecomers". This pattern of accumulation is presented in Figure 2.

Figure 2: Accumulation of Firms' Establishment in the Philippines
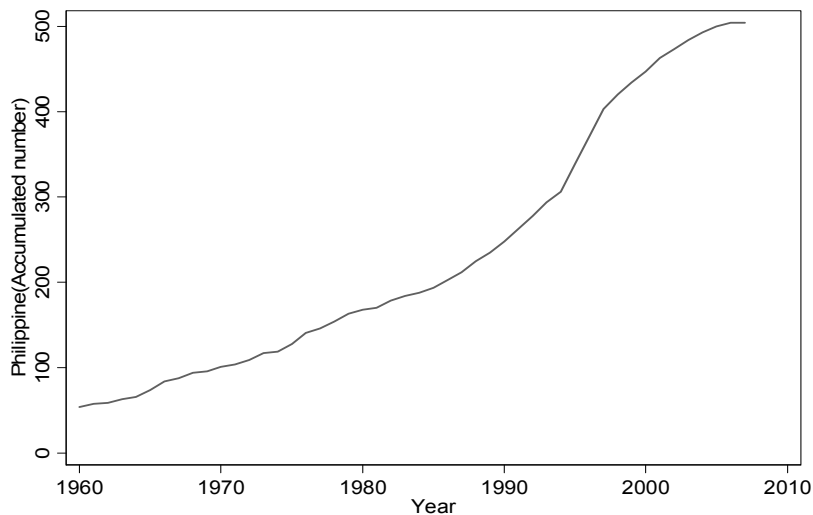
Independent variables, on the other hand, which will explain why firms were attracted by this region, are selected from among the items in the questionnaire, namely: (1) firm size; (2) attracting factors; and (3) functions of the firms when they were established.

The relationship between the year of establishment and the size of firm is examined along the lines of whether the agglomeration is triggered by the entry of large firms such as MNCs or by the smaller firms, which could either be local or foreign. This is aligned with the Flowchart Approach model developed by Kuchiki (2007), Kuchiki and Tsuji (2006, 2008), and Tsuji *et al* (2006). Firm size in the questionnaire is measured by the (i) number of full-time employees; (ii) total assets; and (iii) paid-up capital.

On the other hand, attracting factors or the factors that influenced the firms to establish their presence in the area were enumerated in the questionnaire consisting of 20 pre-determined items. Respondents were asked to consider if each of these factors affected their decision to locate in the country at the time the operation was begun, assessing them according to importance.

The other variable, functions of the firms when they first established, was asked in the questionnaire as Question no. 6. The summary statistics are presented in Table 17.

Table 17: Summary Statistics, Philippines

	Variable	Obs	Mean	Std. Dev.	Min	Max
	Dependent Variable					
Q1)	Agglomeration	504	0.615	0.633	0	2
Q9)	Innovation : Goods	504	0.198	0.399	0	1
	Methods	503	0.189	0.392	0	1
	Markets	504	0.292	0.455	0	1
	Suppliers	503	0.376	0.485	0	1
	Independent Variable					
Q1)	Establishment Year	504	1983.808	19.400	1854	2006
Q3) 1)	Full-time Employees: 50 - 99	504	0.198	0.399	0	1
	100 - 199	504	0.115	0.319	0	1
	200 - 299	504	0.044	0.205	0	1
	300 - 399	504	0.028	0.164	0	1
	400 - 499	504	0.016	0.125	0	1
	500 - 999	504	0.036	0.186	0	1
	1,000 - 1,499	504	0.018	0.133	0	1
	1,500 - 1,999	504	0.004	0.063	0	1
	2,000 & above	504	0.004	0.063	0	1
Q3) 1)	Total Assets(Peso) : 1M less than 5M	504	0.137	0.344	0	1
	5M less than 10M	504	0.089	0.285	0	1
	10M less than 15M	504	0.058	0.233	0	1
	15M less than 20M	504	0.040	0.195	0	1
	20M less than 50M	504	0.083	0.277	0	1
	50M less than 100M	504	0.069	0.254	0	1
	100M less than 500M	504	0.109	0.312	0	1
	500M less than 1B	504	0.038	0.191	0	1
	1B & above	504	0.054	0.225	0	1
Q3) 1)	Paid-UP Capital(Peso) : 1M less than 5M	504	0.179	0.383	0	1
	5M less than 10M	504	0.091	0.288	0	1
	10M less than 15M	504	0.056	0.229	0	1
	15M less than 20M	504	0.032	0.175	0	1
	20M less than 50M	504	0.095	0.294	0	1
	50M less than 100M	504	0.044	0.205	0	1
	100M less than 500M	504	0.073	0.261	0	1
	500M less than 1B	504	0.020	0.140	0	1
	1B & above	504	0.026	0.159	0	1
Q6) 7.8	Retail/ Wholesale trade	504	0.242	0.429	0	1
1	Production (raw-material processing)	504	0.125	0.331	0	1
2	Production (components and parts)	504	0.151	0.358	0	1
3	Production (final products)	504	0.317	0.466	0	1
5	Purchasing/ Procurement/ Logistics	504	0.113	0.317	0	1
14	R&D/ Consulting	504	0.026	0.159	0	1
15	Human resources development	504	0.083	0.277	0	1

Table 17: Summary Statistics, Philippines (continuation)

	Variable	Obs	Mean	Std. Div.	Min	Max
Q7)	1) Investment incentives including tax incentives	487	3.719	1.456	1	5
	2) Liberal trade policy	480	3.310	1.400	1	5
	3) Customs procedures	484	3.384	1.426	1	5
	4) Local content requirements, rule of origin	480	3.363	1.388	1	5
	5) Physical infrastructure (roads, highways, ports, airports, etc.)	492	4.309	0.998	1	5
	6) Infrastructure (telecommunications, IT)	490	4.300	1.042	1	5
	7) Infrastructure (electricity, water supply, other utilities)	493	4.465	0.927	1	5
	8) Government institutional infrastructure	487	3.879	1.142	1	5
	9) Financial system	487	4.246	1.017	1	5
	10) Legal system	489	3.890	1.210	1	5
	11) Protection of intellectual property rights	488	3.684	1.316	1	5
	12) Size of local markets	489	4.098	1.315	1	5
	13) Access to export markets	486	3.438	1.437	1	5
	14) Proximity to suppliers/subcontractors	489	3.961	1.225	1	5
	15) Request by large/related company	485	3.344	1.405	1	5
	16) Availability of low-cost labor	489	3.896	1.258	1	5
	17) Availability of skilled labor and professionals	492	4.313	1.049	1	5
	18) Other companies from the same country are located here (synergy)	485	3.348	1.397	1	5
	19) Access to cutting-edge technology and information	490	3.931	1.216	1	5
	20) Living conditions	487	3.860	1.192	1	5
Q8)	1) Investment incentives including tax incentives	276	3.417	1.214	1	5
	2) Liberal trade policy	267	3.251	1.147	1	5
	3) Customs procedures	267	3.165	1.165	1	5
	4) Local content requirements, rule of origin	261	3.379	1.084	1	5
	5) Physical infrastructure (roads, highways, ports, airports, etc.)	276	3.717	1.092	1	5
	6) Infrastructure (telecommunications, IT)	487	2.199	2.065	0	5
	7) Infrastructure (electricity, water supply, other utilities)	487	2.242	2.094	0	5
	8) Government institutional infrastructure	266	3.632	0.998	1	5
	9) Financial system	274	4.055	0.869	1	5
	10) Legal system	270	3.537	1.030	1	5
	11) Protection of intellectual property rights	272	3.559	1.102	1	5
	12) Size of local markets	277	3.874	1.037	1	5
	13) Access to export markets	264	3.576	1.124	1	5
	14) Proximity to suppliers/subcontractors	274	3.850	0.962	1	5
	15) Request by large/related company	268	3.407	1.103	1	5
	16) Availability of low-cost labor	275	3.625	1.115	1	5
	17) Availability of skilled labor and professionals	280	3.911	1.031	1	5
	18) Other companies from the same country are located here (synergy)	267	3.397	1.110	1	5
	19) Access to cutting-edge technology and information	269	3.714	1.020	1	5
	20) Living conditions	270	3.715	1.000	1	5

3.2. Results of Estimation on Industrial Agglomeration in the Philippines

With the dependent and independent variables already identified, three models were estimated according to the definition of firm size. We find here what is called, full time employees model, the assets model and the paid-up capital model. Estimations were conducted under each model and adopting the Ordered Logit Estimation, utilized the Full model, which takes all variables into account, and the Selected Model, which made use of selected variables only that are considered to significantly influence the dependent variables. A summary of estimations is provided in Table 18, which to facilitate understanding shows signs of estimated coefficients and their significance levels only. Detailed estimation results are in the Appendix section of this paper.

Table 18 Results of Estimations: Agglomeration

	Employees		Assets		Capital	
	Full model	Selected model	Full model	Selected model	Full model	Selected model
Q3) 2 50 - 99persons/5M less than 10M (Peso)/5M less than 10M (Peso)	*	**	**	**	**	**
3 100-199/10M-less than 15M/10M-less than 15M	+	**	**	**	**	**
4 200-299/15M-less than 20M/15M-less than 20M			+		*	*
5 300-399/20M-less than 50M/20M-less than 50M			**	**	**	**
6 400-499/50M-less than 100M/50M-less than 100M			**	**	**	**
7 500-999/50M-less than 100M/50M-less than 100M	[+]	[+]	**	**	**	**
8 1,000-1,499/100M-less than 500M/100M-less than 500M			**	**	**	**
9 1,500-1,999/500M-less than 1B/500M-less than 1B			**	**		
10 2,000 & above/1B & above/1B & above			**	**	**	**
Q8) 1 Investment incentives including tax incentives	*	*	+	+	+	+
2 Liberal trade policy		[+]				
3 Customs procedures			[+]	[*]		[*]
4 Local content requirements, rule of origin		[+]	[*]	[+]		
5 Physical infrastructure (roads, highways, ports, airports, etc.)						
6 Infrastructure (telecommunications, IT)		*				
7 Infrastructure (electricity, water supply, other utilities)						
8 Government institutional infrastructure		[+]	[*]		[+]	
9 Financial system						
10 Legal system						
11 Protection of intellectual property rights	+	*		*	+	*
12 Size of local markets	[**]	[**]	[+]	[*]	[*]	[*]
13 Access to export markets	*	+	*	+		
14 Proximity to suppliers/subcontractors	[**]	[**]	[+]		[+]	
15 Request by large/related company		+				
16 Availability of low-cost labor	+	*				
17 Availability of skilled labor and professionals						
18 Other companies from the same country are located here (synergy)						
19 Access to cutting-edge technology and information						
20 Living conditions						
Q6) 78 Retail/ Wholesale trade						
1 Production (raw-material processing)		[+]				
2 Production (components and parts)	**	**	**	**	**	**
3 Production (final products)	[**]	[**]	[**]	[**]	[**]	[**]
5 Purchasing/ Procurement/ Logistics						
14 R&D/ Consulting						
15 Human resources development						
Nob	461	469	461	473	461	480
Log likelihood	-456.875	-468.075	-434.818	-454.737	-444.054	-471.158
Pseudo R2	0.075	0.069	0.12	0.103	0.101	0.084

Note 1: [ ] indicates that the coefficient is negative, and items without [] imply the coefficient is positive.
Note 2: **, * and + indicates that coefficient is at the 5, 10 and 20% significance level, respectively.

In these Ordered Logit models, latecomers are taken to be standard by the normalization, and accordingly, a positive sign of estimated coefficients indicates that they influence only latecomers. Needless to say, a negative sign of the coefficients refer to the first movers.

3.2.1. Estimation Results under the Full time Employees Model
<u>Full Model</u>

(a) Firm size

The results show that only firms with employees of less than 100 is significant (at 10%). With the sign being positive, the implication is that these small companies are latecomers but in general, no significant relationship between firm size and the year of business establishment is found.

(b) Attracting factors

In terms of the factors that influenced firms to locate in the Philippines, it was found that "Size of local markets" and "Proximity to suppliers/subcontractors" have negative signs and significant at the 5 percent level, indicating that these are the factors that influenced the first movers. On the other hand, "Investment incentives including tax incentives" and "Access to export markets" are positive and significant at the 10 percent level while "Protection of intellectual property rights" and "Availability of low-cost labor" were also found to be positive at the 20 percent significance level. These results imply that these four factors were the ones out of the 20 that had influenced latecomers to agglomerate in the Philippines.

(c) Functions of firms

When it comes to the estimates with functions of firms when they first established as independent variable, we find that "Production (final products)" has a negative sign and significant at the 5 percent level. This indicates that the first movers' activities were along the lines of producing final products. Meanwhile, "Production (components and parts)" was found to be positive and equally significant at the 5 percent level implying that the late comers were into production of components and parts.

<u>Selected Model</u>

In the Selected Model, the number of independent variables is reduced by eliminating those factors that are considered irrelevant in order to increase the accuracy of the estimation in terms of log likelihood, for instance. This model was found to have raised the significance levels of many of the variables in the estimation. For instance, we now find that when it comes to firm size, the significant categories are those firms with employees less than 100 and those with 100 to 199 employees (5% level of significance). Since both signs are positive, the results imply that these smaller firms represent the late comers.

As to the attracting factors, this model raised the significance of "Protection of intellectual property rights," "Availability of low-cost labor" and "Infrastructure (telecommunications, IT)" but reduced that of the "Access to export markets." With the first three factors having positive signs, they confirm that they are the factors that influenced late comers to come to the Philippines while adding telecommunications and IT infrastructure to the equation.

Though significant only at the 20 percent level, factors such as "Liberal trade policy," "Local content requirements, rule of origin," and "Government institutional infrastructure" showed up with negative signs. This somewhat indicate that the first movers were also influenced with these factors when they decided to come to the Philippines, in addition to their primary reasons as size of local markets and proximity to related industries.

3.2.2. Estimation Results under the Total Assets and Paid-up Capital Model

Upon running the estimates, it was found that the total assets and paid-up capital models showed almost the same results. Thus, they will just be treated as one in this analysis.

<u>Full Model</u>

(a) Firm size

With almost all categories showing positive significance at the 5 percent level as indicated in Table 18, it can be deduced that most of these firms agglomerated in the

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Philippines in the later period. This validates the data implied by Figure 2 wherein the number of accumulated firms showed a sharp increase in the middle of the 1990s. This is also consistent with the findings of the survey that indicates that there were more firms showing up between 1990 and 1999, which was the period when the policy reforms instituted in the late 1980s through the 1990s were claimed to have taken effect.

However, the result of this estimation does not indicate the situation in the earlier period. What is found in the results lead one to infer that the Flow Chart approach does not explain the nature of agglomeration in the Philippine case. Apparently, based on the estimation, the firms have agglomerated in the Philippines during this latter period regardless of size and therefore, may not have been significantly influenced by the presence of first movers. In this case and based on the inference on above, agglomeration in the Philippines may be considered as policy driven rather than as a result of a possible synergy between, for instance, MNCs locating first and supporting industries following them as the Flow Chart approach suggests.

(b) Attracting factors

Common to both the assets and capital models are such factors as "Government institutional infrastructure," "Size of local markets," and "Proximity to suppliers/subcontractors," this showed up with negative signs indicating therefore that they were the factors that influenced the first movers. Another common factor but with a positive sign is "Investment incentives including tax incentives" significant at the 20 percent level. This implies that this factor exerted some influence to late comers.

Meanwhile, factors such as "Customs procedure," "local content requirements, rule of origin," and "Access to export markets" were found to be significant only at the assets model. The first two factors showed up negative indicating that they influenced the first movers, while the latter had presented attraction to the late comers.

(c) Functions of firms

In both models, "Production (final products)" and "Production (component and parts) were the only significant categories (at 5% level of significance). Showing up with all positive signs, it can be inferred that the latecomers' business activities when they came in to the Philippines were focused on the production of components and parts,

while the first movers concentrated on the production of final products since the signs of the coefficients were all negative. From Table 18 it can be noted that the results for this category are the same with those coming out from the full time employees model.

Selected Model

When it comes to firm size, the selected model showed the same results for both the assets and the capital models in almost all categories except for two categories. Moreover, almost all conformed to the results of the full model.

As to attracting factors found significant, common to both models are "Customs procedures" and "Size of local markets;" and because of their negative signs indicate that they were influential to the decision of first movers. On the other hand, coming out with positive signs that are common to both models are "Protection of intellectual property rights" and "Investment incentives including tax incentives." These are the factors that affected the late comers. Meanwhile, "Access to export markets" only came out in the assets model and was positive. These results conform to the findings in the full time employees' model.

Summary of the Results

At the early stage of agglomeration, firms entered the Philippine industrial structure to produce final products in collaboration with supporting industries found to be present such as suppliers and subcontractors, and in compliance with local content requirements, for the local market. Their entry to the Philippines was further influenced by the liberal trade policy, the institutional infrastructure of the government and customs procedures prevailing.

At the later stage of agglomeration, firms in all sizes mainly in the production of parts and components clustered in the country due to the investment incentives offered, access to export markets, availability of low-wage labors, presence of telecommunications and IT infrastructure, and the legal framework and programs protecting intellectual property rights.

3.3. Results of Estimation on Industrial Upgrading and Innovation

It is claimed that as a result of agglomeration, the closer interaction between and

among firms lead to transfer of technology and know-how from more advanced firms such as MNCs. A flow of denser information among them as well as the nurturing of human resources has created endogenous forces of industry upgrading and the innovation process for all firms in the region.

In order to examine this industry upgrading or innovation, four categories of upgrading or innovation are defined according to Schumpeter's concepts, namely, (1) introduction of new goods/services; (2) adoption of a new technology; (3) opening a new market and (4) acquisition of a new source of a supply of raw materials.

In the survey, the questions in regard upgrading of business operations asked on whether the respondent has undergone the specified types of upgrades in the last 3 years and which ones do said firm intends to achieve in the next 3 years. The respondent need only to indicate "yes" or "no" in this portion of the questionnaire for each type of innovations. In the econometrics analysis of upgrading and innovation, these four types became the four models of innovation. The two types of replies, "yes" or "no," were the dependent variables, while independent variables consisted of the following: (1) satisfaction with the Philippine's economic circumstances such as policy measures and economic conditions, which occupied a separate item in the questionnaire; (2) function(s) carried out at the time of establishment of the first office; and (3) year of establishment of the firm. Two types of estimation were again made in terms of the full and selected models. The summary results of the estimation are presented in Table 19.

Table 19: Results of Estimation on Innovation

	New goods		New method		New market		New supply	
	Full model	Selected model	Full model	Selected model	Full model	Selected model	Full model	Selected model
Q10) 1 Investment incentivesincluding tax incentives	+							
2 Liberal trade policy								
3 Customs procedures								
4 Local content requirements, rule of origin	+		*					
5 Physical infrastructure(roads, highways, ports,airports, etc.)								
6 Infrastructure(telecommunications, IT)	[**]	*	[+]	*			**	**
7 Infrastructure (electricity,water supply, other utilities)					+			[+]
8 Government institutional infrastructure	[*]	[*]		[*]				
9 Financial system			[**]	[**]				
10 Legal system				+	[+]			
11 Protection of intellectual property rights								
12 Size of local markets				+			**	**
13 Access to export markets							[*]	[**]
14 Proximity to suppliers/subcontractors					[+]			
15 Request by large/related company					[**]	[**]	[**]	[**]
16 Availability of low-cost labor								*
17 Availability of skilled labor and professionals								
18 Other companies from the same country are located here (synergy)			[+]		+			
19 Access to cutting-edge technology and information								
20 Living conditions					[+]		[+]	[**]
Q6) 78 Retail/ Wholesale trade		[**]	+	[**]	[**]	[**]		
1 Production (raw-material processing)	[+]							
2 Production (components and parts)		[+]		[+]				
3 Production (final products)	[+]					*	[**]	[**]
5 Purchasing/ Procurement/ Logistics								
14 R&D/ Consulting							+	**
15 Human resources development								
Q1) When did your company establish its first office?								
_cons								
Obs	229	263	229	257	229	268	229	250
Log likelihood	-77.603	-98.076	-74.46	-95.512	-91.148	-125.35	-120.539	-134.927
Pseudo R2	0.162	0.097	0.196	0.098	0.197	0.088	0.145	0.135

Note 1: [ ] indicates that the coefficient is negative, and items without [] imply the coefficient is positive.
Note 2: **, * and + indicates that coefficient is at the 5, 10 and 20% significance level, respectively.

3.3.1. Estimation of New Goods Model

Full Model

From Table 19, it would be noted that only significant variables were indicated, with stars and a cross indicating significance levels, while each has either a bracket or without. Those enclosed in brackets denote the negative sign, which means that the particular variable discourages innovation. In contrast, those without brackets are positive signs denoting that the variable is an encouraging factor for innovation.

Under the new goods/full model combination, we find that only "Investment incentives including tax incentives" and "Local content requirement, rule of origin" are significant at the 20 percent level. Since they indicate positive signs, these two variables are said to encourage upgrading and innovation. On the other hand, "Infrastructures (telecommunications, IT)" was found to be significant at 5 percent level as well as "Government institutional infrastructures" significant at 10 percent level but the negative signs of both variables indicate that they discourage innovation.

In terms of functions of firms, only two variables were found to be significant namely, "Production (raw-material processing)" and "Production (final products)." Both are denoted as negative and are now said to be factors discouraging the conduct of innovation.

Selected Model

Under the selected model estimation, only three policy factors were found to be significant finding the same result as in the previous model in terms of "Government institutional infrastructure" (significant at 5% level and negative); reversing the result for "Infrastructure (telecommunications, IT)" into positive at 10 percent level of significance; and finding the "Financial system" significant (at 5% level) with a negative sign. Meanwhile, this model has an entirely different result than the other model as it finds the functions "Retail/wholesale trade" and "Production (components and parts) as the significant variables, both with negative signs.

Summary of Results

Estimation results tell us that the availability of investment incentives in the country does encourage innovation as there is a corresponding reward or benefit from

doing so. It may be recalled that the Omnibus Investment Code of the Philippines distinguishes between pioneer and non-pioneer, wherein the former pertains to activities not yet produced in the country in large volumes (new goods) and those that involves new design, formula or system applied. The requirement for local content via rules of origin was also found to be a significantly encouraging factor for upgrading since it stimulates firms to find ways and means to incorporate this requisite into their operations possibly leading to the production of new goods. Under the selected model, telecommunications and IT infrastructure became positive denoting that indeed, the presence of knowledge-based technology enables the introduction of new goods or services to the market.

On the other hand, discouraging the discovery of new goods to be introduced to the market are such factors as the institutional infrastructure of government and the prevailing financial system. Again, this validates the earlier finding that the weak support or linkages with R&D producing institutions including in the public sector do not stimulate innovation among firms. This also has implications on the requirements and procedures attendant to discovery or innovation such as the patent system and appropriate recognition of innovators that may have to be examined further. Meanwhile, the financial system may not be too encouraging of innovation in the sense that it may not be offering the appropriate support and facilities for innovative activities.

In terms of functions, the result show that limiting the firms' value added to producing final products or raw materials would not encourage innovation as there is no need to do so. Introduction of new goods in the market requires design, R&D and incubation of ideas before it can be successfully done so. The functions of retail/wholesale trade, which only involves buying and selling of ready-made goods and production of components and parts alone, would not encourage much innovation as well.

3.3.2. Estimation of New Technology Model
<u>Full Model</u>

Under this model referring to the adoption of new method or technology in production, Table 19 shows that under the full model, three significant and positive variables were found in the policy environment category. "Local content requirements,

rule of origin" is significant at 10 percent level, while the "Legal system" and "Size of local markets" are significant at the 20 percent level. Given their positive signs, these variables denote the encouraging factors for innovation in this area. On the other hand, "Infrastructure (telecommunications, IT) and the variable "Other companies from the same country are located here (synergy)" are found to be significant at the 20 percent level. Indicating negative signs, these represent the factors that do not drive innovation for new method or technology. When it comes to functions of firms, only the variable "Retail/wholesale trade" is found to be significant (at 20% level) and positive denoting its possible contribution to innovation.

Selected Model

In contrast, the selected model was able to identify only one significant variable with a positive sign and that is "Infrastructure (telecommunications, IT)" which was found to have a negative sign in the previous model. Meanwhile, the two variables that are estimated to be significant under this model are "Government institutional infrastructure" and "Financial system." Since they indicate negative signs, they can be regarded as factors that discourage the adoption of new method or technology in the firms' business operations. In terms of functions, those variables that are significant with negative signs are "Retail/wholesale trade" and "Production (components and parts)." The results under this model are the same as those provided under the new goods model.

Summary of Results

Since the full model and selected model only have two variables in common coming out with opposite signs, it may be regarded that the estimation of this particular model of innovation, that is adoption of new method/technology, does not show good results.

3.3.3. Estimation of New Market Model

When it came to the innovation model of opening up a new market, estimation results indicate the following as encouraging factors (significant at 20% level and positive): "Infrastructure (electricity, water supply, other utilities)" and "Other

companies from the same country are located here (synergy)." Meanwhile, those variables that are found to be significant at various levels and indicating negative signs are: "Legal system," "Proximity to suppliers/subcontractors," "Request by large/related company," and "Living conditions." These are the factors discouraging the opening of new market.

In terms of functions, "Retail/wholesale trade" is significant at 5 percent level and indicates negative sign, while "Production (final products)" comes in with positive sign.

The estimation under the selected model comes out with only two significant variables, "Requested by large/related company" (5% significance level) and "Retail/wholesale trade" (5% level of significance), both having negative signs and coinciding with those from the full model.

Summary of Results

Upgrading business operations by opening up a new market is encouraged by the availability of basic infrastructure and the presence of other companies from the same country of origin. The former denotes a basic requirement or factor for establishing presence in a market, while the latter refer to the supporting institution that the firms would find in a new market that would somehow reduce the transaction costs in terms of getting market information and the possibility for collaboration in some aspects of operations. On the other hand, the factors that hinder firms from adopting this model of innovation are the legal system and living conditions that are found in a market's business environment; and presence of related institutions such as suppliers/subcontractors and larger company. Firms engaged in retail/wholesale trade do not see the need to open a new market, while those that produce final products are driven to upgrading in terms of going to another market.

3.3.4. Estimation of New Input Model

Under this model of innovation, firms undertake the acquisition of a new source of supply of inputs. The full model identifies variables that are encouraging for this kind of upgrading. These are "Infrastructure (telecommunications, IT)" and "Size of local markets." On the other hand, those variables found to be hindering firms from undertaking this innovation are: "Access to export markets," "Request by large/related

company," and "Living conditions." As to the functions, "R&D/consulting" is positive, while "Production (final products)" is negative. Except for finding "Infrastructure (electricity, water supply, other utilities)" and "Availability of low-wage labor" significant but the former variable with negative sign and the latter with positive sign, the estimation under the selected model has closely similar results while raising the significant levels of variables such as "Living conditions" (negative sign) and "R&D/ consulting" (positive sign).

Summary of Results

We find that telecommunications and IT infrastructure and size of local markets are conducive for the acquisition of new sources of inputs. Perhaps, the former facilitates the sourcing out of information for the availability of these inputs, while the latter drives the demand for the product requiring firms to get supplies from other sources in order to produce more. On the other hand, quality and standard considerations may hinder firms which have access to export markets from sourcing out new sources of inputs, while affiliation with a large/related company may not be driving the need to find new suppliers. In addition, satisfaction with the living conditions in their present location may be another consideration for not expanding sources of inputs.

In terms of functions, it seems fitting that those firms performing R&D/consulting functions encourage the acquisition of new inputs, either as a result of their research or to provide inputs to their activities.

4. POLICY ISSUES AND RECOMMENDATIONS

4.1. Issues on Industrial Policy

The policy reforms that were instituted starting in the 1980s and the 1990s involving trade liberalization episodes, shift to outward-looking export oriented strategy, investment liberalization, privatization and deregulation have had positive effects on the economy to some extent, particularly coming from the difficulties of the 1970s and the early 1990s. These reforms and their positive impact to the economy in general and industrial development in particular may have been some of the factors that encouraged

agglomeration of firms in the country. However, although it is encouraging that almost half of the firms surveyed have expressed the probability of expanding their operations in their present locations, the country remains to be a laggard when it comes to attracting FDIs compared with its neighbors, while its export performance has still not reached the higher levels of the other countries.

Indeed, there are requisite aspects in the economic fundamentals of the country that have to be addressed. For one, availability and modernization of infrastructures is a pressing need. Apart from increasing its investments in infrastructure, rates of utilities would have to come down particularly when they are not even commensurate to the quality of the services. Macroeconomic fundamentals will have to be kept stable particularly in light of developments in the world market and the current problems in the United States. The rapid appreciation of the pesos is hurting the exporters as well as the families of overseas Filipino workers. It is likewise imperative that there is stability at the political front so that there is consistency in policies while commitments, contracts and agreements are adhered to.

The unilateral trade reforms that have been implemented, despite not having further developments lately, are being sustained by the bilateral and regional free trade agreements and economic partnerships that the country has entered into. It is however, imperative that to continue addressing the negative social impacts of such adjustment policies especially among players in local industries, those engaged in micro, small and medium enterprises and those that are regarded to be at the bottom of the pyramid.

Meanwhile, the investment incentives that the Philippines have been offering had actually enticed firms to locate their business in the country particularly in Metro Manila and the industrial areas in its periphery. The increasing rate of approved investments and firms actually operating in both the public and private economic zones and industrial estates is an indication that these incentives are certainly attractive to them. However, issues that pertain to the hidden costs associated with incentives in terms of foregone revenues and the recent findings of the high redundancy rate of this incentives, i.e. investments would have been carried out even without the incentives, would have to be continuously examined so further rationalization can be effected.

The linkages between institutions producing knowledge via R&D and the industrial sector will have to be strengthened. The survey results manifest the weak linkages as

firms tend to depend on their own efforts. Research and knowledge creation in local universities should reach the appropriate users for their application.

The local governments have an increasing role to play in the country's industrial development, particularly since they have been granted increased autonomy to manage the economic and social affairs of their areas of jurisdiction. Some LGUs have enacted their own investment codes in an effort to develop indigenous industries. The OTOP program and industry clustering initiatives are promising developments in the area of local economic development that should be aggressively pursued.

On the other hand, barriers or disincentives to investments still exist in the Philippines. Land ownership among foreigners is prohibited in the Constitution. Its labor force is beset with problems of low productivity, high wages, militancy of labor unions, and declining quality of education. Exporters are still beset with weak backward linkages as competitive support industries are still lacking and thus, forcing them to continue importing their intermediate inputs. These gaps would have to be addressed in order to minimize the barriers to industrial development.

4.2. Issues from the Survey

The results of the survey conducted in Greater Manila Area revealed the most important factors that influenced firms to locate in the country. They represent the vital importance of having strong and stable economic fundamentals (size of market and physical infrastructure) and conducive policies (investment incentives) to entice and develop industrial agglomerations in the country. These are the areas where continued public investments should be allocated to ensure that this competitive advantage is sustained. Meanwhile, it is also quite telling that government institutional infrastructure did not figure prominently on the list of important encouraging factors from the point of view of the firms surveyed. Combined with the findings from the case study that its competitiveness is adversely being affected by the huge transaction costs of doing business in the country, the current state of some of the aspects of the government's institutional infrastructure actually seem to pose a deterrent to further agglomeration. The country's performance in terms of exports and FDI compared to those of its neighbors show that economic fundamentals and attractive investments (which incidentally is similar to those offered by other ASEAN countries) and programs are not

enough to build up the country's competitive advantage. Factor in a more stable, progressive minded, professional, and efficient government infrastructure in the equation and it is quite possible that an influx of investments could come in the county.

Another important issue that relates directly to productivity and therefore, competitiveness of the country's business environment is the capacity to innovate and upgrade. Although the survey did determine that firms in the Philippines do innovate in terms of introduction of new products and services, upgrading of machineries and equipment, and opening of a new market, they tended to rely on their own in-house capabilities for their source of technology as revealed by the survey. Since there appears to be a much less degree of collaboration with other local institutions in terms of financial support and actual R&D outputs, this is an area that should be looked at more by the policy makers and these respective institutions themselves including industry representatives. On the other hand, the fact that there is actual technology transfer occurring between firms and MNCs is a good indication of the level of linkages existing that goes beyond simple principal-sub-contactor or buyer-supplier relationships. More of this sort is needed to increase the sophistication of industrial activities being undertaken by local firms. The survey shows that the main activities of firms – even some clusters – relate to assembly of goods and products or manufacturing of components and parts. With the emergence of low-cost locations like Vietnam, China, and soon perhaps, Cambodia, the country would eventually lose its advantage in this regard. Thus, it is vital that the activities of its industries should move up the value chain. The clustering strategy, particularly if all stakeholders optimize their potential and their collaboration, may prove to be a step in this direction with the knowledge exchange and spillovers that are supposed to happen.

4.3. Issues from the Econometrics Analysis

In terms of the estimation results on agglomeration in the Philippines, the analysis shows that when it comes to the relationship between year of establishment and firm size, the Philippine case does not appear to be consistent with the Flowchart Approach. Using number of full time employees as indicator of firm size provided the general finding that the latecomers in the Philippines are smaller firms. However, no significant relationship was found. When asset size and capital were used as indicators (they have

the same results), the significance level increased and in almost all categories of firm size. With the sign coming out as positive, the result implies that all firms agglomerated in the latter period (1990s). Since it appears that it is not the larger (or smaller) firms that triggered their influx, it can be deduced that the agglomeration was policy driven or came about as a result of the opening up of the economy and the availability of incentives for investments and physical infrastructure present. These are even borne out by the survey results as the latter two factors were identified as those that influenced the decision of firms to locate in the area.

In terms of the particular factors that attracted firms to locate in the Philippines, those that were found to be significant in all three models (employees, assets, capital) are investment incentives, protection of intellectual property rights, size of local markets, and proximity to suppliers/subcontractors. Meanwhile, those that were found to have influenced first movers who were more into production of final products, were the supporting industries found to be present such as suppliers and subcontractors, local content requirements, and size of the local market. Their entry to the Philippines was further influenced by the liberal trade policy, the institutional infrastructure of the government and customs procedures prevailing. The latecomers are firms in all sizes mainly into production of parts and components that clustered in the country due to the investment incentives offered, access to export markets, availability of low-wage labors, presence of telecommunications and IT infrastructure, and the legal framework and programs protecting intellectual property rights.

Some key variables such as legal systems, skilled labor, cutting-edge technology and information were not found to be significant in the Philippines, although these are claimed to have influenced the agglomeration in other countries.

Given these findings, particularly the policy driven agglomeration of firms in the country, it becomes more imperative that those policies that yield good results in terms of the investment potential of the country should be continued and pursued. Key factors that are equally important but were not identified as significant should be reviewed and when policy gaps are determined, addressed in order to add into the competitive advantage of the Philippines.

In terms of the estimates in upgrading and innovation, the results were found to be not robust to the different models. In particular, some variables are significantly positive

in one model, but they become significantly negative in other models. However, it can still be deduced that the positive factors for upgrading are local content requirement and the size of the market as those firms that have undergone innovation were satisfied with these variables. On the other hand, firms were not satisfied with government institutional infrastructures, financial systems, and living conditions that can be regarded as discouraging factors for innovation. These hurdles to upgrading should be addressed in order to improve the productivity and competitiveness of industries in the Philippines.

NOTES

[i] Fan, Cindy C. and Allen Scott (2003) cited such scholars as Krugman (1991) and Porter (2001) in their article appearing in the journal, *Economic Geography*.

[ii] ASEAN is acronym for Association of South East Asian Nations.

[iii] Figures based on data collected from the ASEAN Secretariat's FDI Database; Global Development Finance, 2005; UNCTAD FDI Interactive Database; and, IMF Direction of Trade Statistics, 2005.

[iv] Data from the National Statistics Office and National Statistical Coordination Board.

[v] Aldaba, R.M. (2006) "FDI Investment Incentive System and FDI Inflows: The Philippine Experience." PIDS Discussion Paper; Bangko Sentral ng Pilipinas; International Monetary Fund.

[vi] Board of Investments and National Statistical Coordination Board.

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APPENDIX

Table A1: Estimation of Agglomeration (Philippines): Full Model

			Full-time Employees		Total Assets		Paid-UP Capital	
			Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Q3)	2	50 - 99persons/1M - less than 5M (Philippine Peso)/1M - less than 5M (Philippine Peso)	0.451	1.81 *	0.861	2.84 **	0.887	3.17 **
	3	100 - 199/5M - less than 10M/5M - less than 10M	0.47	1.54 +	1.448	4.08 **	1.101	3.29 **
	4	200 - 299/10M - less than 15M/10M - less than 15M	-0.025	-0.06	0.653	1.5 +	0.72	1.69 *
	5	300 - 399/15M - less than 20M/15M - less than 20M	-0.571	-0.94	1.423	2.66 **	1.058	2.03 **
	6	400 - 499/20M - less than 50M/20M - less than 50M	-0.465	-0.56	1.841	4.7 **	1.257	3.61 **
	7	500 - 999/50M - less than 100M/50M - less than 100M	-0.721	-1.32 +	1.47	3.7 **	1.928	3.91 **
	8	1,000 - 1,499/100M- less than 500M/100M- less than 500M	-0.504	-0.73	1.953	5.59 **	1.503	3.74 **
	9	1,500 - 1,999/500M - less than 1B/500M - less than 1B	34.761	0	1.21	2.21 **	0.606	0.88
	10	2,000 and above/1B and above /1B and above	35.512	0	1.969	4.21 **	1.591	2.56 **
Q7)	1)	Investment incentives including tax incentives	0.164	1.73 *	0.134	1.38 +	0.144	1.51 +
	2)	Liberal trade policy	-0.124	-1.1	-0.063	-0.55	-0.086	-0.76
	3)	Customs procedures	-0.073	-0.65	-0.167	-1.44 +	-0.136	-1.19
	4)	Local content requirements, rule of origin	-0.121	-1.2	-0.178	-1.69 *	-0.108	-1.05
	5)	Physical infrastructure (roads, highways, ports, airports, etc.)	-0.05	-0.41	0.001	0.01	-0.072	-0.59
	6)	Infrastructure (telecommunications, IT)	0.206	1.28	0.12	0.75	0.136	0.87
	7)	Infrastructure (electricity, water supply, other utilities)	0.023	0.15	0.05	0.31	0.074	0.47
	8)	Government institutional infrastructure	-0.147	-1.2	-0.242	-1.89 *	-0.197	-1.57 +
	9)	Financial system	-0.015	-0.11	0.01	0.07	0.017	0.12
	10)	Legal system	-0.035	-0.25	0.079	0.56	0.012	0.09
	11)	Protection of intellectual property rights	0.159	1.4 +	0.132	1.14	0.174	1.51 +
	12)	Size of local markets	-0.186	-2.03 **	-0.142	-1.53 +	-0.154	-1.68 *
	13)	Access to export markets	0.172	1.93 *	0.157	1.72 *	0.112	1.24
	14)	Proximity to suppliers/subcontractors	-0.188	-2.05 **	-0.134	-1.4 +	-0.133	-1.42 +
	15)	Request by large/related company	-0.011	-0.24	-0.007	-0.15	-0.011	-0.23
	16)	Availability of low-cost labor	0.137	1.46 +	0.098	1.02	0.096	1
	17)	Availability of skilled labor and professionals	0.022	0.18	-0.029	-0.23	0.003	0.02
	18)	Other companies from the same country are located here (synergy)	0.057	0.65	0.088	0.96	0.054	0.6
	19)	Access to cutting-edge technology and information	0.003	0.02	-0.013	-0.11	-0.007	-0.06
	20)	Living conditions	0.07	0.64	0.091	0.81	0.072	0.65
Q6) 7.8)		Retail/ Wholesale trade	0.035	0.15	0.235	0.99	0.226	0.96
	1)	Production (raw-material processing)	-0.352	-1.21	-0.296	-0.98	-0.299	-1.02
	2)	Production (components and parts)	1.083	3.57 **	1.159	3.71 **	1.136	3.65 **
	3)	Production (final products)	-0.482	-2.18 **	-0.49	-2.21 **	-0.489	-2.23 **
	5)	Purchasing/ Procurement/ Logistics	0.11	0.3	0	0	0.01	0.03
	14)	R&D/ Consulting	-0.38	-0.58	-0.297	-0.44	-0.117	-0.18
	15)	Human resources development	0.251	0.57	0.204	0.45	0.204	0.45
		/cut1	-0.224		0.41		0.167	
		/cut2	0.831		1.56		1.275	
		Number of observations	461		461		461	
		Log likelihood	-456.875		-434.818		-444.054	
		Pseudo R2	0.075		0.12		0.101	

Note: **, * and + indicates that coefficient is at the 5, 10 and 20% significant level, respectively.

Table A2: Estimation of Agglomeration (Philippines): Selected Model

		Full-time Employees		Total Assets		Paid-UP Capital	
		Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Q3)	2 50 - 99persons/1M - less than 5M (Philippine Peso)/1M - less than 5M (Philippine Peso)	0.519	2.21 **	0.733	2.59 **	0.904	3.54 **
	3 100 - 199/5M - less than 10M/5M - less than 10M	0.631	2.15 **	1.371	4.13 **	1.062	3.25 **
	4 200 - 299/10M - less than 15M/10M - less than 15M					0.734	1.92 *
	5 300 - 399/15M - less than 20M/15M - less than 20M			1.327	2.56 **	1.165	2.37 **
	6 400 - 499/20M - less than 50M/20M - less than 50M			1.479	4.25 **	1.094	3.45 **
	7 500 - 999/50M - less than 100M/50M - less than 100M	-0.767	-1.47 +	1.41	3.84 **	1.957	4.08 **
	8 1,000 - 1,499/100M- less than 500M/100M- less than 500M			1.771	5.42 **	1.41	3.74 **
	9 1,500 - 1,999/500M - less than 1B/500M - less than 1B			1.133	2.18 **		
	10 2,000 and above/1B and above /1B and above			1.826	4.08 **	1.573	2.58 **
Q7) 1)	Investment incentives including tax incentives	0.163	1.86 *	0.142	1.64 +	0.112	1.33 +
2)	Liberal trade policy	-0.171	-1.64 +				
3)	Customs procedures			-0.191	-1.83 *	-0.165	-1.86 *
4)	Local content requirements, rule of origin	-0.142	-1.5 +	-0.153	-1.63 +		
5)	Physical infrastructure (roads, highways, ports, airports, etc.)						
6)	Infrastructure (telecommunications, IT)	0.197	1.71 *				
7)	Infrastructure (electricity, water supply, other utilities)						
8)	Government institutional infrastructure	-0.156	-1.46 +				
9)	Financial system						
10)	Legal system						
11)	Protection of intellectual property rights	0.166	1.7 *	0.172	1.8 *	0.17	1.95 *
12)	Size of local markets	-0.208	-2.5 **	-0.138	-1.74 *	-0.145	-1.89 *
13)	Access to export markets	0.118	1.48 +	0.133	1.64 +		
14)	Proximity to suppliers/subcontractors	-0.198	-2.23 **				
15)	Request by large/related company	0.122	1.45 +				
16)	Availability of low-cost labor	0.149	1.75 *				
17)	Availability of skilled labor and professionals						
18)	Other companies from the same country are located here (synergy)						
19)	Access to cutting-edge technology and information						
20)	Living conditions						
Q6) 7.8)	Retail/ Wholesale trade						
1)	Production (raw-material processing)	-0.43	-1.55 +				
2)	Production (components and parts)	1.158	3.93 **	1.042	3.6 **	1.05	3.72 **
3)	Production (final products)	-0.468	-2.37 **	-0.492	-2.46 **	-0.437	-2.27 **
5)	Purchasing/ Procurement/ Logistics						
14)	R&D/ Consulting						
15)	Human resources development						
	/cut1	-0.307		0.112		-0.022	
	/cut2	0.741		1.232		1.051	
	Number of observations	469		473		480	
	Log likelihood	-468.075		-454.737		-471.158	
	Pseudo R2	0.069		0.103		0.084	

Note: **, * and + indicates that coefficient is at the 5, 10 and 20% significant level, respectively.

Table A3: Results of Industrial Upgrading and Innovation (Philippines): Full Model

	Goods Coefficient	t-value	Methods Coefficient	t-value	Markets Coefficient	t-value	Suppliers Coefficient	t-value
Q8) 1) Investment incentives including tax incentives	-0.008	-0.03	0.006	0.02	0.185	0.82	0.054	0.3
2) Liberal trade policy	0.43	1.32 +	-0.096	-0.31	0.338	1.28	-0.074	-0.33
3) Customs procedures	-0.021	-0.06	-0.382	-1.17	0.054	0.19	-0.157	-0.68
4) Local content requirements, rule of origin	0.093	0.26	0.621	1.82 *	-0.343	-1.09	0.018	0.07
5) Physical infrastructure (roads, highways, ports, airports, etc.)	0.49	1.48 +	0.405	1.24	-0.144	-0.53	0.228	0.94
6) Infrastructure (telecommunications, IT)	0.38	0.96	-0.648	-1.63 +	-0.09	-0.25	0.688	2.23 **
7) Infrastructure (electricity, water supply, other utilities)	-0.964	-2.45 **	-0.393	-1.02	0.499	1.39 +	-0.364	-1.22
8) Government institutional infrastructure	-0.176	-0.53	0.104	0.34	0.292	1.1	-0.131	-0.53
9) Financial system	-0.666	-1.83 *	0.229	0.56	-0.07	-0.22	0.163	0.59
10) Legal system	0.055	0.16	0.484	1.44 +	-0.417	-1.4 +	-0.123	-0.49
11) Protection of intellectual property rights	-0.228	-0.73	-0.117	-0.38	0.269	0.97	0.091	0.4
12) Size of local markets	0.382	1.17	0.446	1.42 +	0.256	0.97	0.449	2.01 **
13) Access to export markets	-0.009	-0.04	-0.195	-0.75	-0.146	-0.6	-0.327	-1.69 *
14) Proximity to suppliers/subcontractors	-0.111	-0.33	-0.224	-0.74	-0.437	-1.44 +	-0.08	-0.32
15) Request by large/related company	-0.235	-0.83	-0.237	-0.9	-0.525	-2.15 **	-0.425	-2.06 **
16) Availability of low-cost labor	0.1	0.34	0.07	0.24	-0.251	-1.02	0.277	1.26
17) Availability of skilled labor and professionals	-0.263	-0.94	-0.312	-1.16	0.21	0.81	0.134	0.6
18) Other companies from the same country are located here (synergy)	-0.166	-0.6	-0.435	-1.59 +	0.34	1.38 +	0.071	0.33
19) Access to cutting-edge technology and information	0.368	0.93	0.006	0.02	0.159	0.48	-0.315	-1.15
20) Living conditions	0.014	0.04	0.117	0.33	-0.441	-1.37 +	-0.386	-1.38 +
Q6) 7.8 Retail/ Wholesale trade	-0.547	-0.87	0.762	1.44 +	-1.775	-2.53 **	0.041	0.1
1 Production (raw-material processing)	0.774	1.22	-0.325	-0.38	-0.198	-0.29	0.107	0.2
2 Production (components and parts)	-0.971	-1.29 +	-0.78	-0.9	-0.156	-0.27	-0.128	-0.25
3 Production (final products)	0.249	0.52	-0.178	-0.32	0.751	1.73 *	-0.898	-2.18 **
5 Purchasing/ Procurement/ Logistics	-1.356	-1.38 +	0.47	0.56	0.31	0.44	0.084	0.13
14 R&D/ Consulting	1.59	0.57	2.226	1.24	0.966	0.62	2.047	1.49 +
15 Human resources development	0.183	0.15	-1.411	-1.11	0.155	0.18	0.332	0.45
Q1) When did your company establish its first office?	0.008	0.56	-0.001	-0.11	-0.003	-0.28	0.002	0.16
constant	-16.053	-0.56	2.591	0.1	5.325	0.25	-3.598	-0.18
Number of observations	229		229		229		229	
Log likelihood	-77.603		-74.46		-91.148		-120.539	
Pseudo R2	0.162		0.196		0.197		0.145	

Note: **, * and + indicates that coefficient is at the 5, 10 and 20% significant level, respectively.

Table A4: Results of Industrial Upgrading and Innovation (Philippines): Selected Model

		Goods		Methods		Markets		Suppliers	
		Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Q8)	1) Investment incentives including tax incentives								
	2) Liberal trade policy								
	3) Customs procedures			-0.405	-2.16 **				
	4) Local content requirements, rule of origin								
	5) Physical infrastructure (roads, highways, ports, airports, etc.)			0.38	1.61 +				
	6) Infrastructure (telecommunications, IT)	0.41	1.66 *	-0.427	-1.87 **			0.75	3.03 **
	7) Infrastructure (electricity, water supply, other utilities)							-0.33	-1.49 +
	8) Government institutional infrastructure	-0.371	-1.71 *						
	9) Financial system	-0.608	-2.47 **						
	10) Legal system			0.437	1.91 *				
	11) Protection of intellectual property rights								
	12) Size of local markets							0.38	2.08 **
	13) Access to export markets							-0.36	-2.24 **
	14) Proximity to suppliers/subcontractors								
	15) Request by large/related company					-0.518	-3.71 **	-0.47	-2.7 **
	16) Availability of low-cost labor							0.32	1.77 *
	17) Availability of skilled labor and professionals								
	18) Other companies from the same country are located here (synergy)			-0.488	-2.8 **				
	19) Access to cutting-edge technology and information								
	20) Living conditions							-0.55	-2.51 **
Q6) 7.8	Retail/ Wholesale trade	-1.124	-1.98 **			-1.344	-2.67 **		
	1 Production (raw-material processing)								
	2 Production (components and parts)	-0.779	-1.36 +						
	3 Production (final products)							-1.09	-2.94 **
	5 Purchasing/ Procurement/ Logistics								
	14 R&D/ Consulting							2.31	1.99 **
	15 Human resources development								
Q1)	When did your company establish its first office?								
	constant	0.621	0.77	-0.369	-0.44	0.565	1.22	0.07	0.09
	Number of observations	263		257		268		250	
	Log likelihood	-98.076		-95.512		-125.35		-134.927	
	Pseudo R2	0.097		0.098		0.088		0.135	

Note: **, * and + indicates that coefficient is at the 5, 10 and 20% significant level, respectively.

3

The Development of Industrial Agglomeration and Innovation in Thailand

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Abstract

This study aimed to look at agglomeration development in Thailand. The textile and garments industry, and the electrical and electronics industry were used as the examples to explain the development. Interviews were also conducted with representatives from both industries that were used for the case study. Mail survey was used to gather data for three groups of firms, local companies, foreign companies and joint venture companies. The focus of the survey aims to identify influential factors to agglomeration and the innovation of the agglomeration. Based on the result of the survey, some of the factors were found significantly affecting to the development of Thai industrial agglomeration. However, the innovation of agglomeration cannot be concluded clearly since the result from the analysis showed that there were no significant common factors to explain the upgrading of industry among models.

INTRODUCTION

Strong economic background usually comes from strong industrial section of the country that is why most of the countries try to strengthen their industries. However, the strength of industry in each country may come from different paths. For industrial countries, they have originally built their own technology and industrial system. Until the present time as the world becomes smaller, many companies from industrial

countries seek for the new opportunity to invest outside the country. Non-industrial countries such as many countries in Asia are their targets of investment. Many of non-industrial countries have then turned up to be the new industrial countries; Thailand is one of them. Now, gross domestic product (GDP) of Thailand is depended on industrial section rather than on agriculture section as it used to be in the past. As the new comer in industry, Thailand has to find the right way to promote industry of the country in the long term. Industrial agglomeration is one of the effective ways to strengthen the industrial section of Thailand. Therefore, to understand the formation of industrial agglomeration is quite essential for the country to allocate the limited resources to promote industrial agglomeration. Not only helping in suitable resources allocating for the country but also by understanding the formation of industrial agglomeration, it can help the country to understand the needs of them. By the concept Flowchart Approach, Kuchiki, A. and M. Tsuji (2008), the formation of industrial agglomeration can be understood stage by stage. However, the detail of each stage is depended on each country environment (Kuchiki, A., and M. Tsuji, 2005).

History of Thailand's industry can be dated back not more than 50 years ago. From the agricultural country in the past, today Thailand becomes one of the leading industrial countries in South East Asia. Even the short history but the country has been changed a lot and it is very interesting to understand this change. Foreign direct investment (FDI) has played the essential role for the development of Thai industry. With FDI at the earlier time, now some industrial agglomerations have been slowly formed. The agglomeration of industry can strengthen the industry of the country. Therefore, the study of agglomeration development is the objective in this study. The focus of this study aims to identify influential factors to agglomeration and the innovation of the agglomeration by analyzing the data obtained from the survey. Twenty factors were investigated in the survey and the innovation of agglomeration was identified by checking if there was any upgrading in term of technology of production, product, market and sources of supply in the past three years.

This report starts with a discussion of the Thai government policy on industrial clustering to provide some context for the succeeding sections. The next section gives a summary of the development of the two industries in Thailand. The data for the survey were summarized as descriptive statistics and analyzed by econometric analysis in the

last two sections.

1. RESEARCH OBJECTIVES AND METODOLOGY

This study was conducted to analyze the current situation of industrial agglomeration in Thailand in all aspects, including influential factors to agglomeration and innovation of agglomeration. Specifically, it focused on two major sectors, the textile and garments and the electrical and electronics industries.

The research consisted of two parts: a mail survey conducted in November 2007 to collect primary data for statistical analysis and econometric analysis, and interviews with the companies used as the case study.

Since the two groups of industries mentioned have played very important roles in the industrial agglomeration of Thailand, some companies from those groups were selected to represent their respective industries for the cases study: Toshiba Thailand Co. Ltd. for the electrical and electronics industry, and Thai Rut Knitting Co. Ltd. and Oriental Garment Co. Ltd. for the textile and garment industry.

2. THE GOVERNMENT POLICY ON INDUSTRIAL CLUSTERING IN THAILAND

In the past, Thailand development policies were usually a top-down process. The top authorities provided policy and direction, then lower level government agencies would follow. However, the development of industrial clusters would require a very different technique.

According to the flowchart approach (Kuchiki and Tsuji 2008), the development of industrial clusters can be subtle and complex. It requires a synchronization of many components, from both public and private sectors. Therefore, instead of using a presumption and generate a top-down policy, the Thai government attempted to determine the right combination of top-down and bottom-up approaches for which the

policy will not be presumption- issued without a thorough study about the relationships among the business groups involved. Until the formation of relationships that evolved into a network in a well-defined geographic area can be clearly identified, then the government policies and supports could not be issued. Some examples of the relevant government policies discussed below.

In 2004, the government of Thailand planned to support the development of eight industrial clusters. The plan was to have two clusters in each of the fours regions, namely, the North, the Northeast, the Central and the South. It was reported that these industrial clusters would be developed upon 33 existing core industries such as foods, garments, automobiles, electronics parts, plastics, electric appliances, household products, and the like. The Central region where many industrial estates were located, was hoped to become an economic hub of Southeast Asia.

Also, in December 2003, the Board of Investment of Thailand (BOI) released a new investment policy, stating that the provincial clusters should be developed from the viewpoint of improving industrial competitiveness. This provincial industrial cluster strategy of the BOI was designed to support the provincial development plan of Chief Executive Officer (CEO)- Governors. The BOI strategy planned to set up 19 clusters in 4 regions of Thailand as follows:

1. The North (16 provinces, 3 clusters) is to be the IT cities and software parks through of foreign direct investments (FDIs) from the United States (US), Japan and India.

2. The Northeast (19 provinces, 5 clusters) is to be the One Tambon One Product (OTOP) related research and development (R&D) hub and supporting industries related with investment from Japan and the US.

3. The Central and Eastern regions are to be the biotechnology, agro-related R&D, automobiles, electronics, tourism and distribution- related industries through investments from Japan, South Korea, US, and the European Union (EU).

4. The South (14 provinces, 5 clusters) is to be a cluster of tourism, distribution, rubber, and *halal* food for Moslems, considering its closeness to Malaysia and Singapore.

The Industrial Estate Authority of Thailand (IEAT) also planned for the development in specific industrial clusters following the national policy. According to the National Industrial Estate Strategic Plan of the IEAT, the plan for the development of two other industrial clusters is as follows: automobile industries in the Eastern Seaboard which is also known as the "Detroit in Asia", and fashion industries in the Gemopolis industrial estate and textile-garment related industries in Ratchaburi and Kanchanaburi provinces.

In the fiscal year 2005, under the National Science and Technology Development Agency (NSTDA) policy to push forward and increase the potential of the country's science and technology, the National Metal and Materials Technology Center (MTEC) adjusted its operational strategy towards a program-based and integrative operation among the existing national centers under NSTDA, so as to be in line with the development of the major clusters, namely:

1. food and agro-industry,
2. medical and public health industry,
3. automotive and transportation industry,
4. software, microchips and electronics industry,
5. energy and environmental industry, and
6. textile and chemical industry.

3. TEXTILE AND GARMENT INDUSTRY AND ELECTRICAL AND ELECTRONICS INDUSTRY

The textile and garment industry and electrical and electronics industry have a long history of development and have played very important roles in industrial agglomeration in Thailand. This section provides a brief review on these two groups of industries.

3.1. History of Development of the Textile and Garment Industry in Thailand

The history of the Thai textile and garment industry dates back to as early as the

Sukhothai period in the 13th century where cotton and silk products were handmade family products. It has slowly developed until 1922 to 1925 when Chinese merchants brought the Chinese loom into Thailand. The Thai textile and garment industry since then started to grow rapidly and can be classified into seven periods: 1) setting up of textile factories (1950-1959), 2) producing instead of importing (1960-1971), 3) producing for export (1972-1981), 4) industrial expansion for export (1982-1991), 5) gradual declining (1992-1996), 6) economic crisis (1997-2001), and 7) preparation for free trade (2002-2006). Along with these periods, some of the companies have developed themselves into large companies such as the Oriental Garment Co., Ltd. but some companies remained small such as Thai Rut Knitting Co., Ltd.

The textile and garment industry has long been a major player in the development of Thailand's economy. For example, in 2004, export from this sector was as high as 6.4 billion US dollars. Every year, it generates more than a million jobs for skilled workers in the fibers production process from yarning, knitting, dyeing, printing and finishing.

From the interview with the owner, it was found that Thai Rut Knitting Co., Ltd. was currently in a very risky status that relies on a very few customers and few suppliers. The company maintains tight relationships with the suppliers who can discuss more than business issues. There is no contract made for orders or any down payment paid for them. For example, if some orders were cancelled, the materials would remain in the stock. Moreover, each order is tied to the US currency, which has been fluctuating a lot lately, necessitating for orders to be renegotiated for the lower price. The owner once considered moving the factory to another province but was afraid of the local government power that might affect the business.

The Oriental Garment Co., Ltd. is a larger and much more advanced company. Its buyers put pressure to them to lower the lead-time for the whole supply chain. The cluster between tier one and tier two suppliers has been formed and organized by the buyers as the Supplier Summit. Moreover, the buyer organizes the Supplier Summit to create the relationship among the suppliers' group.

The buyer can select the whole chain of suppliers through this summit, which encourages all of the suppliers to work together toward a common goal of improving their production time and quality. Those suppliers who can improve the lead-time and quality of their products will remain in the cluster. However, due to the tax

infrastructure and the check price system, it has been noted that the domestic materials and supply products tend to have much higher cost than the imported ones. This encourages the use of imported products instead.

In October 2005, the BOI had commissioned a group of researchers through the Thailand Textile Institute to conduct the study *"Development and linkage between entrepreneurs of textile and garment cluster for investment development"* in four target provinces, namely, Bangkok and Metropolis, Samutsakorn, Nakornpathom, and Ratchaburi. These four sites were chosen because most of the textile and garment companies in Thailand are located in these provinces. The main objective of this study was to inform both government and private sectors with the current situation of the industry so they could prepare for the forthcoming challenges. The study focused on the following five aspects:

1. Components and distribution
2. Structure of production and trade linkage and logistics
3. Demand and supply estimation
4. Competitiveness
5. Business environmental improvement

3.2 History of Development of Electrical and Electronics Industry in Thailand

After successfully installing the electric lamps in the hall of the palace and lighting them up on the birthday of King Rama V on 20th September 1884, the Thai electrical and electronics industry has been developed gradually. The golden age of electrical industry in Thailand can be claimed to have started in 1955. It was the year that the first Thai-owned electronic-parts producer company was first established, "Thanin Company."

In 1959, the government made the policy to stimulate the development of the electrical industry infrastructure. From then on, the development of Thai electrical and electronic industry has been growing rapidly and can be classified into the following five periods: 1) production instead of importation (1960-1971), 2) production for export (1972-1985), 3) industrial expansion (1986-1992), 4) promotion of support industries (1993-1997), and 5) renovation of industrial infrastructure (1998-present).

From the interview with the Toshiba group, we found that the key factors that encouraged the foreign company to invest in Thailand were the labor cost and the business loyalty. The Thai Toshiba group has started setting up a small research and development (R&D) unit to develop new product designs for the domestic market. The factors that help these domestic companies to upgrade their business are again the costs of labor and energy.

The Thai Toshiba group maintains the same suppliers due to factors of reliability, quality, and good relationships where the former factor is given a higher priority. Another key factor for this industry is the energy cost. From the interview however, it was found that the tax infrastructure discourages the clustering in Thailand because it makes the cost of raw materials and locally supplied products higher than the imported ones.

Both the electrical and electronics industry, and the textile and garment industry still require a lot of skill workers and engineers. Thus, one of the key factors for inducing the growth in these two industries is the human resource preparation. The electrical and electronics industry is starting to develop its R&D, which requires engineers with advanced skills; on the other hand, the textile and garment industry requires skilled labor. Thus, a more aggressive government policy to stimulate the growth in these industries is required.

4. DESCRIPTIVE STATISTICS FROM THE SURVEY

The mail survey was conducted in November 2007 by sending questionnaires to 1,800 companies by mail, by e-mail and some of the questionnaires were distributed in person by random. The response rate was 8.8%, with 160 valid responses returned and most of them came from management people..

This section of the analysis will separate the respondent-companies into three categories: 1) 100% local, 2) 100% foreign, and 3) joint venture. Comparison across the three categories will be carried out on different factors to analyze their differences in perspectives and future plans.

4.1. Age of the Companies

The following figures show the number of years the companies have been established in Bangkok.

Figure 1: Number of Years the Companies has Established Office in Bangkok
(a): 100% Local
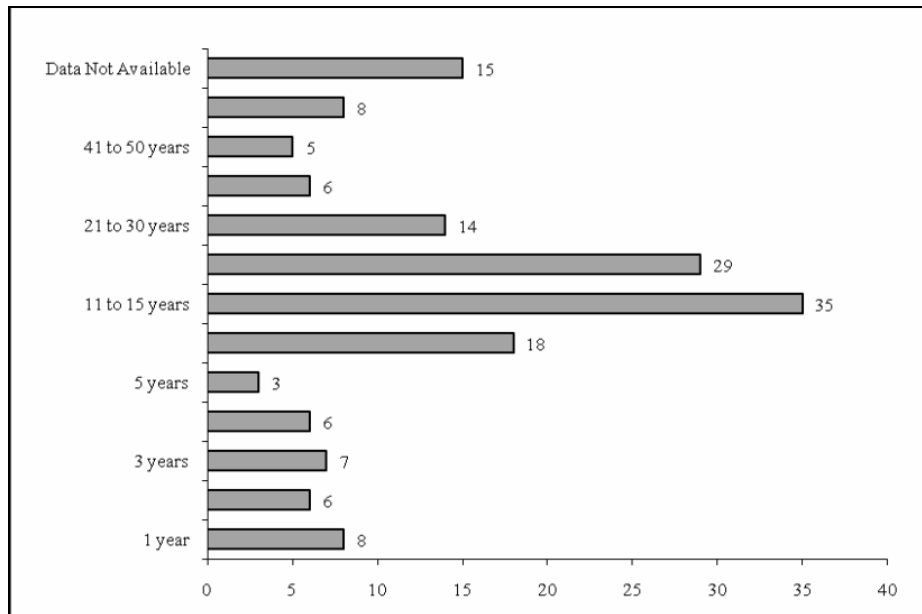
(b): 100% Foreign
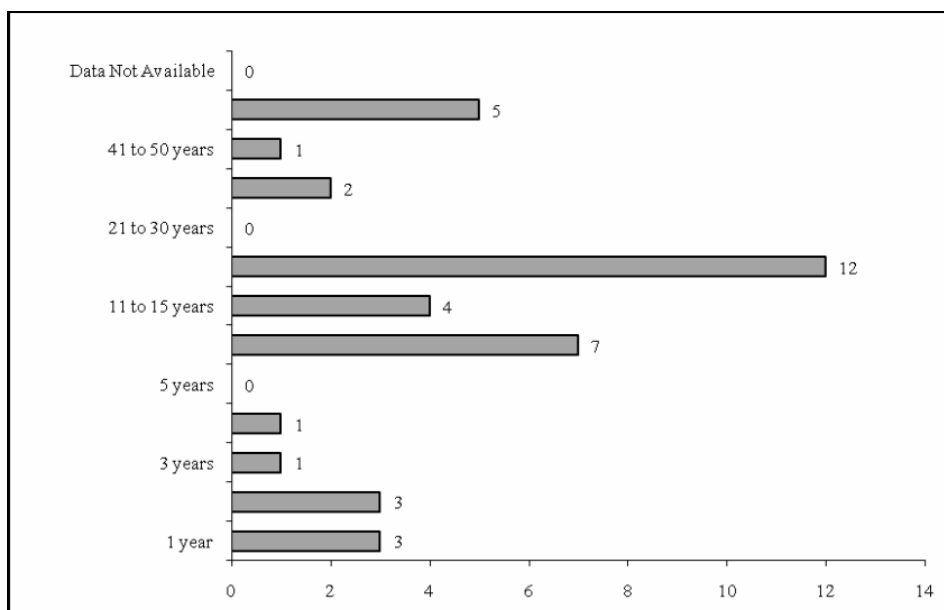
(c) Joint venture
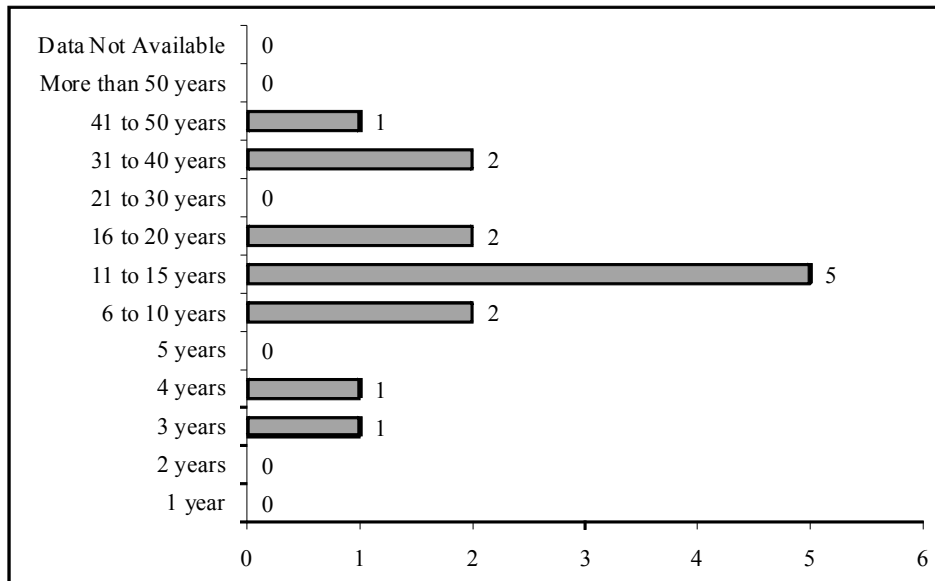
Source: Author

It can be observed from the above figures that most of the companies that participated in this survey have been established in Bangkok for 10 to 20 years. This reconfirms the credibility of the survey results and also provides a credible point of view regarding their future directions.

4.2. Business Activities

Most of the companies in this survey (almost half of those who responded) are involved in the manufacturing section as shown in Figure 2. The same trend is true for the domestic, foreign, and joint venture companies (Figures 3a, 3b and 3c). However, the local companies have more variety in their businesses such as wholesale, transportation and other service businesses; the foreign companies were also into retail and IT/software; while joint venture companies were also engaged in telecommunications. Other businesses applying across the three categories include agricultural export, engineering consultancy, security brokerage, refined alcohol, hospital service, and research and development (R&D).

Figure 2:   Main Business Activities of the Respondents
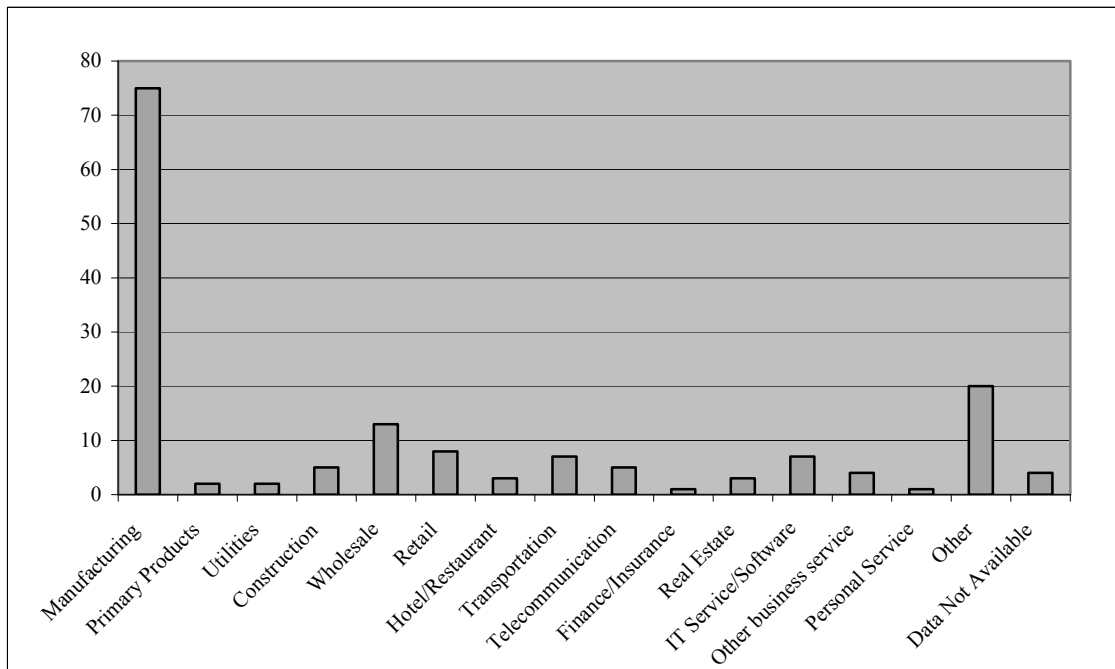
Source: Author.

Figure 3: Main Business Activities in Thailand

(a) 100% Local
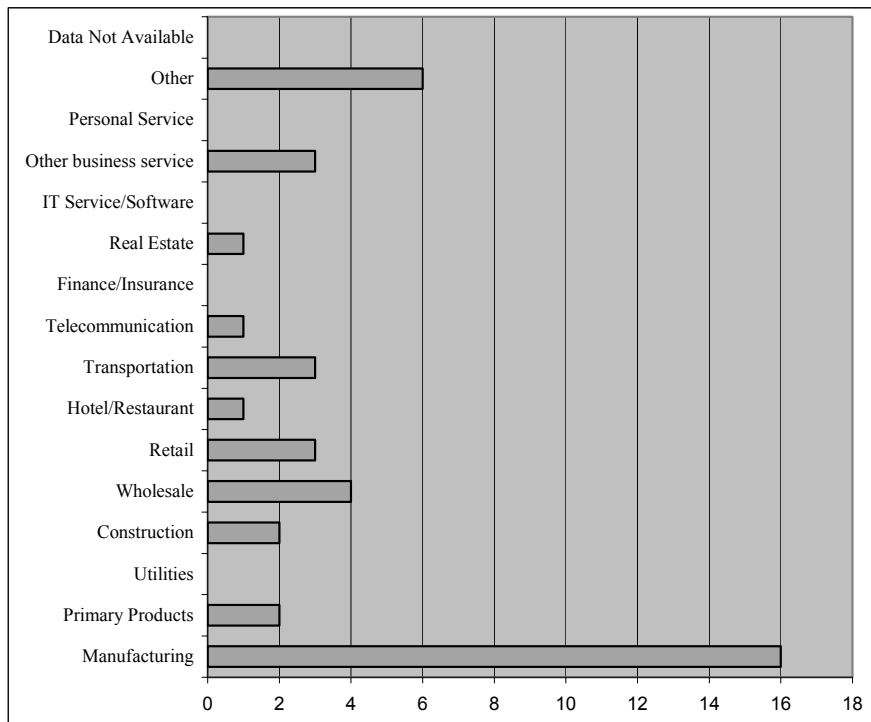
(b) 100% Foreign
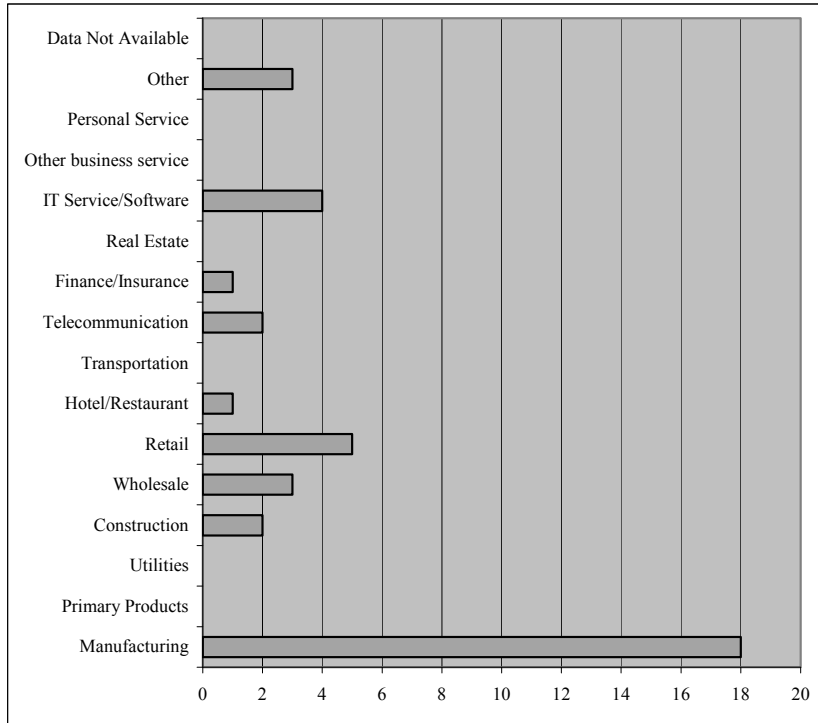
(c) Joint Venture
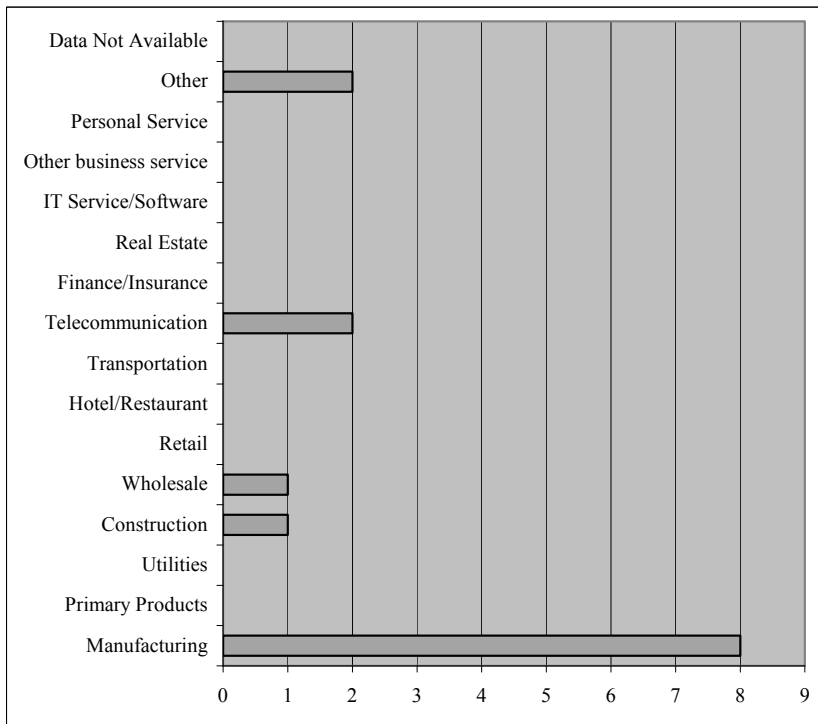
Source: Author.

4.3. Markets and Sources of Raw Materials

From various economic reports, most products produced in Thailand are supplied to or marketed locally; the result of this survey provided the same information. The companies in all three categories of have the same target market (local) and they also access most of their raw materials locally shown in Figures 4, 5 and 6. However, foreign companies have a better understanding of other countries' markets. It can be seen that foreign and joint venture companies' target and source of input are not only domestic, but also partially other countries – either ASEAN, other Asian countries, or even the US and EU as seen in Figures 5 and 6. Fig 4 is 100%local; Fig 5 is 100% foreign- owned; Fig 6 is joint ventures. The joint ventures do not market to or access inputs from the US.

One observation is that very few companies target China as their market country; this is probably because most of the major companies already have their companies established in China. Another observation is that although China has a good reputation in low cost of supply, there are only a few suppliers from China that supply to business in Thailand.

Figure 4: Target Market and Source of Raw Material for 100% Local Companies
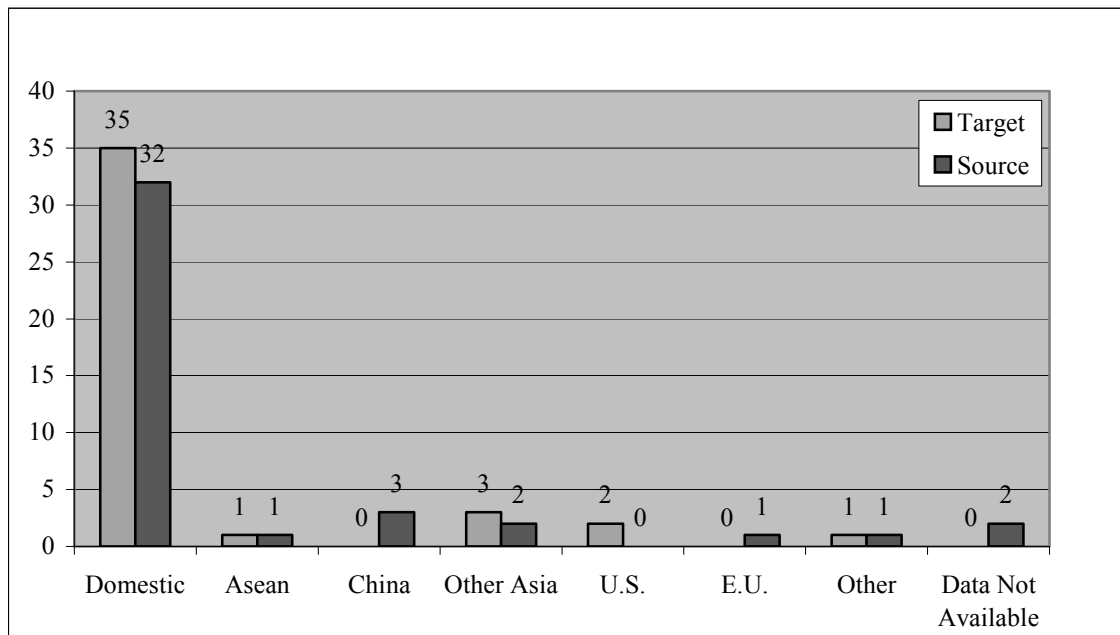
Source: Author.

Figure 5: Target Market and Source of Raw Material for 100% Foreign Companies
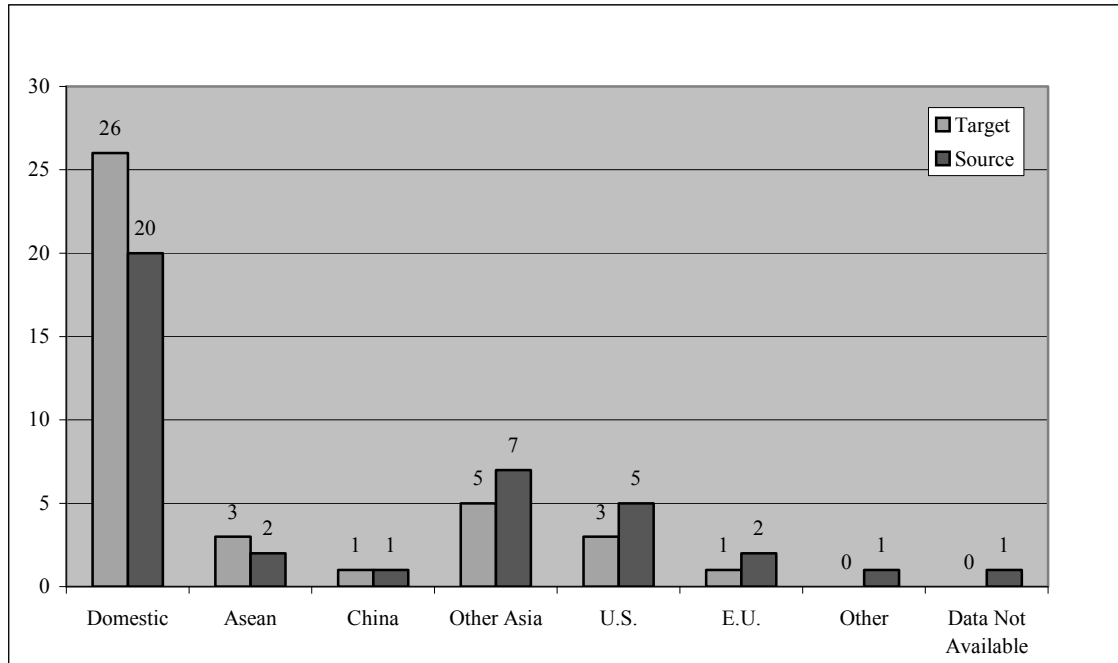
Figure 6: Target Market and Source of Raw Material for Joint Venture Companies
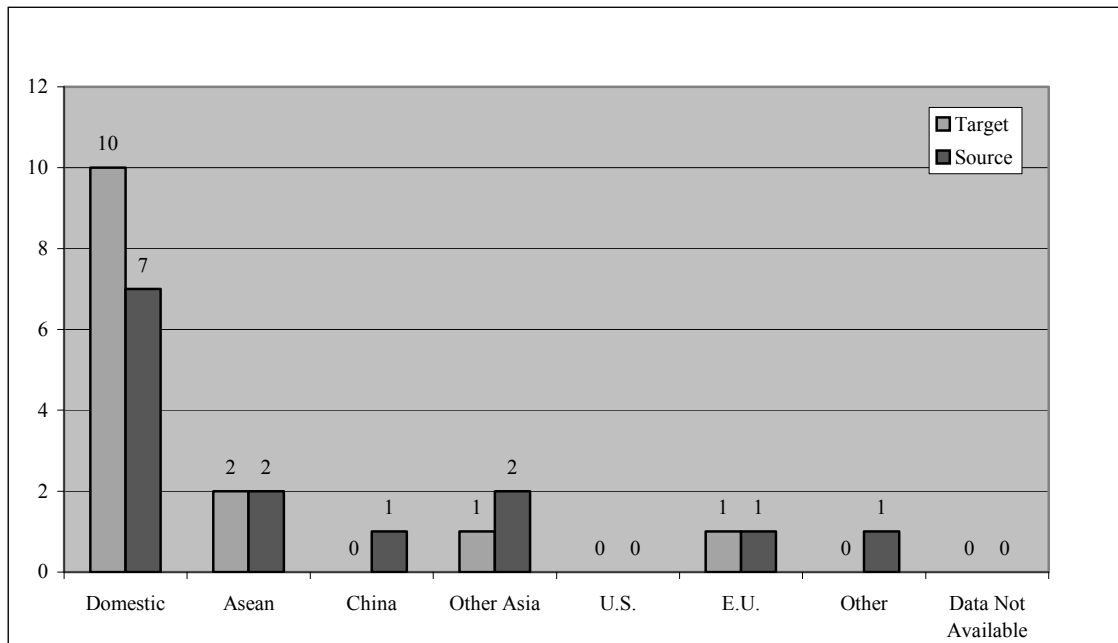
4.4. Factors Affecting Business

There are several factors that might affect the flow of business procedure. Twenty (20) factors were selected for study, shown in the Table 1.

4.4.1. Most Important Factor

From Figures 7 and 8 for local and foreign companies, Factor 12, size of local market, is the most important factor. From the previous section, it was clear that most businesses supplied their products and services locally, therefore, having local market as the first consideration in doing business is logical. Another factor that ranks quite high is Factor 1, investment incentive including tax incentive that is also a significant factor in the models of econometric analysis since several companies are members of the BOI. Under BOI's contract, companies are allowed to import raw materials tax-free and have tax deductions during the earlier years. This greatly decreased their raw material costs at the initial stages of their businesses, which also increased their profits.

Table 1: Factors Affecting the Business for Present and Future
(Used for questions 7 and 8 in the mailed survey questionnaire)

Number	Influential Factor
F1	investment incentives including tax incentives
F2	liberal trade policy
F3	customs procedures
F4	local content requirements, rule of origin
F5	physical infrastructure (roads, highways, ports, airports, etc.)
F6	infrastructure (telecommunications, IT)
F7	infrastructure (electricity, water supply, other utilities)
F8	government institutional infrastructure
F9	financial system
F10	legal system
F11	protection of intellectual property rights
F12	size of local markets
F13	access to export markets
F14	proximity to suppliers/subcontractors
F15	request by large/related company
F16	availability of low-cost labor
F17	availability of skilled labor and professionals
F18	other companies from the same country are located here (synergy)
F19	access to cutting-edge technology and information
F20	living conditions

Figure 7: The Important Factor of Present and Future for 100% Local Companies
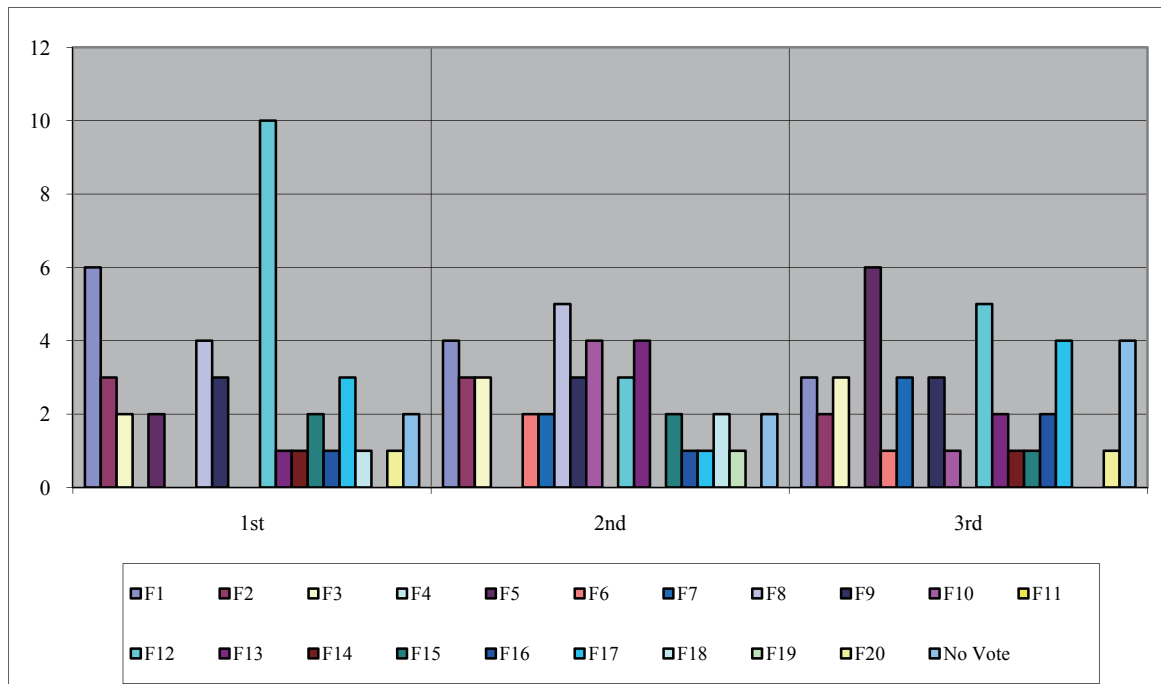
Note: See Table 1 for details on the legend.
Source: Author.

Figure 8: The Important Factor of Present and Future for 100% Foreign Companies
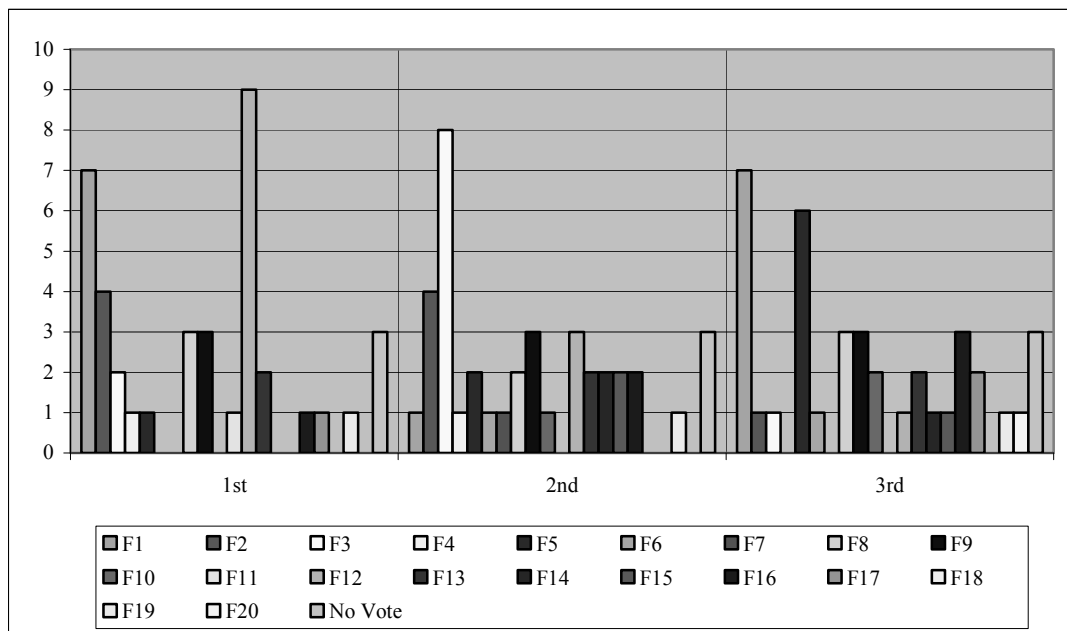
Note: See Table 1 for details on the legend.
Source: Author.

Figure 9: The important Factor of Present and Future for Joint Venture Companies
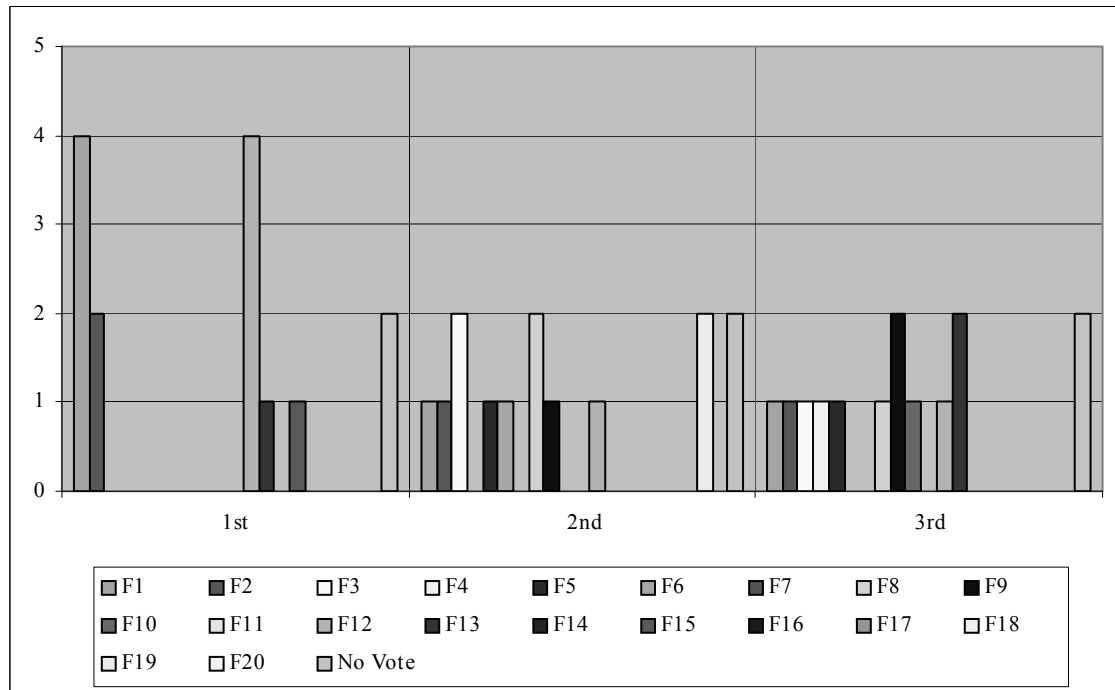
Note: See Table 1 for details on the legend.
Source: Author.

4.4.2. Second Most Important Factor

Regarding the second important factor, local companies focused on Factor 8, government institutional infrastructure, while foreign companies focused on Factor 3, customs procedures. Local companies live in Thailand, their home country; they would not want to move their businesses to other countries unless necessary.   Therefore, how organized the government is determines how stable their business life is.

On the other hand, the foreign companies already have investments in other countries. It does not make much difference if they are to move to a different country, as long as it promises better revenues. Therefore, they are more concerned about customs procedures that can affect their convenience in doing business, which includes both import and export.   Foreign companies' targets are partially other countries, therefore, customs procedures will greatly affect their business interests. Complicated procedures can delay their logistics plan.

For the second important factor, joint venture companies had shown quite an

interesting choice as shown in Figure 9; they selected both Factors 3 and Factors 8 as equally important. This answer however is quite logical since the companies in this group consist of both local and international investors. Therefore, it can be deduced that the important factors for consideration vary according to ownership of the companies.

4.5. Levels of Satisfaction

The next three figures, Figures 10, 11 and 12, showed the satisfaction level of each category of companies for the 20 factors affecting their businesses. From the figures, all three categories of companies showed that they still were not satisfied with Factor 8, government institutional infrastructure. Irrespective of the nature of the companies, it can be explained that they are all worried about Thailand's political situation. They show great concern and lack of confidence.

Figure 10: Satisfaction Level of Each Factor for 100% Local Companies
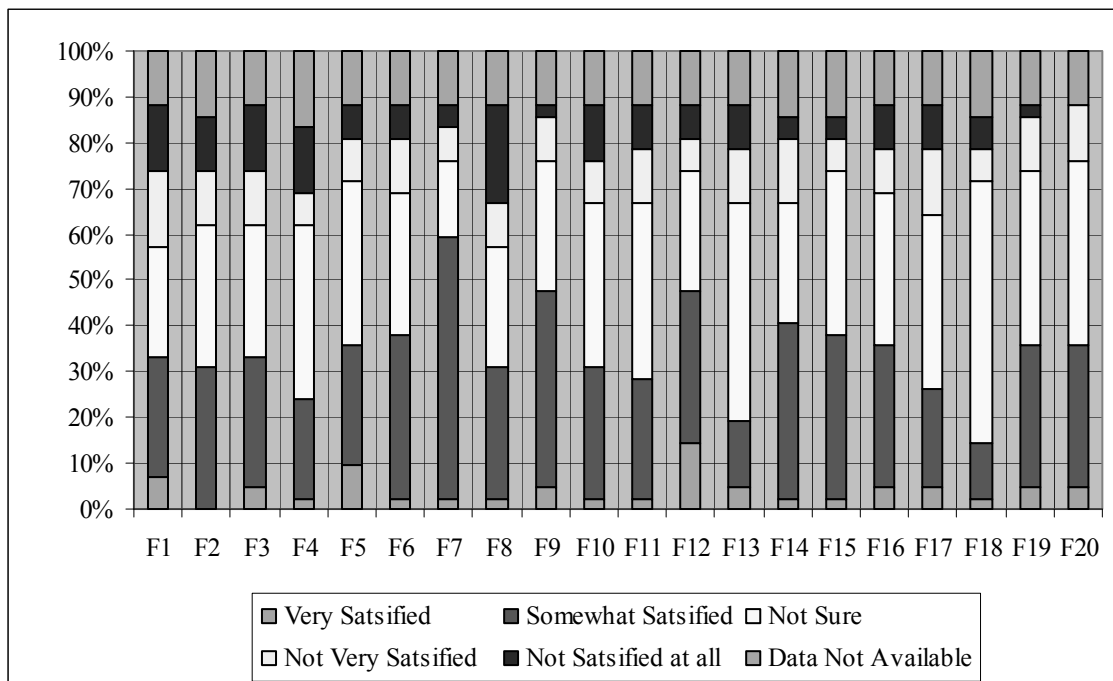
Source: Author.

Figure 11: Satisfaction Level of Each Factor for 100% Foreign Companies
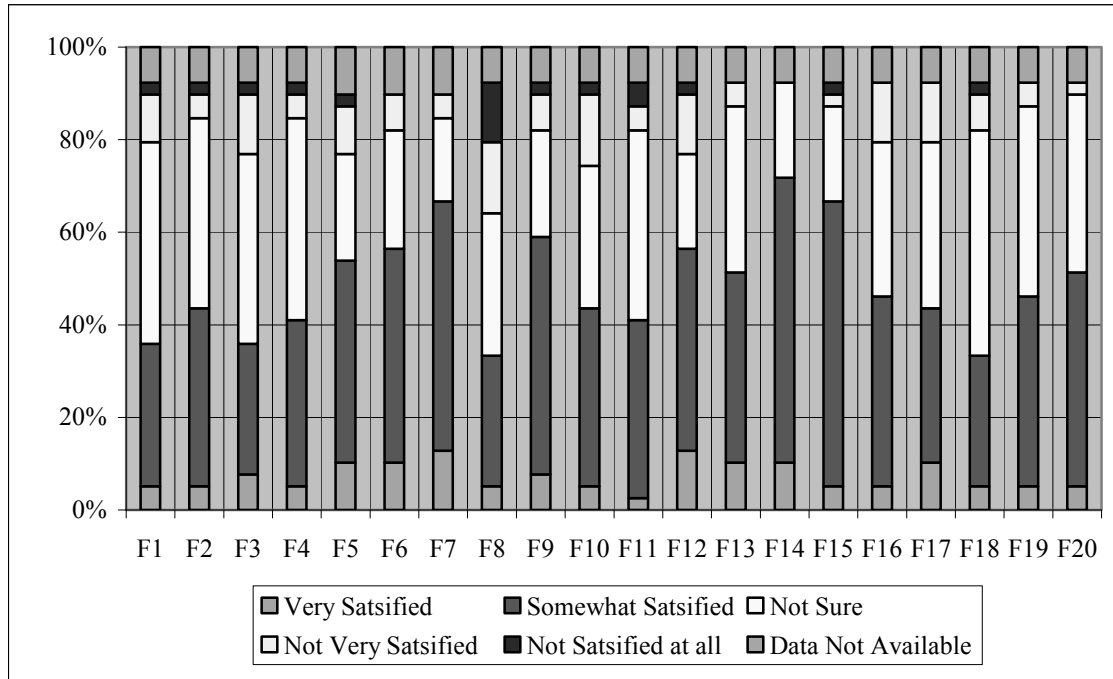
Source: Author.

Figure 12: Satisfaction Level of Each Factor for Joint Venture Companies
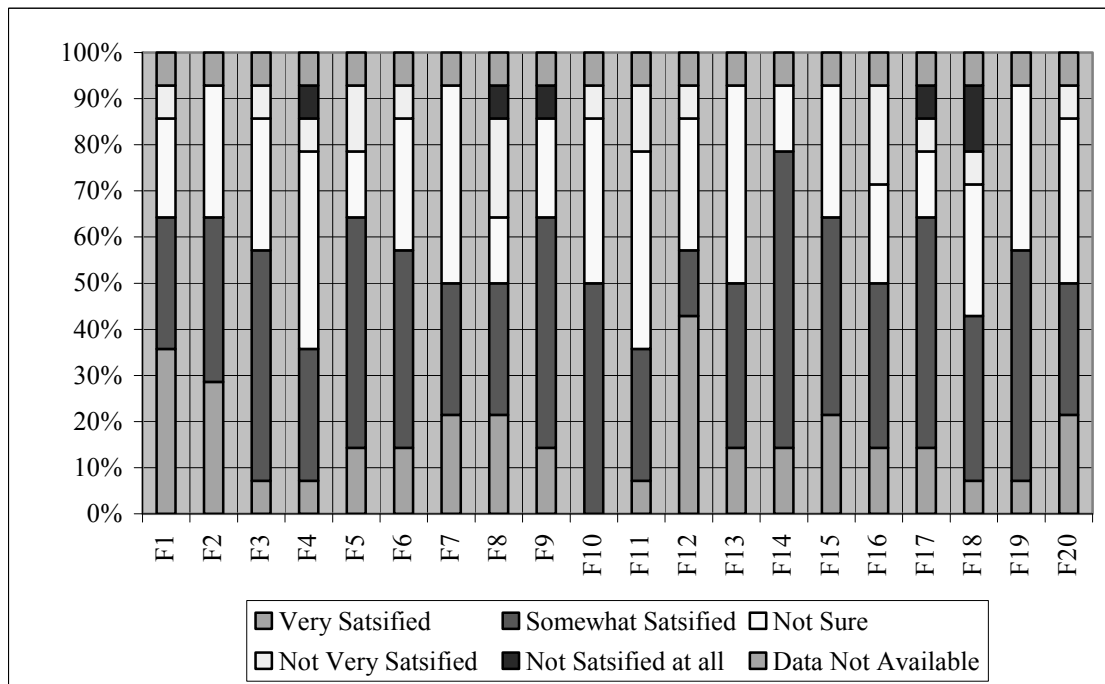
Source: Author.

However, in Figure 12, joint venture companies indicated a high dissatisfaction regarding Factor 18, other companies from the same country is located here (synergy). This is quite interesting. This may be explained as they need more companies from their home countries in the same cluster to be here in Thailand. However, according to theory of scarcity, companies should prefer being the only one with negotiating position. In this case, what they need may not be the companies from their countries with the same types of products. It may be because they are wishing for some suppliers from their own countries to setup their office in Thailand, either to shorten the transportation period or to access their trusted suppliers.

4.6. Future Plans

The companies' future plans will reflect how satisfied they are in Thailand; such plans also include how much further or bigger investment they are planning to deploy.

4.6.1. New Products, New Production Process, New Market and New Source of Supply

Figure 13 shows that even with some dissatisfaction with most of the factors, companies across the three categories are all planning to introduce new goods and products in Thailand. This implies that Thailand still has certain potential markets that each business is looking forward to.   However, many local companies show that they are not searching for new sources of supply (Figure13a). Foreign companies are looking for the new market (Figure 13b). Joint venture companies show the most interest in Thailand's market (Figure 13c). They are willing to invest in new market, new technology for production and even find new suppliers.

4.6.2. Probability of Expansion in Thailand

When companies were asked whether they would expand their office in Bangkok, the response varied. Local companies showed great interest in expansion, as seen in Figure 14. More than 50 percent of local companies are planning to do so ("yes" and "probably yes"). On the other hand, foreign companies show resistance in doing so. Eighteen out of 39 companies are interested, while 16 said they would not and another 5 were undecided. So foreign companies were not very sure whether they should expand

their business in Bangkok.

The same trend is shown by joint venture business, about half said "yes" to plans for expansion while the other half is either not sure or are not going to. This shows that although foreign investors are happy to maintain their businesses and promote new products in Thailand, still they do not have solid confidence in Thailand. The reasons are as shown from previously section regarding political infrastructure and custom procedure.

Figure 13: Future Deployment in Thailand
(a) 100% Local
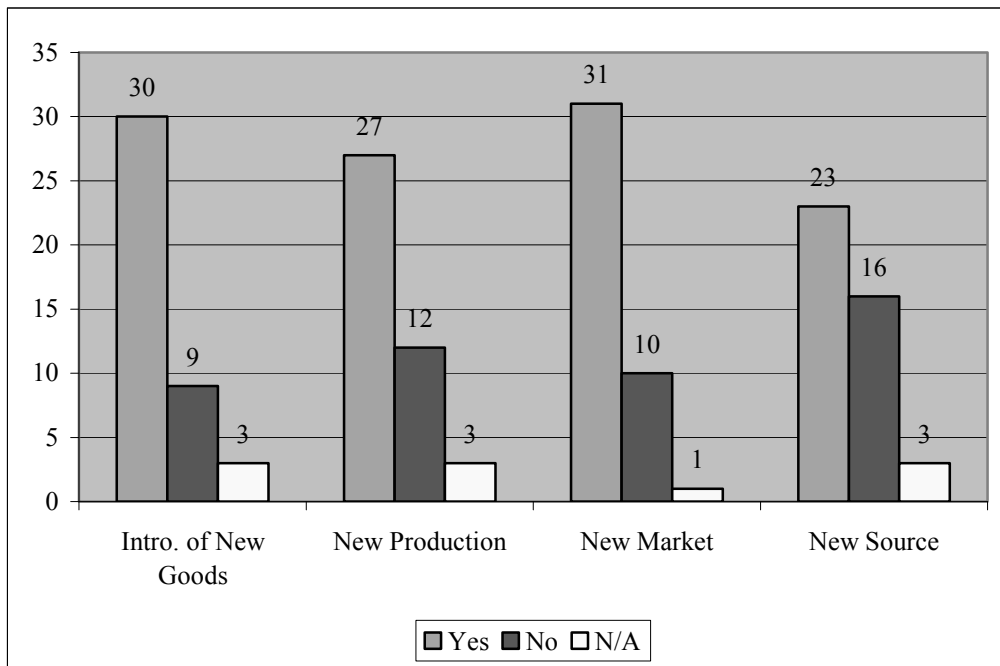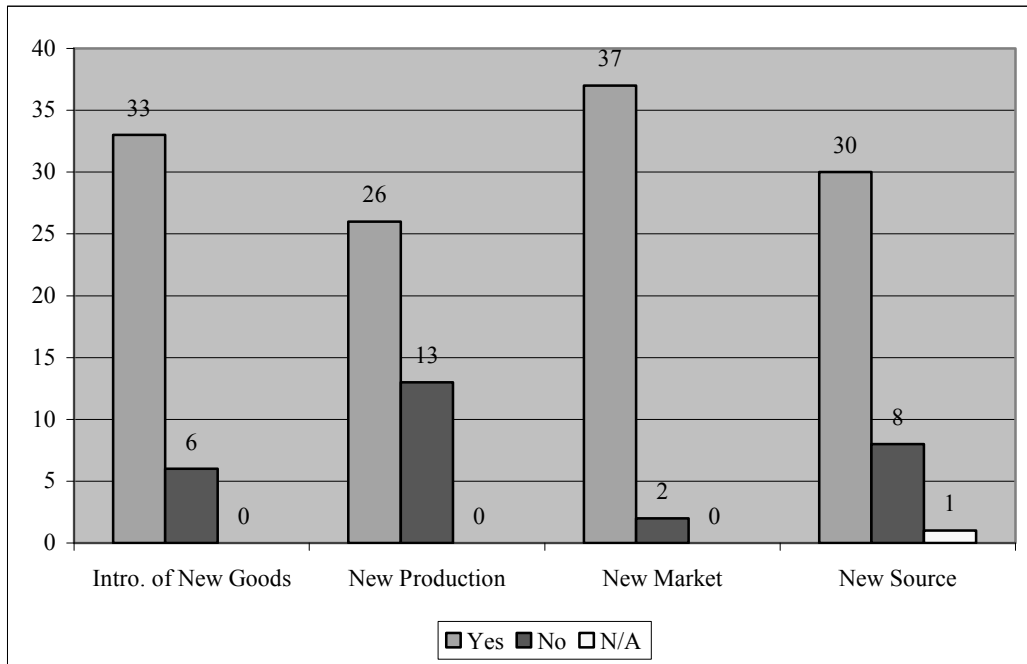
(b) 100% Foreign
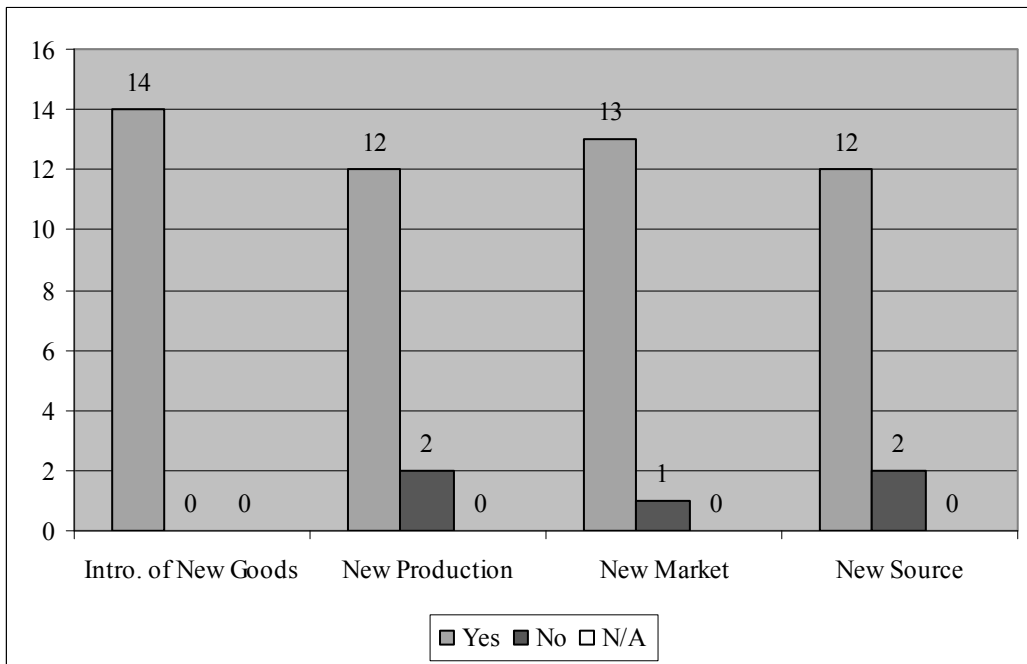
(c) Joint Venture

Source: Author.

Figure 14: Probability of Further Expansion in Bangkok

(a) 100% Local
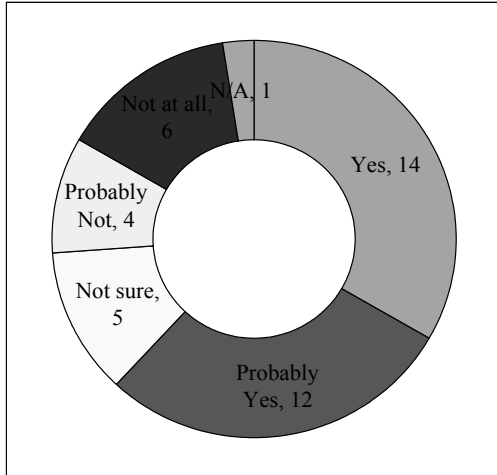
(b) 100% Foreign
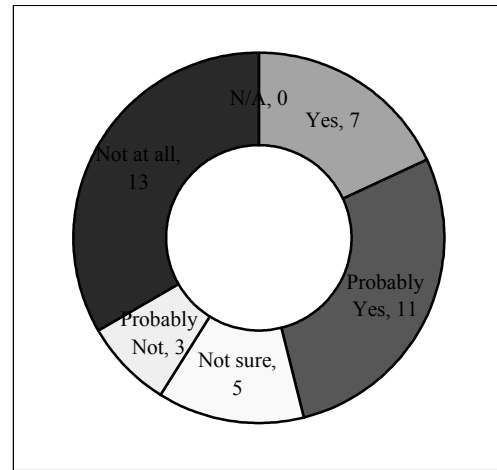
(c) Joint Venture
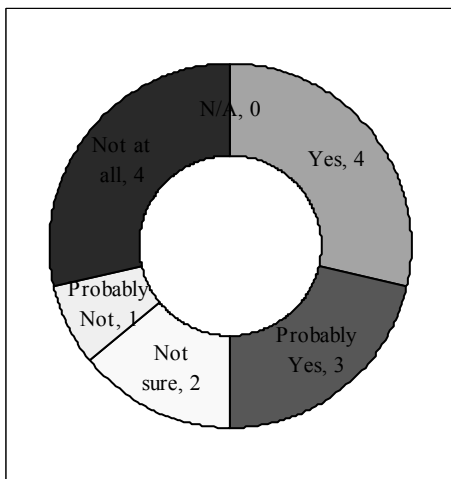
Source: Author.

5. ECONOMETRIC ANALYSIS FROM THE SURVEY DATA

5.1. Agglomeration

Based on the econometric analysis, the years of establishment of firms in Thailand can be divided into three periods according to the trend in accumulation as follows: 1) before 1985; 2) 1986-1998; and 3) after 1999, as seen in Figure 15. This result agrees

with the previous research done in 2005 by Tsuji, M., Y. Ueki, M. Miyahara and K. Somrote.

Figure 15: Accumulated Number of Offices Established in Thailand
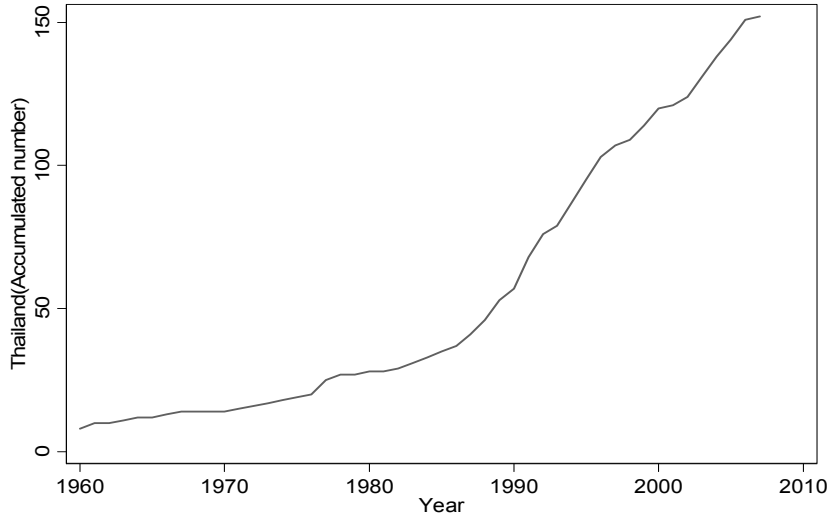
The model used to explain agglomeration in Thailand defined year of establishment of the firm as the dependent variable. Size of firms, influential factors, and functions of an office in Bangkok are used as independent variables, as seen in Equation 1, (Eq.1). The number of employees, firm's assets and paid-in capital explains the size of the firm as shown in Equations 1.1, 1.2 and1.3 respectively.

$YoE = f(firm's\ size,\ influential\ factors,\ function\ of\ an\ office)$ (Eq.1)

$YoE = f(The\ number\ of\ employees,\ influential\ factors,\ function\ of\ an\ office)$ (Eq.1.1)

$YoE = f(firm's\ asset,\ influential\ factors,\ function\ of\ an\ office)$ (Eq.1.2)

$YoE = f(paid\text{-}in\ capital,\ influential\ factors,\ function\ of\ an\ office)$ (Eq.1.3)

where

YoE = year of establishment

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Table 2: Results of Estimations: Agglomeration

			Employees		Assets		Capital	
			Full model	Selected model	Full model	Selected model	Full model	Selected model
Q3)	2	10,000-24,999(US$)/10,000-24,999 (US$)		[+]				
	3	100 - 199/25,000-49,999/25,000-49,999			*	**	*	**
	4	200 - 299/50,000-74,999/50,000-74,999						
	5	300 - 399/75,000-99,999/75,000-99,999	*	+		*		
	6	400 - 499/100,000-499,999/100,000-499,999						
	7	500 - 999/500,000-999,999/500,000-999,999					[*]	[**]
	8	1,000 - 1,499/1 M-4.9M/1M-4.9M						
	9	1,500 - 1,999/5M-9.9 M/5M-9.9M	[*]	[**]				
	10	2,000 & above/10M & above/10M & above						
Q8)	1	Investment incentives including tax incentives	[**]	[**]	[**]	[**]	[**]	[**]
	2	Liberal trade policy	**	**	**	*	**	**
	3	Customs procedures	+	*		+	+	*
	4	Local content requirements, rule of origin		[+]				[+]
	5	Physical infrastructure (roads, highways, ports, airports, etc.)	+	[+]	[+]	[+]	[**]	[**]
	6	Infrastructure (telecommunications, IT)		**		**	+	*
	7	Infrastructure (electricity, water supply, other utilities)		+			+	**
	8	Government institutional infrastructure						
	9	Financial system						
	10	Legal system	[**]	[**]	[**]	[**]	[**]	[**]
	11	Protection of intellectual property rights	**	**	**	*	**	**
	12	Size of local markets						
	13	Access to export markets						
	14	Proximity to suppliers/subcontractors						
	15	Request by large/related company						
	16	Availability of low-cost labor						
	17	Availability of skilled labor and professionals	[*]	[**]	[+]	[**]	[**]	[**]
	18	Other companies from the same country are located here (synergy)						
	19	Access to cutting-edge technology and information						
	20	Living conditions						
Q6)	1	Retail/ Wholesale trade	[**]	[**]	[**]	[**]	[**]	[**]
	2	Production (raw-material processing)			*			
	3	Production (components and parts)						[*]
	4	Production (final products)						[*]
	5	Purchasing/ Procurement/ Logistics						
	6	R&D/ Consulting						
	7	Human resources development	**	[**]	**	**	**	**
Nob			136	143	136	145	136	142
Log likelihood			-110.674	-126.518	-112.496	-131.094	-109.073	-121.714
Pseudo R2			0.199	0.156	0.186	0.138	0.21	0.184

Note 1: [ ] indicates that the coefficient is negative, and items without [] imply the coefficient is positive.
Note 2: **, * and + indicates that coefficient is at the 5, 10 and 20% significance level, respectively.
Source: ERIA Research Project Mail Survey 2007.

By analyzing the significance of the model as shown in Table 2, it can be concluded that for large companies who came earlier, "investment incentive," "legal system" and "availability of skilled labor and professionals" are the significant factors that encouraged investors to establish their business in Thailand. The function of the office in Bangkok for large firms at the beginning was more related to retail and wholesale trade. For smaller firms who usually came later after the large firms, the significant factors for their concerns when establishing their business are "liberal trade policy" and "protection of intellectual rights." In the Flowchart Approach, establishment of larger firms is very important since it is the starting point of agglomeration. However, the formation of the smaller firms around the large ones is important as well since this formation can develop into an industrial agglomeration later.

From the previous findings, it can be explained that the industrial agglomeration of Thailand could be divided into two stages. At the earlier stage, the large companies due to the attractive investment incentives, legal systems and skilled labor established firms related to sales activities in Thailand. At the later stage, attracted by the country's liberal trade policy and the system of intellectual property rights, smaller firms followed suit.

5.2. Upgrading and Innovation

For upgrading or innovation of the agglomeration on Thailand, binary models were used to explain the situation. The upgrading, influential factors and functions of the office in Bangkok are used as independent variables, as seen in Equation 2. The upgrading is defined in terms of new goods, new production methods and new sources of raw materials supply as shown in Equations 2.1, 2.2 and 2.3, respectively.

UoI = f(upgrading, influential factors, function of an office) (Eq.2)

UoI = f(new goods, influential factors, function of an office) (Eq.2.1)

UoI = f(firm's asset, influential factors, function of an office) (Eq.2.2)

UoI = f(paid-in capital, influential factors, function of an office) (Eq.2.3)

where

UoI = whether there is an upgrading or innovation of a firm.

UoI = 0. It means there is no upgrade or no innovation.

UoI = 1. It means there is upgrade or no innovation.

The result for the analysis is shown in Table 3. It shows that the key variables do not robust to different models. Therefore, it is hard to draw the common factors for upgrading and innovation of Thai industrial agglomeration. However, some of the positive significant factors for upgrading are "local content," "legal systems," "proximity to suppliers and subcontractors" while "financial systems" is a negative significant factor.

Table 3: Results of Estimations: Upgrading and Innovation

			New goods		New method		New market		New supply	
			Full model	Selected model	Full model	Selected model	Full model	Selected model	Full model	Selected model
Q10)	1	incentives			[**]	[**]	[**]	[**]		
	2	Liberal trade policy			*	+	+	**		
	3	Customs procedures	+	+						
	4	Local content requirements, rule of origin					[*]	[**]	**	**
	5	Physical infrastructure(roads, highways, ports,airports, etc.)	*	**						
	6	Infrastructure(telecommunications, IT)		[+]						
	7	Infrastructure (electricity,water supply, other utilities)								
	8	Government institutional infrastructure								
	9	Financial system	[**]	[**]	[**]	[*]	[*]	[**]	[+]	
	10	Legal system	*	*			+	**		
	11	Protection of intellectual property rights							[+]	
	12	Size of local markets							[+]	[**]
	13	Access to export markets			**	**			+	
	14	Proximity to suppliers/subcontractors		+	+		**	**	+	
	15	Request by large/related company	**	**			[*]	[**]		
	16	Availability of low-cost labor								
	17	professionals								
	18	Other companies from the same country are located here (synergy)	[+]	[*]	[+]	[+]	[+]			
	19	Access to cutting-edge technology and information	**	[**]	[+]					
	20	Living conditions	+	*						
Q6)	1	Retail/ Wholesale trade	+	*						
	2	Production (raw-material processing)	[*]						[+]	[+]
	3	Production (components and parts)							*	**
	4	Production (final products)	[+]						+	*
	5	Purchasing/ Procurement/ Logistics	[**]	[**]						
	6	R&D/ Consulting	**	**						
	7	Human resources development			[+]	[+]	*	**	[+]	[**]
Q1)		When did your company establish its first office?			[**]	[**]				[+]
		_cons		[*]	**	**		**		+
Obs			123	129	122	127	122	128	122	129
Log likelihood			-40.302	-46.606	-58.682	-66.867	-49.481	-57.632	-61.608	-70.965
Pseudo R2			0.389	0.309	0.264	0.196	0.301	0.211	0.26	0.191

Note 1: [ ] indicates that the coefficient is negative, and items without [ ] imply the coefficient is positive.
Note 2: **, * and + indicates that coefficient is at the 5, 10 and 20% significance level, respectively.
Source: ERIA Research Project Mail Survey 2007.

6. CONCLUSION

In conclusion, the industrial agglomeration of Thailand can be divided into three periods (before 1985, 1986-1998 and after 1999). The earlier establishment of the large firms who were attracted by investment incentives, legal systems and skilled labor, the smaller firms – who were also satisfied with the government policies in liberal trade and the system of intellectual property rights – to form themselves around the large firms. Although the result of descriptive statistics show that there are several upgrading of the firms in term of new goods, new production methods and new sources of raw materials supply; the common factor that supports the upgrading is hard to find.

The Thai government has tried hard to support agglomeration. The government's policies have been changed to determine the right combination of top-down and bottom-up approaches in promoting agglomeration. Not only by providing investment incentive as usual, but also improving all systems that involve industrial investments to be more standard but at the same time also reasonably flexible. Also, several agencies have been established for pointing the government policy into the right direction. Promoting the development of agglomeration is a never-ending task of the government. However, maintaining of the existing agglomerations is also very important. Based on the interviews with the companies, it is found that the weakness of Thai agglomeration is the lack of enough R&D. With R&D, the industrial agglomeration can be strengthened so it can survive in the competitive world of business and industry.

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APPENDIX

Here, detailed results of estimation are presented. Table A1 and A2 show those for agglomeration, and Table A3 and A4 for upgrading and innovation.

Table A1: Estimation of Agglomeration (Thailand): Full Model

		Full-time Employees		Total Assets		Paid-UP Capital	
		Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Q3)	2) 50-99persons/10,000-24,999(US$)/10,000-24,999 (US$)	-0.764	-1.000	-0.216	-0.300	1.005	1.130
	3) 100 - 199/25,000-49,999/25,000-49,999	-0.532	-0.620	1.149	1.690 *	1.160	1.700 *
	4) 200 - 299/50,000-74,999/50,000-74,999	0.386	0.440	-0.531	-0.530	-1.006	-1.000
	5) 300 - 399/75,000-99,999/75,000-99,999	3.328	1.740 *	0.499	0.520	-1.526	-1.270
	6) 400 - 499/100,000-499,999/100,000-499,999	0.292	0.310	0.390	0.520	0.197	0.280
	7) 500 - 999/500,000-999,999/500,000-999,999	-0.147	-0.140	1.001	1.120	-1.773	-1.330 *
	8) 1,000 - 1,499/1 M-4.9M/1M-4.9M	-0.197	-0.200	0.180	0.250	0.572	0.850
	9) 1,500 - 1,999/5M-9.9 M/5M-9.9M	-1.550	-1.780 *	0.944	0.830	1.067	0.830
	10) 2,000 & above/10M & above/10M & above	-0.458	-0.660	0.578	0.720	0.663	0.970
Q7)	1) Investment incentives including tax incentives	-0.561	-2.310 **	-0.704	-2.960 **	-0.738	-2.980 **
	2) Liberal trade policy	0.525	2.350 **	0.459	2.090 **	0.665	2.840 **
	3) Customs procedures	0.345	1.590 +	0.231	1.080	0.298	1.390 +
	4) Local content requirements, rule of origin	-0.160	-0.790	-0.040	-0.190	-0.106	-0.520
	5) Physical infrastructure (roads, highways, ports, airports, etc.)	-0.437	-1.320 +	-0.514	-1.630 +	-0.649	-1.980 **
	6) Infrastructure (telecommunications, IT)	0.347	1.130	0.257	0.860	0.404	1.380 +
	7) Infrastructure (electricity, water supply, other utilities)	0.341	1.250	0.320	1.170	0.382	1.400 +
	8) Government institutional infrastructure	0.150	0.510	0.141	0.480	0.149	0.500
	9) Financial system	-0.127	-0.420	0.096	0.330	0.109	0.370
	10) Legal system	-0.811	-2.420 **	-0.750	-2.200 **	-0.848	-2.470 **
	11) Protection of intellectual property rights	0.524	1.980 **	0.530	2.030 **	0.620	2.250 **
	12) Size of local markets	-0.045	-0.200	-0.033	-0.150	-0.002	-0.010
	13) Access to export markets	-0.084	-0.390	-0.017	-0.080	-0.155	-0.730
	14) Proximity to suppliers/subcontractors	0.230	0.860	0.061	0.240	0.220	0.840
	15) Request by large/related company	0.126	0.540	0.221	0.940	0.211	0.910
	16) Availability of low-cost labor	-0.156	-0.650	-0.220	-0.980	-0.041	-0.170
	17) Availability of skilled labor and professionals	-0.517	-1.780 *	-0.428	-1.540 +	-0.666	-2.310 **
	18) Other companies from the same country are located here (synergy)	0.149	0.660	0.173	0.780	0.100	0.460
	19) Access to cutting-edge technology and information	0.181	0.720	-0.055	-0.220	-0.024	-0.100
	20) Living conditions	-0.142	-0.540	-0.051	-0.200	-0.137	-0.520
Q6)	1) Retail/ Wholesale trade	-1.943	-3.760 **	-1.760	-3.470 **	-1.994	-3.890 **
	2) Production (raw-material processing)	-0.915	-1.270	-1.166	-1.650 *	-0.741	-0.960
	3) Production (components and parts)	-0.615	-0.930	-0.127	-0.200	-0.029	-0.040
	4) Production (final products)	-0.617	-1.250	-0.462	-0.910	-0.514	-1.000
	5) Purchasing/ Procurement/ Logistics	-0.509	-0.810	-0.229	-0.370	-0.230	-0.360
	6) R&D/ Consulting	-0.423	-0.600	-0.313	-0.440	-0.362	-0.530
	7) Human resources development	2.242	2.310 **	2.015	2.210 **	2.341	2.330 **
	/cut1	-3.548		-3.573		-3.206	
	/cut2	-0.316		-0.404		0.087	
Nob		136		136		136	
Log likelihood		-110.674		-112.496		-109.073	
Pseudo R2		0.199		0.186		0.210	

Note: **, * and + indicates that coefficient is at the 5, 10 and 20% significance level, respectively.

Table A2: Estimation of Agglomeration (Thailand): Selected Model

		Full-time Employees		Total Assets		Paid-UP Capital	
		Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Q3)	2) 50-99persons/10,000-24,999(US$)/10,000-24,999 (US$)	-0.982	-1.640 +				
	3) 100 - 199/25,000-49,999/25,000-49,999			1.109	1.990 **	1.602	2.620 **
	4) 200 - 299/50,000-74,999/50,000-74,999						
	5) 300 - 399/75,000-99,999/75,000-99,999	2.407	1.370 +	1.433	1.650 *		
	6) 400 - 499/100,000-499,999/100,000-499,999						
	7) 500 - 999/500,000-999,999/500,000-999,999					-2.188	-2.270 **
	8) 1,000 - 1,499/1 M-4.9M/1M-4.9M						
	9) 1,500 - 1,999/5M-9.9 M/5M-9.9M	-1.526	-2.100 **				
	10) 2,000 & above/10M & above/10M & above						
Q7)	1) Investment incentives including tax incentives	-0.513	-2.820 **	-0.448	-2.580 **	-0.502	-2.690 **
	2) Liberal trade policy	0.463	2.330 **	0.317	1.720 *	0.596	2.810 **
	3) Customs procedures	0.349	1.780 *	0.247	1.380 +	0.343	1.760 *
	4) Local content requirements, rule of origin	-0.288	-1.640 +			-0.242	-1.330 +
	5) Physical infrastructure (roads, highways, ports, airports, etc.)	-0.427	-1.560 +	-0.344	-1.630 +	-0.788	-2.750 **
	6) Infrastructure (telecommunications, IT)	0.509	2.050 **	0.454	1.980 **	0.477	1.910 *
	7) Infrastructure (electricity, water supply, other utilities)	0.368	1.610 +			0.524	2.190 **
	8) Government institutional infrastructure						
	9) Financial system						
	10) Legal system	-0.664	-2.660 **	-0.483	-2.050 **	-0.786	-3.010 **
	11) Protection of intellectual property rights	0.426	2.010 **	0.372	1.840 *	0.571	2.520 **
	12) Size of local markets						
	13) Access to export markets						
	14) Proximity to suppliers/subcontractors						
	15) Request by large/related company						
	16) Availability of low-cost labor						
	17) Availability of skilled labor and professionals	-0.488	-2.390 **	-0.471	-2.400 **	-0.520	-2.510 **
	18) Other companies from the same country are located here (synergy)						
	19) Access to cutting-edge technology and information						
	20) Living conditions						
Q6)	1) Retail/ Wholesale trade	-1.509	-3.640 **	-1.293	-3.270 **	-2.008	-4.250 **
	2) Production (raw-material processing)						
	3) Production (components and parts)					-0.980	-1.720 *
	4) Production (final products)					-0.806	-1.820 *
	5) Purchasing/ Procurement/ Logistics						
	6) R&D/ Consulting						
	7) Human resources development	1.696	2.380 **	1.955	2.890 **	2.310	2.980 **
	/cut1	-3.391		-3.327		-4.037	
	/cut2	-0.692		-0.702		-1.263	
Nob		143		145		142	
Log likelihood		-126.518		-131.094		-121.714	
Pseudo R2		0.156		0.138		0.184	

Note: **, * and + indicates that coefficient is at the 5, 10 and 20% significance level, respectively.

Table A3: Results of Industrial Upgrading and Innovation (Thailand): Full Model

		New Goods		New Method		New Market		New Input	
		Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Q8)	1) Investment incentives including tax incentives	0.187	0.480	-0.870	-2.360 **	-1.011	-2.360 **	-0.061	-0.190
	2) Liberal trade policy	0.344	0.730	0.696	1.760 *	0.733	1.580 +	0.082	0.210
	3) Customs procedures	0.592	1.460 +	-0.127	-0.420	0.308	0.840	-0.007	-0.020
	4) Local content requirements, rule of origin	-0.331	-0.700	-0.193	-0.640	-1.026	-2.630 *	0.639	2.040 **
	5) Physical infrastructure (roads, highways, ports, airports, etc.)	1.242	2.610 *	0.444	1.250	0.273	0.660	0.152	0.440
	6) Infrastructure (telecommunications, IT)	-0.702	-1.180	0.127	0.320	-0.443	-0.900	-0.246	-0.620
	7) Infrastructure (electricity, water supply, other utilities)	-0.382	-0.590	-0.420	-0.940	-0.309	-0.560	0.060	0.140
	8) Government institutional infrastructure	0.087	0.210	0.052	0.160	0.159	0.460	0.148	0.470
	9) Financial system	-1.653	-2.570 **	-0.890	-2.120 **	-0.928	-1.910 *	-0.539	-1.440 +
	10) Legal system	0.884	1.740 *	0.283	0.780	0.595	1.500 +	0.233	0.680
	11) Protection of intellectual property rights	0.328	0.750	0.003	0.010	0.139	0.360	-0.510	-1.510 +
	12) Size of local markets	-0.294	-0.760	0.139	0.470	0.259	0.770	-0.492	-1.590 +
	13) Access to export markets	0.305	0.680	0.723	2.020 **	0.424	1.090	0.516	1.560 +
	14) Proximity to suppliers/subcontractors	0.466	1.020	0.578	1.480 +	1.276	2.620 **	0.476	1.310 +
	15) Request by large/related company	1.106	1.990 **	0.296	0.690	-0.921	-1.790 *	-0.064	-0.160
	16) Availability of low-cost labor	-0.035	-0.070	-0.040	-0.110	0.111	0.250	-0.017	-0.050
	17) Availability of skilled labor and professionals	-0.022	-0.050	-0.194	-0.560	0.252	0.590	-0.021	-0.060
	18) Other companies from the same country are located here (synergy)	-0.759	-1.630 +	-0.586	-1.470 +	-0.584	-1.420 +	-0.239	-0.680
	19) Access to cutting-edge technology and information	-1.036	-2.180 **	-0.486	-1.400 +	-0.264	-0.620	0.163	0.440
	20) Living conditions	0.660	1.400 +	0.074	0.200	0.066	0.150	-0.110	-0.290
Q6)	1) Retail/ Wholesale trade	1.374	1.590 +	0.517	0.810	-0.039	-0.060	0.465	0.840
	2) Production (raw-material processing)	-1.721	-1.660 +	0.315	0.340	-0.416	-0.430	-1.191	-1.510 +
	3) Production (components and parts)	-1.313	-1.230	0.067	0.080	0.344	0.340	1.652	1.880 *
	4) Production (final products)	-1.216	-1.460 +	-0.109	-0.170	0.139	0.180	0.964	1.620 +
	5) Purchasing/ Procurement/ Logistics	-2.566	-2.550 **	0.248	0.290	-1.023	-1.260	-0.382	-0.490
	6) R&D/ Consulting	4.442	2.480 **	0.468	0.500	0.775	0.670	-0.652	-0.790
	7) Human resources development	0.207	0.140	-1.961	-1.460 +	3.343	1.820 *	-1.887	-1.500 +
Q1)	When did your company establish its first office?	-0.024	-0.990	-0.046	-1.970 **	-0.017	-0.910	-0.017	-1.240
	constant	46.429	0.970	92.581	2.000 **	37.855	1.030	34.198	1.230
Nob		123.000		122		122		122	
Log likelihood		-40.302		-58.682		-49.481		-61.608	
Pseudo R2		0.389		0.264		0.301		0.260	

Note: **, * and + indicates that coefficient is at the 5, 10 and 20% significance level, respectively.

Table A4: Results of Industrial Upgrading and Innovation (Thailand): Selected Model

		New Goods		New Method		New Market		New Input	
		Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Q8)	1) Investment incentives including tax incentives			-0.640	-2.260 **	-0.786	-2.530 **		
	2) Liberal trade policy			0.478	1.460 +	0.839	2.450 **		
	3) Customs procedures	0.483	1.650 +						
	4) Local content requirements, rule of origin					-0.900	-2.870 **	0.744	3.160 **
	5) Physical infrastructure (roads, highways, ports, airports, etc.)	1.039	2.920 **						
	6) Infrastructure (telecommunications, IT)	-0.631	-1.610 +						
	7) Infrastructure (electricity, water supply, other utilities)								
	8) Government institutional infrastructure								
	9) Financial system	-0.933	-2.170 **	-0.547	-2.000 *	-0.678	-2.020 **		
	10) Legal system	0.672	1.770 *			0.729	2.170 **		
	11) Protection of intellectual property rights								
	12) Size of local markets			0.776	2.800 **			-0.570	-2.380 **
	13) Access to export markets								
	14) Proximity to suppliers/subcontractors	0.574	1.570 +			1.182	3.010 **		
	15) Request by large/related company	0.909	2.220 **			-0.823	-2.150 **		
	16) Availability of low-cost labor								
	17) Availability of skilled labor and professionals								
	18) Other companies from the same country are located here (synergy)	-0.635	-1.670 *	-0.425	-1.440 +				
	19) Access to cutting-edge technology and information	-0.760	-1.970 *						
	20) Living conditions	0.683	1.730 *						
Q6)	1) Retail/ Wholesale trade	1.227	1.700 *						
	2) Production (raw-material processing)							-1.141	-1.640 +
	3) Production (components and parts)							1.539	2.290 **
	4) Production (final products)							0.938	1.890 *
	5) Purchasing/ Procurement/ Logistics	-2.016	-2.660 **						
	6) R&D/ Consulting	2.693	2.280 **						
	7) Human resources development			-1.264	-1.540 +	3.201	2.250 **	-2.437	-2.560 **
Q1)	1) When did your company establish its first office?			-0.048	-2.230 **			-0.023	-1.510 +
	constant	-3.326	-1.730 *	97.196	2.270 **	2.567	1.970 **	44.981	1.500 +
Nob		129		127		128		129	
Log likelihood		-46.606		-66.867		-57.632		-70.965	
Pseudo R2		0.309		0.196		0.211		0.191	

Note: **, * and + indicates that coefficient is at the 5, 10 and 20% significance level, respectively.

4

Factors of Agglomeration in Vietnam and Recommendations

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INTRODUCTION

Vietnam now presents a picture of rapid economic growth after being damaged badly by years of wars. It is supposed to be an attractive destination for an increasing number of foreign investors. In that context, industry plays an important role for sustainable development and poverty reduction. Lessons from other developed countries show that industrial agglomeration and clustering become an indispensable trend in industrialization and modernization.

Under a research agreement between Bangkok Research Center (BRC) and Institute for Industrial Policies and Strategies (IPSI), this paper, then, focuses on issues related to agglomeration and industrial clusters in Hanoi. This study is the outcome of two research methods: a mail survey as well as a study of cases in Hanoi.

The first part of this paper presents the cluster formation for industries in Vietnam, including factors on agglomeration and industrial cluster. Next, it then reveals the results of the mail survey based on a descriptive analysis and econometric analysis with the assistance of Japanese experts. Generally, the results from the mail survey show that agglomeration in Vietnam started from the mid-1990s, thanks to its main attractions: labor, size of market, and individual linkages between foreign direct investments (FDIs). Vietnam's unique qualities first attracted small and medium enterprises (SMEs) and eventually, large firms.

In the earlier stage of agglomeration, small firms producing raw materials and final products set up operations in Vietnam, attracted by the customs procedures, intuitional infrastructure, and living conditions. In the later stage, firms that came in were attracted by its physical infrastructure and the intellectual property rights system.

This paper concludes with some policy-related recommendations.

1. THE CASE STUDY

1.1. Industrial Agglomeration and Cluster in Vietnam

Although *industrial cluster* is a very new concept in Vietnam, some industries had long formed agglomerations and spontaneously established clusters in the country. Electronics firms gather most in the south of Vietnam, particularly in Ho Chi Minh (HCM) city and Dong Nai province. Such feature labor-intensive industries such as garment and footwear. Vietnam has been performing agricultural products-processing all over the country, from the Mekong Delta (in the South) to the Red River Delta (in the North). Dung Quat, a new province in Central Vietnam, is famous for its oil refinery. Hanoi has developed some heavy Industries such as those engaged in the manufacture of motorcycles and bikes, mechanics, and iron processing. The largest city of Viet Nam, Ho Chi Minh City, prides itself with its IT industry. All these were already in Vietnam even before the country drew up its national industrial development policy/strategy. These are only the spontaneous formation of clusters consisting of foreign drivers (Honda, Vietnam Manufacturing and Export Processing Holdings Limited, and Canon), similar to the pyramidal cluster.

1.2. Geographical Industrial Concentration in Hanoi

Before the 1980s, industrial factories were already spread out in different districts of Hanoi.. Today, industries have concentrated in nine areas: Thuong Dinh, Minh Khai-Vinh Tuy-Mai Dong, Van Dien-Phap Van, Giap Bat-Truong Dinh, Cau Buou, Chem, Duc Giang-Cau Duong, Cau Dien-Mai Dich, and Dong Anh. Hanoi also has six industrial sites with a total area of about 1.164 hectares, drawing in 114 investment projects with a total capital of about US$1,201 million. Further, 18 other projects in small and medium industrial zones have been planned. These industries are mainly interdisciplinary.

Over the past few years, these zones have contributed to resolving enterprises' problem on manufacturing premises, promoting industrial manufacturing, drawing in

foreign investments, creating a favorable investment environment in Hanoi, and creating jobs for employees.

1.3. Factors Affecting to Industrial Cluster Development in Vietnam

1.3.1. Business Environment

Administrative reforms, together with the Enterprise Law, played an important role in recovering and developing the economy, increasing export turnover and budget revenues, creating jobs, eliminating hunger and reducing poverty, and accelerating the formation and development of the market economic institutions. The 2005 Enterprise Law, which was based on the 1999 Enterprise Law, is one of the major reforms in business in Vietnam. The law took effect on July 1, 2006 and is expected to level the playing field for local private businesses as well as state-owned and foreign-owned businesses. The new law helps simplify procedures and cut down expenditures for businesses and improve the business environment. In 2006, Vietnam's prime minister issued Directive No. 32 to regulate administrative discipline and rules in handling requests of individuals and enterprises. The directive requests state agencies to recheck and amend regulations that pose as bottlenecks in administrative procedures; publicize immediately the process, procedures, and time limit for handling people's requests; strengthen internal control and monitoring; and handle resolutely negative and harassments of officials and public servants.

Land law was set in 1993 and amended in 2003. Aside from incentive regulations, land support and infrastructure usage also exist via other incentive laws on private investment. Generally, the law regulates some supporting policies of the state on enterprises: for instance, publicizing land usage projects, developing small and medium industrial zones in poor localities, and building infrastructure outside industrial parks and processing zones.

1.3.2. Supporting Industry

Vietnam has a successful supporting industry that provides supplies for packaging (paper, wood or plastic) to manufacturers. Eighty percent of motorcycles assembled in Vietnam have parts (e.g., small plastic and metal parts, frame, tires and tubes, and batteries) made in Vietnam as well. For the electric and electronic industries, meanwhile,

only 20-40 percent is locally made but the proportion is increasing. Textile garments and footwear producers import 80 percent of their materials.

In general, however, the supporting industry in Vietnam is not fully developed. Technology remains poor. Manufacturing factories for supporting materials such as iron, steel, plastics, technical rubber, fundamental chemicals, electronics parts, cotton, fiber, and footwear are insufficient. Processing technology is out-of-date. Couple this with problems on low energy power, high prices and unstable quality. The technology used by the FDI sector is more modern; however, it only meets the demands of their parent companies. Vietnam's economic environment does not yet allow every economic sector to invest in supporting manufacturing in the long term. Economic linkage is mainly vertical.. Information sharing and enterprise linkage is restricted. In fact, FDI investors do not pay much attention to domestic supporting enterprise development. On the other hands, domestic enterprises face difficulty in approaching FDI enterprises due to their business conditions. The role of professional associations does not impact much on businesses as a whole.

1.3.3. Business Development service (BDS)

In Vietnam, Business Development Service (BDS) begins to develop and accounts for a minority in gross domestic product (GDP)—about 1 percent with low growth (1-2% per year). Not only enterprises but authorities as well have poor awareness of BDS as a tool for business development. The BDS market such as those focusing on training, accounting, financial consultant, and tax and management consultancy is less developed in term of both its supply and demand.

Enterprises' poor awareness

Although Vietnamese enterprises have grown stronger, the awareness of both society and enterprises of the BDS's benefits is still poor. Enterprises often feel uncomfortable to give information to independent consultants. Smaller enterprises also lack the clout to collect information on business services in the market. The situation had only grown better when the government included a BDS development goal in Vietnam's growth and poverty reduction program and issued a decree on "Consultant

Service Provision and Usage" to officially recognize the BDS role in Vietnam's development.

Limited supply and demand

Since SMEs normally have relatively lower income and revenues, their demand for external services including BDS is also low. Many SMEs say that they are unable to commission these services at prevailing market prices. Moreover, a number do not recognize the potential benefits BDS can bring, especially intangible services such as management and strategic consultancy. Similarly, the supply of BDS entities is limited due to reasons that may include, for instance, situations where service providers do not still have the ability to appreciate domestic enterprise's specific demands or lack the skills and know-how in designing appropriate service for local demands. Besides lack of skills, these also have inadequate consultancy experience, particularly in services of most value to customers.

Lack of information

Vietnam's statistical data on industries and market is not yet systematized and unified. Information on external markets and the world economy, technical books or specified information for providers are not always available. This is a significant obstacle since such information and tools are factors that make it possible for BDS providers to provide quality servicesto enterprises.

Remaining legal barriers

A favorable legal environment is one of the factors that support the development of Vietnam's BDS market. Thus, recent legal reforms (such as the Enterprise Law) and economic liberalization, particularly in the service sector, contribute to make Vietnam's BDS market grow in terms of its supply and of the demand for it. The government has exerted extra efforts to improve the investment and business environment and therefore, to enhance enterprises' trust; however, there remains barriers to Vietnam's BDS. Some of these issues include are the expensive market entry fees for some BDS services,

including those on training, auditing or intellectual property. Furthermore, there remain contradictions between existing legal documents, and the Enterprise Law regarding BDS services.

1.4. Encouraging and Hindering Factors on Cluster Formation in Vietnam

The creation of economic clusters is a strong requirement for Vietnam's economic development. The agglomeration of business has in fact been visible in various areas.. Vietnam has had some successes in industrial zone development.

There still exits weak linkages among local firms, and between local firms and MNCs (multinational cooperations)/FDIs. In addition, the government, firms, and social public lack enough knowledge about creating linkages. Moreover, the legal system fails to include laws on subcontracting, and on quality of semiproducts, etc. Vietnam hardly makes an effort nor support policies to linkages. The BDS, an important factor to develop industrial cluster, remains an unfamiliar territory to most enterprises.

2. THE DESCRIPTIVE ANALYSIS OF MAIL SURVEY

In this study, questionnaires were sent to 1,000 respondents consisting of 400 Vietnamese, 400 FDIs and 200 join-venture firms. Of these, 600 are in Manufacturing (chemical, textile, garment, shoes, plastic, wood, steel, motorbikes, iron, and electronics), 100 in Construction, 100 in IT, 100 in Service, and 100 are of other categories. As of December 31, 2007, 102 valid respondents were confirmed, of which 18 were interviewed face to face. Many are Japanese firms. Vietnamese firms accounted for over 70 percent of the respondents; the remaining 30 percent (including FDIs and joint-venture firms) came from: other parts of Asia (mainly, Japan, which has 22 firms or 76% of the Other Asia group]), the United States (3 firms or 10%) and the European Union (4 firms or 14%). No respondent came from ASEAN nor from China.

Figure 1: Establishment Year of Foreign Firms.
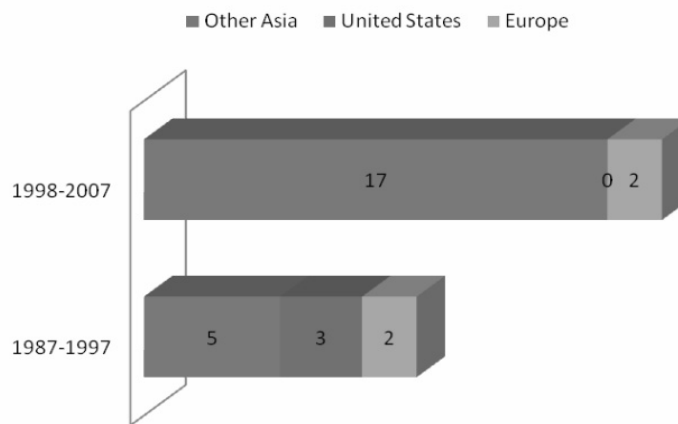
Source: Author.

Prior to 1980, there were only six enterprises in Hanoi. However, this number has gone up year after year. When grouped by economic development periods, 33 respondent-enterprises (32%) came from the third period, ”*Doi mo”* to the East Asian economic crisis period (1987-1997), and 62 firms (61%) came from the post crisis period to the present (1998-2007). Foreign enterprises started their business in Vietnam in the third period. At that time, there only three US firms present in Hanoi. After the crisis, Vietnam in general and Hanoi in particular have increasingly attracted more Asian firms. The EU firms were established during the two periods.

Over the past few years, the respondent-firms succeeded to expand their business scale (in terms of employees, capital and assets) in Hanoi. Respondents' main lines of business are manufacturing (60%), IT and other business service-related firms (around 10%), wholesale and construction firms (6%-7%). Retail firms mainly engage in the finance and insurance fields. When viewed by market structure, 65 percent of enterprises cater to the domestic market as their main markets. The next important markets of respondents are the ASEAN and the rest of Asia with 13 percent.

From the interviews, the market most mentioned besides China and ASEAN, is Japan. Sources of inputs of firms include: domestic (50%), "Other Asia" (23%), ASEAN (12%), and China (10%). Among these markets, the main input sources of FDI

and joint-venture firms (Figure 2) are from Other Asia (12%). Raw material sources for manufacturing firms are classified into four main groups: Domestic sources have gone down to 36 percent while Other Asia, ASEAN and China garnered 34 percent, 13 percent and 12 percent, respectively.

Figure 2: Main inputs sources of FDI and Joint-Venture Firms.
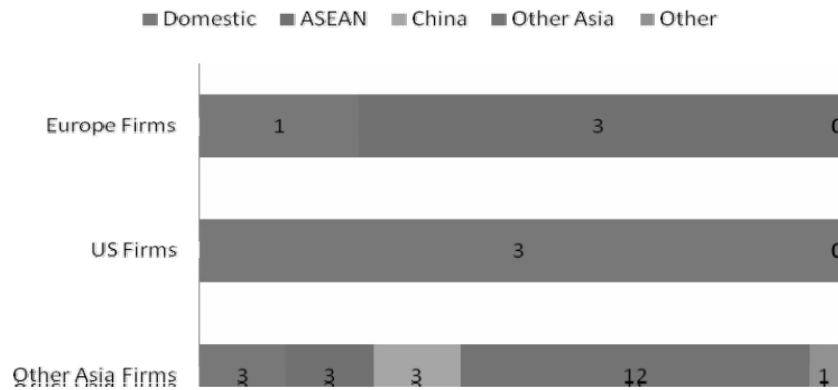
Source: Author.

2.1. Reasons for Establishment in Hanoi

Answers to question 7 of the questionnaire reveal the reason for selecting Hanoi as a business location. Of these, four reasons assessed as "*very important*" are: 12-*Size of the local markets* (59 firms); 17-*Availability of skilled labor and professionals* (43 firms), 1-*Investment incentives including tax incentives* (40 firms), and 19-*Access to cutting-edge technology and information* (39 firms). Indicators appraised as "*somewhat important*" are: 11-*Protection of intellectual property rights*, 15-*Request by large/related company* (35 firms), 6-*Infrastructure (telecommunications, IT,* by 34 firms).

Figure 3: Reasons for Establishment of Operation in Hanoi.
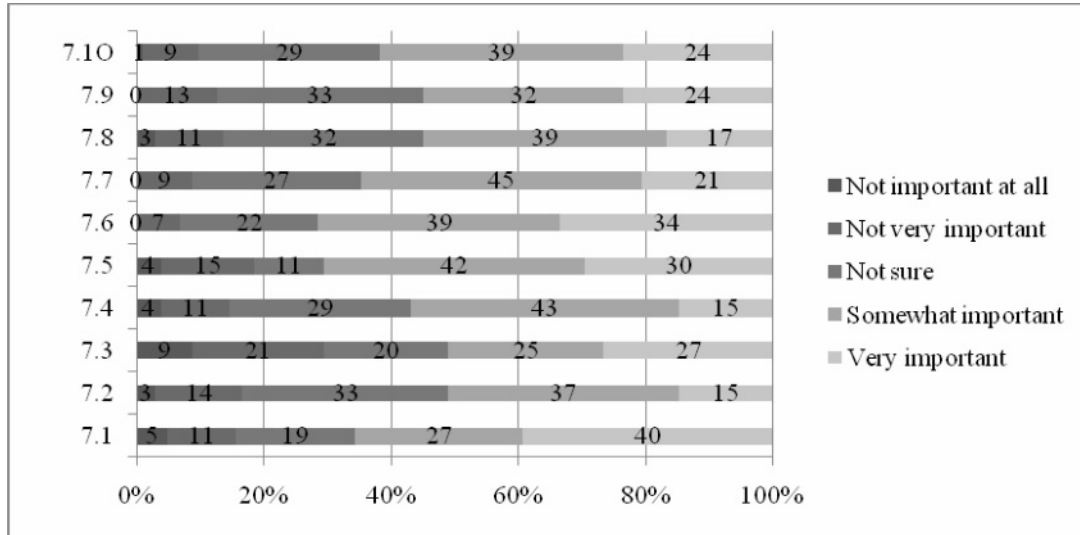
(continued)
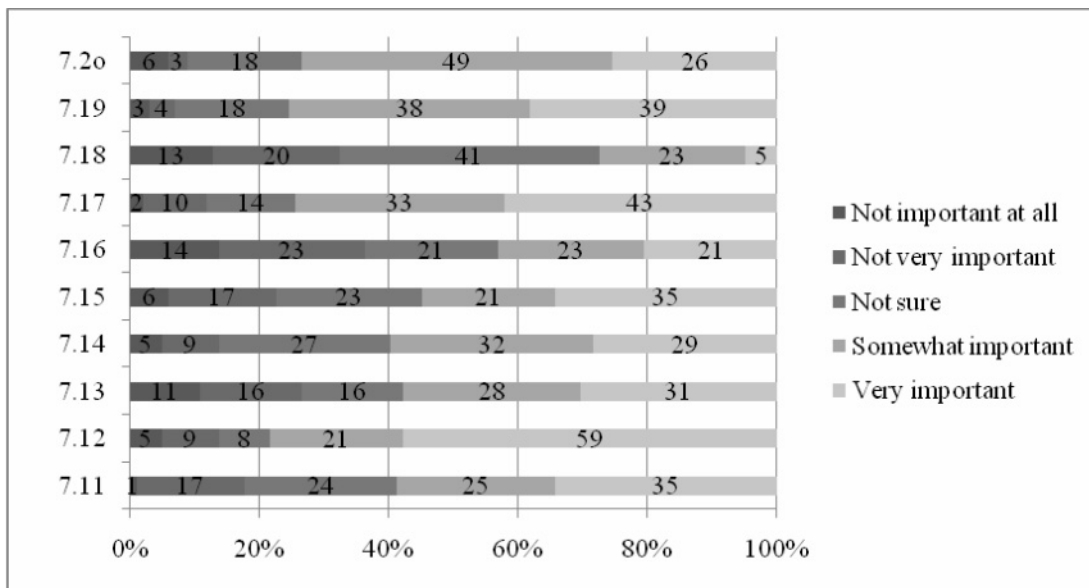
Source: Author

Enterprises, meanwhile, do not pay much attention to the following reasons: *2-Liberal trade policy, 4-Local content requirements, rule of origin, 6-Infrastructure (telecommunications, IT), 18-Other companies from the same country are located here (synergy),* and *20-Living conditions*. While Vietnamese firms have the same sentiments

as the whole sampled respondents, FDI and joint venture firms pay attention to: *5-Physical infrastructure (roads, highways, ports, airports, etc.), 12- Size of local markets, 14-Proximity to suppliers/subcontractors, and 15-Request by large/related company.* In addition, the indicator *1-Investment incentives including tax incentives,* is assessed as "*very important*" by both Vietnamese and other Asian firms.

What the most important indicators are depend on the country of the respondents. Other Asian firms consider the following indicators to be the most important: *12-Size of local markets, 14-Proximity to suppliers/subcontractors, 15-Request by large/related company, 1-Investment incentives including tax incentives,* and *6-Infrastructure (Telecommunications, IT).* The US firms also reveal their reasons for selecting Hanoi as follows (by order of importance): *5-Physical infrastructure (roads, highways, ports, airports, etc.), 8-Government institutional infrastructure, 10-Legal system, 15-Request by large/related company, 17-Availability of skilled labor and professionals,* and *19-Access to cutting-edge technology and information.* The order of importance according to the EU firms are: *12-Size of local markets, 15-Request by large/related company.*

2.2. The Importance of Hanoi's Current Conditions

Question No 8 intends to unravel the importance of Hanoi's current business conditions to enterprises as well as their satisfaction with these. Figure 4 shows that enterprises consider the following to be "*very important*" to Hanoi's current conditions: *12-Size of local markets, 17-Availability of skilled labor and professionals, 9-Access to cutting-edge technology and information, 13-Access to export markets,* and *6-Infrastructure (telecommunications, IT).*

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Figure 4: "Very Important" Indicators.
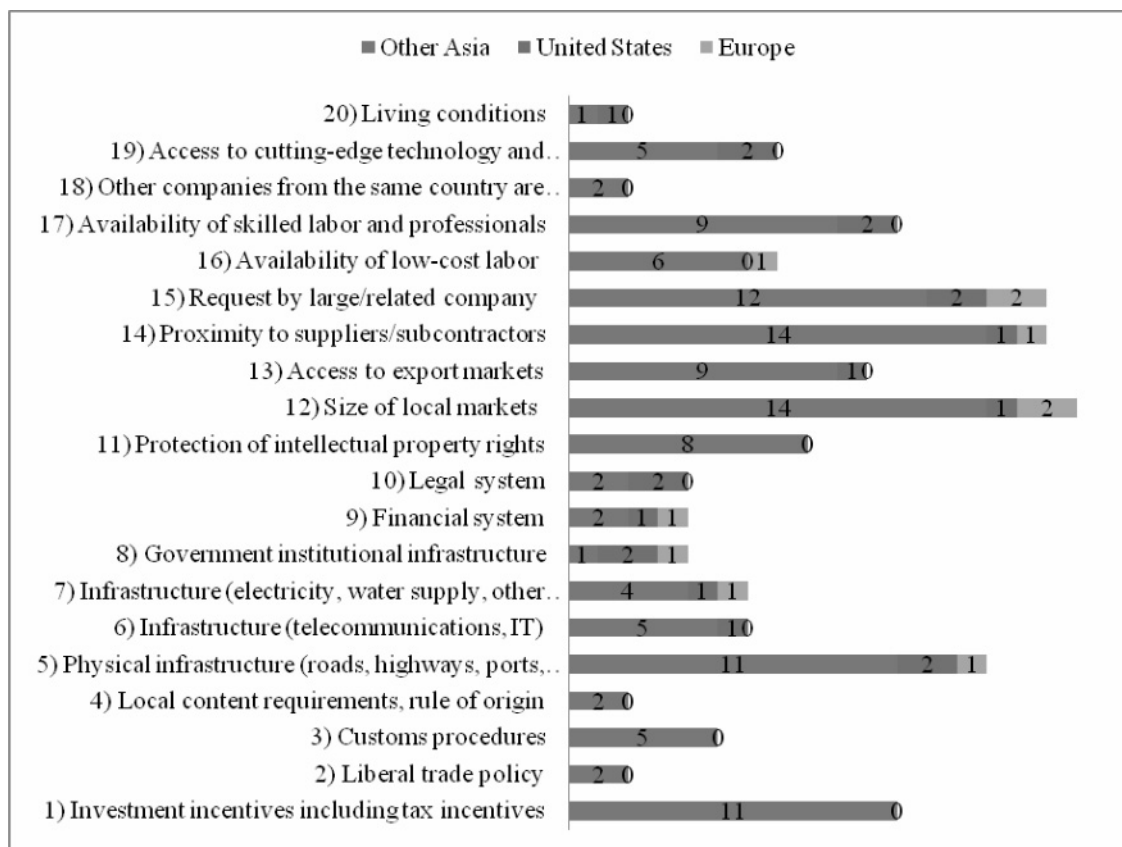
Source: Author.

Meanwhile, Vietnamese firms' results for this question are (in order of importance): *12-Size of local markets* (42 firms), *17-Availability of skilled labor and professionals* (39 firms), *19-Access to cutting-edge technology and information* (34), *11-Protection of intellectual property rights* (32). Other Asian *countries* consider *13-Access to export markets* to be the most important factor among the selections. This is followed by *15-Request by large/related company* and *17-Availability of skilled labor and professionals* ranks last (responded by 11/22 firms for each issue). On the other hand, US firms have a different set of results. All US firms (3/3 firms) think *6-Infrastructure (telecommunications, IT)* to be very important. Remaining issues appraised to be "*very important*" by two-thirds of the US firms are: *2-Liberal trade policy, 10-Legal system,* and *19-Access to cutting-edge technology and information*.

Meanwhile, EU firms (2/4 firms) consider *2-Size of local markets* to be a very important factor.

Since the time they were established in Hanoi, firms have changed slightly the factors they consider as "*very important*". To the Vietnamese firms, Hanoi's attraction remains to be its 12-*Size of local markets* but now adds one more reason: 17-*Availability of skilled labor and professionals*. Although 15-*Request by large/related company* is still a very important indicator, other Asian countries' firms change their priority from 12-*Size of local markets* and 14-*Proximity to suppliers/subcontractors,* to 13-*Access to export markets* and 17-*Availability of skilled labor and professionals*. This proves that businesses in Hanoi have expanded their market and have a high requirement for skilled labor. Also, US firms are no longer interested in 5-*Physical infrastructure (roads, highways, ports, airports, etc.)* but they care about *6-Infrastructure (telecommunications, IT)*. This is because US firms are now engaged in the IT and services business. Although doing business in Hanoi is no longer a 15-*Request by large/related company*, EU firms still pay attention to 12-*Size of local markets* at the time they are to establish their operations in Vietnam.

2.3. Satisfaction with Hanoi's Conditions

The following factors satisfy enterprises the most: 11-*Protection of intellectual property rights*, 6-*Infrastructure (telecommunications, IT),* 18-*Other companies from the same country are located here (synergy)*, 19-*Access to cutting-edge technology and information*, 20-*Living conditions*. However, it is also a fact that four of the above factors are not given much attention when enterprises decide to do business in Hanoi.

Vietnamese firms (60/73 firms or 82%), meanwhile, are satisfied with the *Size of local markets* and no firm has responded, "*not satisfied at all*". However, only 14 firms (19%) have said they are very satisfied with *Availability of skilled labor and professionals*. . Relatedly, around 13 enterprises (16%) are clearly dissatisfied with this very important indicator.

Figure 5: Current "Very Satisfaction" Evaluation.
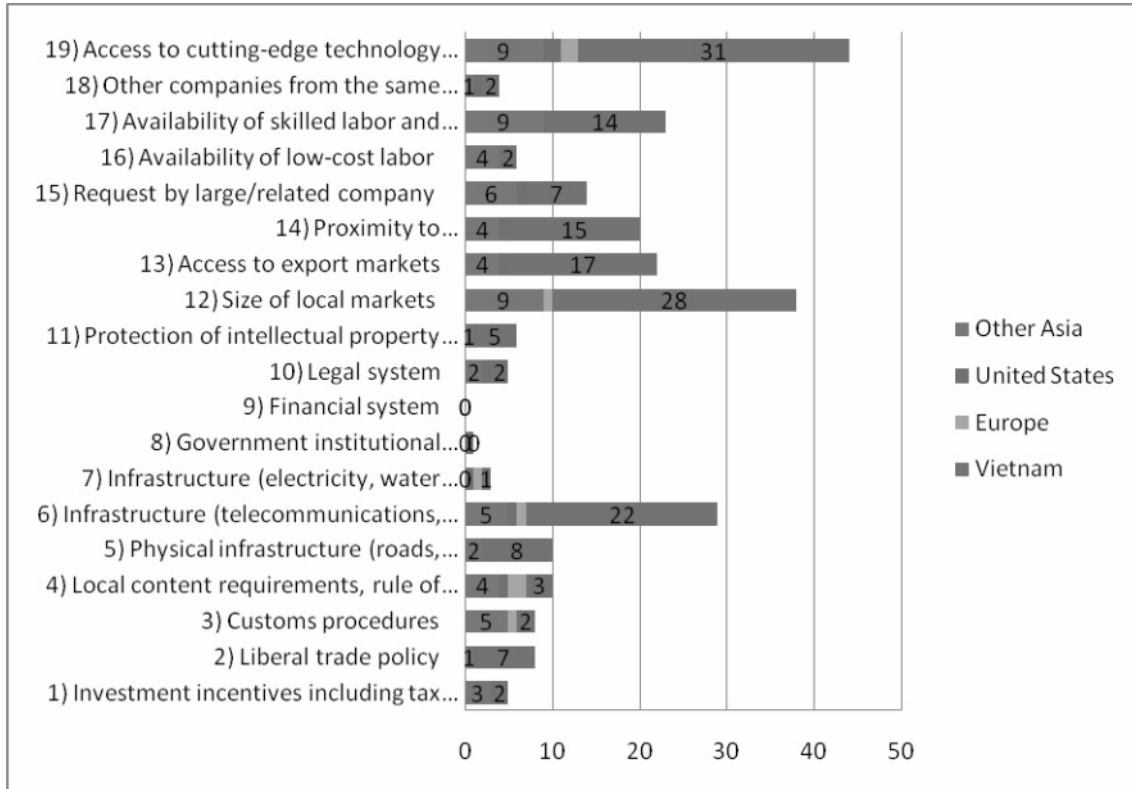
Source: Author.

Figure 5 indicates that among the 22 *Other Asia* firms, no one gave a "*not satisfied at all*" rating to their three most important indicators. In contrast to the Vietnamese firms, Other Asia firms seem to have no issues with the *Availability of skilled labor and professionals* since nine out of 22 respondents gave a "*very satisfied*" answer and eight out of 22 were "*somewhat satisfied*". For indicator 15-*Request by large/related company*, 13 out of 22 firms are not satisfied while two respondents are somewhat satisfied. The Indicator *Access to export markets* satisfies 68 percent of the group. Next, three US firms consider *Infrastructure (telecommunications, IT)* to be the most important, where one of them gave this indicator a "*very satisfied*" rating; the other two gave it a "*somewhat satisfied*," and "*not sure*" answer, respectively. No respondent indicated, "*not satisfied*". Finally, of the four EU firms, one gave the *Size of local markets* a "*very satisfied*" answer; the remaining three firms are "*somewhat satisfied*".

2.4. Current Situation

2.4.1. Remaining Issues

When it comes to enterprises' common complaints, *Availability of low-cost labor* does not satisfy 27 firms (where 8 are not satisfied at all and 19 not very satisfied). Likewise, 17 respondents are not very satisfied with *Request by large/related company*, Twenty firms (5 not satisfied at all and 15 not very satisfied) rated *4-Local content requirements, rule of origin* poorly as well. . So with *3-Customs procedures* (17 firms), *1-Investment incentives including tax incentives* (15 firms), *5-Physical infrastructure (roads, highways, ports, airports, etc.)* (14 firms). Indicator *18-Other companies from the same country are located here (synergy)* encounters less complaint and is, in fact, considered satisfactory by 28 firms.

2.4.2. Innovation

Over the past three years, firms have focused on markets and product development. In the survey, a Yes response was given by 81 percent of respondent-firms to *Introduction of new goods* and 85 percent to *Opening of a new market*. The four EU firms, three US companies and 86% of Vietnamese firms have, in fact, expanded their markets in the last three years. Meanwhile, Asian firms rank the last with 77 percent only in terms of expansion. Enterprises are as much interested in upgrading manufacturing in terms of production method as well as material source as they are in the market and product themselves.

As far as their willingness to cooperate in innovation is concerned, 17 out of 22 of those in the Other Asian group confirm that Yes, they have a good relationship with MNCs. On the other hand, domestic firms seem to have less linkage with MNCs

2.4.3. Future Plans

Only two firms (1 Vietnamese and 1 Other Asia) are uninterested to continue their business in Hanoi. Vietnamese firms seem to hesitate to expand to other locations in Vietnam whereas only two FDI firms say, No (i.e., will not expand) and two others are "*not sure*".

When it comes to the possible markets to expand to, 35 percent focuses on the

ASEAN (except Cambodia, Laos and Myanmar, or CLM), and 20 percent each to CLM, Other Asia, and others. Only 5 percent selects China. One can observe here that all EU and US firms intend to expand their market beyond Vietnam whereas only over half of other Asia firms are considering such a strategy.

2.5. Summary of Descriptive Analysis

The important factors that pose the greatest impact on any firm's Hanoi operations are:

- *Size of local market*
- *Physical infrastructure (roads, highways, ports, airports, etc.),*
- *Proximity to suppliers/subcontractors*
- *Request by large/related company*
- *Investment incentives*

Important factors that can satisfy enterprises doing business in Hanoi are

- *Protection of intellectual property rights*
- *Infrastructure (telecommunications, IT),*
- *Presence of other companies from the same country that are located in Hanoi (synergy),*
- *Access to cutting-edge technology and information,*
- *Living conditions*

Of the issues evaluated as important, the following got good ratings:

- *Size of local markets*
- *Availability of skilled labor and professionals,*
- *Access to export markets*
- *Infrastructure (telecommunications, IT)*

Issues deemed as "*not very satisfied*" are

- *Availability of low-cost labor*
- *Request by large/related company*
- *Local content requirements, rule of origin*

- *Customs procedures*
- *Investment incentives including tax incentives*
- *Physical infrastructure (roads, highways, ports, airports, etc.)*
- *Other companies from the same country are located here (synergy)*

According to the analysis above, the first important factor for agglomeration in Hanoi is the "*Size of the local market*". Although Greater Hanoi is not the most populous in Vietnam (in comparison with Ho Chi Minh City or Mekong Delta), many domestic firms and government agencies concentrated here. Also, the area has citizens who received the best education and highest income in the country. These factors caught the attention of FDI and joint venture firms. It is also the most satisfactory factor evaluated by local firms. Eighteen out of 22 *Other Asia* firms feel *satisfied* and *very satisfied on the overall*. All four EU firms are satisfied, while only one US firm does not highly appreciate the local market.

The next important factor for attracting FDI and joint venture firm to Hanoi is *Proximity to suppliers/subcontractors*. This is also synonymous with *Request by large/related company*, which applies to new entrants in the Vietnam market. In some interviews with FDI firms (especially those from Japan), interviewees had indicated that their parent companies still wanted to do business in Hanoi first despite the high appreciation for Ho Chi Minh's market.. They have assumed that Hanoi has a *political* position as the capital of Vietnam. *Proximity to suppliers/subcontractors* does not simply refer to providers or subcontractors but to government agencies, too, which is a comparative advantage of Hanoi.

Vietnamese enterprises have invested in Hanoi because of its skilled labor. Hanoi is known for its quality and trained human resources, especially in the fundamental industrial manufacturing such as mechanics, electricity, electronics, and machinery assembling. In addition to basic training, the presence of industrial manufacturing in Hanoi for several years has created experienced and skilled staff. However, these good and skilled labor resources lack creativeness, self-control, and foreign-language capacity. Note that in the initial period of agglomeration, these attributes are one of the reasons Hanoi could attract investment. Table 1-a indicates enterprises' degree of satisfaction with this factor.

Table 1: Satisfaction with Skilled Labor.

(a) By Sector

	Not satisfied at all	Not very satisfied	Not sure	Somewhat satisfied	Very satisfied	Total
Manufacturing	1	7	17	22	14	61
Construction	1	0	2	2	1	6
Wholesale	0	2	0	3	2	7
Retail	0	0	0	0	1	1
Finance/ Insurance	0	0	1	2	0	3
IT services/ Software	0	0	4	5	1	10
Other business services	0	2	1	5	4	12
Other	0	0	0	2	0	2
Total	2	11	25	41	23	102

(b) By Country Origin of FDI Firms

	Not very satisfied	Not sure	Somewhat satisfied	Very satisfied	Total
Other Asia	0	5	8	9	22
United States	0	1	2	0	3
Europe	1	2	1	0	4
Total	1	8	11	9	29

Source: Author.

Thirty-six out of 61 manufacturing firms (59%) say they are "*satisfied*" and "*very satisfied*" with the existing skilled labor; however, 13% of the manufacturing firms seem dissatisfied while 60 percent of IT firms are satisfied and no firm is dissatisfied. Of the FDI firms (Table 1-b), 77 percent of Other Asia firms evaluate these as "*good*", including nine firms that gave a "*very satisfied*" response. Two-thirds of the US firms sound not very satisfied with skilled labor. Furthermore, EU firms assess the factor as "*not very satisfied*" since only one firm seems to be satisfied while the remaining other companies (over 4 firms) are not satisfied with skilled labor of Hanoi.

Investment incentives (including tax incentives) is another common factor that attracts Vietnamese and other Asia firms to Hanoi. However, Hanoi does not yet offer the best investment incentive policy in the country. In the 2007 survey, *Investment incentives* satisfy 40 percent of the firms, including 55 percent (12/22) of the *Other Asia*

firms and around 66 percent of the US firms questioned. Only 37 percent of Vietnamese firms are satisfied while all four EU firms seem not very satisfied.

Table 2: Satisfaction with Investment incentives by Country Origin of Firms.

	Not satisfied at all	Not very satisfied	Not sure	Somewhat satisfied	Very satisfied	Total
Other Asia	1	1	8	9	3	22
United States	0	0	1	2	0	3
Europe	0	1	3	0	0	4
Vietnam	0	12	34	25	2	73
Total	2	11	25	41	23	100

Source: Author.

3. ECONOMETRIC ANALYSIS OF THE MAIL SURVEY

3.1. Factors of Agglomeration

The agglomeration in Vietnam can be divided into three main periods: (1) before 1987; (2) 1988-2000; and (3) after 2001. The year a firm or business activity was established in Vietnam is considered a dependent variable in the econometric analysis. The firms established in the earlier period are referred to as "first movers," and those that came in the later period as "latecomers". Independent variables, on the other hand, which would explain why investors are attracted to the region, are selected from the questionnaire data based on the following characteristics: (1) firm size; (2) attraction factors; and (3) functions of the companies when they were first established.

The relationship between the year of establishment and the size of firms is examined to uncover whether the agglomeration is triggered by large firms such as MNCs or by small ones, either local or foreign. This issue is related to the "Flowchart Approach," which was initiated by Kuchiki (2007), Kuchiki and Tsuji (2005, 2008), and Tsuji *et al* (2006).[i] Meanwhile, three aspects of a firm size are asked in Question 3 of the survey form, namely: (1) number of full-time employees; (2) total assets; and (3) paid-up capital.

Figure 6: Accumulated Number of Office Established in Vietnam.
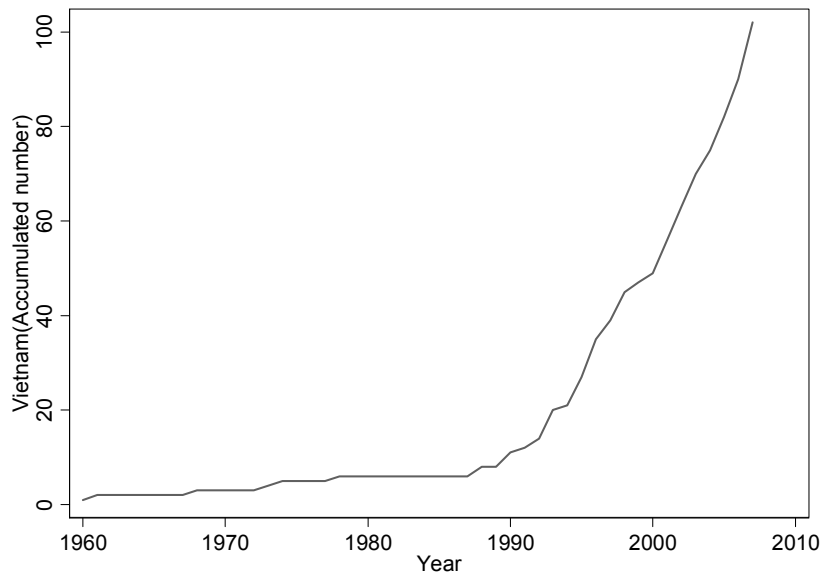
Source: Author.

After determining the dependent and independent variables, three models were estimated according to the definition of the firm size. The Ordered Logit Estimation is adopted, and the Full Model and the Selected Model are estimated. The former model takes all variables into account, while the latter selects variables that are considered to significantly influence the dependent variables. It should be noted that in these Ordered Logit Models, latecomers are taken to be standard by the normalization, and accordingly, a positive (negative) sign of estimated coefficients indicates that they influence only latecomers (first movers). The summarized results are presented below, beginning with the estimation using the number of full-time employees as the variable representing the firm size.

(a) Firm size.

In the Full Model, which utilizes all dependent variables in the estimation, firms with 50-90 and those with 300-399 employees have negative signs with the 5 percent significance levels, and there is no other significant firm size. Since signs are negative, these smaller companies are first movers, but in general no significant relationship between the firm size and the year the business was established is found.

(b) Attracting factors.

Among factors that attracted firms to come to Vietnam, *Customs procedures* (5% significance level), *Government institutional infrastructure* (20%), and *Living conditions* (20%) have negative signs, which implies that these factors influenced first movers. On the other hand, *Physical infrastructure (roads, highways, ports, airports, etc.)* (5%), and *Access to cutting-edge technology and information* (10%) are positive. All these four factors influenced latecomers to agglomerate in Vietnam.

(c) Function of companies.

Human resources development (5%) has a negative sign, and first movers' business activities include this function. In Table 3, the results of the Selected Model are also presented. The number of independent variables is reduced by eliminating irrelevant ones so as to increase accuracy of the estimation in terms of log likelihood, for instance. The Selected Model finds a new variable in firm size with 100-199 employees, which has a negative sign and 5 percent significance level. This reinforces the assertion mentioned earlier that first movers are SMEs. The Selected model raises significance levels of variables such as physical infrastructure and access to new technology and information, and lowers the significance level of customs procedures. The Selected model coincides with the Full model and strengthens the latter's results.

Table 3: Results of Estimations: Agglomeration

	Employees		Assets		Capital	
	Full model	Selected model	Full model	Selected model	Full model	Selected model
Q3) 2) 10,000-24,999(US$)/10,000-24,999 (US$)	[**]	[**]				
3) 100 - 199/25,000-49,999/25,000-49,999		[**]		[**]		
4) 200 - 299/50,000-74,999/50,000-74,999						
5) 300 - 399/75,000-99,999/75,000-99,999	[**]	[**]	**	+	+	+
6) 400 - 499/100,000-499,999/100,000-499,999			[+]	[+]		
7) 500 - 999/500,000-999,999/500,000-999,999						
8) 1,000 - 1,499/1 M-4.9M/1M-4.9M						
9) 1,500 - 1,999/5M-9.9 M/5M-9.9M						
10) 2,000 & above/10M & above/10M & above						
Q8) 1) Investment incentives including tax incentives						
2) Liberal trade policy				+		
3) Customs procedures	[**]	[+]	[**]	[**]	[**]	
4) Local content requirements, rule of origin						
5) Physical infrastructure (roads, highways, ports, airports, etc.)	*	**	+			
6) Infrastructure (telecommunications, IT)						
7) Infrastructure (electricity, water supply, other utilities)			[**]			
8) Government institutional infrastructure	[+]	[*]	[**]	[**]	[**]	[**]
9) Financial system			*			
10) Legal system						
11) Protection of intellectual property rights	**	**	**	**	+	*
12) Size of local markets			[+]			
13) Access to export markets						
14) Proximity to suppliers/subcontractors						
15) Request by large/related company						
16) Availability of low-cost labor						
17) Availability of skilled labor and professionals			[**]		[*]	
18) Other companies from the same country are located here (synergy)						
19) Access to cutting-edge technology and information	*	**	*		+	**
20) Living conditions	[+]	[+]	[+]			
Q6) 1) Retail/ Wholesale trade						
2) Production (raw-material processing)			[+]	[*]	[+]	[+]
3) Production (components and parts)						
4) Production (final products)			[+]	[*]	[+]	
5) Purchasing/ Procurement/ Logistics						
6) R&D/ Consulting						
7) Human resources development	[**]					
Nob	102	102	102	102	102	102
Log likelihood	-56.846	-62.216	-64.059	-73.069	-67.423	-76.743
Pseudo R2	0.360	0.300	0.279	0.178	0.024	0.136

Note 1: [ ] indicates that the coefficient is negative, and items without [] imply the coefficient is positive.
Note 2: **, * and + indicates that coefficient is at the 5, 10 and 20 percent significance level, respectively.

3.2. Industrial Upgrading and Innovation

Here, the current situation on industrial upgrade and innovation in Vietnam is examined. As a result of agglomeration, technology and know-how have been transferred from large and advanced firms such as MNCs to local firms. The flow of

denser information among them as well as the value given to human resources has created endogenous forces that lead to an industrial upgrade and innovation among all firms in the region. To examine, four categories of upgrade or innovation are defined according to Schumpeter's concepts, namely: (1) introduction of new goods; (2) adoption of a new technology; (3) opening of a new market; and (4) acquisition of new input such as raw materials. Question 9 asks, "What upgrades have your company carried out in the last three years, and what upgrades do you intend to achieve in the next three years?" Respondents are then asked to reply either "yes" or "no". These four models are estimated by taking the replies, "yes" or "no" to Question 9 as dependent variables, while the independent variables consisted of the following: (1) satisfaction with Vietnam's economic circumstances such as policy measures and economic conditions, as enquired in Question 8;[ii] (2) function(s) carried out at the time of establishment of the first office, as enquired in Question 6; and (3) year of establishment of offices, as enquired in Question 1. These variables are summarized in Table 3. The results of four estimates are presented in Table 4 in the same way as in Table 3. The next sections now discuss factors that promote industry upgrade or innovation in each model.

3.2.1. Estimation of New Goods Model

This section starts with an introduction of new goods in the Full Model. In the same way as that in Table 3, only significance variables are noted, with stars indicating significance levels, and variables having a negative (positive) sign written with (without) brackets. Note further that factors with negative (positive) signs indicate that they discourage (encourage) innovation. Table 4 shows that no significant variable is identified in the Full Model, but in the Selected Model, variables with positive signs are *Liberal trade policy* (5% significance level), *Customs procedures* (10%), *Protection of intellectual property right* (5%), *Proximity suppliers/subcontractors* (10%), and *Other companies from the same country are located here* (5%). These encourage upgrade and innovation. On the other hand, *Local content requirement, rule of origin* (5%), *Physical infrastructure* (roads, highways, ports, airports, etc.) (5%), *Government institutional infrastructure* (5%), *Size of local markets* (5%), *Requested by large/related companies* (5%), and *Availability of low-cost labor* (10%) are found to have negative signs; accordingly, they are required to improve so as to pave the way for further upgrade and

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innovation.

When assessed by company's function, *Production (raw-materials processing)* (10%), *Production (components and parts)* (5%), and *Production (final products)* (5%) have negative coefficients, and they discourage any upgrade. The Selected Model also shows that the year the business was established has a positive negative sign with a 10 percent significance level, which implies that first movers are more innovative.

3.2.2. Estimation of New Technology Model

This section now examines the model of the adoption of a new technology. At first, *Liberal trade policy* (5% significance level), *Infrastructures (electricity, water supply, other utilities)* (5%) *Government institutional infrastructure* (10%) and *Size of local markets* (5%) have positive signs and accordingly encourage upgrade of this type of model. On the other hand, *Physical infrastructure (roads, highways, ports, airports, etc.)* (10%), *Infrastructure (Telecommunications, IT)* (5%), and *Legal system* (5%) are found to be negatively related.

When assessed by company function, *Retail/wholesale trade* (5%), *Production (components and parts)* (5%), *Production (final products)* (5%), and *R&D/consulting* (5%) have positive signs. This indicates that firms with these functions tend to experience upgrade and innovation.

Table 4: Results of Estimations: Upgrading and Innovation.

	New goods		New method		New market		New supply	
	Full model	Selected model	Full model	Selected model	Full model	Selected model	Full model	Selected model
Q8) 1 incentives		+			**	**		
2 Liberal trade policy		**	**	**			**	**
3 Customs procedures		*			**	**		
4 Local content requirements, rule of origin		[**]					[**]	[**]
5 Physical infrastructure(roads, highways, ports,airports, etc.)		[**]	[*]	[*]			[*]	[+]
6 Infrastructure(telecommunications, IT)			[**]	[**}	[**]	[**]	[+]	[**]
7 Infrastructure (electricity,water supply, other utilities)			**	+	+	*		
8 Government institutional infrastructure		[**]	*	*	*	**	*	*
9 Financial system					[**]	[**]	[**]	[**]
10 Legal system			[**]	[**]	[+]	[+]		[*]
11 Protection of intellectual property rights		**			[**]	[**]		
12 Size of local markets		[**]	**	**		[*]		
13 Access to export markets						[+]	*	**
14 Proximity to suppliers/subcontractors		*			+	+		
15 Request by large/related company		[**]						
16 Availability of low-cost labor		[*]						
17 professionals								
18 Other companies from the same country are located here (synergy)		**			+	[*]	*	*
19 Access to cutting-edge technology and information				[+]	+	[*]		
20 Living conditions					**	**		
Q6) 1 Retail/ Wholesale trade			**	*	**	**		+
2 Production (raw-material processing)		*	+	+			**	**
3 Production (components and parts)		**	**	+	**	**	+	*
4 Production (final products)		**	**	**			**	**
5 Purchasing/ Procurement/ Logistics					+	*		
6 R&D/ Consulting			**	*	+	*		
7 Human resources development			+	[+]				
Q1) When did your company establish its first office?		[*]			+			
_cons		**			[+]			
Obs	98	102	102	102	87	87	98	98
Log likelihood	0.000	-16.751	-47.121	-50.891	-18.444	-20.522	-41.994	-44.861
Pseudo R2	1.000	0.658	0.327	0.273	0.539	0.487	0.375	0.332

Note 1: [ ] indicates that the coefficient is negative, and items without [] imply the coefficient is positive.
Note 2: **, * and + indicates that coefficient is at the 5, 10 and 20 percent significance level, respectively.

The Selected Model identifies the following variables to have a positive sign: *Liberal trade policy* (5% significance level), *Infrastructure (electricity, water supply, other utilities)* (5%), *Government institutional infrastructure* (10%) and *Size of local markets (5%)*. These findings are exactly consistent with the Full Model, since *Infrastructure (electricity, water supply, other utilities)* is also positively significant at the 20 percent level. On the other hand, *Physical infrastructure (roads, highways, ports,*

airports, etc.) (10%), *Infrastructure (Telecommunications, IT)* (5%), and *Legal system (5%)* have negative signs. As for by functions of company, *Retail/wholesale trade* (5%) and *Production (components and parts)* (5%) are the same as the Full Model, but this estimate also includes *Puchasing/procument/logistics* (10%) and *R&D/consulting (10%)* as variables with a positive relationship.

The industrial upgrade that allows one to adopt to the new market in Vietnam is supported by government initiatives such as liberal trade policies as well as enhanced by the size of the local market, but Vietnam's other infrastructure require further improvement.

3.2.3. Estimation of New Market Model

This section examines the model on the opening of a new market. According to Table 3, factors encouraging upgrade or innovation in Vietnam are *Investment incentives including tax incentives* (5%), *Government institutional infrastructure* (10%), and *Living conditions* (5%). On the other hand, variables such as *Infrastructure (Telecommunications, IT)* (5%), *Legal system* (5%), *Protection of intellectual property rights* (5%) have negative signs.

The Selected Model identifies the same variables as mentioned in the Full Model, and raises the significance level of *Government institutional infrastructure* from 10 percent to 5 percent, and *Infrastructure (electricity, water supply, other utilities)* from 20 percent to 10 percent. These two have positive signs. This model is inconsistent with the other model in the following variable: *Other companies from the same country are located here* and *Access to cutting-edge technology and information*. These two have different signs in two estimates.

In sum, the two models on adoption of new technology have conclusions that coincide with each other and show good results in terms of significance. The industrial upgrade related to the opening of the new market in Vietnam is thus promoted by government initiatives such as investment subsidies, customs procedures and institutional infrastructures as well as living conditions, but Vietnam still has other infrastructure---such as those related to telecommunications, finance, intellectual property rights---that require improvement.

3.2.4. Estimation of New Input Model

Here, the model on the acquisition of a new source of input is examined. At first, the Full Model identifies the following factors with positive signs: *Liberal trade policy* (5%), *Government institutional infrastructure* (10%), *Access to export markets (10%)*, and *Other companies from the same country are located here* (10%). These factors encourage upgrades. On the other hand, *Local content requirement, rule of origin* (5%), *Physical infrastructure (roads, highways, ports, airports, etc.)* (10%), *Infrastructure (telecommunications, IT)* (20%) and *Financial systems* (5%) are found to have negative signs, which are thought to be obstacles to any upgrade. The company functions, *Production (raw-material processing)* (5%) and *Production (final products)* (5%) have positive signs.

In the Selected Model, almost all variables related to factors that attract business to Hanoi are the same as in the Full Model except *Legal systems* (10%), which is identified by the Selected Model. The Selected Model also raises significance levels of telecommunications and access to export markets. As for the function of companies, two variables must be mentioned, that is, Retail/wholesale trade becomes significant at a 20 percent level and production *(component and parts)* raises significance level from 20 to 10 percent.

The two models used here are found to have closely similar results with each other.

3.3. Summary of Econometric Analysis

Based on the above empirical analysis, the results of estimation conduced for Vietnam and the present policy issues for further agglomeration are summarized below:

Agglomeration

In terms of firm size, no clear conclusion can be found except that smaller firms are established at the early stage of agglomeration in terms of the number of employees. Vietnam's result is not consistent with that of the Flowchart Approach. The characteristics of agglomeration in Vietnam might be due to the fact that the rapid agglomeration started only recently---in the mid-1990s---and firms that set up business in Vietnam were of all sizes, making it difficult to identify the clear difference.

Except firm size, those factors that attract business to Vietnam (Question 8) and the

functions of companies (Question 6), show signs of significant variables that are consistent across the three models; in other words, no variables have contrasting signs in the three models of the definition of firm size as well as the Full and Selected Models. Factors related to the government policy such as *Customs procedures*, *Government institutional infrastructure*, and *Protection of intellectual property rights* are identified in three models as those with high significance levels. The former two have negative signs, which influence first movers, while the last one is positive and influences latecomers. *Access to cutting-edge technology* also has a positive sign and is found to be significant by the three models. Furthermore, *Availability of skilled labor and professionals* is identified by the assets and capital model as one to influence first movers. Another interesting point is found in inter-firms relationships or networks; namely, factors related to proximity, synergy, and request from large/related firms are not significant, according to the three models' findings. This connotes that the establishment of foreign firms is based on individual decisionmaking, which is different from what the Flowchart Approach suggests.

The agglomeration process in Vietnam can be describe as such: At the earlier stage of agglomeration, small firms producing raw materials and final products established in Vietnam, attracted by this nation's customs procedures, intuitional infrastructure, and living conditions. At the later stage, firms were attracted to the site by its physical infrastructure and the intellectual property rights system. Their decision set up business in Vietnam was independent of those of other firms.

Based on the above discussions, factors of agglomeration are now more clearly identified, which contrasts the results of other countries. However, other variables such as government policies on investment and foreign trades, infrastructure (physical, utilities, telecommunication, and legal system), inter-firms relationships (proximity to suppliers/subcontractors, request by other firms, and synergy), and targeting local as well as export markets are not identified in any of the three models. In other words, these are not effective variables for the agglomeration in Vietnam so far. To effectively encourage more foreign firms into the country, further effective policies are required.

Upgrade and Innovation

It is difficult to find common factors for industrial upgrade and innovation, since

key variables are not robust in all models. Some variables are significantly positive in one model, but are significantly negative in other models. It can be concluded from the estimation exercise that positive factors for upgrade are liberal trade policy, government institutional infrastructure. There are, however, many unsatisfactory factors identified, especially those related to physical as well as social infrastructure. Roads, highways, airports, telecommunications are typical examples of the former, while government institutional infrastructure, financial systems, legal systems, systems of intellectual property rights are related to the latter. The social infrastructure mentioned here is also essential for innovation.

In addition, the inter-firms relationships such as *Proximity to suppliers/subcontractors*, *Request by other firms*, *Other companies from the same countries are located here (synergy)*, and *Access to cutting-edge technology and information* are not identified clearly. The transfer of technology, know-how, and information are essential for industry upgrade and innovation, and this is achieved by networking with firms, research institutions, local governments in the regions they are located. To further the industrial upgrade and innovation, the framework and channel of information flows among firms in the regions are essential.

4. SUMMARY AND RECOMMENDATION

Based on the result of the case study and mail survey, the implications are as follows:

- Agglomeration on Hanoi/Vietnam existed spontaneously without the conscious intention of the central and local governments. Although Hanoi is not supposed to be an ideal environment to enterprises, it has been made more attractive by many "natural and historical" factors as location, market size, skilled labor and individual linkages between FDIs. Thus, it is necessary to make timely effort in order to meet enterprise's requirements.

- Vietnamese firms with no linkage with MNCs, larger firms, and universities in R&D activities find little benefits from the agglomeration. Supporting organizations and authorities need to create policies and programs so that

enterprises could participate in agglomeration, gradually forming clusters. Vietnam hardly exerts effort and supports policies to linkages. Legal system should approve inclusion of clauses on sub-contract law and on quality of semi-products.

- Skilled labor in Hanoi receives good reviews; however, low-cost labor does not meet the demand. Local economic development policies should pay attention to this kind of human resources since it is a social problem and related to industrial distribution.

- Continue initiating better studies on agglomeration. If industry-based agglomeration evaluation over the past 20 years is possible, such will help researchers to propose appropriate policies as well as supporting and effective programs for firms and the local economy.

Policy recommendations

- Focus on the HR development system, especially on gradual training of unskilled labor, and on foreign language ability of skilled labor

- Develop a practical and sustainable strategy for supporting industries

- Provide entrepreneurs the information on linkages

- Create a database on industrial subsectors (mechanic, plastic, molding) in Hanoi

- Focus on technology-intensive industries and build a master plan and strategy for developing regional and national industries

- Concentrate on BDS services in Hanoi as a tool for SME promotion

For international development organizations

- Further research and estimate agglomeration or concentration in areas in Hanoi

- Implement a pilot project to develop industrial clusters in Hanoi

- Build linkage-capacity programs (training courses, workshops) for the government, firms and nongovernmental organizations (NGOs)

- Ask NGOs, United Nations Industrial Organization (UNIDO), United Nations Development Program (UNDP) to help Vietnam in training cluster development agent (CDA), who conceptualizes the overall developmental strategy for a cluster and initiates implementation.

<u>Issues for further research</u>

- Accumulation, concentration and agglomeration can form clusters. It is suggested that cases on cluster creation should be evaluated. What is needed here is to select at least an emerging industry as a case study that can be continually reviewed.

NOTES

[i] The Flowchart Approach captures the nature of the East Asian model of agglomeration, which asserts that large MNCs are established first in special economic zones, for example, and then smaller firms follow to be near to them. This process eventually leads to industrial clusters.

[ii] Question 8 asks respondents' degree of satisfaction. Accordingly, it does not directly relate to factors of upgrade and innovation. It can be interpreted, however, since the dependent variable is whether they experienced an upgrade or not. Firms with affirmative replies to factors are considered to be promoting or supporting upgrade and innovation.

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APPENDIX

Here, detailed results of estimation are presented. Table A1 and A2 show those for agglomeration, and Table A3 and A4 for upgrading and innovation.

Table A1: Estimation of Agglomeration (Vietnam): Full Model

		Full-time Employees		Total Assets		Paid-UP Capital	
		Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Q3)	2) 50-99persons/10,000-24,999(US$)/10,000-24,999 (US$)	-3.316	-3.220 **	0.330	0.310	-0.534	-0.480
	3) 100 - 199/25,000-49,999/25,000-49,999	-1.125	-1.040	-1.470	-1.260	0.055	0.050
	4) 200 - 299/50,000-74,999/50,000-74,999	0.737	0.470	-0.076	-0.070	0.315	0.270
	5) 300 - 399/75,000-99,999/75,000-99,999	-6.458	-3.650 **	2.694	1.960 **	2.030	1.430 +
	6) 400 - 499/100,000-499,999/100,000-499,999	0.831	0.510	-1.925	-1.490 +	-0.497	-0.480
	7) 500 - 999/500,000-999,999/500,000-999,999	-1.256	-0.660	-0.548	-0.420	0.589	0.450
	8) 1,000 - 1,499/1 M-4.9M/1M-4.9M	37.286	0.000	1.157	0.960	0.777	0.680
	9) 1,500 - 1,999/5M-9.9 M/5M-9.9M		0.000	0.889	0.540	1.830	1.210
	10) 2,000 & above/10M & above/10M & above	38.821	0.900	1.748	0.780	1.915	0.930
Q7)	1) Investment incentives including tax incentives	0.285	0.890	0.267	0.880	0.136	0.450
	2) Liberal trade policy	0.308	-2.060	0.325	0.940	0.220	0.680
	3) Customs procedures	-0.607	-0.250 **	-0.978	-2.890 **	-0.640	-2.370 **
	4) Local content requirements, rule of origin	-0.093	2.450	0.367	0.920	0.111	0.300
	5) Physical infrastructure (roads, highways, ports, airports, etc.)	0.850	-0.530 *	0.479	1.420 +	0.465	1.170
	6) Infrastructure (telecommunications, IT)	-0.272	-0.760	0.417	0.910	0.381	0.880
	7) Infrastructure (electricity, water supply, other utilities)	-0.301	-1.310	-0.864	-1.980 **	-0.507	-1.210
	8) Government institutional infrastructure	-0.531	0.000 +	-1.258	-2.820 **	-0.953	-2.430 **
	9) Financial system	0.000	0.180	0.802	1.650 *	0.391	0.940
	10) Legal system	0.085	2.060	-0.024	-0.050	0.136	0.300
	11) Protection of intellectual property rights	0.815	-0.160 **	0.888	2.180 **	0.544	1.460 +
	12) Size of local markets	-0.053	-0.040	-0.423	-1.300 +	-0.328	-1.060
	13) Access to export markets	-0.012	-0.650	-0.110	-0.420	0.002	0.010
	14) Proximity to suppliers/subcontractors	-0.221	-0.200	-0.451	-1.230	-0.181	-0.570
	15) Request by large/related company	-0.054	0.720	0.249	0.910	0.218	0.840
	16) Availability of low-cost labor	0.207	-0.490	0.305	1.080	0.225	0.810
	17) Availability of skilled labor and professionals	-0.198	1.030	-0.862	-2.000 **	-0.680	-1.740 *
	18) Other companies from the same country are located here (synergy)	0.328	1.720	0.322	0.960	0.231	0.680
	19) Access to cutting-edge technology and information	0.988	-1.370 *	1.138	1.840 *	0.767	1.450 +
	20) Living conditions	-0.619	0.110 +	-0.616	-1.320 +	-0.154	-0.400
Q6)	1) Retail/ Wholesale trade	0.071	-1.170	0.118	0.190	-0.077	-0.130
	2) Production (raw-material processing)	-1.178	-0.970	-1.387	-1.510 +	-1.430	-1.560 +
	3) Production (components and parts)	-0.900	-0.940	0.426	0.500	-0.221	-0.270
	4) Production (final products)	-0.751	-0.250	-0.981	-1.310 +	-1.109	-1.490 +
	5) Purchasing/ Procurement/ Logistics	-0.401	0.060	-1.148	-0.650	-0.208	-0.130
	6) R&D/ Consulting	0.039	0.070	0.224	0.330	0.338	0.510
	7) Human resources development	0.078		-0.743	-0.630	-0.129	-0.110
	/cut1	-2.466		-4.502		-2.603	
	/cut2	2.200		-0.746		1.089	
Nob		102		102		102	
Log likelihood		-56.846		-64.059		-67.423	
Pseudo R2		0.360		0.279		0.024	

Note: **, * and + indicates that coefficient is at the 5, 10 and 20% significance level, respectively.

Table A2: Estimation of Agglomeration (Vietnam): Selected Model

		Full-time Employees		Total Assets		Paid-UP Capital	
		Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Q3)	2) 50-99persons/10,000-24,999(US$)/10,000-24,999 (US$)	-2.992	-3.610 **				
	3) 100 - 199/25,000-49,999/25,000-49,999	-1.607	-1.980 **	-1.736	-2.230 **		
	4) 200 - 299/50,000-74,999/50,000-74,999						
	5) 300 - 399/75,000-99,999/75,000-99,999	-6.510	-4.180 **	1.288	1.400 +	1.251	1.400 +
	6) 400 - 499/100,000-499,999/100,000-499,999			-1.227	-1.650 +		
	7) 500 - 999/500,000-999,999/500,000-999,999						
	8) 1,000 - 1,499/1 M-4.9M/1M-4.9M						
	9) 1,500 - 1,999/5M-9.9 M/5M-9.9M						
	10) 2,000 & above/10M & above/10M & above						
Q7)	1) Investment incentives including tax incentives						
	2) Liberal trade policy			0.401	1.520 +		
	3) Customs procedures	-0.292	-1.350 +	-0.401	-1.980 **		
	4) Local content requirements, rule of origin						
	5) Physical infrastructure (roads, highways, ports, airports, etc.)	0.661	2.580 **				
	6) Infrastructure (telecommunications, IT)						
	7) Infrastructure (electricity, water supply, other utilities)						
	8) Government institutional infrastructure	-0.482	-1.880 *	-0.714	-2.810 **	-0.451	-2.060 **
	9) Financial system						
	10) Legal system						
	11) Protection of intellectual property rights	0.743	2.730 **	0.786	3.490 **	0.401	1.810 *
	12) Size of local markets						
	13) Access to export markets						
	14) Proximity to suppliers/subcontractors						
	15) Request by large/related company						
	16) Availability of low-cost labor						
	17) Availability of skilled labor and professionals						
	18) Other companies from the same country are located here (synergy)						
	19) Access to cutting-edge technology and information	0.781	2.160 **			0.531	2.180 **
	20) Living conditions	-0.504	-1.450 +				
Q6)	1) Retail/ Wholesale trade						
	2) Production (raw-material processing)			-1.492	-1.960 *	-1.124	-1.460 +
	3) Production (components and parts)						
	4) Production (final products)			-0.929	-1.890 *		
	5) Purchasing/ Procurement/ Logistics						
	6) R&D/ Consulting						
	7) Human resources development						
	/cut1	-3.391		-3.661		-1.270	
	/cut2	-0.692		-0.289		1.966	
Nob		102		102		102	
Log likelihood		-62.216		-73.069		-76.743	
Pseudo R2		0.300		0.178		0.136	

Note: **, * and + indicates that coefficient is at the 5, 10 and 20% significance level, respectively.

Table A3: Results of Industrial Upgrading and Innovation (Vietnam): Full Model

		New goods		New method		New market		New supply	
		Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Q8)	1) Investment incentives including tax incentives	354.545	0.030	-0.614	-1.110	5.273	2.490 **	-0.276	-0.430
	2) Liberal trade policy	423.935	0.040	1.623	2.560 **	-1.275	-0.990	1.387	2.040 **
	3) Customs procedures	145.581	0.050	0.261	0.530	3.591	2.120 **	0.170	0.300
	4) Local content requirements, rule of origin	-390.750	-0.030	-0.171	-0.430	0.000	0.000	-0.982	-2.070 **
	5) Physical infrastructure (roads, highways, ports, airports, etc.)	-375.797	-0.050	-0.901	-1.900 *	0.205	0.200	-0.983	-1.720 *
	6) Infrastructure (telecommunications, IT)	-255.196	-0.020	-1.690	-2.600 **	-4.722	-2.210 **	-0.995	-1.580 +
	7) Infrastructure (electricity, water supply, other utilities)	98.683	0.010	1.390	2.240 **	2.136	1.570 +	-0.202	-0.330
	8) Government institutional infrastructure	-95.976	-0.020	1.017	1.710 *	3.109	1.840 *	1.404	1.960 *
	9) Financial system	-173.849	-0.040	-0.588	-1.030	-3.093	-2.080 **	-1.658	-2.410 **
	10) Legal system	-525.951	-0.060	-1.229	-2.170 **	-1.876	-1.560 +	-0.727	-1.230
	11) Protection of intellectual property rights	306.490	0.050	-0.146	-0.350	-2.497	-2.040 **	-0.180	-0.390
	12) Size of local markets	-445.042	-0.030	1.325	2.510 **	-1.618	-1.080	0.619	1.210
	13) Access to export markets	-85.275	-0.020	-0.392	-0.730	-1.143	-0.920	1.204	1.920 *
	14) Proximity to suppliers/subcontractors	53.241	0.000	0.049	0.100	1.716	1.610 +	-0.149	-0.310
	15) Request by large/related company	-418.726	-0.050	0.371	0.870	-0.693	-0.720	-0.265	-0.530
	16) Availability of low-cost labor	-215.119	-0.050	-0.301	-0.910	-0.550	-0.760	0.040	0.110
	17) Availability of skilled labor and professionals	63.387	0.000	-0.127	-0.300	-0.586	-0.670	-0.319	-0.710
	18) Other companies from the same country are located here (synergy)	336.256	0.030	-0.463	-0.910	-2.377	-1.560 +	1.227	1.950 *
	19) Access to cutting-edge technology and information	92.347	0.020	-0.626	-1.260	-2.180	-1.630 +	-0.224	-0.450
	20) Living conditions	173.139	0.010	0.187	0.350	4.845	2.360 **	0.535	0.850
Q6)	1) Retail/ Wholesale trade	-1.235	0.000	1.649	2.190 **	4.715	2.060 **	0.991	1.230
	2) Production (raw-material processing)	339.394	0.020	1.965	1.510 +			5.489	2.880 **
	3) Production (components and parts)	276.076	0.040	1.879	1.980 **	9.141	2.230 **	1.279	1.280 +
	4) Production (final products)	720.702	0.040	3.763	3.260 **	0.467	0.260	2.560	2.340 **
	5) Purchasing/ Procurement/ Logistics	234.371	0.030	-2.379	-1.190	5.006	1.460 +		
	6) R&D/ Consulting	-210.101	-0.020	1.822	2.040 **	3.020	1.580 +	-0.129	-0.140
	7) Human resources development	-20.850	-0.080	-1.934	-1.350 +			-1.988	-1.170
Q1)	When did your company establish its first office?	45337.080	0.080	-0.007	-0.200	0.116	1.360 +	0.024	0.640
	constant	327.359	2.040	15.964	0.210	-222.391	-1.310 +	-47.808	-0.640
Nob		98		102		87		98	
Log likelihood		0.000		-47.121		-18.444		-41.994	
Pseudo R2		1.000		0.327		0.539		0.375	

Note: **, * and + indicates that coefficient is at the 5, 10 and 20% significance level, respectively.

Table A4: Results of Industrial Upgrading and Innovation (Vietnam): Selected Model

	New goods Coefficient	New goods t-value	New method Coefficient	New method t-value	New market Coefficient	New market t-value	New supply Coefficient	New supply t-value
Q8) 1) Investment incentives including tax incentives	2.435	1.490 +			4.066	2.440 **		
2) Liberal trade policy	4.979	2.590 **	0.862	2.110 **			1.036	2.290 **
3) Customs procedures	2.383	2.140 *			2.618	2.320 **		
4) Local content requirements, rule of origin	-6.785	-2.420 **					-0.817	-2.000 **
5) Physical infrastructure (roads, highways, ports, airports, etc.)	-2.771	-2.490 **	-0.638	-1.820 *	-3.554	-2.350 **	-0.604	-1.540 +
6) Infrastructure (telecommunications, IT)			-1.217	-2.490 **	2.035	1.780 *	-0.982	-2.000 **
7) Infrastructure (electricity, water supply, other utilities)			0.693	1.430 +				
8) Government institutional infrastructure	-4.186	-2.030 **	0.889	1.840 *	3.240	2.350 **	1.124	1.860 *
9) Financial system					-2.716	-2.270 **	-1.351	-2.440 **
10) Legal system			-1.392	-3.140 **	-1.515	-1.570 +	-0.906	-2.050 *
11) Protection of intellectual property rights	2.417	2.230 **			-2.359	-2.180 **		
12) Size of local markets	-6.447	-2.460 **	1.052	2.550 **	-1.953	-1.700 *		
13) Access to export markets					-1.559	-1.430 +	1.183	2.850 **
14) Proximity to suppliers/subcontractors	2.477	1.650 *			1.108	1.310 +		
15) Request by large/related company	-4.201	-2.260 **						
16) Availability of low-cost labor	-1.338	-1.700 *						
17) Availability of skilled labor and professionals								
18) Other companies from the same country are located here (synergy)	4.514	2.370 **	-0.520	-1.470 +	-1.991	-1.900 *	0.953	1.910 *
19) Access to cutting-edge technology and information					-1.649	-1.730 *		
20) Living conditions					3.929	2.430 **		
Q6) 1) Retail/ Wholesale trade			0.962	1.650 *	2.748	2.330 **	0.842	1.450 +
2) Production (raw-material processing)	6.253	1.930 *	1.349	1.380 +			4.503	2.780 **
3) Production (components and parts)	5.745	2.350 **	0.910	1.310 +	6.255	2.360 **	1.063	1.680 *
4) Production (final products)	7.705	2.820 **	2.718	3.450 **			2.531	3.180 **
5) Purchasing/ Procurement/ Logistics			1.318	1.820 *	4.798	1.720 *		
6) R&D/ Consulting			-1.866	-1.430 +	2.114	1.850 *		
7) Human resources development								
Q1) When did your company establish its first office?	-0.150	-1.960 *						
constant	327.359	2.040 **	-0.474	-0.250	5.864	1.210	0.050	0.020
Nob	102		102		87		98	
Log likelihood	-16.751		-50.891		-20.522		-44.861	
Pseudo R2	0.658		0.273		0.487		0.332	

Note: **, * and + indicates that coefficient is at the 5, 10 and 20% significance level, respectively.

5

Consolidated Multi-country Analysis of Agglomeration

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Abstract

Industrial agglomeration and upgrading is further fuelling the rapid economic development in East Asia, especially in the Association of Southeast Asian Nations (ASEAN) countries. To examine how these have been occurring, this paper makes an attempt to identify factors promoting agglomeration and innovation using rigorous statistical econometric methods. Ordered and Binary Logit Models were used to analyze the nature and characteristics of the agglomeration and industrial upgrading or innovation in four ASEAN countries, namely, Indonesia, the Philippines, Thailand, and Vietnam. Data from these countries were consolidated to analyze the issues of the region as a whole, rather than individually. Particular focus was placed on factors such as policy measures and the economic environment, which contribute to or are required for agglomeration and innovation.

INTRODUCTION

East Asian economies have been attracting global interests because of their fast-paced growth on the back of strong domestic economies and foreign direct investments (FDI). Multinational corporations (MNCs) have been establishing production bases in these countries by taking advantage of their human, land and natural resources and bringing their own technologies. Because of FDI, local firms are also

forced to upgrade to be able to compete and remain competitive. Kuchiki and Tsuji (2005, 2008); Tsuji, et al. (2006); Tsuji, et al. (2007); and Tsuji, et al. (2008) extensively analyzed industrial agglomeration or clustering in Asia and other countries as a factor of economic development, and proposed a hypothesis related to East Asian agglomeration, referred to as the East Asian Model or the "Flowchart Approach". This postulates that MNCs, which are referred to as anchor firms, establish production bases first, then followed by local firms, mostly small- and medium-sized enterprises (SMEs), which are actually suppliers or sub-contractors to both foreign and local MNCs. This eventually leads to the formation of industrial clusters.

The Flowchart Approach summarizes that the common success of these industrial agglomerations depends on three conditions: (a) infrastructure (highways, ports, electricity supply, human resources, etc.); (b) institutional framework (legal systems, deregulation, market setups); and (c) government support in terms of taxation, finance, and incentives. Above all, the role of government is essential. In developing countries, the market mechanism to foster agglomeration does not function well due to regulations, bureaucracy, and existing legal framework. Moreover, there is no proper market for capital and human resources. In such a case, the government must complement the market mechanism and prepare the above three conditions. Government-led industrial parks and estates seen in East Asian economies provide good examples where collaboration of these three conditions had worked well.

Another factor that contributes to the economic development of East Asian economies is the creation of the endogenous innovation process. Agglomeration by foreign investors can be rather easily achieved by offering attractive incentives to MNCs. However, if agglomerations by MNCs are aimed at seeking production bases, they are neither stable nor sustainable to host countries as they easily leave once they find other attractive places. Each economy has to create innovation for their growth to be sustainable. Agglomerations can facilitate further exchange of information, know-how, technologies and even tacit knowledge, and consequently promote endogenous flow of innovation or research and development (R&D). The theoretical foundation of how agglomeration is transformed to endogenous innovation is discussed in Porter (1980); Krugman (1991); Fujita, et al. (1999); and Fujita and Thisse (2002).

In particular, ASEAN countries have shown rapid growth after the economic crisis

in 1997, and there is no doubt that industrial agglomeration and upgrading played a big role. To examine how these have been occurring, this paper attempted to identify factors promoting agglomeration and innovation. Statistical econometric methods were used to analyze the nature and characteristics of the agglomeration and industrial upgrading or innovation in four ASEAN countries, namely, Indonesia, the Philippines, Thailand, and Vietnam, which participate in an international joint research of ERIA (Economic Research Institute for ASEAN and East Asia). Data from these four countries were consolidated to determine the issues of the region as a whole, rather than individually. Particular focus was placed on factors such as policy measures and the economic environment, which contribute to or are required for agglomeration and innovation.

1. SURVEYS AND DATA

Each country's research team conducted mail surveys and in-depth interviews with firms engaged in business activities in the four countries. The mail surveys, which used the same questionnaire for all sample countries[i] were conducted in October and December 2007. Total number of respondents was 888 broken down as follows: Indonesia, 121; the Philippines, 505; Thailand, 160; and Vietnam, 102 (Table 1). Using the data generated, the nature and characteristics of agglomeration and innovation in the four ASEAN countries were determined. This paper thus presents the model of agglomeration first and later discusses industrial upgrading and innovation.

Table 1: Number of Dispatch and Valid Respondents of the Questionnaire

	Dispatch	Valid Response	Response Rate
Indonesia	1,000	121	12.1%
The Philippines	516	505	97.9%
Thailand	1,800	160	8.9%
Vietnam	1,000	102	10.2%
Total	4,316	888	20.6%

Source: Authors

2. FACTORS OF AGGLOMERATION

2.1. Index of Agglomeration for Analysis

The nature of industrial agglomeration was studied and factors which attracted firms to particular areas were identified. Question 1 on the questionnaire asked the year of the company's establishment in the particular country.

Figure 1 shows the number of firms established in the four ASEAN countries since 1960, with a notably sharp increase occurring during the late 1980s. The data for the different countries cannot be directly compared because the total number of firms differed among them. The number of firms established in each economy each year was divided by the total sample number of firms in 2007 and the accumulated percentage for each was plotted in Figure 2. The trend for the four countries combined is shown in Figure 3.

Figure 1: Agglomerations in the Four Economies
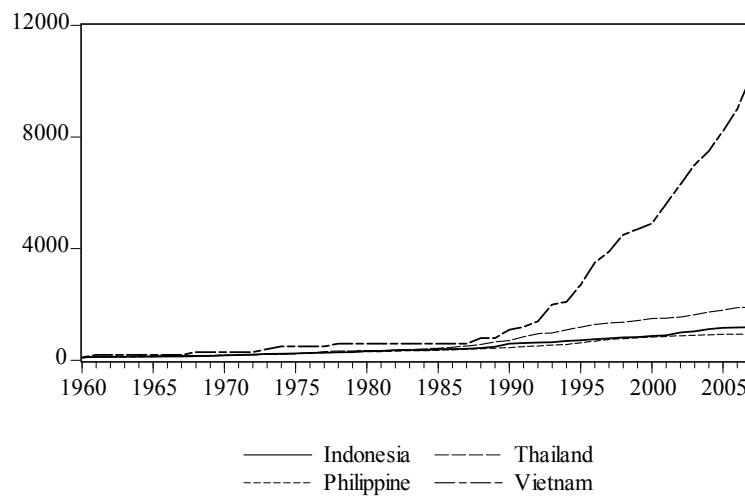
Source: Authors

Figure 2: Agglomerations in the Four Countries (Cumulative Percentage)
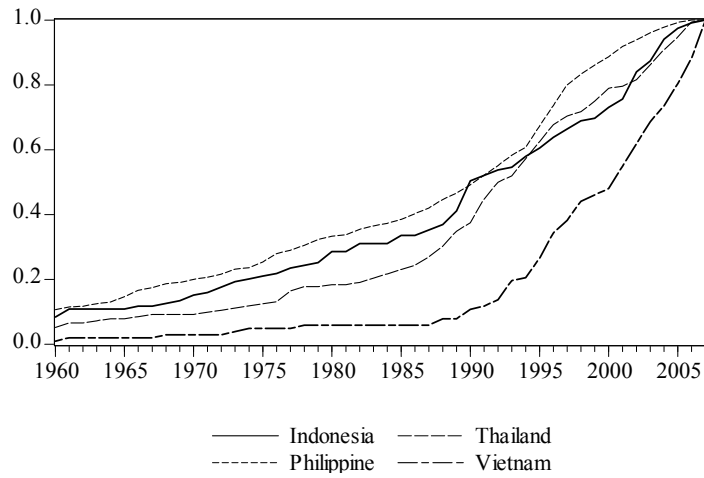
Source: Authors.

Figure 3: Agglomeration of the Four Countries Combined
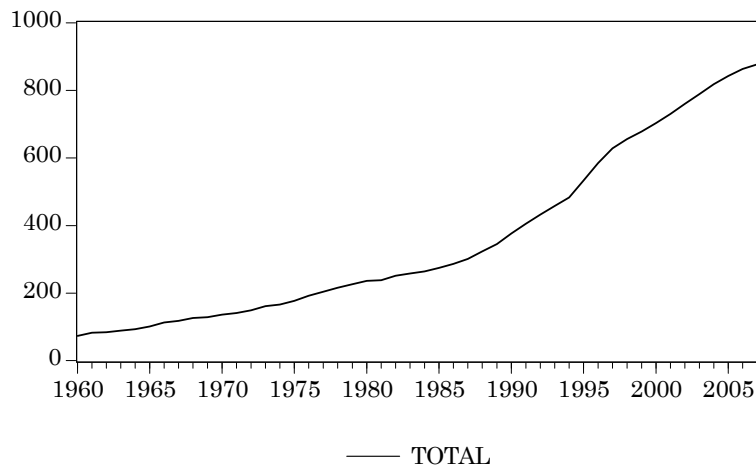
Source: Authors.

Several observations can be derived from Figures 2 and 3. Indonesia has been growing at a steady pace except from 1995 to 1997 while the Philippines experienced rapid growth from 1986 to 1997. Thailand had the same growth rate, but it slowed after 1997. Vietnam showed the most rapid growth, especially after 1987, even though the rate was lower from 1998 to 2000. In all four economies, the number of firms established increased after 1986, but then the rate of increase slowed down for several years after the economic crisis of 1997.

The plotted trends in Figure 3 would fail to show any distinctive time periods. Hence, division was based on the occurrence of economic events. In the late 1980s, for example, the rapid appreciation of the Japanese yen and the Japanese economic bubble forced Japanese firms to relocate to ASEAN countries. The 1997 economic crisis likewise brought significant impacts, resulting to restrain FDI, and consequently caused serious recession. Thus, based on these events, three divisions can be used: (1) before 1985; (2) 1986-1997; and (3) after 1998.[ii]

2.2. Variables for Estimation

The year of establishment of each firm was taken as a dependent variable in the econometric analysis, with firms established before 1985 being taken as 0, those established during 1986-1997 as 1, and those after 1998 as 2. Firms established earlier were referred to as "first movers," and those that came later as "latecomers."

Independent variables, which explain why they were attracted to these regions, were selected from the following "characteristic" choices on the questionnaire: (1) important considerations such as infrastructure present, legal and financial systems, and incentives (Question 7), (2) office function (e.g. production, purchasing) when it was established (Question 6), (3) firm size (Question 3), (4) industry (e.g., manufacturing, business) (Question 4), and (5) orientation to export (Question 5).

The relationship between the year of establishment and firm size (3) is of interest as it is theorized that agglomeration is triggered by large firms such as MNCs, or small ones, whether local or foreign. This issue is related to the "Flowchart Approach," which was initiated and verified by Kuchiki and Tsuji (2005, 2008), Tsuji, et al. (2006), and Kuchiki (2007).

Thus, Question 3 of the survey was about the three categories relating to firm size, namely, number of full-time employees; total assets; and paid-up capital. There was, however, one serious problem that arose related to the firm size question. The Philippine Team used Philippine pesos (PHP) as the unit, rather than the US dollar. To address this problem, two models were adopted for consideration, Case A and Case B, depending on the definition of firm size. In Case A, new variables were constructed in such a way that if a firm is of a certain size in terms of employment, assets, and capital, it used the logarithm of the mean value of that size rather than a dummy variable. This method of

construction allowed the variables related to the three categories of firm size to be continuous.[iii] Case B, on the other hand, used dummy variables for the three categories related to country analysis and firm size.

The firms were also asked to choose from the following 15 industries (Question 4): (1) Manufacturing; (2) Primary products (Agriculture, Forestry, Fishing, Mining); (3) Utilities (Electricity, Gas, Water Supply); (4) Construction; (5) Wholesale; (6) Retail; (7) Hotels/Restaurants; (8) Transportation; (9) Telecommunications; (10) Finance/ Insurance; (11) Real estate; (12) IT services/Software; (13) Other business services; (14) Personal services; and (15) Others. Since manufacturing and business services industries were the focus as they are essential for agglomeration and industry upgrading, a reply of "yes" to manufacturing was considered to be a dummy variable (referred to as "manufacturing"). Answering "yes" to the following four industries ("business services") was also taken as a dummy variable: (10) Finance/Insurance; (11) Real estate; (12) IT services/Software; and (13) Other business services. If a firm replied "yes" to one of these, the variable was taken as 1, otherwise it was 0.

Since exporting boosts the growth of ASEAN countries, orientation to export was also determined through item Q5-1 of the questionnaire, which asked for the firms' main target markets. If a firm replied that they target the foreign market, then the variable is taken as 1, otherwise it was 0.

In addition, Indonesia, the Philippines, and Vietnam were treated as country dummies, with Thailand as the standard.

The summary of statistics used for estimation is presented in Table 2.

Table 2: Summary Statistics: Consolidated Model

Variable			Obs	Mean	Std. Dev.	Min	Max
Dependent Variables							
Q1)	Agglomeration		878	0.969	0.773	0	2
Q9)	Innovation :	Goods	364	0.747	0.435	0	1
		Methods	362	0.577	0.495	0	1
		Markets	364	0.753	0.432	0	1
		Suppliers	363	0.493	0.501	0	1
Independent Variables							
Q1)	Establishment Year		878	######	19.928	1805	2007
Q1)	Dummy (1986-1997=1, other=0)		878	0.402	0.491	0	1
	Dummy (1998-2007=1, other=0)		878	0.284	0.451	0	1
Q3)	1) Size of company :	Full-time Employees	822	4.257	1.321	3.219	7.601
		Total Assets	794	12.147	2.340	9.210	16.785
		Paid-up Capital	774	11.931	2.173	9.210	16.785
Q3)	1) Full-time Employees :	50 - 99	878	0.162	0.368	0	1
		100 - 199	878	0.100	0.300	0	1
		200 - 299	878	0.044	0.206	0	1
		300 - 399	878	0.023	0.149	0	1
		400 - 499	878	0.023	0.149	0	1
		500 - 999	878	0.031	0.173	0	1
		1,000 - 1,499	878	0.023	0.149	0	1
		1,500 - 1,999	878	0.016	0.125	0	1
Q3)	1) Total Assets (US$) :	10,000-24,999	878	0.123	0.329	0	1
		25,000-49,999	878	0.091	0.288	0	1
		50,000-74,999	878	0.072	0.258	0	1
		75,000-99,999	878	0.048	0.214	0	1
		100,000-499,999	878	0.087	0.281	0	1
		500,000-999,999	878	0.071	0.256	0	1
		1 million-4.9 million	878	0.104	0.305	0	1
		5 million-9.9 million	878	0.038	0.190	0	1
Q3)	1) Paid-up Capital (US$)	10,000-24,999	878	0.146	0.353	0	1
		25,000-49,999	878	0.104	0.305	0	1
		50,000-74,999	878	0.059	0.236	0	1
		75,000-99,999	878	0.041	0.198	0	1
		100,000-499,999	878	0.105	0.306	0	1
		500,000-999,999	878	0.048	0.214	0	1
		1 million-4.9 million	878	0.087	0.281	0	1
		5 million-9.9 million	878	0.027	0.163	0	1
Q4)	Manufacturing		878	0.494	0.500	0	1
	Business		878	0.166	0.373	0	1
Q5)	Exporters		878	0.312	0.464	0	1
	Dummy (Indonesia=1, other countries=0)		878	0.136	0.342	0	1
	Dummy (the Philippines=1, other countries=0)		878	0.574	0.495	0	1
	Dummy (Vietnam=1, other countries=0)		878	0.116	0.321	0	1
Q6)	1 Retail/Wholesale trade		871	0.278	0.448	0	1
	2 Production (raw-material processing)		871	0.123	0.328	0	1
	3 Production (components and parts)		871	0.147	0.354	0	1
	4 Production (final products)		870	0.307	0.461	0	1
	5 Purchasing/Procurement/Logistics		871	0.118	0.323	0	1
	6 R&D/Consulting		871	0.085	0.279	0	1
	7 Human resources development		871	0.079	0.270	0	1

Table 2: Summary Statistics: Consolidated Analysis (continued)

Variable		Obs	Mean	Std. Dev.	Min	Max
Q7)	1) Investment incentives including tax incentives	855	3.742	1.361	1	5
	2) Liberal trade policy	847	3.307	1.336	1	5
	3) Customs procedures	853	3.339	1.417	1	5
	4) Local content requirements, rule of origin	845	3.363	1.320	1	6
	5) Physical infrastructure (roads, highways, ports,	860	4.199	1.032	1	5
	6) Infrastructure (telecommunications, IT)	858	4.200	1.007	1	5
	7) Infrastructure (electricity, water supply, other	862	4.285	0.986	1	5
	8) Government institutional infrastructure	856	3.828	1.102	1	5
	9) Financial system	857	4.167	0.998	1	5
	10) Legal system	858	3.899	1.124	1	5
	11) Protection of intellectual property rights	853	3.660	1.243	1	5
	12) Size of local markets	857	4.130	1.223	1	5
	13) Access to export markets	852	3.393	1.394	1	5
	14) Proximity to suppliers/subcontractors	853	3.853	1.183	1	5
	15) Request by large/related company	843	3.536	1.333	1	5
	16) Availability of low-cost labor	855	3.716	1.257	1	5
	17) Availability of skilled labor and professionals	858	4.225	1.035	1	5
	18) Other companies from the same country are located there (synergy)	849	3.226	1.306	1	5
	19) Access to cutting-edge technology and	856	3.915	1.157	1	5
	20) Living conditions	853	3.893	1.087	1	5
Q8)	1) Investment incentives including tax incentives	349	3.160	0.981	1	5
	2) Liberal trade policy	346	3.263	0.925	1	5
	3) Customs procedures	351	3.028	0.962	1	5
	4) Local content requirements, rule of origin	344	3.134	0.900	1	5
	5) Physical infrastructure (roads, highways, ports,	350	3.309	1.033	1	5
	6) Infrastructure (telecommunications, IT)	349	3.662	0.968	1	5
	7) Infrastructure (electricity, water supply, other	347	3.536	0.890	1	5
	8) Government institutional infrastructure	350	3.011	1.027	1	5
	9) Financial system	348	3.480	0.840	1	5
	10) Legal system	349	3.103	0.980	1	5
	11) Protection of intellectual property rights	348	3.101	0.932	1	5
	12) Size of local markets	350	3.723	0.964	1	5
	13) Access to export markets	349	3.330	0.984	1	5
	14) Proximity to suppliers/subcontractors	347	3.548	0.896	1	5
	15) Request by large/related company	347	3.464	0.884	1	5
	16) Availability of low-cost labor	351	3.185	0.999	1	5
	17) Availability of skilled labor and professionals	349	3.444	1.020	1	5
	18) Other companies from the same country are located here (synergy)	349	3.143	0.832	1	5
	19) Access to cutting-edge technology and	348	3.664	0.951	1	5
	20) Living conditions	351	3.553	0.899	1	5

Source: Authors.

3. Result of Estimation I: Agglomeration

As discussed in the previous section, three models were used based on the definition of firm size; namely, employees, assets, and capital models. The Ordered Logit Estimation (OLS) method was adopted and six estimates were made to come up with a Full Model and a Selected Model for each definition of firm size. The Full Model took all variables into account, while the Selected Model chose only variables that could

significantly influence the dependent variables. [iv] Table 3 shows the estimated coefficients and their significance levels. Detailed estimation results are presented in the Appendix.

3.1. Agglomeration Case A: Continuous Firm Size

It should be noted that in these Ordered Logit Models, latecomers were made standard by normalization, and accordingly, a positive (negative) sign beside the estimated coefficients in the tables indicated that they influence only latecomers (first movers). The estimation results for Case A, in which the firm size variables were made continuous, are shown in Table 3.

To all six estimations, the common negatively significant variables that influenced first movers were the following: local content requirements, rule of origin (at least 10%); government institutional infrastructure (5%); proximity to suppliers/subcontractors (5%); manufacturing (5%); and business (5%). For 20 percent of all six estimations, the following were negatively significant: size of local markets; production (raw-material processing) (10%); and production (final products) (5%).

On the contrary, the following variables were positive for all six estimations and influenced latecomers: production (components and parts) (at least 10%); R&D/consulting (at least 10%); protection of intellectual property rights (almost 5%); and exports (almost 5%). To at least 20 percent for all six estimations, the following were likewise positively significant: infrastructure (electricity, water supply, other utilities); financial system; availability of low-cost labor; and other companies from the same country are located there (synergy).

Table 3: Estimation Results: Agglomeration Case A

		Employees		Assets		Capital	
		Full model	Selected model	Full model	Selected model	Full model	Selected model
Q7)	1) Investment incentives, including tax incentives						
	2) Liberal trade policy			+			
	3) Customs procedures						
	4) Local content requirements, rule of origin	[*]	[*]	[*]	[**]	[*]	[*]
	5) Physical infrastructure (roads, highways, ports,						
	6) Infrastructure (telecommunications, IT)				+		
	7) Infrastructure (electricity, water supply, other utilities)	*	*	+		+	+
	8) Government institutional infrastructure	[**]	[**]	[**]	[**]	[**]	[**]
	9) Financial system		+	*	*	*	*
	10) Legal system						
	11) Protection of intellectual property rights	*	**	**	**	**	**
	12) Size of local markets	[*]	[*]	[*]	[+]	[*]	[+]
	13) Access to export markets						
	14) Proximity to suppliers/subcontractors	[**]	[**]	[**]	[**]	[**]	[**]
	15) Request by large/related company						
	16) Availability of low-cost labor	+	**	+	+	*	*
	17) Availability of skilled labor and professionals						
	18) Other companies from the same country are located there (synergy)	+	*	**	*	+	
	19) Access to cutting-edge technology and information						
	20) Living conditions						
Q6)	1 Retail/Wholesale trade						
	2 Production (raw-material processing)	[*]	[*]	[+]	[*]	[+]	[+]
	3 Production (components and parts)	*	*	**	**	**	**
	4 Production (final products)	[**]	[**]	[+]	[+]	[+]	[+]
	5 Purchasing/Procurement/Logistics						
	6 R&D/Consulting	**	**	*	*	**	**
	7 Human resources development						
Q3) 1)	Size of company: Full-time Employees	[**]	[**]				
	Total Assets			**	**		
	Paid-up Capital					**	**
Q4)	Manufacturing	[**]	[**]	[**]	[**]	[**]	[**]
	Business	[**]	[**]	[**]	[**]	[**]	[**]
Q5)	Exporters	**	**	**	*	**	**
	Dummy (Indonesia=1, other countries=0)	[+]	[+]				
	Dummy (the Philippines=1, other countries=0)	[**]	[**]	[**]	[**]	[**]	[**]
	Dummy (Vietnam=1, other countries=0)	**	**	**	**	**	**
	Number of observations	753	772	732	750	714	735
	Log likelihood	-735.4	-761.177	-714.31	-739.705	-698.07	-727.041
	Pseudo R2	0.099	0.091	0.1	0.091	0.096	0.09

Note 1: [ ] indicates that the coefficient is negative, and items without [ ] have a positive coefficient.
Note 2: **, *, and + indicate that the coefficient is at 5, 10, and 20 percent significance level, respectively.
Source: Authors.

Given these results, agglomeration can be described as follows: in the early stage, labor-intensive companies, with activities related to the production of raw materials and finished goods, found locations in the four countries. The size of local markets and the institutional framework related to the governments and utilities often attracted the firms to set up their businesses in these areas. At the later stage of agglomeration, capital-intensive firms which function as offices for the parts production and R&D were attracted by the institutional framework such as the intellectual property rights and

financial systems, as well as infrastructure like telecommunications and utilities. In addition, the synergy effect or the tendency of firms from the same country to locate around the same area, and low labor costs were also important factors. The production of components and parts, R&D, and exporting characterize this stage because R&D activities are related to the patent systems. The four countries are also involved in the global network of production and distribution, thus, part production and exporting became significant factors.

Consistent with the results obtained using the Flowchart Approach, the results indicated that first movers are rather large firms.

3.2. Agglomeration Case B: Discrete Firm Size

As with the previous case, six estimations were made, and are presented in Table 4. Case B estimations treated variables indicating firm size as dummy variables.

In this scenario, the negatively significant variables common to all six estimations which have influenced first movers were: government institutional infrastructure (5%); size of local markets (5%); production (final products) (5%); and production (raw-material processing) (at least 10%).

The following were negatively significant to at least 20 percent for all or almost all six estimations: local content requirements, rule of origin (at least 20%); and proximity to suppliers/subcontractors (at least 20%).

In contrast, variables that were positive for all six estimations and influenced latecomers were: protection of intellectual property rights (almost 5%); other companies from the same country are located in the area (synergy); and R&D/ consulting (at least 10%). To at least 20 percent for all or almost all six estimations, positively significant variables (at least 10%) were production (components and parts); and R&D/consulting. In addition, infrastructure such as electricity, water supply, and other utilities; and the availability of low-cost labor were also considered.

For Case B, the standard firm size is the smallest in all three categories. The size is indicated by whether firms of a particular size came earlier or later than the minimum class. Table 4 shows that almost all classes have positive signs, and, accordingly, latecomers tend to be larger firms.[v] These results are not consistent with the Flowchart Approach. Finally, the Philippines dummy (5%) was negative, while the Vietnam

dummy was positive (5%), which means that the Philippines started agglomeration earlier than Thailand, while Vietnam joined the trend after Thailand.

Table 4: Results of Estimation: Agglomeration Case B

		Employees		Assets		Capital	
		Full model	Selected model	Full model	Selected model	Full model	Selected model
Q7)	1) Investment incentives including tax incentives						
	2) Liberal trade policy			+		+	
	3) Customs procedures						
	4) Local content requirements, rule of origin	[+]	[*]	[*]	[**]	[+]	[*]
	5) Physical infrastructure (roads, highways, ports,						
	6) Infrastructure (telecommunications, IT)		**		**		+
	7) Infrastructure (electricity, water supply, other						
	8) Government institutional infrastructure	[**]	[**]	[**]	[**]	[**]	[**]
	9) Financial system						+
	10) Legal system						
	11) Protection of intellectual property rights	**	**	*	**	**	**
	12) Size of local markets	[**]	[**]	[**]	[**]	[**]	[**]
	13) Access to export markets						
	14) Proximity to suppliers/subcontractors	[*]	[*]	[+]		[+]	
	15) Request by large/related company						
	16) Availability of low-cost labor	+	*	+	+		
	17) Availability of skilled labor and professionals						
	18) Other companies from the same country are located here (synergy)	*	*	**	**	*	*
	19) Access to cutting-edge technology and						
	20) Living conditions						
Q6)	1 Retail/Wholesale trade						
	2 Production (raw-material processing)	[*]	[*]	[**]	[**]	[**]	[**]
	3 Production (components and parts)	*	+	+		+	+
	4 Production (final products)	[**]	[**]	[**]	[**]	[**]	[**]
	5 Purchasing/Procurement/Logistics						
	6 R&D/Consulting	+	*	**	**	*	*
	7 Human resources development						
Q3) 1)	50 - 99 persons/ 10,000-24,999 (US$)/10,000-24,999 (US$)			+	+	**	**
	100 - 199/25,000-49,999/25,000-49,999			**	**	**	**
	200 - 299/50,000-74,999/50,000-74,999			+	+	*	*
	300 - 399/75,000-99,999/75,000-99,999		[*]	**	**	**	**
	400 - 499/100,000-499,999/100,000-499,999			**	**	**	**
	500 - 999/500,000-999,999/500,000-999,999			**	**	**	**
	1,000 - 1,499/1 M-4.9M/1M-4.9M			**	**	**	**
	1,500 - 1,999/5M-9.9 M/5M-9.9M			**	**	+	
	Dummy (Indonesia=1, other countries=0)		[+]		[+]		
	Dummy (Philippine=1, other countries=0)	[**]	[**]	[**]	[**]	[**]	[**]
	Dummy (Vietnam=1, other countries=0)	**	**	**	**	**	**
	Number of observations	801	822	801	824	801	822
	Log likelihood	-802	-826.5	-784.5	-813.1	-787.6	-813.6
	Pseudo R2	0.08	0.076	0.1	0.093	0.097	0.09

Note 1: [ ] indicates that the coefficient is negative, and items without [ ] have a positive coefficient.
Note 2: **, *, and + indicate that the coefficient is at 5, 10, and 20 percent significance level, respectively.
Source: Authors.

The estimation results for Case B were almost the same as those for Case A. Agglomeration also began with labor-intensive companies engaged in activities related

to the production of raw materials and finished goods. These businesses were attracted to locate in the four countries because of the size of local markets and the institutional framework related to the governments and utilities. At the later stage of agglomeration, capital-intensive firms which function as offices for the parts production and R&D were also attracted by the institutional framework such as the intellectual property rights and financial systems as well as infrastructure like telecommunications and utilities. Synergy effect or the presence of firms from the same country, as well as low labor costs were also important factors that were considered. The later stage was also marked by R&D, exporting, and the production of components and parts mainly because R&D activities are related to patent systems. The four countries were also involved in the global network of production and distribution, thus, part production and exporting became significant factors. The results indicated that larger firms came later, which is not consistent with the Flowchart Approach.

4. RESULT OF ESTIMATION II: INDUSTRIAL UPGRADING AND INNOVATION, CASE A

In this estimate, the current consolidated industrial upgrading and innovation situation of four countries was examined using the Binary Logit Model. Also looked into was how agglomeration has transferred technology and know-how from large and advanced firms such as MNCs to local firms. The increased flow information between them, as well as the nurturing of human resources, creates endogenous forces that upgrade industries and businesses of firms in the region.

4.1. Estimation Method and Variables

To examine industry upgrading or innovation, four categories were defined according to Schumpeter's concepts. These are the introduction of new goods, adoption of a new technology, opening of a new market, and new input acquisitions such as raw materials.[vi] Question 9 (Q9) of the survey looked into the upgrades that the company have carried out in the last three years, as well as what they intend to achieve in the next three years. Respondents were asked to reply either "yes" or "no" to the question. From

these, four models were made using these "yes" or "no" replies as dependent variables. The independent variables, on the other hand, consisted of the following factors: (1) satisfaction with economic circumstances such as policy measures, and economic conditions in the countries where they are located; (2) function(s) carried out at the time of establishment of the first office (Question 6); and (3) year of establishment of offices (Question 1). These variables are also presented in Table 2. In Case A, two dummy variables attached to the years before and after 1997 were added. Table 5 shows the results of these four estimations.

Table 5: Results of Estimations: Upgrading and Innovation Case A

	New goods		New technology		New market		New input	
	Full model	Selected model	Full model	Selected model	Full model	Selected model	Full model	Selected model
Q8) 1) Investment incentives, including tax incentives		+	[+]	[**]		[+]		
2) Liberal trade policy	**	**	*	**	+	*		
3) Customs procedures	*	+						
4) Local content requirements, rule of origin	[+]	[+]				[*]		
5) Physical infrastructure (roads, highways, ports,								
6) Infrastructure (telecommunications, IT)							[*]	
7) Infrastructure (electricity, water supply, other		[**]			[+]	[+]		
8) Government institutional infrastructure	[+]	[*]			**	*		
9) Financial system		**			[*]	[**]	[*]	[**]
10) Legal system	**				*	*		
11) Protection of intellectual property rights						+		
12) Size of local markets		[*]						
13) Access to export markets	[*]	**			[+]	[*]	*	**
14) Proximity to suppliers/subcontractors	+				+	+	+	*
15) Request by large/related company				+				
16) Availability of low-cost labor			+	*				
17) Availability of skilled labor and professionals	+							
18) Other companies from the same country are located there (synergy)		[+]		[**]				
19) Access to cutting-edge technology and	[+]							
20) Living conditions								
Q6) 1 Retail/Wholesale trade	+	+						
2 Production (raw-material processing)			**	**			**	**
3 Production (components and parts)	+			+				
4 Production (final products)								
5 Purchasing/Procurement/ Logistics					[**]	[**]		
6 R&D/Consulting				+				
7 Human resources development	[+]			[+]	**	**	+	[+]
Q1) Dummy (1986-1997=1, other=0)			[+]				+	
Dummy (1998-2007=1, other=0)		[+]	[*]	[*]				
Q4) Manufacturing	+	**	*		+	**		
Business	*	**			*	*	[**]	[**]
Q5) Exporters	*	**						
Dummy (Indonesia=1, other countries=0)				[**]			[**]	[**]
Dummy (Vietnam=1, other countries=0)				[+]				
constant					+	+		
Number of observations	317	323	316	316	317	323	316	333
Log likelihood	-142	-154.83	-193	-192.771	-142	-159.16	-181	-198.56
Pseudo R2	0.18		0.11	0.106	0.18	0.12	0.17	

Note 1: [ ] indicates that the coefficient is negative, and items without [ ] have a positive coefficient.
Note 2: **, *, and + indicate that the coefficient is at the 5, 10, and 20 percent significance level, respectively.
Source: Authors.

4.2. Estimation of the New Goods Model

As in Table 3, only significant variables are presented, with stars indicating the significance levels, and a negative (positive) sign with (without) brackets written next to the variable. It should be noted that factors with negative (positive) signs indicate that they encourage (discourage) innovation.[vii] Table 5 lists the following factors and their signs.

Identified variables that are said to encourage upgrading and innovation (those with positive sign) included liberal trade policy (5% significance level); customs procedures (5%); legal system (5%); business (10%); and export (10%), all with positive signs. On the other hand, "access to export markets" (10%) has a negative sign, denoting that this factor discourages upgrading.

Similarly, the Selected Model identified almost the same factors as positive: liberal trade policy (5%); financial systems (5%); access to the export markets (5%); manufacturing (5%); business (5%); and export (5%). On the other hand, physical and institutional infrastructure (electricity, water supply and other utilities (5%); government institutional infrastructure (10%); size of local markets (10%); and access to export markets(5%), have negative signs, indicating that they discourage upgrading and innovation.

Thus, the two models have only a few factors in common that encourage upgrading, such as liberal trade policy; business; and export.

4.3. Estimation of the New Technology Model

Only a few factors had a positive value or are said to contribute to the adoption of a new technology and encourage innovation in the Full Model. These were liberal trade policy (10% significance level); production (raw-material processing) (5%); and manufacturing (10%). There were no significant variables with a negative sign except "Dummy (1998-2007) (10%)."

In the Selected Model, variables which had positive signs included availability of low-cost labor (10% significance level); liberal trade policy (5%); and production (raw-material processing) (5%). Variables that had negative signs or those that discourage upgrading consisted of investment incentives, including tax incentives (5%);

presence of other companies from the same country in the area or synergy (5%); and "Dummy (1998-2007)" (10%).

The common factors for both models were "liberal trade policy" and "production (raw-material processing)," which both had positive signs.

4.4. Estimation of the New Market Model

A model of a new market opening was also calculated. In the Full Model (Table 5), factors that encourage upgrading or innovation were legal system (10% significance level); business (10%); government institutional infrastructure (5%); and human resource development (5%). Those that discourage upgrading were access to export market (10%); financial systems (5%); and purchasing/procurement/logistics (5%).

In the Selected Model, factors with positive signs included business (10%); government institutional infrastructure (5%); legal systems (5%); human resource development (5%); and manufacturing (5%). In contrast, the factors identified that discourage upgrading were local content requirements, rule of origin (10%); access to export markets (10%); financial systems (5%);, and purchasing/procurement/logistics (5%).

Factors common to both models were government institutional infrastructure; human resources development; and business, which have positive signs. Financial systems, and purchasing/procurement/logistics, however, had negative signs, or those that discourage innovation.

4.5. Estimation of the New Input Model

A model of input acquisitions such as raw material was come up with. The factors in the Full Model with positive signs (Table 5) were access to export market (10%); and production (raw-material processing) (5%), while infrastructure (telecommunications, IT) (10%); financial systems (10%); and business (5%) had negative signs.

As with the Full Model, access to export market (5%) and production (raw-material processing) (5%) were also positive in the Selection Model, along with proximity to suppliers/subcontractors (10%). Financial systems (10%) and business (5%) were likewise negative in this model.

5. RESULTS OF ESTIMATION II: INDUSTRIAL UPGRADING AND INNOVATION CASE B

Case B comprised three time periods, namely, before 1986; 1986-1977, and after 1998. The results of these estimations are summarized in Table 6.

5.1. Estimation of the New Goods Model

In the Full Model, the following factors have positive signs or which encourage upgrading and innovation: liberal trade policy (10% significance level), legal system (10%), and customs procedures (5%). On the other hand, the question which asked when was her company establish their first office (10%) had a negative sign, implying that first movers were more innovative.

The Selection Model indicated that proximity to suppliers/subcontractors (10%); production (components and parts) (10%); customs procedures (10%); liberal trade policy (5%); and legal systems (5%) were positive, or those that encourage upgrading. On the other hand, government institutional infrastructure (10%); access to export markets (10%); human resources development (10%); and infrastructure (electricity, water supplies and other utilities) (5%), as well as the question on when their company establish its first office (10%) had negative signs.

Factors identified to be common to both models were liberal trade policy; customs procedures, and legal systems which had positive signs. The question on when did the company establish its first office had a negative sign.

5.2. Estimation of the New Technology Model

The model for adoption of a new technology was likewise examined. The Full Model identified only production (raw-material processing) (5%) as having a positive sign, and only the question "When did your company establish its first office?" (10%) generated a negative sign, implying that first movers were more innovative.

In the Selected Model, availability of low-cost labor (10%), manufacturing (10%), liberal trade policy (5%), and production (raw-material processing) (5%) were the factors that had positive signs. On the other hand, investment incentives, including tax

incentives (10%), and the question as to when was the first office of the company was established (10%) had negative signs, and thus discouraged innovations.

Production (raw-material processing) and the question on when the company established its first office were common to both models, with the former having a positive sign and the latter negative sign.

Table 6: Results of Estimations: Upgrading and Innovation Case B

		Goods		Methods		Markets		Suppliers	
		Full model	Selected model	Full model	Selected model	Full model	Selected model	Full model	Selected model
Q8)	1) Investment incentives, including tax incentives		+	[+]	[**]		[+]		
	2) Liberal trade policy	**	**	*	**	+	*		
	3) Customs procedures	*	+						
	4) Local content requirements, rule of origin	[+]	[+]				[*]		
	5) Physical infrastructure (roads, highways, ports,								
	6) Infrastructure (telecommunications, IT)							[*]	
	7) Infrastructure (electricity, water supply, other		[**]			[+]	[+]		
	8) Government institutional infrastructure	[+]	[*]			**	*		
	9) Financial system		**			[*]	[**]	[*]	[**]
	10) Legal system	**				*	*		
	11) Protection of intellectual property rights						+		
	12) Size of local markets		[*]						
	13) Access to export markets	[*]	**			[+]	[*]	*	**
	14) Proximity to suppliers/subcontractors	+				+	+	+	*
	15) Request by large/related company				+				
	16) Availability of low-cost labor			+	*				
	17) Availability of skilled labor and professionals	+							
	18) Other companies from the same country are located there (synergy)		[+]		[**]				
	19) Access to cutting-edge technology and	[+]							
	20) Living conditions								
Q6)	1 Retail/Wholesale trade	+	+						
	2 Production (raw-material processing)			**	**			**	**
	3 Production (components and parts)	+			+				
	4 Production (final products)								
	5 Purchasing/Procurement/Logistics					[**]	[**]		
	6 R&D/Consulting				+				
	7 Human resources development	[+]			[+]	**	**		[+]
Q1)	Dummy (1986-1997=1, other=0)			[+]				+	
	Dummy (1998-2007=1, other=0)		[+]	[*]	[*]				
Q4)	Manufacturing	+	**	*		+	**		
	Business	*	**			*	*	[**]	[**]
Q5)	Exporters	*	**						
	Dummy (Indonesia=1, other countries=0)				[**]			[**]	[**]
	Dummy (Vietnam=1, other countries=0)				[+]				
	constant					+	+		
	Number of observations	317	323	316	316	317	323	316	333
	Log likelihood	-142	-154.83	-193	-192.771	-142	-159.16	-181	-198.563
	Pseudo R2	0.18		0.11	0.106	0.18	0.12	0.17	

Note 1: [ ] indicates that the coefficient is negative, and items without [ ] have a positive coefficient.
Note 2: **, *, and + indicate that the coefficient is at the 5, 10, and 20 percent significance level, respectively.
Source: Authors.

5.3. Estimation of the New Market Model

The model of a new market opening was also looked into. In the Full Model, factors encouraging upgrading or innovation were government institutional infrastructure (10% significance level), legal system (10%), and human resource

development (5%). The factors considered to discourage upgrading were financial systems (10%), and purchasing/procurement/logistics (5%).

The Selected Model identified government institutional infrastructure (5%), and human resource development (10%) as those that encourage upgrading. Infrastructure (electricity, water supply, other utilities) (10%), financial systems (10%), and purchasing/procurement/logistics (5%) were identified as discouraging factors.

Factors common to both models were government institutional infrastructure and human resource development, which had positive signs, and financial systems and purchasing/procurement/logistics which had negative signs or those that discourage innovation.

5.4. Estimation of the New Input Model

The model of input acquisitions, such as raw material, was estimated. In the Full Model, the following factors had positive signs (Table 6): production (components and parts) (10%); access to export market (5%); proximity to suppliers/subcontractors (5%); production (raw-material processing) (5%); and production (final products) (5%). On the other hand, infrastructure (telecommunications, IT) (10%) and financial systems (10%) had positive signs.

In the Selection Model, access to export market (5%), proximity to suppliers/subcontractors (5%), production (raw-material processing) (5%), production (components and parts) (5%), and production (final products) (5%) were encouraging factors. Human resources development (10%) and financial systems (5%) had negative signs.

Factors common to both models were access to export market (5%), proximity to suppliers/subcontractors (5%), production (raw-material processing) (5%), production (components and parts) (5%), and production (final products) (5%), which had positive signs, while financial systems was identified as a negative or discouraging factor.

6. CONCLUSION OF CONSOLIDATED MULTI-COUNTRY ANALYSIS

With the above results, the Consolidated Multi-country Model estimations can be made by focusing on contributing factors and policy measures that encourage future agglomeration and industrial upgrading (as determined by econometric analysis). Based on the estimates, the characteristics and structure of the industrial agglomeration in ASEAN four countries are summarized in Figure 4. The results of agglomeration and innovation are summarized below.

6.1. Agglomeration

The two models of agglomeration presented were analyzed using a rigorous method. The results were found to be similar for both. No clear results on firm size were obtained, but larger firms, in terms of the full-time employees, tended to be first comers, which is consistent with the "Flowchart Approach". Firms considered to be first movers were those whose production involved raw materials and final products, while latecomers were involved with R&D and the production of components and parts. As with industrial technology, business activities in these four countries have also been upgrading to a higher level.

(a) Factor of agglomeration

The six agglomeration estimations made from the three models and the Full and Selected Models were consistent with each other except for the firm size coefficients in Case B. Contributing factors for first movers with regard to agglomeration were local content requirements, rule of origin, government institutional infrastructure, size of local markets, and proximity to suppliers/subcontractors. Identified factors for latecomers were the protection of intellectual property rights and financial systems.

Tables A1, A2, A3, and A4 in the Appendix show how these factors actually affected agglomeration in the four countries. For first movers, government institutional infrastructure has the largest coefficient, which is larger than that in Case A (-0.320).[viii] The coefficients of the remaining factors, in order of size, were as follows: proximity to suppliers/subcontractors (>-0.167), size of local markets (-0.125), and local content

requirements, rule of origin (-0.111).[ix] For latecomers, the order of coefficients considered significant was as follows: protection of intellectual property rights (>0.154), infrastructure (electricity, water supply, other utilities) (0.152), other companies from the same country are located there (synergy) (0.110), and availability of low-cost labor (0.101).[x]

Figure 4 Summary of Agglomeration

- Local content requirements, rule of origin
- Government institutional infrastructure
- Size of local markets
- Proximity to suppliers/subcontractors
- Production (final products)
- Size of company: Full-time Employees
- Manufacturing

- Production (raw-material processing)
- Business

- Infrastructure (electricity, water supply, other utilities)
- Financial system
- Protection of intellectual property rights
- Availability of low-cost labor
- Other companies from the same country are located here (synergy)
- Production (components and parts)
- R&D/ Consulting
- Size of company: Total Assets
- Size of company: Paid-up Capital
- Exporters

From the above discussions the factor which has the greatest effect could be identified. The data, however, can be analyzed from a different viewpoint such as who contributed more, the public or the private sector. Many of the public sector policy measures, both general and preferential, promote agglomeration. The private sector can decide where to locate by comparing the costs and profits of different locations. Based on the above comparisons of coefficients, these two sectors seem to contribute equally.

(b) Policy measures

Industrial agglomeration has been promoted by policies that do not only establish industrial or science parks, which are special economic zones, but also provide incentives such as tax allowances and subsidies.[xi] The results presented in the consolidated model do not verify the contributions relating to, policy. In particular, policy measures aiming at objectives such as investment incentives, including tax incentives, liberal trade policy, and customs procedures were not identified as significant. Moreover, physical infrastructure such as roads, highways, ports, and airports, and living conditions as well as telecommunications, IT and utilities were not also identified. This is in striking contrast to the so-called soft infrastructure such as government institutional infrastructure, protection of intellectual property rights, and financial systems which were clearly stated.

A similar situation occurred with human resources and technology. Availability of skilled labor and professionals and access to cutting-edge new technology and information were not identified, but availability of low-cost labor was mentioned. Latecomers continue to agglomerate because of low-cost, rather than skilled labor. However, this will not contribute to upgrading and innovation in the four countries.

6.2. Upgrading and Innovation

Four types of innovation or industrial upgrading as defined by Schumpeter were discussed. These four innovations were different from each other in meaning and actual forms. Factors related to these innovations are consequently different. The results of estimations showed that some factors were encouraging in one category but discouraging in another, and thus it was rather difficult to derive an overall conclusion. Nevertheless, in Case A, encouraging factors did not conflict with upgrading, and

included the following categories: liberal trade policy,, legal systems, and proximity to suppliers/subcontractors. Unsatisfactory factors that did not contradict each other included local contents requirement, rule of origin, infrastructure (electricity, water supply, other utilities), and the presence of other companies from the same countries (synergy).

NOTES

[i] The Philippine Team modified the definition of firm size by expressing it in Philippine Pesos instead of U.S. dollars. In the analysis, adjustments were made by redefining the data or using suitable analytical methods.

[ii] To determine the years of transformation, the step-wise Chou test was used.

[iii] In this construction, three estimates were made based on the three definitions of firm size.

[iv] The variable used for estimation is usually selected using the Akaike Information Criterion of the OLS estimation. The method, however, was not applicable in this case so the Ordered Logit Model was used. In this paper, the variables were selected individually, according to significance level.

[v] Refer to Schumpeter (1934).

[vi] This can be verified by checking the estimated coefficients shown in the Appendix. Table A1 shows that the coefficient of class of US$ 100,000-499,999 is the largest (1.206), indicating that this class probably came in the later stage.

[vii] In this estimation, the Ordered Logit Model was also used, and "yes" replies were taken as standard for normalization purposes.

[viii] The figure chosen was the smallest in the three Case A models, as well as in the Full and Selected Models. This is the same for the following figures. For the interpretation of coefficients here, it should be noted that the marginal effects of the coefficients are suitable measures to discuss.

[ix] In addition, "legal system" is greater than -120 and was found only in the Full Model.

[x] Figures for factors other than "protection of intellectual property rights" were only in the Full Model.

[xi] Policy measures for the process of agglomeration were extensively discussed by Kuchiki and Tsuji (2005, 2008), and Tsuji, Giovannetti and Kagami (2007).

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APPENDIX

The estimation results are presented in details below. Tables A1, A2, A3, and A4 show the estimates for agglomeration, while Tables A5, A6, A7, and A8 are computations for upgrading and innovation.

Table A1. Estimation: Agglomeration Case A; Full Model

	Full-time Employees		Total Assets		Paid-up Capital	
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Q7) 1) Investment incentives, including tax incentives	-0.024	-0.340	-0.077	-1.050	-0.035	-0.470
2) Liberal trade policy	0.091	1.200	0.115	1.480 +	0.100	1.270
3) Customs procedures	-0.074	-0.960	-0.077	-0.980	-0.069	-0.860
4) Local content requirements, rule of origin	-0.132	-1.790 *	-0.128	-1.700 *	-0.142	-1.870 *
5) Physical infrastructure (roads, highways, ports, airports, etc.)	-0.092	-0.970	-0.117	-1.220	-0.088	-0.910
6) Infrastructure (telecommunications, IT)	0.100	0.910	0.106	0.960	0.078	0.690
7) Infrastructure (electricity, water supply, other utilities)	0.189	1.750 *	0.152	1.380 +	0.167	1.480 +
8) Government institutional infrastructure	-0.325	-3.430 **	-0.333	-3.470 **	-0.332	-3.460 **
9) Financial system	0.128	1.220	0.173	1.650 *	0.174	1.650 *
10) Legal system	-0.123	-1.180	-0.120	-1.130	-0.130	-1.220
11) Protection of intellectual property rights	0.154	1.820 *	0.187	2.180 **	0.195	2.230 **
12) Size of local markets	-0.125	-1.720 *	-0.135	-1.830 *	-0.125	-1.680 *
13) Access to export markets	0.036	0.520	0.004	0.060	-0.007	-0.090
14) Proximity to suppliers/subcontractors	-0.193	-2.580 **	-0.167	-2.210 **	-0.187	-2.430 **
15) Request by large/related company	0.006	0.080	-0.008	-0.120	0.000	0.000
16) Availability of low-cost labor	0.113	1.590 +	0.101	1.410 +	0.125	1.720 *
17) Availability of skilled labor and professionals	0.003	0.030	-0.064	-0.690	-0.044	-0.470
18) Other companies from the same country are located there	0.110	1.600 +	0.140	2.010 **	0.095	1.350 +
19) Access to cutting-edge technology and information	0.048	0.530	0.047	0.520	0.054	0.590
20) Living conditions	0.101	1.210	0.101	1.190	0.101	1.160
Q6) 1 Retail/Wholesale trade	-0.158	-0.900	-0.089	-0.500	-0.034	-0.190
2 Production (raw-material processing)	-0.383	-1.680 *	-0.367	-1.590 +	-0.335	-1.430 +
3 Production (components and parts)	0.440	1.910 *	0.564	2.400 **	0.597	2.530 **
4 Production (final products)	-0.445	-2.240 **	-0.300	-1.470 +	-0.336	-1.620 +
5 Purchasing/Procurement/Logistics	0.270	1.100	0.204	0.800	0.239	0.940
6 R&D/Consulting	0.620	2.040 **	0.528	1.760 *	0.770	2.480 **
7 Human resources development	-0.063	-0.200	-0.215	-0.690	-0.383	-1.210
Q3) 1) Size of company	-0.158	-2.690 **	0.106	3.190 **		
Q4) Manufacturing	-0.609	-2.660 **	-0.709	-3.010 **	-0.716	-3.000 **
Business	-0.987	-3.830 **	-0.844	-3.270 **	-0.966	-3.610 **
Q5) Exporters	0.498	2.660 **	0.385	2.050 **	0.435	2.290 **
Dummy (Indonesia=1, other countries=0)	-0.479	-1.600 +	-0.253	-0.840	-0.069	-0.220
Dummy (the Philippines=1, other countries=0)	-1.078	-4.790 **	-1.063	-4.740 **	-0.851	-3.740 **
Dummy (Vietnam=1, other countries=0)	1.063	3.610 **	1.133	3.860 **	1.213	4.060 **
/cut1	-2.741		-1.146		-1.173	
/cut2	-0.674		0.915		0.865	
Number of observations	753		732		714	
Log likelihood	-735.398		-714.308		-698.067	
Pseudo R2	0.099		0.100		0.096	

Note: ** , * , and + indicate that the coefficient is at 5, 10, and 20 percent significance level, respectively.

Table A2. Estimation: Agglomeration Case A; Selected Model

		Full-time Employees		Total Assets		Paid-up Capital	
		Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Q7)	1) Investment incentives, including tax incentives						
	2) Liberal trade policy						
	3) Customs procedures						
	4) Local content requirements, rule of origin	-0.126	-1.910 *	-0.134	-2.010 **	-0.130	-1.960 *
	5) Physical infrastructure (roads, highways, ports, airports, etc.)						
	6) Infrastructure (telecommunications, IT)			0.123	1.350 +		
	7) Infrastructure (electricity, water supply, other utilities)	0.171	1.890 *			0.124	1.370 +
	8) Government institutional infrastructure	-0.335	-3.830 **	-0.338	-3.870 **	-0.332	-3.770 **
	9) Financial system	0.145	1.550 +	0.167	1.730 *	0.184	1.950 *
	10) Legal system						
	11) Protection of intellectual property rights	0.173	2.370 **	0.181	2.430 **	0.228	3.100 **
	12) Size of local markets	-0.118	-1.720 *	-0.109	-1.590 +	-0.096	-1.390 +
	13) Access to export markets						
	14) Proximity to suppliers/subcontractors	-0.167	-2.440 **	-0.158	-2.280 **	-0.167	-2.410 **
	15) Request by large/related company						
	16) Availability of low-cost labor	0.129	1.990 **	0.092	1.400 +		
	17) Availability of skilled labor and professionals						
	18) Other companies from the same country are located there	0.113	1.840 *	0.114	1.830 *	0.114	1.730 *
	19) Access to cutting-edge technology and information						
	20) Living conditions						
Q6)	1 Retail/Wholesale trade						
	2 Production (raw-material processing)	-0.373	-1.670 *	-0.388	-1.730 *	-0.331	-1.460 +
	3 Production (components and parts)	0.434	1.960 *	0.506	2.240 **	0.567	2.500 **
	4 Production (final products)	-0.381	-2.000 **	-0.251	-1.300 +	-0.307	-1.560 +
	5 Purchasing/Procurement/Logistics						
	6 R&D/Consulting	0.647	2.290 **	0.478	1.720 *	0.651	2.280 **
	7 Human resources development						
Q3)	1) Size of company	-0.163	-2.890 **	0.102	3.200 **	0.077	2.310 **
Q4)	Manufacturing	-0.572	-2.680 **	-0.675	-3.100 **	-0.721	-3.240 **
	Business	-0.837	-3.410 **	-0.762	-3.100 **	-0.837	-3.300 **
Q5)	Exporters	0.471	2.720 **	0.299	1.710 *	0.372	2.120 **
	Dummy (Indonesia=1, other countries=0)	-0.440	-1.610 +				
	Dummy (the Philippines=1, other countries=0)	-1.036	-4.920 **	-0.901	-5.150 **	-0.779	-4.470 **
	Dummy (Vietnam=1, other countries=0)	1.056	3.740 **	1.222	4.740 **	1.240	4.750 **
	/cut1	-2.649		-0.828		-1.026	
	/cut2	-0.612		1.199		0.969	
	Number of observations	772		750		735	
	Log likelihood	-761.177		-739.705		-727.041	
	Pseudo R2	0.091		0.091		0.090	

Note: **, *, and + indicate that the coefficient is at 5, 10, and 20 percent significance level, respectively.

Table A3. Estimation: Agglomeration Case B; Full Model

		Full-time Employees		Total Assets		Paid-up Capital	
		Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Q7)	1) Investment incentives, including tax incentives	-0.019	-0.270	-0.067	-0.950	-0.051	-0.740
	2) Liberal trade policy	0.092	1.250	0.099	1.340 +	0.096	1.290 +
	3) Customs procedures	-0.062	-0.840	-0.066	-0.880	-0.062	-0.830
	4) Local content requirements, rule of origin	-0.111	-1.570 +	-0.122	-1.700 *	-0.113	-1.590 +
	5) Physical infrastructure (roads, highways, ports, airports, etc.)	-0.006	-0.070	0.014	0.160	-0.052	-0.580
	6) Infrastructure (telecommunications, IT)	0.100	0.940	0.103	0.940	0.108	1.000
	7) Infrastructure (electricity, water supply, other utilities)	0.073	0.710	0.062	0.590	0.082	0.790
	8) Government institutional infrastructure	-0.315	-3.460 **	-0.346	-3.760 **	-0.320	-3.500 **
	9) Financial system	0.099	1.000	0.091	0.910	0.112	1.120
	10) Legal system	-0.078	-0.780	-0.045	-0.440	-0.061	-0.610
	11) Protection of intellectual property rights	0.168	2.060 **	0.156	1.910 *	0.173	2.110 **
	12) Size of local markets	-0.186	-2.800 **	-0.180	-2.690 **	-0.192	-2.850 **
	13) Access to export markets	-0.005	-0.080	-0.005	-0.080	-0.008	-0.120
	14) Proximity to suppliers/subcontractors	-0.133	-1.890 *	-0.103	-1.450 +	-0.102	-1.430 +
	15) Request by large/related company	0.021	0.320	0.016	0.240	0.017	0.250
	16) Availability of low-cost labor	0.107	1.560 +	0.101	1.470 +	0.084	1.210
	17) Availability of skilled labor and professionals	-0.016	-0.180	-0.031	-0.350	-0.023	-0.260
	18) Other companies from the same country are located there	0.113	1.710 *	0.145	2.150 **	0.130	1.930 *
	19) Access to cutting-edge technology and information	0.019	0.230	0.007	0.080	0.019	0.220
	20) Living conditions	0.086	1.080	0.097	1.190	0.080	0.990
Q6)	1 Retail/Wholesale trade	-0.005	-0.030	0.035	0.210	0.053	0.320
	2 Production (raw-material processing)	-0.390	-1.820 *	-0.443	-2.030 **	-0.453	-2.060 **
	3 Production (components and parts)	0.342	1.660 +	0.304	1.470 +	0.328	1.580 +
	4 Production (final products)	-0.448	-2.770 **	-0.488	-3.000 **	-0.500	-3.070 **
	5 Purchasing/Procurement/Logistics	0.151	0.630	0.148	0.610	0.176	0.730
	6 R&D/Consulting	0.457	1.620 +	0.602	2.080 **	0.549	1.920 *
	7 Human resources development	-0.090	-0.300	-0.145	-0.480	-0.183	-0.610
Q3)	1) 50 - 99 persons / 10,000-24,999 (US$) / 10,000-24,999 (US$)	-0.068	-0.350	0.355	1.540 +	0.605	2.740 **
	100 - 199 / 25,000-49,999 / 25,000-49,999	0.223	0.950	0.696	2.740 **	0.676	2.760 **
	200 - 299/50,000-74,999/50,000-74,999	0.014	0.040	0.408	1.390 +	0.516	1.700 *
	300 - 399 / 75,000-99,999 / 75,000-99,999			0.884	2.580 **	1.187	3.120 **
	400 - 499 / 100,000-499,999 / 100,000-499,999			1.206	4.430 **	0.845	3.480 **
	500 - 999 / 500,000-999,999 / 500,000-999,999			0.730	2.610 **	1.042	3.160 **
	1,000 - 1,499 / 1 M-4.9M / 1M-4.9M			0.989	4.070 **	0.824	3.160 **
	1,500 - 1,999 / 5M-9.9 M / 5M-9.9M			0.932	2.430 **	0.618	1.410 +
	Dummy (Indonesia=1, other countries=0)	-0.320	-1.130	-0.304	-1.060	-0.199	-0.690
	Dummy (the Philippines=1, other countries=0)	-0.766	-3.740 **	-0.793	-3.840 **	-0.738	-3.560 **
	Dummy (Vietnam=1, other countries=0)	1.169	4.140 **	1.044	3.580 **	0.986	3.420 **
	/cut1	-1.621		-1.305		-1.320	
	/cut2	0.325		0.709		0.681	
	Number of observations	801		801		801	
	Log likelihood	-802.011		-784.501		-787.560	
	Pseudo R2	0.080		0.100		0.097	

Note: **, *, and + indicate that the coefficient is at 5, 10, and 20 percent significance level, respectively.

Table A4. Estimation: Agglomeration Case B; Selected Model

	Full-time Employees		Total Assets		Paid-UP Capital	
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Q7)						
1) Investment incentives, including tax incentives						
2) Liberal trade policy						
3) Customs procedures						
4) Local content requirements, rule of origin	-0.104	-1.660 *	-0.123	-1.970 **	-0.106	-1.720 *
5) Physical infrastructure (roads, highways, ports, airports, etc.)						
6) Infrastructure (telecommunications, IT)	0.197	2.310 **	0.186	2.160 **	0.114	1.300 +
7) Infrastructure (electricity, water supply, other utilities)						
8) Government institutional infrastructure	-0.278	-3.550 **	-0.325	-4.110 **	-0.317	-3.860 **
9) Financial system					0.125	1.350 +
10) Legal system						
11) Protection of intellectual property rights	0.180	2.530 **	0.170	2.390 **	0.179	2.500 **
12) Size of local markets	-0.154	-2.510 **	-0.158	-2.650 **	-0.176	-2.850 **
13) Access to export markets	-0.113	-1.740 *				
14) Proximity to suppliers/subcontractors						
15) Request by large/related company						
16) Availability of low-cost labor	0.117	1.870 *	0.097	1.560 +		
17) Availability of skilled labor and professionals						
18) Other companies from the same country are located there	0.102	1.710 *	0.127	2.080 **	0.117	1.940 *
19) Access to cutting-edge technology and information						
20) Living conditions						
Q6)						
1 Retail/Wholesale trade						
2 Production (raw-material processing)	-0.400	-1.920 *	-0.493	-2.350 **	-0.512	-2.420 **
3 Production (components and parts)	0.306	1.580 +			0.281	1.450 +
4 Production (final products)	-0.372	-2.490 **	-0.473	-3.170 **	-0.464	-3.100 **
5 Purchasing/Procurement/Logistics						
6 R&D/Consulting	0.465	1.770 *	0.547	2.040 **	0.501	1.890 *
7 Human resources development			0.365	1.640 +		
Q3)						
1) 50 - 99 persons / 10,000-24,999(US$) / 10,000-24,999 (US$)						
100 - 199 / 25,000-49,999 / 25,000-49,999			0.725	2.910 **	0.633	3.020 **
200 - 299/50,000-74,999/50,000-74,999			0.426	1.480 +	0.679	2.830 **
300 - 399 / 75,000-99,999 / 75,000-99,999			0.873	2.620 **	0.521	1.780 *
400 - 499 / 100,000-499,999 / 100,000-499,999	-0.953	-1.950 *	1.267	4.850 **	1.299	3.540 **
500 - 999 / 500,000-999,999 / 500,000-999,999			0.655	2.470 **	0.839	3.630 **
1,000 - 1,499 / 1 M-4.9M / 1M-4.9M			0.981	4.150 **	0.970	3.090 **
1,500 - 1,999 / 5M-9.9 M / 5M-9.9M			0.983	2.630 **	0.846	3.360 **
Dummy (Indonesia=1, other countries=0)	-0.350	-1.360 +	-0.347	-1.350 +		
Dummy (the Philippines=1, other countries=0)	-0.798	-4.240 **	-0.835	-4.390 **	-0.655	-4.190 **
Dummy (Vietnam=1, other countries=0)	1.101	4.140 **	0.987	3.600 **	1.042	4.100 **
/cut1	-1.655		-1.197		-1.159	**
/cut2	0.276		0.793		0.826	**
Number of observations	822		824		822	
Log likelihood	-826.528		-813.147		-813.572	
Pseudo R2	0.076		0.093		0.090	

Note: **, *, and + indicate that the coefficient is at 5, 10, and 20 percent significance level, respectively.

Table A5. Results: Industrial Upgrading and Innovation Case A; Full Model

	New goods			New technology			New market			New input		
	Coefficient	t-value		Coefficient	t-value		Coefficient	t-value		Coefficient	t-value	
Q8) 1) Investment incentives, including tax incentives	0.207	0.990		-0.234	-1.380	+	-0.236	-1.210		0.151	0.890	
2) Liberal trade policy	0.450	2.030	**	0.338	1.820	*	0.296	1.410	+	0.050	0.260	
3) Customs procedures	0.351	1.790	*	0.007	0.040		-0.086	-0.450		0.176	1.050	
4) Local content requirements, rule of origin	-0.291	-1.400	+	-0.091	-0.540		-0.243	-1.260		0.014	0.080	
5) Physical infrastructure (roads, highways, ports, airports, etc.)	-0.014	-0.070		0.064	0.390		0.058	0.310		0.077	0.450	
6) Infrastructure (telecommunications, IT)	-0.166	-0.700		-0.105	-0.570		-0.148	-0.670		-0.333	-1.710	*
7) Infrastructure (electricity, water supply, other utilities)	-0.257	-1.090		0.141	0.760		-0.293	-1.310	+	0.081	0.420	
8) Government institutional infrastructure	-0.308	-1.550	+	-0.068	-0.410		0.384	2.060	**	0.175	1.020	
9) Financial system	-0.231	-1.010		-0.192	-1.030		-0.366	-1.720	*	-0.370	-1.890	*
10) Legal system	0.404	1.970	**	0.147	0.870		0.338	1.740	*	-0.214	-1.200	
11) Protection of intellectual property rights	0.250	1.220		0.022	0.130		0.236	1.210		-0.121	-0.690	
12) Size of local markets	-0.131	-0.650		0.156	0.970		-0.016	-0.080		-0.078	-0.460	
13) Access to export markets	-0.376	-1.710	*	-0.036	-0.200		-0.333	-1.570	+	0.351	1.940	*
14) Proximity to suppliers/subcontractors	0.309	1.440	+	0.116	0.640		0.324	1.530	+	0.304	1.560	+
15) Request by large/related company	0.021	0.100		0.217	1.180		-0.201	-0.910		-0.128	-0.660	
16) Availability of low-cost labor	-0.017	-0.100		0.231	1.530	+	0.160	0.920		0.034	0.220	
17) Availability of skilled labor and professionals	0.269	1.430	+	-0.144	-0.910		0.057	0.310		-0.043	-0.260	
18) Other companies from the same country are located there	-0.233	-1.020		-0.190	-1.020		-0.140	-0.660		0.034	0.170	
19) Access to cutting-edge technology and information	-0.358	-1.580	+	-0.131	-0.720		-0.094	-0.430		-0.080	-0.410	
20) Living conditions	0.167	0.760		-0.068	-0.380		-0.009	-0.040		-0.013	-0.070	
Q6) 1 Retail/Wholesale trade	0.553	1.490	+	0.043	0.150		0.308	0.860		0.194	0.640	
2 Production (raw-material processing)	0.031	0.060		1.111	2.360	**	0.227	0.440		1.133	2.500	**
3 Production (components and parts)	0.746	1.310	+	0.315	0.740		0.331	0.620		0.442	1.020	
4 Production (final products)	0.478	1.180		0.018	0.050		0.047	0.120		0.270	0.810	
5 Purchasing/Procurement/Logistics	-0.391	-0.810		0.230	0.540		-1.304	-2.820	**	0.254	0.580	
6 R&D/Consulting	0.514	1.080		0.468	1.200		0.204	0.410		0.115	0.280	
7 Human resources development	-0.827	-1.370	+	-0.572	-1.020		1.805	2.290	**	-0.632	-1.050	
Q1) Dummy (1986-1997=1, other=0)	0.179	0.380		-0.528	-1.330	+	0.283	0.650		0.538	1.350	+
Dummy (1998-2007=1, other=0)	-0.582	-1.230		-0.715	-1.780	*	-0.069	-0.150		0.371	0.900	
Q4) Manufacturing	0.667	1.470	+	0.658	1.760	*	0.681	1.610	+	0.339	0.910	
Infra_service	0.837	1.840	*	0.234	0.610		0.763	1.670	*	-0.965	-2.330	**
Q5) Exporters	0.763	1.800	*	0.254	0.820		0.163	0.420		-0.081	-0.250	
Dummy (Indonesia=1, other countries=0)	-0.031	-0.070		-0.452	-1.240		-0.265	-0.660		-0.853	-2.260	**
Dummy (Vietnam=1, other countries=0)	-0.090	-0.180		-0.335	-0.840		0.197	0.410		-0.089	-0.220	
constant	0.706	0.560		-0.251	-0.250		1.822	1.530	+	-0.308	-0.290	
Number of observations	317			316			316			316		
Log likelihood	-141.589			-192.691			-152.064			-180.813		
Pseudo R2	0.178			0.107			0.149			0.174		

Note: **, *, and + indicate that the coefficient is at 5, 10, and 20 percent significance level, respectively.

Table A6. Results: Industrial Upgrading and Innovation Case A; Selected Model

	New goods		New technology		New market		New input	
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Q8)								
1) Investment incentives, including tax incentives	0.257	1.380 +	-0.290	-1.990 **	-0.239	-1.340 +		
2) Liberal trade policy	0.471	2.350 **	0.358	2.230 **	0.323	1.690 *		
3) Customs procedures	0.232	1.310 +						
4) Local content requirements, rule of origin	-0.259	-1.400 +			-0.329	-1.870 *		
5) Physical infrastructure (roads, highways, ports, airports, etc.)								
6) Infrastructure (telecommunications, IT)								
7) Infrastructure (electricity, water supply, other utilities)	-0.344	-2.150 **			-0.262	-1.560 +		
8) Government institutional infrastructure	-0.325	-1.850 *			0.305	1.870 *		
9) Financial system	0.443	2.480 **			-0.422	-2.200 **	-0.387	-2.890 **
10) Legal system					0.340	1.880 *		
11) Protection of intellectual property rights					0.239	1.320 +		
12) Size of local markets								
13) Access to export markets	-0.364	-1.890 *			-0.336	-1.810 *	0.310	2.310 **
14) Proximity to suppliers/subcontractors	0.365	2.050 **			0.266	1.440 +	0.235	1.660 *
15) Request by large/related company			0.177	1.290 +				
16) Availability of low-cost labor			0.237	1.840 *				
17) Availability of skilled labor and professionals								
18) Other companies from the same country are located there	-0.282	-1.580 +						
19) Access to cutting-edge technology and information			-0.322	-1.980 **				
20) Living conditions								
Q6)								
1 Retail/Wholesale trade	0.510	1.580 +						
2 Production (raw-material processing)			1.399	3.220 **			0.962	2.530 **
3 Production (components and parts)			0.526	1.430 +				
4 Production (final products)					-1.342	-3.140 **		
5 Purchasing/Procurement/Logistics			0.470	1.350 +				
6 R&D/Consulting			-0.674	-1.370 +	1.865	2.510 **		
7 Human resources development							-0.688	-1.440 +
Q1)								
Dummy (1986-1997=1, other=0)	-0.412	-1.390 +	-0.438	-1.760 *				
Dummy (1998-2007=1, other=0)								
Q4)								
Manufacturing	0.980	2.720 **			0.788	2.260 **		
Business	0.863	2.210 **			0.721	1.810 *	-1.321	-4.490 **
Q5)								
Exporters	0.733	1.970 **						
Dummy (Indonesia=1, other countries=0)			-0.645	-2.240 **			-0.874	-3.230 **
Dummy (Vietnam=1, other countries=0)			-0.449	-1.430 +				
constant					1.328	1.450 +		
Number of observations	323		316		323		333	
Log likelihood	-154.831		-192.771		-159.161		-198.563	
Pseudo R2			0.106		0.120			

Note: **, *, and + indicate that the coefficient is at 5, 10, and 20 percent significance level, respectively.

Table A7. Results: Industrial Upgrading and Innovation Case B; Full Model

	New goods		New technology		New market		New input	
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Q8) 1) Investment incentives, including tax incentives	0.236	1.160	-0.195	-1.180	-0.179	-0.940	0.218	1.310 +
2) Liberal trade policy	0.427	1.960 *	0.302	1.640 +	0.261	1.260	0.026	0.140
3) Customs procedures	0.381	2.000 **	0.031	0.190	-0.044	-0.240	0.180	1.090
4) Local content requirements, rule of origin	-0.288	-1.410 +	-0.065	-0.390	-0.204	-1.070	0.003	0.010
5) Physical infrastructure (roads, highways, ports, airports, etc.)	-0.090	-0.480	0.065	0.400	0.023	0.120	0.123	0.740
6) Infrastructure (telecommunications, IT)	-0.105	-0.470	-0.108	-0.590	-0.096	-0.440	-0.329	-1.730 *
7) Infrastructure (electricity, water supply, other utilities)	-0.205	-0.910	0.124	0.670	-0.246	-1.130	0.049	0.260
8) Government institutional infrastructure	-0.298	-1.550 +	-0.092	-0.570	0.343	1.910 *	0.029	0.170
9) Financial system	-0.219	-1.000	-0.186	-1.010	-0.391	-1.860 *	-0.326	-1.710 *
10) Legal system	0.385	1.940 *	0.142	0.840	0.348	1.810 *	-0.191	-1.100
11) Protection of intellectual property rights	0.182	0.910	-0.015	-0.090	0.186	0.970	-0.133	-0.780
12) Size of local markets	-0.247	-1.300 +	0.112	0.730	-0.085	-0.490	-0.096	-0.610
13) Access to export markets	-0.256	-1.290 +	0.084	0.510	-0.265	-1.350 +	0.393	2.300 **
14) Proximity to suppliers/subcontractors	0.278	1.340 +	0.097	0.540	0.273	1.330 +	0.370	1.960 *
15) Request by large/related company	0.029	0.140	0.236	1.300 +	-0.196	-0.910	-0.042	-0.230
16) Availability of low-cost labor	-0.017	-0.100	0.223	1.500 +	0.167	0.970	-0.005	-0.030
17) Availability of skilled labor and professionals	0.274	1.480 +	-0.147	-0.940	0.062	0.340	-0.099	-0.620
18) Other companies from the same country are located there	-0.244	-1.120	-0.222	-1.210	-0.181	-0.880	0.038	0.200
19) Access to cutting-edge technology and information	-0.335	-1.530 +	-0.151	-0.830	-0.101	-0.480	-0.234	-1.230
20) Living conditions	0.158	0.730	-0.058	-0.320	0.020	0.100	0.079	0.420
Q6) 1 Retail/Wholesale trade	0.323	0.920	0.037	0.130	0.228	0.660	0.308	1.030
2 Production (raw-material processing)	0.019	0.040	1.230	2.650 **	0.206	0.410	1.253	2.870 **
3 Production (components and parts)	0.774	1.490 +	0.547	1.360 +	0.470	0.940	0.783	1.940 *
4 Production (final products)	0.524	1.420 +	0.214	0.720	0.113	0.330	0.624	2.080 **
5 Purchasing/Procurement/Logistics	-0.317	-0.680	0.262	0.620	-1.208	-2.640 **	0.315	0.730
6 R&D/Consulting	0.524	1.160	0.447	1.180	0.333	0.720	-0.176	-0.460
7 Human resources development	-0.849	-1.450 +	-0.600	-1.080	1.675	2.160 **	-0.696	-1.200
Q1) When did your company establish its first office?	-0.024	-1.920 *	-0.024	-2.530 **	-0.018	-1.590 +	-0.007	-0.920
Dummy (Indonesia=1, other countries=0)	-0.296	-0.720	-0.505	-1.410 +	-0.376	-0.960	-0.913	-2.470 **
Dummy (Vietnam=1, other countries=0)	0.108	0.220	-0.149	-0.380	0.406	0.870	0.132	0.340
constant	48.448	1.970 **	48.216	2.510 **	38.605	1.690 *	12.757	0.900
Number of observations	317		316		316		316	
Log likelihood	-145.213		-192.594		-153.196		-186.924	
Pseudo R2	0.157		0.107		0.143		0.146	

Note: ** , * , and + indicate that the coefficient is at 5, 10, and 20 percent significance level, respectively.

Table A8. Results: Industrial Upgrading and Innovation Case B; Selected Model

	New goods		New technology		New market		New input	
	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Q8) 1) Investment incentives, including tax incentives	0.272	1.480 +	-0.248	-1.700 *			0.199	1.490 +
2) Liberal trade policy	0.404	2.030 **	0.389	2.360 **				
3) Customs procedures	0.292	1.660 *						
4) Local content requirements, rule of origin	-0.254	-1.370 +						
5) Physical infrastructure (roads, highways, ports, airports, etc.)								
6) Infrastructure (telecommunications, IT)							-0.221	-1.510 +
7) Infrastructure (electricity, water supply, other utilities)	-0.414	-2.360 **			-0.298	-1.830 *		
8) Government institutional infrastructure	-0.298	-1.760 *			0.261	1.670 *		
9) Financial system					-0.304	-1.690 *	-0.354	-2.380 **
10) Legal system	0.362	2.080 **			0.276	1.640 +		
11) Protection of intellectual property rights								
12) Size of local markets	-0.243	-1.450 +						
13) Access to export markets	-0.306	-1.730 *			-0.253	-1.600 +	0.316	2.110 **
14) Proximity to suppliers/subcontractors	0.301	1.720 *					0.332	2.170 **
15) Request by large/related company			0.240	1.620 +				
16) Availability of low-cost labor			0.251	1.900 *	0.202	1.440 +		
17) Availability of skilled labor and professionals								
18) Other companies from the same country are located there			-0.251	-1.470 +				
19) Access to cutting-edge technology and information			-0.185	-1.350 +			-0.244	-1.590 +
20) Living conditions								
Q6) 1 Retail/Wholesale trade	0.431	1.350 +						
2 Production (raw-material processing)			1.289	2.920 **			1.057	2.730 **
3 Production (components and parts)	0.859	1.860 *					0.727	2.050 **
4 Production (final products)	0.526	1.560 +					0.633	2.340 **
5 Purchasing/Procurement/Logistics					-1.029	-2.540 **		
6 R&D/Consulting	0.523	1.300 +						
7 Human resources development	-0.923	-1.800 *			1.234	1.920 *		
Q1) When did your company establish its first office?	-0.018	-1.750 *	-0.022	-2.580 **	-0.021	-1.940 *		
Dummy (Indonesia=1, other countries=0)			-0.683	-2.500 **	-0.544	-1.660 *	-0.836	-1.710 *
Dummy (Vietnam=1, other countries=0)					0.612	1.570 +	-0.925	-3.330 **
constant	35.976	1.790 *	42.729	2.560 **	42.855	2.030 **		
Number of observations	325		330		334		328	
Log likelihood	-158.603		-205.294		-168.170		-198.152	
Pseudo R2	0.126		0.087		0.097			

Note: **, *, and + indicate that the coefficient is at 5, 10, and 20 percent significance level, respectively.

6

Fostering Innovation and Finding Sources of New Technologies: Firm-Level Evidences from Indonesia, Thailand and Viet Nam

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Abstract

We examine factors affecting decisionmaking on innovation at the firm level using a novel research design to empirically detect the effect of firm-level perception. More precisely, binary probit models are estimated to verify factors promoting four categories of industrial upgrading or innovation, which are defined according to Schumpeter's concept, and access to different sources of new technologies and information necessary for upgrading. Differences in firm-level attributes are considered by estimating the models based on subsets of sample firms divided according to capital tie-up with foreign firms and main market. On the assumption that not only the degree of importance of a specific business condition for firms but also the degree of satisfaction

with it affects decisionmaking of firms on investments in innovation, we propose a "D-score," which is a simple difference between these degrees of importance and of satisfaction. This is an indicator of policy demands introduced in the model as independent variables. The pooled data composed of the sub-data sets of Indonesia, Thailand, and Viet Nam are developed by organizing mail surveys in these countries to be used for these analyses. This research strategy allows deriving detailed and practical policy recommendations for regional growth.

INTRODUCTION

Industrial cluster and innovation policies are increasingly emphasized by policymakers and local businesses not only in developed but also in developing countries. It is generally recognized that in the catching-up process, industrial policies are crucially important. Experiences in Asia until the 1990s offer evidences that support the role of government in industrial development. However, recent changes in economic environments, especially trade and investment liberalizations and the substantial progress of economic integration, impose huge challenges of economic development to developing countries. One of these policy issues is how to achieve industrialization and sustainable and stable growth. The other is to address the widening gap within a country and within a subregion in the global economic system. Industrial clusters and innovation policies are considered as potential measures to address these issues. Porter (2000) provides the basic idea for understanding the effects of industrial clustering and the influential argument for cluster policy. However, doubts have been raised about his framework, particularly the effectiveness and implementability of cluster policy.

In particular, Duranton (2008a) is skeptical about the ability of local governments to manipulate the global land market. He describes that clustering is not a choice variable that local policymakers can easily manipulate. The formation of cluster depends largely on location choice decisions made by an individual firm. When a firm chooses a city to put up his factory, he considers global aspects such as the size of market in the periphery area of the city and transportation networks that connect him to markets, other production bases, the headquarters, and his suppliers and customers, rather than simply the characteristics of the local business environment in the individual cluster. Duranton emphasizes the importance of land market as a factor that both economists and local policymakers should consider when they study or design a cluster policy. Duranton (2008b) likewise explicitly introduces land market as housing markets into his model of urban development. In addition, he raises several questions on the framework of Porter. He notes that Porter's framework assumes that clusters generate competitiveness but it lacks any explanation about the structures of production and competition. Duranton adds that Porter does not explain whether the removal of entry barriers is consistent with new product development that places increased emphasis on the industrial policy. In reality, there is no critical evidence that the free entry encourages firms to differentiate their products so that it results in promoting product innovation.

Moreover, Kuchiki and Tsuji (2008) consider Porter's framework impractical and unfeasible for developing countries because it gives only a picture of the nonlinear complex system of industrial agglomeration and innovation and does not present any policy priorities according to development stage.

Our research gives special focus on the factors that promote innovations and

encourage knowledge-creating firms to access sources of new technologies and information. We develop firm-level qualitative and quantitative data by organizing mail surveys in selected ASEAN countries that are in different stages of industrialization. Our research also uncovers the black box of the relationship between innovation evidence and firms' perception of business and market conditions. This allows us to derive policy implications useful for policy practitioners.

The rest of this paper is organized as follows. The background reviews literature on industrial agglomeration and innovation. Then, a new section presents the analytical framework, followed by another section explaining how and where we got our data. Then, evidence on the factors promoting innovations is discussed in another section. Sources of new technologies or information necessary for innovation are discussed next. The penultimate section provides the summary of our analyses and discussions about policy issues. The final section offers some conclusions.

1. BACKGROUND

Closing gaps in industrial development is one of the domestic and international political issues. In reality, the locations of firms are concentrated in a limited number of geographical areas. Another matter of concern is that activities for innovation, which is a key driving force of economic growth, are clustered as production activities.

Recently, more applied economic literature shed light on these phenomena. The distribution of innovative activities is more heterogeneous than production activities. Knowledge diffusion occurs within a very limited geographical scope (Audretsch and Feldman 1996). New economic geography and other applied microeconomic theories

provide the foundation explaining the system that generates unequal distribution of business activities at the city level.

Fujita and Thisse (2002: Chapter 11) note that because knowledge creation and transfer through interaction between knowledge workers is expensive, innovative activities can be viable in a very limited number of geographical areas, mainly large cities with advanced infrastructure, to provide knowledge workers a comfortable life and to foster interaction between them.

Even if shipping costs and communication costs are decreased by economies of scale and density in the transportation process, expansion of the geographic coverage of telecommunications network, and revolutionary information technology, the importance of collaboration for creating new knowledge based on face-to-face interactions is not necessarily diminishing. Instead, the importance of cities as a space for knowledge creation continues to increase (Gasper and Glaeser 1998). Markusen (1998) emphasizes that although information mobility is enhanced and information expense becomes less costly (slippery spaces) in the economic space, a space suitable for knowledge creation becomes limited with scarcities of goods and information indispensable for innovation activities (sticky places). Furthermore, according to Moretti (2004a,b,c), innovative activities stimulated by cross-interaction between knowledge-creating workers and production activities supported by such mechanism for spurring innovations have multiplier effects (precisely social multiplier and externalities in cities) of accelerating localization of these activities.

Although these previous works provide suggestive ideas to consider the innovation system at the city level, the unit of a place where innovations are created is in reality smaller than a city. Decisions about introduction of new products, exploitation of new

market, selection of new suppliers to procure new intermediary goods to enhance productivities, and introduction of new management system to support such activities are made at the firm level.

Therefore, to identify performance of innovation activities and business and market environments that affect attainments of innovation, it is necessary to implement a survey on the decisionmaking at the level of the individual firm. For the purpose of such analysis, it is indispensable to collect not only detailed data on firm attributes and infrastructure surrounding firms but also firms' perception of business and market conditions. Even though such data are usually compiled in official statistics, they are not sufficient to deeply understand behavioral pattern of firms.

For this reason, we propose in this paper a novel approach that develops subjective evaluations on these environments made by individual firms. We try to create various measures to approximate numerically the states of business and market environments faced by individual firms in reality. The main objective of our research is to discuss priorities and effectiveness of public policies based on these measures, instead of simply tabulating policy menus. The methodology is discussed in the next section.

The motivation and framework of this paper are based on Tsuji et al. (2006) and Kuchiki and Tsuji (2008). In Kuchiki and Tsuji (2008), Kuchiki proposes a "flowchart approach to industrial cluster policy" as a practical policy framework, which identifies factors promoting industrial agglomeration. Tsuji et al. (2006) organized a mail survey in Bangkok in 2005 and the surrounding area to verify Kuchiki's hypothesis. Miyahara and Tsuji (2007) use the data set constructed by Tsuji et al. (2006) to analyze innovations. However, there are rooms to improve their analysis because the data were developed mainly to analyze industrial agglomeration toward innovation or upgrading.

Our work is related to several previous literature that share a common interest with this present research in terms of objectives and approach. Bresnahan et al. (2002) pays attention to the difference in intensiveness of the use of information technology (IT) between firms and found the evidence of complementarities among IT, organizational change in workplace, and new products and services by using firm-level data. Their study showed the importance of in-depth surveys on employment practice and workplace organization within firms and quantifying them. It is almost impossible without such data to consider accurately innovative activities conducted daily in workplaces and complementarities among technologies that companies have, organizations that facilitate to utilize the technologies, and introduction of new goods enabled by effective combinations of these three.

Bloom and Reenen (2007) place their research focus on firm-level managerial practice to explain productivity differences between firms and countries. They conducted a survey of firms utilizing an instrument they developed to measure managerial practices, which codify the concept of "good" or "bad" management into scores from one (worst practice) to five (best practice). They also created a novel approach to analyze firm performance such as productivities and adoption of new technologies by combining discontinuous qualitative data collected by surveys and continuous quantitative data available from published information sources. They examined correlation between their survey data with data on firm performance constructed from completely independent data sources such as firm accounts and stock market values to investigate the association between their measure of managerial practices and firm performance.

On the strength of effectiveness of qualitative survey on firm-level management

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organization shown by these literature, we directly asked firms about their own evaluations on business and markets environments and then developed a model to examine whether these subjective evaluations are associated with a firm's innovation performance.

2. MEASURING DEMANDS FOR PUBLIC POLICIES TO PROMOTE INNOVATIONS

The models of industrial upgrading or innovation estimated in other chapters presented effects of levels of satisfaction with the 20 policy-related items on achievements of four categories of industrial upgrading or innovation. In this chapter, we develop an indicator of policy demands for these 20 items named "D-score" and applied them to models similar to those analyzed in the previous sections to complement their results and verify policy fields demanded by firms. In addition, we develop new models of determining sources of new technologies and information with the D-scores as independent variables. The data used for these analyses are the pooled data composed of the data sets of Indonesia, Thailand, and Viet Nam.

2.1. A Framework for Explanation of Industrial Upgrading and Measuring Policy Demands

2.1.1. A Conceptual Framework for Explanation of Industrial Upgrading

Many factors affect decisionmaking by firms on investments in business activities. As a result, these factors have influences on shaping firm specificities and geographic characteristics of types of business function, knowledge or technology intensiveness,

size of business operations, and so on.

Firm characteristics are fundamental elements that determine in part the capability and rationality of activities firms could engage in. For example, it seems obvious that manufacturing firms tend to introduce new production methods more often than other industrial sectors, although it is necessary to prove this hypothesis by statistical methods.

Local business conditions or external factors, which are given conditions for firms, have a great influence on profitability of specific businesses. For example, existence of competitors affects a firm's business strategy on introducing new methods of production. Again, the strategy regarding whether this firm develops a new technology by itself or subcontract it to suppliers is affected by availability of potential suppliers. Competition also encourages firms to be more innovative, and then again access to new technologies and skilled engineers indispensable for innovative activities depends on local innovation system and labor pool, respectively.

Considering their own characteristics and local business conditions, firms assess priorities and obstacles for their business. Such assessments stimulate both entrepreneurship and demand for public support to overcome the prioritized but dissatisfied matters.

These three elements—firm characteristics, local business conditions, and prescriptions for impediments including public policies—facilitate access to new technologies and information or new markets, leading to investments in expanding or upgrading existing operations. This simple framework for consideration of strategic issues for the private and public sectors such as industrial upgrading and technology transfer is depicted in Figure 1.

Figure 1: A Simple Framework to Explain the Effects of Policy Demand on Industrial Upgrading and Business Expansion
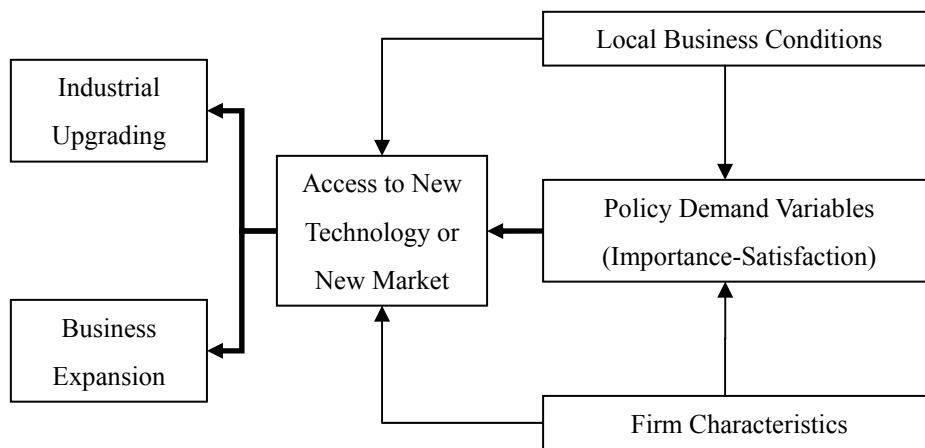
Source: Author.

2.1.2. Measuring Demands for Public Policies to Promote Industrial Upgrading

As shown in the conceptual framework developed to explain industrial upgrading, companies are motivated or encouraged by various factors to access sources of new technologies and markets, and carry out attempts for upgrading their activities. The models estimated in the previous sections focused on the effects of levels of satisfaction with potential influential factors on achievements of upgrading.

However, it seems that both the levels of importance and of satisfaction can affect the strategic behavior firms take. The models estimated in other chapters lack consideration for the levels of importance. In addition, the satisfaction level for a specific factor is not necessarily related to demands for policies to alleviate discontent with this factor if this factor is not important. In order to reduce these problems and keep the model and interpretations of estimated model straightforward, we propose a

"D-score."

We define D-score as a simple difference between "importance (*imp*)" and "satisfaction (*sat*)" for a firm (*j*) about each policy-related factor (*p*). More precisely, the importance minus satisfaction is the D-score as follows.

$$D_{pj} \equiv imp_{pj} - sat_{pj}$$

Explicitly positive D-scores express degrees of dissatisfaction with factors. We presume that D-scores measure implicitly the degree of subjective demands for each public policy. This is because larger D-score for a specific business condition implies more dissatisfaction with it, which result in increasing demands for public policies to improve the condition. D-scores are included in the econometric models estimated in the following section.

2.2 Models of Industrial Upgrading and Sources of New Technologies or Information

Based on the conceptual framework explained in the previous section, we develop two econometric models to verify factors promoting industrial upgrading and access to different sources of new technologies and information necessary for upgrading. Now we omit each firm's subscript (*j*) to simplify presentation of empirical specification.

2.2.1. The Model of Industrial Upgrading

We set the degree of subjective demand for each public policy (*p*) variable as D_p. This variable means the importance of each public policy or market structure for each firm. A set of other factors and unobserved factors are denoted by *X* and *u,* respectively. For each policy, we run a probit regression of the type:

$$\Pr(G = 1) = \beta_0 + \beta_1(imp_p - sat_p) + \gamma X + u$$
$$\Pr(G = 1) = \beta_0 + \beta_1 D_p + \gamma X + u \qquad .$$

In the model of industrial upgrading, the event $\Pr(G=1)$ is a type of upgrading carried out by firms in the last three years. The dependent variable is binary; if a company achieved an industrial upgrading, G equals 1, or else 0. Industrial upgrading is categorized into the following four types as asked in the questionnaire (Q9-1):

(1) Introduction of new goods,

(2) Adoption of a new method of production,

(3) Opening of a new market,

(4) Acquisition of a new source of supply of raw materials.

The independent variables are D-scores (D_ps) and attributes of respondent firms. We assume Imp_p and Sat_p, on which coefficients are equivalent, are key factors that affect implementation of upgrading, and factors other than Imp_p and Sat_p are contained in the control variables (Xs) and the error term (u).

This model is interpreted as follows. A negative coefficient on D_p for a specific factor means that the larger the difference between importance and satisfaction with the factor is, the less motivation to practice innovative activities firms find. That is to say, if the coefficient on a variable related to a policy (p) is negative, the current policy framework (p) does not meet policy demands from firms or variables related to the policy (p) would be obstacles for a firm to realize upgrading. On the other hand, the interpretation of positive coefficients is not as straightforward as negative ones. In this case, importance of the factor relative to degree of satisfaction for the innovative firm promotes upgrading or such companies give importance to it. One interpretation is that unfavorable conditions for firms and the market mechanism including competition

stimulate their entrepreneurship.

2.2.2. The Model of Sources of New Technologies or Information

The model of determining sources of new technologies or information is formulated in the same form as the model of industrial upgrading, while the event (y) is a source of new technologies or information accessed by firms that carried out at least one of the types of upgrading in the last three years. Such sources are categorized into the following as asked in Q9-3.

(1) Technology transfer from multinational companies,

(2) Technical assistance from foreign agencies (including official development assistance [ODA]),

(3) Technical cooperation with (or assistance from) local government,

(4) Technical cooperation with (or assistance from) local business organization,

(5) Technical cooperation with (or assistance from) local university or R&D institutes,

(6) Technology transfer from or cooperation with local companies

In this model of a source of new technologies or information, if the coefficient of a D-score for a specific policy is positive, this suggests that firms depend on the technology/information source to overcome obstacles they face to carry out innovative activities. If the coefficient is negative, the current policy (p) or variables related to the policy (p) would discourage firms to access such sources of industrial upgrading. Or the firms that carried out innovation did not give importance to the policy aspect.

3. THE DATA AND SUMMARY STATISTICS

3.1. The Data

The data used for these analyses are the pooled data composed of the data sets of Indonesia, Thailand, and Viet Nam. Each of them was constructed based on a standardized questionnaire designed exclusively for this research project. Mail surveys are organized by the Centre for Strategic and International Studies (CSIS) in Indonesia, the Sirindhorn International Institute of Technology, Thammasat University (SIIT) in Thailand, and Institute for Industry Policy and Strategy (IPSI) in Viet Nam. The questionnaires were sent out to firms located in major industrial districts—Jakarta, Bandung, and Surabaya in Indonesia; Bangkok and surrounding regions in Thailand; and Hanoi and the surrounding regions in Viet Nam—and collected by the end of 2007.

The D-scores are calculated from question 8 (Q8) in the questionnaire on "How important are the following factors in your company's decision to continue/expand its operations (in the surveyed area)?" and "How satisfied are you with the current condition of each of these factors?." Summary statistics of dependent and independent variables, including D-scores, are listed below.

From mean values of the degree of importance, firms attach importance to physical infrastructure such as roads and ports, telecommunications infrastructure, utilities, size of local markets, and availability of skilled labors or professionals. On the other hand, firms are discontent with customs procedures, local content requirements/rule of origin, government institutional infrastructure, financial system, legal system, and protection of intellectual property rights.

Table 1: Summary Statistics of Dependent and Independent Variables

		Variable	Obs	Mean	Std. Dev.	Min	Max
Dependent Variable							
Q9-1)		Innovation : Goods	364	0.747	0.435	0	1
		Methods	362	0.577	0.495	0	1
		Markets	364	0.753	0.432	0	1
		Suppliers	363	0.493	0.501	0	1
Q9-3)	1)	Technology transfer from multinational companies	342	0.582	0.494	0	1
	2)	Technical assistance from foreign agencies (including ODA)	341	0.364	0.482	0	1
	3)	Technical cooperation with (or assistance from) local government	342	0.371	0.484	0	1
	4)	Technical cooperation with (or assistance from) local business organization	339	0.566	0.496	0	1
	5)	Technical cooperation with (or assistance from) local university or R&D institutes	341	0.440	0.497	0	1
	6)	Technology transfer from or cooperation with local companies	339	0.560	0.497	0	1
Independent Variable							
Q2)		Multinationals	374	0.350	0.478	0	1
Q3)	1)	Size of company Full-time Employees	373	374.799	553.813	25	2000
		Total Assets	347	3182032	3942501	10000	10000000
		Paid-UP Capital	333	2467703	3628215	10000	10000000
Q4)		Manufacturing	374	0.479	0.500	0	1
Q5)		Exporters	374	0.241	0.428	0	1
D-score	1)	Investment incentives including tax incentives	349	0.702	1.364	-3	4
	2)	Liberal trade policy	346	0.390	1.125	-3	4
	3)	Customs procedures	349	0.490	1.366	-2	4
	4)	Local content requirements, rule of origin	343	0.169	1.257	-4	4
	5)	Physical infrastructure (roads, highways, ports, airports, etc.)	349	0.888	1.421	-3	4
	6)	Infrastructure (telecommunications, IT)	348	0.586	1.172	-3	4
	7)	Infrastructure (electricity, water supply, other	346	0.610	1.226	-3	4
	8)	Government institutional infrastructure	350	0.871	1.368	-2	4
	9)	Financial system	347	0.628	1.085	-2	4
	10)	Legal system	348	0.856	1.340	-3	4
	11)	Protection of intellectual property rights	344	0.622	1.283	-2	4
	12)	Size of local markets	348	0.497	1.048	-3	3
	13)	Access to export markets	346	0.269	1.258	-3	3
	14)	Proximity to suppliers/subcontractors	345	0.301	1.004	-3	3
	15)	Request by large/related company	344	0.323	1.012	-3	3
	16)	Availability of low-cost labor	350	0.323	1.340	-3	4
	17)	Availability of skilled labor and professionals	348	0.776	1.203	-3	4
	18)	Other companies from the same country are located here (synergy)	348	0.040	1.128	-4	4
	19)	Access to cutting-edge technology and information	347	0.380	1.155	-3	4
	20)	Living conditions	349	0.461	1.185	-3	4

Source: ERIA Research Project Mail Survey 2007.

As the important factors do not correspond to the dissatisfied factors, the important factors do not coincide with factors with large D-scores. From the calculated D-scores,

policy areas that firms are discontented with include investment incentives, physical infrastructure, government institutional infrastructure, legal system, and availability of skilled labors or professionals.

Table 2: Average of Importance, Satisfaction, and D-Score by Business and Market Environment

		Importance	Satisfaction	D-score
1)	Investment incentives including tax incentives	3.876	3.160	0.846
2)	Liberal trade policy	3.670	3.263	0.417
3)	Customs procedures	3.547	3.028	0.509
4)	Local content requirements, rule of origin	3.321	3.134	0.198
5)	Physical infrastructure (roads, highways, ports, airports, etc.)	4.193	3.309	0.944
6)	Infrastructure (telecommunications, IT)	4.243	3.662	0.628
7)	Infrastructure (electricity, water supply, other utilities)	4.146	3.536	0.657
8)	Government institutional infrastructure	3.904	3.011	0.960
9)	Financial system	4.125	3.480	0.699
10)	Legal system	3.967	3.103	0.969
11)	Protection of intellectual property rights	3.723	3.101	0.608
12)	Size of local markets	4.214	3.723	0.495
13)	Access to export markets	3.630	3.330	0.240
14)	Proximity to suppliers/subcontractors	3.866	3.548	0.300
15)	Request by large/related company	3.801	3.464	0.332
16)	Availability of low-cost labor	3.507	3.185	0.388
17)	Availability of skilled labor and professionals	4.212	3.444	0.793
18)	Other companies from the same country are located here (synergy)	3.183	3.143	0.062
19)	Access to cutting-edge technology and information	4.044	3.664	0.379
20)	Living conditions	4.006	3.553	0.497

Note: Importance minus satisfaction is the D-score. Average of D-score is positive for all business and market environment. Higher D-score means that the degree of dissatisfaction is also high. Top three of D-score are: (1) Legal System; (2) Government Institutional Infrastructure; (3) Physical infrastructure. This finding suggests that transaction and transportation costs still higher in sample countries. On the contrary, average of importance for these top three of D-score is not so higher than other more economic environment. Top three of business and market environment are not satisfied with many firms even though basic factors to promote industrial upgrading.

Source: ERIA Research Project Mail Survey 2007.

3.2. Summary Statistics of Sources of New Technologies

In the analyses developed from the following section, we verified the effects of the difference of firm-level characteristics on the probability of (1) industrial upgrading or innovation, and (2) sources of new technologies or information that are accessed by firms that have achieved at least one of four categories of innovations in last three years.

To examine the importance of firm-level attributes, we divide firms in our data set into two groups according to (1) whether or not firms are multinational companies (MNCs) and (2) whether or not they are exporters. To define MNCs, in Q2) of the questionnaire, firms are asked to choose one of the following capital structure: 1 100% local; 2 100% foreign; and 3 joint venture. MNCs are defined as firms with "100% foreign" capital or "joint venture." To define exporters, in Q5-1), firms are asked to choose as their main markets one of the following geographical areas: 1 domestic; 2 ASEAN; 3 China; 4 Other Asia; 5 United States; 6 Europe; and 7 Other. A company is categorized as nonexporter if its response is "1 domestic," and as exporter if the reply is anything else.

Among our sample of 374 firms, 35 percent of them are MNCs and 24 percent are exporters. Some 19 percent of the total number of non-MNCs (local firms) and 32 percent of MNCs are exporters. On the other hand, among non-exporters, 69 percent are local and 31 percent are MNCs. Likewise, among exporters, 52 percent are local and 48 percent are MNCs. In sum, our sample firms are mainly local firms, in particular local nonexporting firms (65 percent and 52 percent of the total, respectively). Even among MNCs, two-thirds of them are nonexporting and domestic-oriented.

We defined the four categories according to Schumpeter's concepts, namely, (1)

introduction of new goods; (2) adoption of a new method of production (new technology); (3) opening a new market and (4) acquisition of a new input such as raw materials. Question 9-1 is related to the question "What upgrades has your company carried out in the last three years," and asks respondents to reply either "yes" or "no".

Table 3: Innovations achieved by MNCs and Exporters

	Local (%)	MNCs (%)	Domestic (%)	Exporters (%)	Total (No.)	Total (%)
Q9-1_1: Introduction of new goods						
Yes	74.04	75.97	73.19	79.55	272	74.73
No	25.96	24.03	26.81	20.45	92	25.27
Total	100.00	100.00	100.00	100.00	364	100.00
Q9-1_2: Adoption of a new method of production						
Yes	57.94	57.36	56.93	60.23	209	57.73
No	42.06	42.64	43.07	39.77	153	42.27
Total	100.00	100.00	100.00	100.00	362	100.00
Q9-1_3: Opening of a new market						
Yes	75.74	74.42	74.64	77.27	274	75.27
No	24.26	25.58	25.36	22.73	90	24.73
Total	100.00	100.00	100.00	100.00	364	100.00
Q9-1_4: Acquisition of a new source of input						
Yes	48.29	51.16	48.36	52.27	179	49.31
No	51.71	48.84	51.64	47.73	184	50.69
Total	100.00	100.00	100.00	100.00	363	100.00

Note: Local means local firms without any relationship with multinationals. MNCs means firms with capital relationship with multinationals. Domestic means firms' main target is domestic market. Exporters means firms' main target is outside country.
Source: ERIA Research Project Mail Survey 2007.

Cross tables of these variables allow us to overview interesting present situation of innovation achieved by companies in developing countries. It is surprising that almost half or more of the firms answered that they have succeeded in at least one category of innovations in the last three years. By category of innovation, about 75 percent of respondents did introduction of new goods or opened a new market. Some 58 percent

and 49 percent of them adopted a new technology and acquired a new source of input, respectively. What is more important is that there are not significant differences in these probabilities between local and multinational firms and between exporters and non-exporters.

Table 4: Sources of New Technologies or Information

	Non-MNCs	MNCs	Domestic	Exporters	Total	
	(%)	(%)	(%)	(%)	(No.)	(%)
Q9-3_1: Technology transfer from MNCs						
Yes	46.58	78.86	58.62	56.79	199	58.19
No	53.42	21.14	41.38	43.21	143	41.81
Total	100.00	100.00	100.00	100.00	342	100.00
Q9-3_2: Technical assistance from foreign agencies						
Yes	32.27	43.80	35.50	39.24	124	36.36
No	67.73	56.20	64.50	60.76	217	63.64
Total	100.00	100.00	100.00	100.00	341	100.00
Q9-3_3: Technical cooperation with (or assistance from) local government						
Yes	43.18	26.23	37.93	34.57	127	37.13
No	56.82	73.77	62.07	65.43	215	62.87
Total	100.00	100.00	100.00	100.00	342	100.00
Q9-3_4: Technical cooperation with (or assistance from) local business organization						
Yes	65.30	40.83	57.53	53.75	192	56.64
No	34.70	59.17	42.47	46.25	147	43.36
Total	100.00	100.00	100.00	100.00	339	100.00
Q9-3_5: Technical cooperation with (or assistance from) local university or R&D institutes						
Yes	49.32	34.43	44.62	41.98	150	43.99
No	50.68	65.57	55.38	58.02	191	56.01
Total	100.00	100.00	100.00	100.00	341	100.00
Q9-3_6: Technology transfer from or cooperation with local companies						
Yes	61.64	45.83	58.69	47.50	190	56.05
No	38.36	54.17	41.31	52.50	149	43.95
Total	100.00	100.00	100.00	100.00	339	100.00

Note: Local means local firms without any relationship with multinationals. MNCs means firms with capital relationship with multinationals. Domestic means firms' main target is domestic market. Exporters means firms' main target is outside country.

Source: ERIA Research Project Mail Survey 2007.

We cannot find significant disparity in the percentages of technology sources between exporters and non-exporters except technology transfer from local firms. For both domestic-oriented and exporting firms, technology transfer from MNCs and technical cooperation with local business organization are main sources of new technologies or information. However, more nonexporting firms depend on technological cooperation with local firms. Because about 70 percent of non-exporters are local firms, this implies that technology transfers or cooperation between local firms are one of the main sources for local firms.

On the other hand, sources of technologies and information are significantly different between MNCs and non-MNCs. MNCs depend on foreign sources such as technology transfer from MNCs and technical assistance from foreign agencies. For local firms, of importance are local sources, especially in terms of technical cooperation with local business organization and technology transfer from or cooperation with local companies. This implies that local firms are cut off from MNC networks for technology transfer and cooperation, but develop their own geographically localized networks. In addition, factors affecting the choice of technology sources made by firms would be different between MNCs and local firms.

4. FACTORS PROMOTING INDUSTRIAL UPGRADING

In this section, binary probit models are estimated to analyze the nature and characteristics of the industrial upgrading or innovation processes. Special focus is placed on factors such as policy measures and economic environments that have contributed so far and are required for future upgrading. In addition to full-sample

models based on the complete pooled data composed of three countries, three sample restricted models for MNCs, non-MNCs, and non-exporters (hereinafter referred to as MNC model, Local model and non-Exporter model, respectively) are estimated to consider the effects of different attributes and different sources of upgrading.

4.1. The New Goods

Let us first examine the full-sample model of the introduction of new goods in the last three years. In Table 5, significant variables are indicated with asterisks corresponding to their level of significance. The figures in Table 5 are marginal effects calculated from coefficients (βs), which enable to compare impacts of changes in each variable on the probability of the introduction of new goods. It should be noted that factors with negative (positive) signs indicate that a one-point decrease in a D-score, for example by an appropriate policy intervention, increases (decreases) the probability of introducing new goods by firms by β percentage points.

Table 5 shows that "Tax Incentives" (5% or 10% significant level), "Legal system" (1% level), and "Request by large companies" (5% or 10% level) have negative signs. Therefore, these are policy areas that can be taken as additional measures to promote product innovations. Among these, the marginal effect of "Legal system" is the most substantial. A one-point increase in the D-score for "Legal system" decreases the probability of introduction of new goods by 5.4-8 percentage points. A less influential factor is tax incentives whose marginal effect is between -0.03 and -0.05. On the other hand, "Local content requirements" (1% or 5% level), "Access to cutting-edge technologies" (5% or 10% level), and "Living conditions" (5% or 10% level) have positive signs, which suggests that firms that introduced new goods placed importance

on these matters. The significantly positive marginal effect for "manufacturing," which is one if the firm belongs to the manufacturing sector, means that manufacturing firms tend to introduce new goods more often than other sectors. Likewise, "exporters," which is a dummy variable defined to be one if the firm is an exporter, are more innovative.

Table 6 presents the results of estimation of the models whereby samples are grouped into three categories. Among the negative variables in the full-sample model, "Tax incentives" is significant for local firms and non-exporters but "Request by large companies" is not robust. "Legal system" is significant at one or five percent level for MNCs and at one percent level for non-exporters. This factor has a great impact on MNCs whose marginal effect is approximately -0.11. On the other hand, as for the positive variables in the full-sample model, "Local content requirements" is significant for all attributes of firms, and the marginal effect for MNCs (about 0.09) is around twice those for non-MNCs and non-exporters. "Access to cutting-edge technologies" is significant mainly for MNCs (5% or 10% level) and has a considerable marginal effect (about 0.1). "Living conditions" (5% or 10% level) is a key factor for non-MNCs and non-exporters. The dummy variable for "manufacturing" is significant at 5 or 10 percent level except the model for MNCs. Among other factors, "Access to export markets" (5% or 10% level) is significantly positive only for non-MNCs. "Government institutional infrastructure" (5% level) encourages only MNCs to be innovative. The negative "Lower costs of labor" (10% level) characterizes non-exporters.

Table 5: Results: Introduction of New Goods (Full-sample)

	Pool (three countries)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Probit Regression (Marginal Effects)	Dependent: Introduction of New Goods Last 3 years=1, otherwise 0						
D-score: Tax Incentives	-0.031	-0.032	-0.032	-0.034	-0.042	-0.049	-0.054
	(1.607)	(1.621)	(1.625)	(1.741)*	(2.190)**	(2.483)**	(2.556)**
D-score: Liberal Trade Policy	-0.006	-0.007	-0.007	-0.009	-0.016	-0.011	-0.001
	(0.279)	(0.311)	(0.299)	(0.399)	(0.730)	(0.474)	(0.033)
D-score: Customs Procedures	0.007	0.001	0.002	0.001	0.008	-0.001	0.015
	(0.406)	(0.071)	(0.083)	(0.066)	(0.467)	(0.051)	(0.839)
D-score: Local Content	0.048	0.045	0.045	0.042	0.046	0.05	0.045
	(2.449)**	(2.359)**	(2.354)**	(2.249)**	(2.586)***	(2.634)***	(2.336)**
D-score: Physical Infrastructure	-0.031	-0.026	-0.025	-0.026	-0.029	-0.034	-0.036
	(1.405)	(1.213)	(1.177)	(1.248)	(1.438)	(1.622)	(1.638)
D-score: ICTs	0.022	0.035	0.035	0.034	0.031	0.033	0.043
	(0.814)	(1.309)	(1.294)	(1.287)	(1.248)	(1.271)	(1.574)
D-score: Utilities	0.008	-0.01	-0.01	-0.008	-0.009	-0.007	-0.008
	(0.357)	(0.424)	(0.433)	(0.356)	(0.406)	(0.280)	(0.345)
D-score: Government Institution	0.023	0.021	0.021	0.028	0.026	0.025	0.023
	(1.073)	(1.031)	(1.034)	(1.410)	(1.341)	(1.282)	(1.165)
D-score: Financial System	0.005	0.008	0.007	0.004	0	-0.007	0
	(0.180)	(0.282)	(0.273)	(0.144)	(0.016)	(0.248)	(0.018)
D-score: Legal System	-0.081	-0.071	-0.072	-0.071	-0.066	-0.054	-0.059
	(3.368)***	(3.123)***	(3.112)***	(3.172)***	(3.175)***	(2.532)**	(2.597)***
D-score: Protection of IPRs	0.019	0.015	0.015	0.016	0.02	0.011	-0.002
	(0.899)	(0.743)	(0.752)	(0.813)	(1.092)	(0.551)	(0.076)
D-score: Size of Local Markets	0	0.01	0.01	0.017	0.022	0.015	0.036
	(0.008)	(0.370)	(0.370)	(0.642)	(0.905)	(0.592)	(1.272)
D-score: Access to Export Markets	0.015	0.009	0.009	0.002	0.004	0.01	0.003
	(0.669)	(0.396)	(0.400)	(0.072)	(0.200)	(0.457)	(0.129)
D-score: Proximity of Suppliers	0	-0.002	-0.002	0.003	0.008	0.008	0.001
	(0.016)	(0.066)	(0.077)	(0.094)	(0.332)	(0.273)	(0.036)
D-score: Request by Large Companies	-0.051	-0.052	-0.052	-0.052	-0.057	-0.043	-0.052
	(1.825)*	(1.898)*	(1.894)*	(1.915)*	(2.274)**	-1.608	(1.854)*
D-score: Lower Costs of Labor	-0.022	-0.028	-0.028	-0.029	-0.028	-0.032	-0.028
	(1.138)	(1.448)	(1.457)	(1.465)	(1.534)	(1.623)	(1.356)
D-score: Skilled Labor	-0.01	-0.011	-0.011	-0.012	-0.009	-0.012	-0.013
	(0.420)	(0.503)	(0.504)	(0.583)	(0.425)	(0.580)	(0.604)
D-score: Synergy	-0.009	-0.01	-0.01	-0.008	0.011	-0.008	-0.017
	(0.396)	(0.447)	(0.446)	(0.374)	(0.505)	(0.329)	(0.739)
D-score: Cutting-Edge Technology	0.049	0.051	0.05	0.055	0.049	0.055	0.053
	(1.753)*	(1.884)*	(1.880)*	(2.106)**	(1.983)**	(2.096)**	(1.993)**
D-score: Living Conditions	0.04	0.044	0.044	0.044	0.037	0.054	0.031
	(1.714)*	(1.877)*	(1.866)*	(1.880)*	-1.632	(2.261)**	-1.342
Manufacturing		0.158	0.159	0.153	0.126	0.123	0.162
		(2.922)***	(3.005)***	(2.908)***	(2.559)**	(2.312)**	(2.988)***
Multinationals			-0.005	-0.016	-0.067	-0.053	-0.09
			(0.106)	(0.322)	(1.338)	(0.994)	(1.599)
Exporters				0.11	0.109	0.116	0.108
				(1.979)**	(2.064)**	(2.039)**	(1.846)*
Full-time Employees					Yes		
Total Assets (US$)						Yes	
Paid-up Capital (US$)							Yes
Observations	314	314	314	314	313	295	283

Note: Robust z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Source: ERIA Research Project Mail Survey 2007.

Table 6: Results: Introduction of New Goods (Restricted Sample)

	Pool (three countries)								
	Non Multinationals			Multinationals			Non Exporters		
Sample Restriction	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Probit Regression (Marginal Effects)	Dependent: Introduction of New Goods Last 3 years=1, otherwise 0								
D1: Tax Incentives	-0.024	-0.031	-0.045	-0.015	-0.022	-0.02	-0.043	-0.041	-0.051
	(0.963)	(1.216)	(1.968)**	(0.434)	(0.640)	(0.589)	(1.748)*	(1.643)	(2.030)**
D2: Liberal Trade Policy	-0.035	-0.038	-0.03	-0.021	-0.018	-0.02	0.003	0.003	-0.008
	(1.160)	(1.354)	(1.231)	(0.549)	(0.482)	(0.530)	(0.121)	(0.123)	(0.297)
D3: Customs Procedures	0.024	0.02	0.023	0.01	0.015	0.015	0.004	-0.005	0
	(1.044)	(0.958)	(1.294)	(0.286)	(0.455)	(0.435)	(0.179)	(0.232)	(0.005)
D4: Local Content	0.046	0.039	0.042	0.096	0.09	0.091	0.043	0.039	0.047
	(2.057)**	(1.925)*	(2.307)**	(1.712)*	-1.633	(1.651)*	(1.806)*	(1.739)*	(2.178)**
D5: Physical Infrastructure	-0.035	-0.032	-0.038	-0.007	-0.009	-0.008	-0.019	-0.018	-0.024
	(1.277)	(1.276)	(1.733)*	(0.185)	(0.268)	(0.231)	(0.655)	(0.654)	(0.913)
D6: ICTs	0.014	0.028	0.016	-0.013	-0.02	-0.018	0.015	0.028	0.029
	(0.402)	(0.841)	(0.564)	(0.269)	(0.427)	(0.369)	(0.432)	(0.835)	(0.904)
D7: Utilities	0.013	-0.012	-0.011	-0.038	-0.031	-0.032	0.025	0.006	0.006
	(0.428)	(0.400)	(0.456)	(0.999)	(0.796)	(0.808)	(0.849)	(0.216)	(0.220)
D8: Government Institution	-0.015	-0.003	0.001	0.082	0.085	0.081	0.037	0.039	0.035
	(0.540)	(0.100)	(0.062)	(2.312)**	(2.566)**	(2.371)**	(1.388)	(1.494)	(1.356)
D9: Financial System	-0.024	-0.022	-0.032	0.019	0.021	0.023	-0.008	-0.01	-0.008
	(0.670)	(0.661)	(1.037)	(0.362)	(0.403)	(0.446)	(0.238)	(0.307)	(0.262)
D10: Legal System	-0.042	-0.034	-0.033	-0.112	-0.116	-0.116	-0.089	-0.083	-0.076
	(1.474)	(1.344)	(1.437)	(2.470)**	(2.621)***	(2.611)***	(3.123)***	(3.067)***	(2.947)***
D11: Protection of IPRs	0.014	0.003	0.013	0.006	-0.001	-0.001	0.028	0.024	0.025
	(0.624)	(0.119)	(0.669)	(0.133)	(0.024)	(0.025)	(1.055)	(0.923)	(1.039)
D12: Size of Local Markets	-0.039	-0.014	0.004	0.071	0.075	0.075	0.007	0.022	0.026
	(1.288)	(0.523)	(0.166)	(1.307)	(1.403)	(1.398)	(0.212)	(0.693)	(0.873)
D13: Access to Export Markets	0.062	0.047	0.034	-0.017	-0.015	-0.016	-0.003	-0.012	-0.008
	(2.186)**	(1.685)*	-1.453	-0.385	-0.359	-0.368	-0.098	-0.413	-0.282
D14: Proximity of Suppliers	-0.009	-0.003	0	-0.017	-0.014	-0.01	0.006	0.006	0.01
	(0.270)	(0.102)	(0.015)	(0.370)	(0.305)	(0.216)	(0.167)	(0.164)	(0.314)
D15: Request by Large Companies	-0.025	-0.022	-0.029	-0.079	-0.07	-0.07	-0.051	-0.054	-0.059
	(0.747)	(0.676)	(1.054)	(1.825)*	(1.577)	(1.573)	(1.524)	(1.569)	(1.811)*
D16: Lower Costs of Labor	-0.041	-0.043	-0.033	-0.03	-0.022	-0.023	-0.047	-0.049	-0.043
	(1.538)	(1.716)*	(1.489)	(1.037)	(0.694)	(0.731)	(1.750)*	(1.861)*	(1.629)
D17: Skilled Labor	-0.013	-0.02	-0.01	0.041	0.037	0.035	0.004	0.001	0
	(0.448)	(0.789)	(0.459)	(0.831)	(0.736)	(0.713)	(0.147)	(0.045)	(0.007)
D18: Synergy	0.048	0.048	0.046	-0.114	-0.109	-0.096	-0.001	-0.004	0.011
	(1.673)*	(1.750)*	(2.053)**	(2.523)**	(2.445)**	(1.985)**	(0.037)	(0.151)	(0.426)
D19: Cutting-Edge Technology	0.038	0.044	0.056	0.1	0.098	0.088	0.019	0.024	0.024
	(1.137)	(1.332)	(1.987)**	(2.261)**	(2.170)**	(1.933)*	(0.576)	(0.737)	(0.789)
D20: Living Conditions	0.056	0.061	0.051	-0.03	-0.033	-0.033	0.057	0.06	0.054
	(1.917)*	(2.102)**	(1.888)*	(0.738)	(0.833)	(0.823)	(2.028)**	(2.090)**	(1.931)*
Manufacturing		0.241	0.183		-0.062	-0.066		0.163	0.135
		(3.435)***	(2.929)***		(0.643)	(0.696)		(2.539)**	(2.167)**
Full-time Employees			Yes			Yes			Yes
Observations	201	201	200	113	113	113	237	237	236

Note: Robust z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Source: ERIA Research Project Mail Survey 2007.

4.2. The New Production Method

Here we examine the full-sample model of the adoption of a new method of production (Table 7). Only two factors are identified. "Local content requirements" is

positively significant at one percent level and "Legal system" is negatively significant at one or five percent level. "Manufacturing" is significantly positive at one or five percent level. From the marginal effect, a one-point increase in D-score for legal system decreases the possibility of introduction of new production method by approximately 6-8 percentage points. On the other hand, firms that attach importance to local content requirements or rules of origin but are not satisfied with them have a higher probability of introducing it; the marginal effect of this factor is about 0.07.

Legal system has a greater impact on MNCs, although this is significant for non-exporters too (Table 8). The probability of introduction by MNCs decreases by about 16 percentage points with a one-point increase in the D-score for legal system. Another noteworthy result for MNCs is the importance of protection of intellectual property rights (IPRs). The marginal effect for IPRs is significantly negative only for MNCs. The marginal effect of it is around -0.20. Other factors that have significantly positive marginal effects are "Customs procedures," "Financial system," "Size of local market," and "Request by large firms." For their part, non-MNCs can absorb new technologies more often than in the last three years if governments introduced appropriate "Liberal trade policy" or policies to expand "Size of local markets," which are significantly negative at 5 or 10 percent level. Even for non-exporters, the marginal effect of "Customs procedures" is positive. This implies that both export and import procedures directly or indirectly affect adoption of new technologies by firms.

Table 7: Results: Adoption of New Method (Full-sample)

Probit Regression (Marginal Effects)	Pool (three countries)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Dependent: Adoption of a New Method of Production Last 3 years =1, otherwise 0						
D1: Tax Incentives	0.017	0.019	0.019	0.019	0.015	0	-0.005
	(0.672)	(0.770)	(0.749)	(0.738)	(0.607)	(0.006)	(0.203)
D2: Liberal Trade Policy	-0.047	-0.049	-0.047	-0.047	-0.053	-0.052	-0.035
	(1.571)	(1.616)	(1.545)	(1.546)	(1.725)*	(1.607)	(1.072)
D3: Customs Procedures	0.029	0.026	0.027	0.027	0.033	0.027	0.033
	(1.263)	(1.095)	(1.153)	(1.153)	(1.382)	(1.073)	(1.273)
D4: Local Content	0.07	0.067	0.068	0.068	0.072	0.068	0.084
	(2.772)***	(2.683)***	(2.703)***	(2.693)***	(2.840)***	(2.597)***	(3.119)***
D5: Physical Infrastructure	-0.03	-0.028	-0.026	-0.026	-0.029	-0.019	-0.034
	(1.090)	(0.991)	(0.918)	(0.919)	(1.053)	(0.658)	(1.131)
D6: ICTs	-0.004	0.012	0.01	0.01	0.013	0.005	0.004
	(0.125)	(0.337)	(0.292)	(0.291)	(0.355)	(0.132)	(0.106)
D7: Utilities	-0.005	-0.026	-0.028	-0.028	-0.031	-0.006	-0.013
	(0.165)	(0.829)	(0.874)	(0.867)	(0.985)	(0.197)	(0.410)
D8: Government Institution	0.019	0.017	0.018	0.018	0.015	0.01	0.018
	(0.666)	(0.585)	(0.623)	(0.629)	(0.508)	(0.349)	(0.599)
D9: Financial System	0.017	0.021	0.021	0.02	0.013	0.01	0.002
	(0.497)	(0.585)	(0.575)	(0.572)	(0.371)	(0.260)	(0.055)
D10: Legal System	-0.081	-0.072	-0.074	-0.074	-0.07	-0.063	-0.073
	(2.622)***	(2.295)**	(2.367)**	(2.368)**	(2.223)**	(1.949)*	(2.197)**
D11: Protection of IPRs	0.023	0.02	0.02	0.02	0.025	0.011	0.01
	(0.837)	(0.723)	(0.717)	(0.719)	(0.890)	(0.394)	(0.325)
D12: Size of Local Markets	-0.032	-0.023	-0.023	-0.023	-0.014	-0.024	-0.007
	(0.948)	(0.693)	(0.689)	(0.677)	(0.425)	(0.648)	(0.179)
D13: Access to Export Markets	0.035	0.028	0.028	0.028	0.026	0.037	0.033
	(1.242)	(1.000)	(1.004)	(0.973)	(0.911)	(1.274)	(1.089)
D14: Proximity of Suppliers	0.004	0.004	0.002	0.002	0.007	0.004	0.017
	(0.127)	(0.117)	(0.062)	(0.065)	(0.216)	(0.118)	(0.446)
D15: Request by Large Companies	0	-0.004	-0.004	-0.004	-0.013	0.011	-0.005
	(0.009)	(0.115)	(0.095)	(0.094)	(0.338)	(0.274)	(0.123)
D16: Lower Costs of Labor	0.001	-0.005	-0.005	-0.005	-0.003	-0.004	0.004
	(0.035)	(0.184)	(0.206)	(0.206)	(0.101)	(0.149)	(0.133)
D17: Skilled Labor	0.044	0.045	0.044	0.044	0.05	0.044	0.042
	(1.529)	(1.573)	(1.554)	(1.552)	(1.751)*	(1.473)	(1.383)
D18: Synergy	0.023	0.025	0.024	0.025	0.041	0.01	0.012
	(0.785)	(0.838)	(0.826)	(0.828)	(1.380)	(0.345)	(0.372)
D19: Cutting-Edge Technology	0.032	0.034	0.033	0.033	0.026	0.033	0.046
	(0.957)	(1.008)	(0.988)	(0.991)	(0.788)	(0.958)	(1.304)
D20: Living Conditions	0.04	0.047	0.046	0.046	0.041	0.04	0.046
	(1.328)	(1.528)	(1.496)	(1.495)	(1.322)	(1.267)	(1.436)
Manufacturing		0.172	0.176	0.175	0.164	0.143	0.183
		(2.765)***	(2.803)***	(2.788)***	(2.548)**	(2.141)**	(2.722)***
Multinationals			-0.039	-0.039	-0.087	-0.124	-0.101
			(0.598)	(0.601)	(1.268)	(1.736)*	(1.396)
Exporters				0.004	0.006	0.047	0.05
				(0.055)	(0.083)	(0.619)	(0.661)
Full-time Employees					Yes		
Total Assets (US$)						Yes	
Paid-up Capital (US$)							Yes
Observations	313	313	313	313	312	294	282

Note: Robust z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Source: ERIA Research Project Mail Survey 2007.

Table 8: Results: Adoption of New Method (Restricted Sample)

	Pool (three countries)								
	Non Multinationals			Multinationals			Non Exporters		
Sample Restriction	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Probit Regression (Marginal Effects)	Dependent: Adoption of a New Method of Production Last 3 years =1, otherwise 0								
D1: Tax Incentives	0.058	0.059	0.051	-0.053	-0.03	-0.026	0.021	0.024	0.02
	(1.751)*	(1.766)*	(1.506)	(1.123)	(0.597)	(0.449)	(0.712)	(0.808)	(0.647)
D2: Liberal Trade Policy	-0.082	-0.084	-0.08	0.01	0.001	-0.018	-0.043	-0.043	-0.054
	(1.952)*	(1.995)**	(1.910)*	(0.176)	(0.022)	(0.314)	(1.178)	(1.156)	(1.460)
D3: Customs Procedures	0.017	0.016	0.021	0.118	0.098	0.101	0.054	0.05	0.054
	(0.530)	(0.505)	(0.666)	(2.614)***	(2.074)**	(2.134)**	(1.943)*	(1.770)*	(1.912)*
D4: Local Content	0.088	0.086	0.093	-0.037	-0.021	-0.022	0.043	0.041	0.05
	(2.905)***	(2.850)***	(3.120)***	(0.598)	(0.345)	(0.345)	(1.458)	(1.384)	(1.674)*
D5: Physical Infrastructure	-0.024	-0.026	-0.036	0.007	0.021	0.044	-0.017	-0.018	-0.022
	(0.710)	(0.756)	(1.059)	(0.120)	(0.345)	(0.733)	(0.501)	(0.539)	(0.644)
D6: ICTs	-0.003	0.005	0.003	-0.03	-0.013	0	-0.012	-0.003	0
	(0.074)	(0.105)	(0.067)	(0.427)	(0.186)	(0.007)	(0.305)	(0.073)	(0.007)
D7: Utilities	-0.03	-0.041	-0.038	-0.003	-0.027	-0.048	0.019	0.006	0.003
	(0.776)	(1.037)	(0.987)	(0.039)	(0.391)	(0.690)	(0.487)	(0.167)	(0.092)
D8: Government Institution	-0.001	0.003	0.009	-0.005	-0.02	-0.052	0.019	0.02	0.013
	(0.030)	(0.088)	(0.252)	(0.086)	(0.353)	(0.909)	(0.572)	(0.593)	(0.380)
D9: Financial System	-0.019	-0.02	-0.03	0.173	0.175	0.201	0.009	0.008	0.004
	(0.403)	(0.425)	(0.649)	(2.007)**	(2.015)**	(2.370)**	(0.221)	(0.184)	(0.091)
D10: Legal System	-0.05	-0.048	-0.048	-0.166	-0.155	-0.146	-0.081	-0.077	-0.072
	(1.314)	(1.254)	(1.253)	(2.276)**	(2.092)**	(2.038)**	(2.201)**	(2.093)**	(1.953)*
D11: Protection of IPRs	0.05	0.046	0.051	-0.206	-0.18	-0.202	0.046	0.043	0.048
	(1.580)	(1.462)	(1.624)	(2.933)***	(2.463)**	(2.716)***	(1.429)	(1.349)	(1.492)
D12: Size of Local Markets	-0.085	-0.078	-0.066	0.144	0.137	0.166	-0.075	-0.066	-0.061
	(2.052)**	(1.854)*	(1.541)	(1.720)*	(1.583)	(1.795)*	(1.858)*	(1.632)	(1.466)
D13: Access to Export Markets	0.11	0.106	0.098	-0.059	-0.066	-0.064	0.045	0.04	0.041
	(2.915)***	(2.780)***	(2.539)**	(1.085)	(1.181)	(1.106)	(1.316)	(1.162)	(1.204)
D14: Proximity of Suppliers	0.005	0.007	0.011	-0.086	-0.103	-0.084	0.005	0.006	0.011
	(0.116)	(0.186)	(0.274)	(1.205)	(1.393)	(1.113)	(0.140)	(0.157)	(0.272)
D15: Request by Large Companies	-0.049	-0.05	-0.051	0.208	0.192	0.16	-0.005	-0.007	-0.015
	(1.029)	(1.039)	(1.068)	(2.623)***	(2.452)**	(2.034)**	(0.118)	(0.169)	(0.358)
D16: Lower Costs of Labor	-0.001	0	0.005	0.011	-0.013	-0.021	-0.011	-0.013	-0.002
	(0.025)	(0.001)	(0.157)	(0.285)	(0.295)	(0.458)	(0.346)	(0.419)	(0.053)
D17: Skilled Labor	0.047	0.045	0.047	0.028	0.043	0.043	0.055	0.054	0.057
	(1.372)	(1.314)	(1.389)	(0.375)	(0.551)	(0.565)	(1.678)*	(1.656)*	(1.737)*
D18: Synergy	0.069	0.071	0.064	0.057	0.046	0.136	0.018	0.018	0.033
	(1.794)*	(1.866)*	(1.697)*	(1.043)	(0.849)	(2.156)**	(0.532)	(0.529)	(0.961)
D19: Cutting-Edge Technology	0.061	0.063	0.067	0.002	0.008	-0.044	-0.009	-0.006	-0.006
	(1.465)	(1.514)	(1.612)	(0.030)	(0.131)	(0.724)	(0.233)	(0.161)	(0.145)
D20: Living Conditions	0.061	0.064	0.065	-0.005	0.012	-0.022	0.075	0.078	0.075
	(1.584)	(1.647)*	(1.679)*	(0.102)	(0.240)	(0.411)	(2.119)**	(2.179)**	(2.107)**
Manufacturing		0.097	0.083		0.211	0.231		0.102	0.087
		(1.225)	(1.025)		(1.554)	(1.734)*		(1.422)	(1.178)
Full-time Employees			Yes			Yes			Yes
Observations	200	200	199	113	113	113	236	236	235

Note: Robust z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Source: ERIA Research Project Mail Survey 2007.

4.3. The New Market Exploration

In this subsection, we examine the model of the opening of a new market. Table 9, which is the result of the full-sample model, indicates that a one-point increase in the D-score for "physical infrastructure" (10% significant level)" decreases the probability of opening a new market by four percentage points. Likewise, the impact of "Access to cutting-edge technologies" is around 5.5-6.5 percentage points

From the results of non-Exporter model in Table 10, a one-point decrease in "Physical infrastructure" and "Access to cutting-edge technology" increases the probability by 5 and 6.5 percentage points, respectively. As for non-MNCs, the increase in D-scores for "Government institutional infrastructure" and "Access to cutting-edge technologies" has negative impacts on this type of innovation, while firms that place emphasis on "Availability of skilled labor" are active in opening new markets. On the other hand, the innovativeness of MNCs is influenced by "Legal system" and "Proximity to suppliers or subcontractors," whose marginal effects are around 12 percentage points. The MNC model also shows that path-breaking MNCs place importance on "Tax incentives," "Financial system," and "Request by large or related company."

Table 9: Results: Opening of New Market (Full-sample)

Probit Regression (Marginal Effects)	Pool (three countries)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Dependent: Opening of a New Market Last 3 years =1, otherwise 0						
D1: Tax Incentives	0.022	0.024	0.023	0.022	0.018	0.007	0.007
	(1.071)	(1.140)	(1.123)	(1.047)	(0.862)	(0.346)	(0.315)
D2: Liberal Trade Policy	0.009	0.009	0.01	0.01	0.006	0.028	0.031
	(0.374)	(0.351)	(0.400)	(0.402)	(0.242)	(1.147)	(1.258)
D3: Customs Procedures	-0.013	-0.015	-0.015	-0.014	-0.012	-0.012	-0.011
	(0.660)	(0.789)	(0.749)	(0.728)	(0.636)	(0.603)	(0.540)
D4: Local Content	0.034	0.033	0.033	0.032	0.033	0.023	0.032
	(1.553)	(1.494)	(1.499)	(1.468)	(1.507)	(1.003)	(1.405)
D5: Physical Infrastructure	-0.043	-0.042	-0.041	-0.042	-0.041	-0.046	-0.039
	(1.811)*	(1.789)*	(1.729)*	(1.743)*	(1.751)*	(1.919)*	-1.593
D6: ICTs	0.025	0.031	0.03	0.029	0.029	0.029	0.018
	(0.893)	(1.088)	(1.047)	(1.031)	(1.025)	(1.047)	(0.627)
D7: Utilities	0.034	0.028	0.028	0.028	0.028	0.043	0.056
	(1.288)	(1.026)	(1.002)	(1.032)	(1.061)	(1.602)	(2.037)**
D8: Government Institution	-0.032	-0.033	-0.033	-0.031	-0.037	-0.033	-0.038
	(1.365)	(1.400)	(1.378)	(1.279)	(1.510)	(1.384)	(1.582)
D9: Financial System	0.027	0.029	0.028	0.028	0.034	0.028	0.042
	(0.882)	(0.964)	(0.946)	(0.933)	(1.173)	(0.922)	(1.439)
D10: Legal System	-0.025	-0.022	-0.022	-0.022	-0.017	-0.029	-0.039
	(0.964)	(0.826)	(0.842)	(0.844)	(0.682)	(1.110)	(1.480)
D11: Protection of IPRs	0.015	0.013	0.013	0.013	0.014	0.017	0.024
	(0.640)	(0.546)	(0.546)	(0.575)	(0.630)	(0.715)	(1.025)
D12: Size of Local Markets	0.006	0.009	0.009	0.011	0.01	0.013	0.02
	(0.208)	(0.335)	(0.350)	(0.414)	(0.365)	(0.484)	(0.708)
D13: Access to Export Markets	0.038	0.036	0.036	0.033	0.036	0.029	0.029
	(1.612)	(1.526)	(1.518)	(1.366)	(1.529)	(1.179)	(1.143)
D14: Proximity of Suppliers	-0.029	-0.029	-0.03	-0.029	-0.025	-0.009	-0.011
	(1.017)	(1.038)	(1.053)	(1.013)	(0.879)	(0.272)	(0.344)
D15: Request by Large Companies	0.025	0.024	0.025	0.025	0.016	0.009	0.004
	(0.896)	(0.878)	(0.892)	(0.910)	(0.607)	(0.341)	(0.133)
D16: Lower Costs of Labor	-0.029	-0.033	-0.033	-0.033	-0.032	-0.022	-0.034
	(1.331)	(1.484)	(1.514)	(1.524)	(1.510)	(1.001)	(1.560)
D17: Skilled Labor	0.037	0.037	0.037	0.037	0.036	0.036	0.027
	(1.535)	(1.553)	(1.554)	(1.540)	(1.548)	(1.514)	(1.116)
D18: Synergy	0.024	0.025	0.025	0.025	0.042	0.029	0.023
	(0.942)	(0.972)	(0.961)	(0.987)	(1.673)*	(1.161)	(0.916)
D19: Cutting-Edge Technology	-0.056	-0.055	-0.056	-0.055	-0.061	-0.065	-0.065
	(2.042)**	(2.045)**	(2.061)**	(2.040)**	(2.347)**	(2.454)**	(2.420)**
D20: Living Conditions	0.001	0.001	0.001	0.001	-0.005	0.007	0.006
	(0.044)	(0.052)	(0.026)	(0.037)	(0.225)	(0.297)	(0.272)
Manufacturing		0.067	0.07	0.067	0.05	0.031	0.032
		(1.247)	(1.302)	(1.250)	(0.928)	(0.573)	(0.573)
Multinationals			-0.023	-0.027	-0.071	-0.052	-0.07
			(0.423)	(0.495)	(1.250)	(0.942)	(1.163)
Exporters				0.037	0.029	0.078	0.072
				(0.607)	(0.475)	(1.261)	(1.130)
Full-time Employees					Yes		
Total Assets (US$)						Yes	
Paid-up Capital (US$)							Yes
Observations	313	313	313	313	312	294	282

Note: Robust z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Source: ERIA Research Project Mail Survey 2007.

Table 10: Results: Opening of New Market (Restricted Sample)

	Pool (three countries)								
	Non Multinationals			Multinationals			Non Exporters		
Sample Restriction	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Probit Regression (Marginal Effects)	Dependent: Opening of a New Market Last 3 years =1, otherwise 0								
D1: Tax Incentives	-0.005	-0.005	-0.017	0.108	0.096	0.105	0.014	0.017	0.009
	(0.182)	(0.171)	(0.596)	(2.427)**	(2.070)**	(2.469)**	(0.543)	(0.659)	(0.359)
D2: Liberal Trade Policy	0.027	0.023	0.026	-0.022	-0.021	-0.023	0	0	-0.008
	(0.885)	(0.814)	(0.938)	(0.491)	(0.469)	(0.520)	(0.016)	(0.012)	(0.258)
D3: Customs Procedures	0.001	-0.002	0	-0.055	-0.043	-0.049	-0.023	-0.028	-0.025
	(0.024)	(0.093)	(0.001)	(1.530)	(1.190)	(1.393)	(0.988)	(1.203)	(1.050)
D4: Local Content	0.036	0.031	0.035	0.058	0.053	0.054	0.037	0.036	0.039
	(1.407)	(1.279)	(1.440)	(1.125)	(1.018)	(1.074)	(1.400)	(1.376)	(1.518)
D5: Physical Infrastructure	-0.044	-0.045	-0.048	0.01	0.005	0.019	-0.049	-0.049	-0.051
	(1.544)	(1.599)	(1.781)*	(0.201)	(0.105)	(0.387)	(1.636)	(1.657)*	(1.757)*
D6: ICTs	0.003	0.012	0.009	0.007	0.002	0.014	0.026	0.033	0.034
	(0.084)	(0.364)	(0.268)	(0.149)	(0.031)	(0.279)	(0.791)	(0.969)	(1.006)
D7: Utilities	0.044	0.035	0.039	-0.013	-0.001	-0.018	0.055	0.047	0.049
	(1.424)	(1.127)	(1.333)	(0.235)	(0.021)	(0.328)	(1.782)*	(1.465)	(1.600)
D8: Government Institution	-0.068	-0.064	-0.065	0.032	0.039	0.035	-0.034	-0.033	-0.041
	(2.150)**	(2.071)**	(2.167)**	(0.818)	(0.970)	(0.785)	(1.097)	(1.080)	(1.320)
D9: Financial System	0.014	0.017	0.021	0.11	0.101	0.112	0.037	0.038	0.05
	(0.372)	(0.459)	(0.593)	(1.930)*	(1.740)*	(2.004)**	(1.036)	(1.091)	(1.459)
D10: Legal System	0.008	0.013	0.016	-0.111	-0.114	-0.121	-0.025	-0.022	-0.015
	(0.260)	(0.408)	(0.494)	(2.117)**	(2.145)**	(2.497)**	(0.818)	(0.716)	(0.514)
D11: Protection of IPRs	0.017	0.011	0.015	-0.023	-0.035	-0.035	0.02	0.018	0.018
	(0.645)	(0.425)	(0.587)	(0.416)	(0.604)	(0.640)	(0.758)	(0.688)	(0.673)
D12: Size of Local Markets	0.013	0.023	0.023	-0.005	0.001	-0.001	0.01	0.017	0.013
	(0.432)	(0.734)	(0.776)	(0.085)	(0.024)	(0.018)	(0.313)	(0.506)	(0.385)
D13: Access to Export Markets	0.039	0.034	0.032	0.07	0.071	0.071	0.033	0.03	0.035
	(1.355)	(1.183)	(1.128)	(1.452)	(1.461)	(1.433)	(1.125)	(1.043)	(1.229)
D14: Proximity of Suppliers	-0.01	-0.008	-0.004	-0.125	-0.118	-0.107	-0.041	-0.042	-0.038
	(0.290)	(0.225)	(0.111)	(2.129)**	(2.008)**	(1.832)*	(1.174)	(1.184)	(1.103)
D15: Request by Large Companies	-0.01	-0.007	-0.014	0.107	0.118	0.109	0.013	0.011	0.003
	(0.309)	(0.202)	(0.403)	(1.976)**	(2.085)**	(1.934)*	(0.377)	(0.329)	(0.078)
D16: Lower Costs of Labor	-0.036	-0.04	-0.036	-0.047	-0.033	-0.034	-0.017	-0.021	-0.014
	(1.349)	(1.518)	(1.390)	(1.332)	(0.836)	(0.866)	(0.636)	(0.778)	(0.538)
D17: Skilled Labor	0.054	0.05	0.049	0.044	0.033	0.032	0.044	0.043	0.038
	(2.029)**	(1.920)*	(1.970)**	(0.823)	(0.624)	(0.621)	(1.567)	(1.548)	(1.412)
D18: Synergy	0.042	0.043	0.047	-0.002	0.003	0.044	-0.002	-0.002	0.014
	(1.348)	(1.410)	(1.604)	(0.053)	(0.072)	(0.845)	(0.079)	(0.086)	(0.493)
D19: Cutting-Edge Technology	-0.057	-0.056	-0.051	-0.054	-0.053	-0.082	-0.063	-0.062	-0.065
	(1.765)*	(1.748)*	(1.640)	(1.092)	(1.055)	(1.602)	(1.918)*	(1.905)*	(2.075)**
D20: Living Conditions	0.028	0.024	0.019	-0.061	-0.069	-0.075	0.003	0.003	-0.002
	(0.921)	(0.825)	(0.664)	(1.336)	(1.472)	(1.611)	(0.100)	(0.101)	(0.060)
Manufacturing		0.134	0.101		-0.103	-0.106		0.088	0.06
		(2.086)**	(1.521)		(0.915)	(0.949)		(1.371)	(0.934)
Full-time Employees			Yes			Yes			Yes
Observations	200	200	199	113	113	113	236	236	235

Note: Robust z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Source: ERIA Research Project Mail Survey 2007.

4.4. The New Input Exploitation

Here we examine the model of the acquisition of a new source of supply of raw material. As shown in Table 11, the variable "Other companies from the same country are located here" (listed as "Synergy") has a negative sign (5-10% significant level); the marginal effect of the D-score for this factor is seven percentage points. On the other hand, "Local content requirements" (1%), "Financial system" (5% or 10%), and "Manufacturing" (1%) all have positive signs.

These results are particularly true for MNCs. As shown in Table 12, "Synergy" has a greater influence on the probability of the acquisition of a new source of raw materials; if the D-score for the factor increases by one point, the probability decreases by 17-20 percentage points. "Financial system" is significant at one or five percent only for MNCs. Among other factors, "Legal system" (1%) has a negative marginal effect as is the case with other types of upgrading. For non-MNCs, the present "Government institutional infrastructure" is a discouraging factor, inducing a decrease in probability of about 0.07.

Table 11: Results: Acquisition of New Input (Full-sample)

Probit Regression (Marginal Effects)	Pool (three countries)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Dependent: Acquisition of a New Source of Supply Last 3 years =1, otherwise 0						
D1: Tax Incentives	0.009	0.014	0.015	0.015	0.013	0.008	0.016
	(0.343)	(0.537)	(0.551)	(0.544)	(0.480)	(0.295)	(0.566)
D2: Liberal Trade Policy	-0.003	-0.005	-0.006	-0.006	-0.008	-0.009	0.001
	(0.095)	(0.146)	(0.180)	(0.180)	(0.273)	(0.274)	(0.044)
D3: Customs Procedures	0.025	0.019	0.018	0.018	0.021	0.028	0.023
	(1.041)	(0.772)	(0.725)	(0.725)	(0.825)	(1.094)	(0.882)
D4: Local Content	0.093	0.088	0.087	0.087	0.091	0.077	0.083
	(3.518)***	(3.350)***	(3.333)***	(3.327)***	(3.450)***	(2.786)***	(2.991)***
D5: Physical Infrastructure	-0.035	-0.03	-0.031	-0.031	-0.034	-0.027	-0.028
	(1.265)	(1.068)	(1.105)	(1.105)	(1.206)	(0.938)	(0.945)
D6: ICTs	-0.001	0.025	0.026	0.026	0.029	0.033	0.038
	(0.026)	(0.673)	(0.695)	(0.694)	(0.763)	(0.865)	(0.961)
D7: Utilities	0.012	-0.022	-0.021	-0.021	-0.025	-0.014	-0.022
	(0.386)	(0.674)	(0.640)	(0.635)	(0.737)	(0.413)	(0.637)
D8: Government Institution	-0.015	-0.019	-0.02	-0.02	-0.022	-0.034	-0.024
	(0.529)	(0.670)	(0.694)	(0.683)	(0.738)	(1.132)	(0.785)
D9: Financial System	0.057	0.067	0.067	0.067	0.061	0.065	0.099
	(1.603)	(1.844)*	(1.856)*	(1.851)*	(1.673)*	(1.706)*	(2.509)**
D10: Legal System	-0.048	-0.037	-0.037	-0.037	-0.034	-0.017	-0.044
	(1.512)	(1.146)	(1.117)	(1.117)	(1.039)	(0.513)	(1.252)
D11: Protection of IPRs	0.011	0.009	0.009	0.009	0.011	0.019	0.026
	(0.391)	(0.294)	(0.303)	(0.304)	(0.383)	(0.618)	(0.822)
D12: Size of Local Markets	-0.013	0.002	0.002	0.002	0.011	0.006	0.021
	(0.379)	(0.068)	(0.065)	(0.071)	(0.322)	(0.152)	(0.537)
D13: Access to Export Markets	-0.01	-0.024	-0.024	-0.024	-0.027	-0.024	-0.036
	(0.359)	(0.854)	(0.859)	(0.849)	(0.936)	(0.786)	(1.173)
D14: Proximity of Suppliers	0.023	0.024	0.025	0.025	0.029	0.019	0.01
	(0.678)	(0.693)	(0.730)	(0.733)	(0.837)	(0.531)	(0.261)
D15: Request by Large Companies	0.032	0.026	0.026	0.026	0.021	0.025	0.005
	(0.866)	(0.722)	(0.706)	(0.707)	(0.585)	(0.659)	(0.119)
D16: Lower Costs of Labor	0.032	0.022	0.022	0.022	0.025	0.028	0.024
	(1.233)	(0.820)	(0.824)	(0.824)	(0.908)	(1.003)	(0.857)
D17: Skilled Labor	0.009	0.01	0.011	0.011	0.013	0	-0.008
	(0.303)	(0.347)	(0.360)	(0.360)	(0.446)	(0.016)	(0.267)
D18: Synergy	-0.068	-0.069	-0.069	-0.068	-0.059	-0.064	-0.081
	(2.157)**	(2.153)**	(2.150)**	(2.147)**	(1.806)*	(1.927)*	(2.444)**
D19: Cutting-Edge Technology	0.023	0.03	0.03	0.03	0.026	0.024	0.03
	(0.683)	(0.854)	(0.862)	(0.862)	(0.742)	(0.659)	(0.839)
D20: Living Conditions	-0.004	0.003	0.004	0.004	0	-0.003	0.018
	(0.116)	(0.106)	(0.126)	(0.126)	(0.009)	(0.083)	(0.577)
Manufacturing		0.283	0.281	0.28	0.274	0.242	0.263
		(4.503)***	(4.444)***	(4.434)***	(4.292)***	(3.595)***	(3.927)***
Multinationals			0.025	0.025	-0.011	-0.028	-0.002
			(0.391)	(0.382)	(0.158)	(0.383)	(0.032)
Exporters				0.003	0.01	0.013	0.003
				(0.046)	(0.130)	(0.173)	(0.036)
Full-time Employees					Yes		
Total Assets (US$)						Yes	
Paid-up Capital (US$)							Yes
Observations	313	313	313	313	312	294	282

Note: Robust z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Source: ERIA Research Project Mail Survey 2007.

Table 12: Results: Acquisition of New Input (Restricted Sample)

	Pool (three countries)								
	Non Multinationals			Multinationals			Non Exporters		
Sample Restriction	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Probit Regression (Marginal Effects)	Dependent: Acquisition of a New Source of Supply Last 3 years =1, otherwise 0								
D1: Tax Incentives	0.034	0.032	0.032	-0.009	0.043	0.056	0.021	0.033	0.033
	(1.054)	(0.971)	(0.957)	(0.171)	(0.768)	(0.932)	(0.694)	(1.078)	(1.046)
D2: Liberal Trade Policy	-0.039	-0.041	-0.04	0.025	0.009	-0.01	-0.002	0.001	-0.006
	(0.931)	(1.000)	(0.978)	(0.441)	(0.148)	(0.151)	(0.043)	(0.027)	(0.172)
D3: Customs Procedures	0.019	0.02	0.021	0.048	0.008	0.002	0.038	0.027	0.029
	(0.602)	(0.640)	(0.681)	(1.039)	(0.164)	(0.047)	(1.376)	(0.967)	(1.052)
D4: Local Content	0.104	0.098	0.1	0.078	0.11	0.128	0.098	0.095	0.104
	(3.313)***	(3.193)***	(3.216)***	-1.28	(1.663)*	(1.910)*	(3.235)***	(3.281)***	(3.540)***
D5: Physical Infrastructure	0.017	0.017	0.011	-0.136	-0.118	-0.105	-0.026	-0.026	-0.031
	(0.496)	(0.465)	(0.315)	(1.998)**	(1.687)*	(1.477)	(0.770)	(0.771)	(0.921)
D6: ICTs	-0.052	-0.035	-0.032	-0.017	0.003	0.028	-0.04	-0.017	-0.012
	(1.133)	(0.716)	(0.652)	(0.279)	(0.044)	(0.389)	(0.967)	(0.399)	(0.266)
D7: Utilities	0.049	0.029	0.027	-0.055	-0.106	-0.145	0.007	-0.028	-0.034
	(1.277)	(0.725)	(0.682)	(0.768)	(1.553)	(2.031)**	(0.203)	(0.739)	(0.893)
D8: Government Institution	-0.076	-0.07	-0.064	0.086	0.066	0.051	-0.053	-0.053	-0.059
	(2.064)**	(1.914)*	(1.769)*	(1.561)	(1.170)	(0.831)	(1.549)	(1.528)	(1.664)*
D9: Financial System	0.01	0.015	0.008	0.182	0.211	0.244	0.03	0.032	0.027
	(0.217)	(0.344)	(0.175)	(2.417)**	(2.601)***	(2.952)***	(0.735)	(0.780)	(0.649)
D10: Legal System	0.037	0.042	0.04	-0.213	-0.211	-0.225	-0.005	-0.001	0.004
	(0.875)	(0.993)	(0.956)	(3.178)***	(2.963)***	(3.090)***	(0.135)	(0.017)	(0.111)
D11: Protection of IPRs	-0.011	-0.018	-0.016	0.06	0.126	0.126	0.036	0.035	0.037
	(0.305)	(0.518)	(0.467)	(0.760)	(1.497)	(1.460)	(1.086)	(1.044)	(1.097)
D12: Size of Local Markets	-0.025	-0.005	0.005	-0.02	-0.046	-0.036	-0.001	0.023	0.034
	(0.590)	(0.109)	(0.121)	(0.245)	(0.546)	(0.404)	(0.018)	(0.563)	(0.810)
D13: Access to Export Markets	0.002	-0.016	-0.021	0.003	-0.011	-0.025	-0.005	-0.022	-0.024
	(0.059)	(0.435)	(0.563)	(0.052)	(0.183)	(0.404)	(0.154)	(0.660)	(0.696)
D14: Proximity of Suppliers	0.061	0.071	0.072	-0.09	-0.124	-0.109	0.006	0.007	0.011
	(1.428)	(1.663)*	(1.685)*	(1.374)	(1.790)*	(1.478)	(0.144)	(0.185)	(0.277)
D15: Request by Large Companies	0.019	0.021	0.022	0.124	0.077	0.062	0.044	0.036	0.031
	(0.390)	(0.445)	(0.456)	(1.779)*	(1.163)	(0.863)	(1.019)	(0.843)	(0.719)
D16: Lower Costs of Labor	0.056	0.056	0.06	0	-0.055	-0.053	0.065	0.063	0.074
	(1.564)	(1.556)	(1.630)	(0.006)	(1.060)	(0.967)	(2.018)**	(1.997)**	(2.328)**
D17: Skilled Labor	-0.001	-0.009	-0.009	0.112	0.156	0.161	-0.001	-0.004	-0.005
	(0.032)	(0.269)	(0.259)	(1.693)*	(2.146)**	(2.176)**	(0.022)	(0.133)	(0.161)
D18: Synergy	-0.034	-0.036	-0.041	-0.136	-0.167	-0.103	-0.069	-0.074	-0.065
	(0.840)	(0.886)	(1.003)	(1.841)*	(2.286)**	(1.314)	(1.915)*	(2.021)**	(1.748)*
D19: Cutting-Edge Technology	0.02	0.025	0.027	0.045	0.055	0.008	0.013	0.023	0.024
	(0.482)	(0.598)	(0.627)	(0.686)	(0.826)	(0.116)	(0.332)	(0.572)	(0.576)
D20: Living Conditions	-0.005	-0.006	-0.004	-0.019	0.018	-0.003	0.008	0.014	0.011
	(0.126)	(0.156)	(0.114)	(0.329)	(0.291)	(0.052)	(0.207)	(0.389)	(0.289)
Manufacturing		0.26	0.263		0.422	0.439		0.276	0.272
		(3.237)***	(3.207)***		(2.879)***	(2.932)***		(3.719)***	(3.604)***
Full-time Employees			Yes			Yes			Yes
Observations	200	200	199	113	113	113	236	236	235

Note: Robust z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Source: ERIA Research Project Mail Survey 2007.

5. FACTORS PROMOTING ACESSES TO SOURCES OF NEW TECHNOLGOIES AND INFORMATION FOR INDUSTRIAL UPGRADING

We adopt binary probit models to analyze sources of new technologies or information accessed by firms that carried out at least one of the four types of industrial upgrading or innovation analyzed in the previous section. As earlier indicated, special focus is placed on D-scores or factors such as policy measures as well as economic environments that encourage or facilitate innovative firms to access new technologies or information necessary for future upgrading. In addition to full-sample models based on the complete pooled data composed of three countries, MNC, Local and non-Exporter models are estimated to consider effects of different attributes and different targets of marketing.

5.1. Technology Transfer from MNCs

Let us first examine the full-sample model of technology transfer from MNCs. In Table 13, significant variables are indicated with asterisks that present their level of significance. The estimated values of coefficients (βs) in Table 13 are marginal effects, which enable to compare impacts of changes in each variable on the probability of the technology transfer from MNCs. It should be mentioned that factors with negative (positive) signs indicate that a one-point decrease in a D-score, for example by an appropriate policy intervention, increases (decreases) the probability of technology transfer from MNCs by β percentage points. "Full-time employees" is the current

number of employees, precisely the means of each category defined in the questionnaire (Q3-1). This variable is included to control the effects of firm size, although this is not significant.[i]

According to Table 13, there are not any robust marginal effects for D-scores. The positive marginal effect on "Multinationals" indicates the probability of technology transfer among MNCs is more than 30 percent higher than the probability for transfer from MNCs to non-MNCs. This means technology transfers among MNCs occur more often than those from MNCs to local firms.

To consider the technology transfer among MNCs, Table 14 is shown. According to the MNC model, factors with negative signs for MNCs are "Liberal trade policy," "Protection of IPRs," and "Access to export market." The marginal effects for these variables mean that if the D-score for "Liberal trade policy" increases by one point, the probability of technology transfer among MNCs decreases by more than seven percentage points. The changes in the possibility caused by "Protection of IPRs" and "Access to export market" are about 10 and 11 percentage points, respectively. A policy implication from these results for the public sector is that appropriate policies are needed to improve satisfactions with these factors. In contrast, "Government institutional infrastructure," "Size of local market," and "Synergy" have positive marginal effects. This means firms that put emphasis on these factors tend to receive technology transfers from MNCs. Among other factors, the marginal effects of "Utilities" for non-MNCs and "Availability of low-cost labor" for non-exporters are almost same, about -0.08 percentage point.

Table 13: Results: Technology Transfer from MNCs (Full-sample)

	Pool (three countries)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Probit Regression (Marginal Effects)	Dependent: Technology transfer from multinational companies =1, otherwise 0						
D1: Tax Incentives	-0.011	-0.01	-0.005	-0.003	-0.007	-0.02	-0.023
	(0.420)	(0.392)	(0.177)	(0.108)	(0.257)	(0.726)	(0.749)
D2: Liberal Trade Policy	0.016	0.016	-0.004	-0.004	-0.005	0.003	0.017
	(0.496)	(0.492)	(0.126)	(0.120)	(0.133)	(0.073)	(0.474)
D3: Customs Procedures	0.004	0.002	-0.011	-0.011	-0.009	-0.023	-0.007
	(0.142)	(0.097)	(0.461)	(0.453)	(0.371)	(0.892)	(0.255)
D4: Local Content	0.043	0.042	0.036	0.037	0.044	0.027	0.032
	(1.633)	(1.594)	(1.366)	(1.403)	(1.640)	(0.950)	(1.071)
D5: Physical Infrastructure	-0.019	-0.018	-0.036	-0.036	-0.043	-0.03	-0.066
	(0.658)	(0.633)	(1.235)	(1.231)	(1.447)	(1.025)	(2.096)**
D6: ICTs	-0.041	-0.034	-0.023	-0.022	-0.022	-0.021	0.002
	(1.181)	(0.962)	(0.616)	(0.587)	(0.586)	(0.561)	(0.054)
D7: Utilities	-0.022	-0.032	-0.017	-0.019	-0.023	-0.009	-0.019
	(0.713)	(0.990)	(0.522)	(0.567)	(0.707)	(0.251)	(0.555)
D8: Government Institution	0.018	0.017	0.008	0.005	0.004	-0.004	0.006
	(0.611)	(0.551)	(0.247)	(0.161)	(0.109)	(0.126)	(0.175)
D9: Financial System	0.035	0.036	0.047	0.048	0.042	0.033	0.031
	(0.986)	(1.021)	(1.268)	(1.297)	(1.141)	(0.862)	(0.772)
D10: Legal System	0	0.005	0.022	0.021	0.028	0.031	0.028
	(0.014)	(0.145)	(0.629)	(0.623)	(0.814)	(0.888)	(0.771)
D11: Protection of IPRs	-0.005	-0.006	-0.003	-0.003	-0.001	-0.001	-0.004
	(0.177)	(0.216)	(0.090)	(0.118)	(0.022)	(0.019)	(0.116)
D12: Size of Local Markets	0.019	0.023	0.029	0.026	0.039	0.03	0.042
	(0.545)	(0.672)	(0.810)	(0.734)	(1.107)	(0.786)	(1.070)
D13: Access to Export Markets	0.005	0.002	-0.008	-0.004	-0.007	-0.004	-0.015
	(0.167)	(0.054)	(0.265)	(0.146)	(0.227)	(0.133)	(0.451)
D14: Proximity of Suppliers	-0.007	-0.008	0.009	0.008	0.009	0.021	0.017
	(0.195)	(0.221)	(0.256)	(0.223)	(0.264)	(0.538)	(0.414)
D15: Request by Large Companies	0.03	0.028	0.019	0.019	0.014	0.021	0.02
	(0.829)	(0.752)	(0.517)	(0.521)	(0.386)	(0.558)	(0.506)
D16: Lower Costs of Labor	-0.046	-0.049	-0.045	-0.046	-0.046	-0.035	-0.02
	(1.760)*	(1.854)*	-1.594	-1.608	-1.606	-1.205	-0.665
D17: Skilled Labor	-0.012	-0.013	-0.01	-0.01	-0.008	-0.017	-0.015
	(0.395)	(0.428)	(0.322)	(0.327)	(0.238)	(0.515)	(0.431)
D18: Synergy	-0.006	-0.006	-0.001	-0.002	0.007	-0.005	0.003
	(0.222)	(0.191)	(0.039)	(0.066)	(0.237)	(0.160)	(0.100)
D19: Cutting-Edge Technology	0.025	0.027	0.031	0.031	0.027	0.031	0.028
	(0.726)	(0.789)	(0.887)	(0.880)	(0.749)	(0.853)	(0.766)
D20: Living Conditions	0.028	0.031	0.042	0.041	0.039	0.033	0.034
	(0.950)	(1.031)	(1.290)	(1.273)	(1.198)	(1.027)	(1.004)
Manufacturing		0.089	0.062	0.066	0.04	0.007	0.046
		(1.387)	(0.931)	(0.983)	(0.580)	(0.098)	(0.641)
Multinationals			0.368	0.373	0.342	0.317	0.354
			(5.798)***	(5.797)***	(5.135)***	(4.444)***	(4.892)***
Exporters				-0.044	-0.035	-0.023	0.018
				(0.590)	(0.461)	(0.287)	(0.228)
Full-time Employees					Yes		
Total Assets (US$)						Yes	
Paid-up Capital (US$)							Yes
Observations	294	294	294	294	293	276	263

Note: Robust z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Source: ERIA Research Project Mail Survey 2007.

Table 14: Results: Technology Transfer from MNCs (Restricted Sample)

	Pool (three countries)								
	Non Multinationals			Multinationals			Non Exporters		
Sample Restriction	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Probit Regression (Marginal Effects)	Dependent: Technology transfer from multinational companies =1, otherwise 0								
D1: Tax Incentives	-0.002	-0.004	-0.025	-0.05	-0.053	-0.05	-0.017	-0.018	-0.032
	(0.054)	(0.113)	(0.641)	(1.282)	(1.344)	(1.493)	(0.516)	(0.543)	(0.931)
D2: Liberal Trade Policy	0.049	0.049	0.066	-0.078	-0.074	-0.076	-0.002	0	-0.004
	(1.189)	(1.203)	(1.611)	(1.837)*	(1.704)*	(2.302)**	(0.044)	(0.007)	(0.096)
D3: Customs Procedures	-0.038	-0.038	-0.037	0.042	0.046	0.035	-0.004	-0.007	-0.001
	(1.182)	(1.182)	(1.110)	(1.238)	(1.352)	(1.351)	(0.143)	(0.209)	(0.024)
D4: Local Content	0.045	0.044	0.059	0.006	0.002	0.012	0.026	0.024	0.037
	(1.371)	(1.355)	(1.816)*	(0.135)	(0.052)	(0.437)	(0.806)	(0.764)	(1.122)
D5: Physical Infrastructure	-0.034	-0.033	-0.053	-0.018	-0.017	-0.007	-0.002	-0.002	-0.007
	(0.930)	(0.921)	(1.419)	(0.526)	(0.523)	(0.267)	(0.058)	(0.042)	(0.184)
D6: ICTs	-0.018	-0.015	-0.016	-0.005	-0.01	0.01	-0.018	-0.014	-0.011
	(0.395)	(0.339)	(0.337)	(0.122)	(0.266)	(0.318)	(0.429)	(0.323)	(0.270)
D7: Utilities	-0.077	-0.081	-0.087	0.057	0.062	0.046	-0.006	-0.015	-0.023
	(1.922)*	(1.995)**	(2.164)**	(1.374)	-1.479	(1.654)*	(0.174)	(0.395)	(0.597)
D8: Government Institution	-0.026	-0.025	-0.014	0.066	0.073	0.042	0.012	0.012	0.001
	(0.612)	(0.580)	(0.309)	(2.073)**	(2.218)**	(1.131)	(0.330)	(0.332)	(0.028)
D9: Financial System	0.019	0.019	0.007	0.01	0.008	-0.01	0.007	0.005	0.008
	(0.397)	(0.401)	(0.150)	(0.216)	(0.174)	(0.332)	(0.173)	(0.123)	(0.193)
D10: Legal System	0.029	0.029	0.019	0.035	0.027	0.041	0.009	0.009	0.019
	(0.699)	(0.701)	(0.454)	(0.775)	(0.594)	(1.551)	(0.241)	(0.237)	(0.505)
D11: Protection of IPRs	0.031	0.03	0.039	-0.106	-0.113	-0.098	0.005	0.005	0.008
	(0.922)	(0.893)	(1.131)	(2.353)**	(2.406)**	(2.997)***	(0.141)	(0.157)	(0.228)
D12: Size of Local Markets	0.001	0.003	0.021	0.172	0.171	0.155	0.011	0.016	0.024
	(0.030)	(0.071)	(0.496)	(2.905)***	(2.958)***	(3.580)***	(0.256)	(0.373)	(0.556)
D13: Access to Export Markets	0.05	0.048	0.047	-0.113	-0.115	-0.082	0.011	0.009	0.012
	(1.299)	(1.252)	(1.216)	(2.328)**	(2.398)**	(2.543)**	(0.323)	(0.244)	(0.350)
D14: Proximity of Suppliers	-0.016	-0.015	-0.019	0.075	0.077	0.071	-0.021	-0.021	-0.023
	(0.366)	(0.344)	(0.453)	-1.516	-1.621	(2.370)**	(0.517)	(0.513)	(0.557)
D15: Request by Large Companies	0.025	0.025	0.023	-0.062	-0.055	-0.06	0.038	0.036	0.027
	(0.519)	(0.518)	(0.477)	(1.201)	(1.088)	(1.665)*	(0.837)	(0.788)	(0.609)
D16: Lower Costs of Labor	-0.058	-0.058	-0.055	-0.001	0.005	-0.007	-0.083	-0.087	-0.077
	(1.585)	(1.583)	(1.458)	(0.040)	(0.163)	(0.246)	(2.425)**	(2.483)**	(2.189)**
D17: Skilled Labor	0.022	0.021	0.024	-0.073	-0.075	-0.066	0.019	0.018	0.017
	(0.591)	(0.563)	(0.629)	(1.524)	(1.578)	(2.182)**	(0.545)	(0.511)	(0.482)
D18: Synergy	-0.027	-0.027	-0.042	0.134	0.138	0.165	-0.039	-0.039	-0.027
	(0.703)	(0.712)	(1.066)	(2.813)***	(2.999)***	(3.457)***	(1.159)	(1.157)	(0.765)
D19: Cutting-Edge Technology	0.026	0.026	0.035	-0.008	-0.01	-0.048	-0.032	-0.029	-0.031
	(0.574)	(0.577)	(0.721)	(0.181)	(0.231)	(1.230)	(0.747)	(0.676)	(0.733)
D20: Living Conditions	0.054	0.055	0.062	-0.01	-0.013	-0.022	0.006	0.008	0.005
	(1.302)	(1.330)	(1.483)	(0.258)	(0.361)	(0.729)	(0.169)	(0.211)	(0.150)
Manufacturing		0.038	0.011		-0.057	-0.012		0.07	0.054
		(0.445)	(0.130)		(0.614)	(0.177)		(0.900)	(0.685)
Full-time Employees			Yes			Yes			Yes
Observations	186	186	185	108	108	108	222	222	221

Note: Robust z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Source: ERIA Research Project Mail Survey 2007.

5.2. Technical Assistance from Foreign Agencies

Here we analyze the factors promoting technical assistance from foreign agencies. According to Table 15, a one-point increase of D-score for "Financial system" increases the probability of foreign technical assistance by 10 percentage points. If the D-score for "Protection of IPRs" decreases by one point, the probability increases by 4.3 percentage points. The positive marginal effect of "Multinationals" indicates MNCs tend to make better use of technical assistance programs provided by foreign agencies.

As shown in Table 16, the marginal effects of "Financial system" continue to be significantly positive even after dividing the sample firms into three types. But the impact of the increase in the D-score by one point is different among them; the marginal effect for MNCs is about 0.14, which is larger than for non-MNCs (about 0.104) and twice the effect for non-exporters (0.065). "Liberal trade policy" and "Protection of IPRs" have negative marginal effects on MNCs. The negative sign of "Government institutional infrastructure" and the positive sign of "Customs procedure" are estimated for non-MNCs.

Table 15: Results: Technical Assistance from Foreign Agencies (Full-sample)

	Pool (three countries)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Probit Regression (Marginal Effcts)	Dependent: Technical assistance from foreign agencies =1, otherwise 0						
D1: Tax Incentives	0.01	0.01	0.013	0.012	0.012	0.011	-0.018
	(0.392)	(0.401)	(0.498)	(0.460)	(0.449)	(0.398)	(0.647)
D2: Liberal Trade Policy	-0.033	-0.033	-0.04	-0.04	-0.042	-0.033	-0.007
	(1.105)	(1.115)	(1.345)	(1.351)	(1.412)	(1.100)	(0.249)
D3: Customs Procedures	0.026	0.026	0.021	0.021	0.022	0.012	0.022
	(1.126)	(1.134)	(0.912)	(0.905)	(0.951)	(0.526)	(0.915)
D4: Local Content	0.024	0.024	0.023	0.022	0.026	0.015	0.035
	(0.936)	(0.954)	(0.871)	(0.841)	(1.008)	(0.556)	(1.241)
D5: Physical Infrastructure	0.038	0.038	0.034	0.034	0.034	0.033	0.018
	(1.395)	(1.399)	(1.229)	(1.221)	(1.212)	(1.183)	(0.627)
D6: ICTs	-0.006	-0.009	-0.004	-0.004	-0.003	0.001	-0.002
	(0.192)	(0.274)	(0.119)	(0.125)	(0.081)	(0.027)	(0.065)
D7: Utilities	-0.003	0.001	0.006	0.007	0.003	-0.001	-0.011
	(0.106)	(0.018)	(0.194)	(0.224)	(0.107)	(0.033)	(0.353)
D8: Government Institution	-0.011	-0.01	-0.015	-0.013	-0.016	-0.024	-0.016
	(0.375)	(0.350)	(0.522)	(0.455)	(0.539)	(0.820)	(0.553)
D9: Financial System	0.099	0.098	0.102	0.101	0.099	0.108	0.114
	(2.816)***	(2.797)***	(2.917)***	(2.890)***	(2.835)***	(2.995)***	(3.002)***
D10: Legal System	-0.027	-0.029	-0.023	-0.023	-0.022	-0.018	-0.004
	(0.880)	(0.937)	(0.758)	(0.750)	(0.699)	(0.577)	(0.123)
D11: Protection of IPRs	-0.043	-0.043	-0.043	-0.043	-0.041	-0.029	-0.042
	(1.698)*	(1.685)*	(1.700)*	(1.673)*	-1.625	-1.139	-1.541
D12: Size of Local Markets	0.005	0.004	0.004	0.006	0.014	0.004	0.006
	(0.157)	(0.125)	(0.127)	(0.171)	(0.417)	(0.111)	(0.153)
D13: Access to Export Markets	0.013	0.014	0.011	0.009	0.008	-0.001	0.001
	(0.466)	(0.511)	(0.405)	(0.322)	(0.274)	(0.048)	(0.020)
D14: Proximity of Suppliers	0.023	0.023	0.031	0.031	0.033	0.055	0.068
	(0.707)	(0.721)	(0.960)	(0.974)	(1.034)	(1.607)	(1.942)*
D15: Request by Large Companies	-0.011	-0.01	-0.011	-0.011	-0.016	-0.02	-0.034
	(0.315)	(0.280)	(0.330)	(0.317)	(0.445)	(0.551)	(0.943)
D16: Lower Costs of Labor	-0.003	-0.002	-0.002	-0.002	0	0.005	0.016
	(0.131)	(0.085)	(0.063)	(0.067)	(0.003)	(0.201)	(0.624)
D17: Skilled Labor	-0.02	-0.019	-0.018	-0.018	-0.015	-0.022	-0.011
	(0.701)	(0.685)	(0.642)	(0.635)	(0.521)	(0.763)	(0.368)
D18: Synergy	0.005	0.004	0.005	0.006	0.014	0.013	0.001
	(0.161)	(0.145)	(0.180)	(0.202)	(0.487)	(0.441)	(0.030)
D19: Cutting-Edge Technology	0.017	0.017	0.018	0.018	0.014	0.018	0.019
	(0.521)	(0.499)	(0.538)	(0.534)	(0.414)	(0.527)	(0.563)
D20: Living Conditions	0.017	0.016	0.018	0.018	0.014	0.007	0.027
	(0.579)	(0.549)	(0.626)	(0.628)	(0.493)	(0.223)	(0.909)
Manufacturing		-0.035	-0.047	-0.049	-0.059	-0.057	-0.057
		(0.563)	(0.752)	(0.785)	(0.950)	(0.871)	(0.868)
Multinationals			0.133	0.131	0.104	0.101	0.087
			(2.132)**	(2.059)**	(1.589)	(1.474)	(1.247)
Exporters				0.027	0.031	0.027	0.066
				(0.378)	(0.424)	(0.371)	(0.873)
Full-time Employees					Yes		
Total Assets (US$)						Yes	
Paid-up Capital (US$)							Yes
Observations	293	293	293	293	292	275	262

Note: Robust z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Source: ERIA Research Project Mail Survey 2007.

Table 16: Results: Technical Assistance from Foreign Agencies (Restricted Sample)

	Pool (three countries)								
	Non Multinationals			Multinationals			Non Exporters		
Sample Restriction	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Probit Regression (Marginal Effects)	Dependent: Technical assistance from foreign agencies =1, otherwise 0								
D1: Tax Incentives	-0.015	-0.014	-0.031	0.1	0.087	0.088	0.017	0.017	0.014
	(0.453)	(0.423)	(1.026)	(1.876)*	(1.536)	(1.525)	(0.587)	(0.571)	(0.475)
D2: Liberal Trade Policy	-0.019	-0.019	-0.011	-0.106	-0.1	-0.101	-0.055	-0.055	-0.061
	(0.552)	(0.553)	(0.329)	(1.896)*	(1.773)*	(1.788)*	(1.621)	(1.635)	(1.818)*
D3: Customs Procedures	0.05	0.049	0.056	-0.054	-0.044	-0.044	0.021	0.022	0.025
	(1.810)*	(1.796)*	(2.053)**	(1.201)	(0.958)	(0.965)	(0.798)	(0.831)	(0.923)
D4: Local Content	0.042	0.042	0.06	-0.054	-0.06	-0.06	0	0.001	0.011
	(1.440)	(1.438)	(2.157)**	(0.777)	(0.848)	(0.844)	(0.012)	(0.030)	(0.395)
D5: Physical Infrastructure	0.052	0.052	0.035	0.017	0.013	0.015	0.05	0.05	0.05
	(1.559)	(1.587)	(1.022)	(0.297)	(0.234)	(0.266)	(1.483)	(1.496)	(1.458)
D6: ICTs	-0.029	-0.03	-0.029	0.037	0.028	0.029	0.005	0.003	0.005
	(0.712)	(0.736)	(0.717)	(0.554)	(0.426)	(0.435)	(0.137)	(0.076)	(0.136)
D7: Utilities	-0.015	-0.013	-0.012	0.074	0.086	0.084	-0.003	0.001	-0.005
	(0.455)	(0.399)	(0.339)	(1.141)	(1.326)	(1.282)	(0.077)	(0.029)	(0.141)
D8: Government Institution	-0.066	-0.067	-0.062	0.045	0.055	0.053	0.001	0	-0.006
	(1.788)*	(1.816)*	(1.667)*	(0.866)	(1.026)	(0.980)	(0.025)	(0.014)	(0.188)
D9: Financial System	0.104	0.104	0.107	0.143	0.136	0.138	0.065	0.065	0.066
	(2.461)**	(2.457)**	(2.591)***	(1.835)*	(1.763)*	(1.763)*	(1.681)*	(1.695)*	(1.726)*
D10: Legal System	0.023	0.023	0.019	-0.089	-0.095	-0.095	-0.024	-0.025	-0.021
	(0.643)	(0.622)	(0.525)	(1.349)	(1.436)	(1.438)	(0.723)	(0.744)	(0.641)
D11: Protection of IPRs	-0.026	-0.026	-0.024	-0.106	-0.124	-0.126	-0.045	-0.045	-0.044
	(0.926)	(0.893)	(0.827)	(1.486)	(1.714)*	(1.708)*	(1.540)	(1.539)	(1.527)
D12: Size of Local Markets	-0.024	-0.025	-0.01	0.076	0.086	0.088	0.006	0.004	0.013
	(0.660)	(0.689)	(0.269)	(0.921)	(1.055)	(1.079)	(0.157)	(0.108)	(0.347)
D13: Access to Export Markets	0.028	0.03	0.024	0.018	0.02	0.02	0.024	0.026	0.025
	(0.865)	(0.894)	(0.737)	(0.285)	(0.315)	(0.316)	(0.739)	(0.786)	(0.773)
D14: Proximity of Suppliers	0.043	0.042	0.044	-0.008	-0.001	0.001	0.045	0.046	0.048
	(1.150)	(1.123)	(1.151)	(0.129)	(0.011)	(0.010)	(1.218)	(1.235)	(1.300)
D15: Request by Large Companies	0.023	0.024	0.019	-0.107	-0.1	-0.103	0.013	0.015	0.01
	(0.559)	(0.580)	(0.470)	(1.346)	(1.248)	(1.248)	(0.345)	(0.389)	(0.255)
D16: Lower Costs of Labor	-0.01	-0.01	-0.001	-0.023	-0.008	-0.008	-0.029	-0.029	-0.02
	(0.317)	(0.327)	(0.043)	(0.472)	(0.147)	(0.154)	(0.992)	(0.977)	(0.663)
D17: Skilled Labor	-0.027	-0.026	-0.03	-0.01	-0.015	-0.015	-0.014	-0.013	-0.012
	(0.800)	(0.769)	(0.851)	(0.147)	(0.233)	(0.227)	(0.455)	(0.435)	(0.400)
D18: Synergy	-0.001	-0.001	-0.008	0.042	0.049	0.053	-0.007	-0.007	0.002
	(0.042)	(0.043)	(0.237)	(0.680)	(0.807)	(0.801)	(0.223)	(0.225)	(0.058)
D19: Cutting-Edge Technology	0.016	0.016	0.021	-0.029	-0.029	-0.032	-0.031	-0.032	-0.034
	(0.417)	(0.405)	(0.551)	(0.405)	(0.411)	(0.437)	(0.805)	(0.839)	(0.890)
D20: Living Conditions	-0.005	-0.006	-0.006	0.095	0.084	0.082	0.013	0.012	0.008
	(0.143)	(0.161)	(0.182)	(1.655)*	(1.464)	(1.417)	(0.387)	(0.362)	(0.231)
Manufacturing		-0.024	-0.069		-0.116	-0.116		-0.032	-0.047
		(0.327)	(0.907)		(0.887)	(0.894)		(0.461)	(0.662)
Full-time Employees			Yes			Yes			Yes
Observations	186	186	185	107	107	107	222	222	221

Note: Robust z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Source: ERIA Research Project Mail Survey 2007.

5.3. Technical Cooperation with Local Government

In the full-sample model, only "Financial system" and "Request by large/related firms" yield significant D-scores, whose marginal effects are around 0.06 and -0.06, respectively. The marginal effect for "Multinationals" is negative, suggesting that local firms tend to have closer relation with local governments than with MNCs.

There are no common significant variables among non-MNC, MNC, and non-Exporter models. In the case of non-MNCs, the negative marginal effect for "Request by large/related company" (10%) and the positive marginal effect for "Synergy" (5%) are significant. This implies that local firms dissatisfied with their relations with large firms or are placing less significance on it do not tend to cooperate with local governments, while those that place importance on forging relations with local firms work closely with local public bodies.

"Financial system," "Access to cutting-edge technology," and "Access to export market" are significantly positive for non-exporters. Although the interpretation on "Access to export market" is not easy, non-exporting firms who put emphasis on the former two factors tend to work together with local governments. On the other hand, as "Availability of skilled labor" is negative, the satisfaction with "Availability of skilled labor" discourages non-exporters from cooperating with local governments.

For MNCs, the marginal effects on "Liberal trade policy" and "Utilities" are positive. This indicates that MNCs need to establish closer relation with local governments to solve these policy-related issues in case they find problems in these. In contrast, "Government institutional infrastructure" has a negative sign, suggesting that MNCs hesitate to have cooperative relation with local government if the government institution is not well-established.

Table 17: Results: Technical Cooperation with Local Government (Full-sample)

Probit Regression (Marginal Effects)	Pool (three countries)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Dependent: Technical cooperation with local government =1, otherwise 0						
D1: Tax Incentives	0.022	0.023	0.018	0.018	0.018	0.017	0.03
	(0.868)	(0.882)	(0.713)	(0.711)	(0.720)	(0.657)	(1.056)
D2: Liberal Trade Policy	0.004	0.003	0.013	0.013	0.013	0.019	0.015
	(0.122)	(0.104)	(0.405)	(0.405)	(0.405)	(0.576)	(0.447)
D3: Customs Procedures	-0.005	-0.005	0.002	0.002	0.003	0.006	0.012
	(0.210)	(0.200)	(0.098)	(0.098)	(0.109)	(0.243)	(0.454)
D4: Local Content	0.027	0.028	0.031	0.031	0.031	0.029	0.018
	(1.094)	(1.140)	(1.231)	(1.224)	(1.250)	(1.081)	(0.658)
D5: Physical Infrastructure	0.004	0.003	0.01	0.01	0.009	0.018	0.025
	(0.131)	(0.121)	(0.369)	(0.369)	(0.341)	(0.639)	(0.826)
D6: ICTs	-0.018	-0.024	-0.032	-0.032	-0.03	-0.037	-0.051
	(0.539)	(0.746)	(0.952)	(0.952)	(0.915)	(1.086)	(1.467)
D7: Utilities	0.018	0.026	0.021	0.021	0.02	0.019	0.027
	(0.604)	(0.857)	(0.700)	(0.702)	(0.672)	(0.615)	(0.827)
D8: Government Institution	-0.042	-0.04	-0.034	-0.034	-0.034	-0.03	-0.04
	(1.474)	(1.398)	(1.195)	(1.177)	(1.160)	(0.990)	(1.327)
D9: Financial System	0.06	0.058	0.056	0.056	0.053	0.061	0.088
	(1.683)*	(1.642)	(1.607)	(1.600)	(1.513)	(1.655)*	(2.213)**
D10: Legal System	0.016	0.012	0.004	0.004	0.004	0	0
	(0.517)	(0.374)	(0.118)	(0.118)	(0.121)	(0.015)	(0.012)
D11: Protection of IPRs	-0.006	-0.006	-0.007	-0.007	-0.006	-0.006	-0.006
	(0.248)	(0.216)	(0.271)	(0.271)	(0.249)	(0.211)	(0.204)
D12: Size of Local Markets	-0.027	-0.029	-0.029	-0.029	-0.026	-0.031	-0.03
	(0.816)	(0.896)	(0.877)	(0.873)	(0.772)	(0.839)	(0.792)
D13: Access to Export Markets	0.024	0.028	0.031	0.031	0.03	0.029	0.025
	(0.841)	(0.979)	(1.094)	(1.065)	(1.033)	(0.899)	(0.780)
D14: Proximity of Suppliers	0.027	0.028	0.019	0.019	0.02	0.026	0.039
	(0.846)	(0.865)	(0.596)	(0.594)	(0.614)	(0.729)	(1.061)
D15: Request by Large Companies	-0.064	-0.064	-0.059	-0.059	-0.06	-0.063	-0.076
	(1.780)*	(1.769)*	(1.631)	(1.630)	(1.647)*	(1.641)	(1.890)*
D16: Lower Costs of Labor	0.014	0.017	0.014	0.014	0.014	0.017	0.017
	(0.568)	(0.681)	(0.552)	(0.552)	(0.571)	(0.640)	(0.629)
D17: Skilled Labor	-0.04	-0.039	-0.04	-0.04	-0.04	-0.033	-0.043
	(1.424)	(1.368)	(1.433)	(1.434)	(1.408)	(1.141)	(1.431)
D18: Synergy	0.048	0.048	0.045	0.045	0.046	0.04	0.032
	(1.543)	(1.540)	(1.422)	(1.421)	(1.453)	(1.191)	(0.962)
D19: Cutting-Edge Technology	0.053	0.05	0.048	0.048	0.047	0.037	0.047
	(1.537)	(1.467)	(1.420)	(1.420)	(1.409)	(1.047)	(1.352)
D20: Living Conditions	0.005	0.004	-0.001	-0.001	-0.001	0	-0.013
	(0.177)	(0.121)	(0.033)	(0.033)	(0.038)	(0.004)	(0.419)
Manufacturing		-0.079	-0.064	-0.064	-0.064	-0.055	-0.09
		(1.292)	(1.049)	(1.049)	(1.035)	(0.835)	(1.376)
Multinationals			-0.174	-0.174	-0.178	-0.126	-0.176
			(2.763)***	(2.745)***	(2.755)***	(1.795)*	(2.412)**
Exporters				0	0.003	0.026	0.004
				(0.005)	(0.040)	(0.331)	(0.048)
Full-time Employees					Yes		
Total Assets (US$)						Yes	
Paid-up Capital (US$)							Yes
Observations	293	293	293	293	292	275	262

Note: Robust z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Source: ERIA Research Project Mail Survey 2007.

Table 18: Results: Technical Cooperation with Local Government (Restricted Sample)

	Pool (three countries)								
	Non Multinationals			Multinationals			Non Exporters		
Sample Restriction	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Probit Regression (Marginal Effects)	Dependent: Technical cooperation with local government =1, otherwise 0								
D1: Tax Incentives	0.017	0.019	0.023	0.065	0.06	0.068	0.016	0.013	0.015
	(0.498)	(0.548)	(0.668)	(1.602)	(1.428)	(1.539)	(0.550)	(0.431)	(0.475)
D2: Liberal Trade Policy	-0.02	-0.021	-0.023	0.098	0.101	0.099	0.02	0.017	0.018
	(0.477)	(0.491)	(0.552)	(2.020)**	(2.058)**	(2.038)**	(0.530)	(0.455)	(0.482)
D3: Customs Procedures	0.041	0.04	0.039	-0.054	-0.049	-0.058	0.024	0.03	0.03
	(1.276)	(1.253)	(1.227)	(1.543)	(1.373)	(1.649)*	(0.832)	(1.054)	(1.051)
D4: Local Content	0.044	0.045	0.042	-0.049	-0.053	-0.05	0.031	0.033	0.032
	(1.438)	(1.472)	(1.377)	(0.890)	(0.949)	(0.957)	(1.076)	(1.142)	(1.086)
D5: Physical Infrastructure	0.016	0.018	0.023	-0.029	-0.033	-0.034	-0.031	-0.031	-0.03
	(0.453)	(0.495)	(0.628)	(0.625)	(0.731)	(0.763)	(0.916)	(0.886)	(0.885)
D6: ICTs	-0.047	-0.051	-0.049	0.01	0.005	0.021	-0.018	-0.033	-0.032
	(1.076)	(1.174)	(1.130)	(0.183)	(0.096)	(0.422)	(0.458)	(0.847)	(0.833)
D7: Utilities	-0.007	-0.001	-0.005	0.107	0.114	0.11	0.026	0.046	0.045
	(0.178)	(0.023)	(0.123)	(2.200)**	(2.293)**	(2.251)**	(0.712)	(1.232)	(1.214)
D8: Government Institution	-0.029	-0.031	-0.029	-0.083	-0.076	-0.09	-0.051	-0.052	-0.047
	(0.735)	(0.777)	(0.734)	(1.842)*	(1.746)*	(2.110)**	(1.494)	(1.507)	(1.375)
D9: Financial System	0.071	0.07	0.066	0.071	0.071	0.078	0.095	0.1	0.094
	(1.614)	(1.583)	(1.496)	(1.120)	(1.123)	(1.216)	(2.309)**	(2.403)**	(2.263)**
D10: Legal System	0.044	0.042	0.04	-0.075	-0.081	-0.075	0.015	0.01	0.007
	(1.102)	(1.050)	(1.006)	(1.605)	(1.705)*	(1.620)	(0.426)	(0.287)	(0.193)
D11: Protection of IPRs	0.014	0.017	0.017	-0.088	-0.1	-0.11	0.017	0.018	0.019
	(0.462)	(0.546)	(0.533)	(1.399)	(1.542)	(1.721)*	(0.533)	(0.585)	(0.614)
D12: Size of Local Markets	-0.028	-0.032	-0.032	-0.012	-0.008	0.006	-0.048	-0.061	-0.058
	(0.705)	(0.790)	(0.770)	(0.187)	(0.131)	(0.095)	(1.232)	(1.527)	(1.447)
D13: Access to Export Markets	0.059	0.063	0.063	0.039	0.04	0.032	0.056	0.069	0.067
	(1.534)	(1.633)	(1.632)	(0.724)	(0.740)	(0.614)	(1.581)	(1.932)*	(1.878)*
D14: Proximity of Suppliers	0.024	0.02	0.019	-0.015	-0.01	-0.007	0.007	0.006	0.005
	(0.558)	(0.491)	(0.454)	(0.273)	(0.183)	(0.130)	(0.180)	(0.160)	(0.142)
D15: Request by Large Companies	-0.076	-0.076	-0.073	-0.052	-0.044	-0.057	-0.068	-0.068	-0.065
	(1.666)*	(1.679)*	(1.617)	(0.886)	(0.743)	(0.910)	(1.637)	(1.640)	(1.576)
D16: Lower Costs of Labor	0.006	0.006	0.004	0.017	0.025	0.033	0.017	0.023	0.02
	(0.164)	(0.179)	(0.119)	(0.466)	(0.644)	(0.802)	(0.571)	(0.721)	(0.649)
D17: Skilled Labor	-0.057	-0.054	-0.052	-0.013	-0.019	-0.022	-0.062	-0.058	-0.057
	(1.657)*	(1.576)	(1.521)	(0.249)	(0.352)	(0.421)	(1.924)*	(1.789)*	(1.774)*
D18: Synergy	0.08	0.081	0.079	-0.014	-0.009	0.027	0.039	0.04	0.035
	(2.059)**	(2.087)**	(2.042)**	(0.274)	(0.186)	(0.497)	(1.067)	(1.086)	(0.972)
D19: Cutting-Edge Technology	0.061	0.058	0.057	0.054	0.052	0.03	0.101	0.095	0.095
	(1.431)	(1.378)	(1.356)	(0.953)	(0.923)	(0.533)	(2.563)**	(2.412)**	(2.432)**
D20: Living Conditions	-0.003	-0.004	-0.001	0	-0.006	-0.02	0.001	-0.003	0
	(0.068)	(0.094)	(0.029)	(0.006)	(0.131)	(0.409)	(0.031)	(0.072)	(0.013)
Manufacturing		-0.07	-0.051		-0.067	-0.08		-0.177	-0.167
		(0.873)	(0.621)		(0.651)	(0.757)		(2.429)**	(2.268)**
Full-time Employees			Yes			Yes			Yes
Observations	186	186	185	107	107	107	221	221	220

Note: Robust z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Source: ERIA Research Project Mail Survey 2007.

5.4. Technical Cooperation with Local Business Organization

Here we analyze the factors promoting technical cooperation with local business

organization. According to Table 19, if the D-score for "Synergy" increases by one point, the probability that firms have technical cooperation with local business organization decreases by 7-10 percentage points. This implies that companies willing to build a closer inter-business linkage tend to develop cooperative relations with local business organization. The positive marginal effect of "Living conditions" indicates that firms that pursue localization seek technical cooperation with local organization. The negative sign (about -0.3) for "Multinationals" means the ratio of MNCs gaining cooperation with such business organization is 30 percent lower than for local firms.

As shown in Table 20, "Synergy" has a greater influence on MNCs than on non-MNCs and non-exporters. Its marginal effect on MNCs is about -0.12, greater than for non-MNCs (-0.06) and non-exporters (-0.08). This indicates that weak inter-firm linkages hamper cooperation with local business organization. "Living conditions" is not significant only for MNCs. The signs of "Local content requirements" are different between MNCs and non-MNCs; the marginal effects on this factor are positive for non-MNCs but negative for MNCs. The positive marginal effects of "Access to cutting-edge technology" for all but MNCs mean that innovative activities by domestic firms are partly based on closer relation with local business organization. Positive marginal effects on infrastructure-related factors such as "Physical infrastructure" for MNCs and "Utilities" for non-MNCs suggest local business organizations can play important role in mitigating business obstacles caused by local infrastructure. On the other hand, weak ICT infrastructures, which can be a key platform for collaboration, discourage such cooperation as implied by the negative effect of "telecommunications or IT infrastructure" for non-MNCs. What should be noted is the negative effect of "Manufacturing" for MNCs, which invokes limited cooperative relation between MNCs

and local business associations in the manufacturing sector.

Table 19: Results: Technical Cooperation with Local Business Organization
(Full-sample)

Probit Regression (Marginal Effects)	Pool (three countries)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent: Technical cooperation with local business organization =1, otherwise 0							
D1: Tax Incentives	-0.008	-0.007	-0.014	-0.016	-0.018	-0.023	-0.015
	(0.299)	(0.271)	(0.495)	(0.555)	(0.613)	(0.794)	(0.495)
D2: Liberal Trade Policy	-0.003	-0.002	0.015	0.015	0.015	0.018	0.016
	(0.099)	(0.071)	(0.489)	(0.485)	(0.477)	(0.555)	(0.470)
D3: Customs Procedures	-0.021	-0.021	-0.008	-0.008	-0.007	-0.007	-0.004
	(0.835)	(0.823)	(0.293)	(0.303)	(0.279)	(0.261)	(0.149)
D4: Local Content	0.011	0.015	0.02	0.019	0.021	0.032	0.017
	(0.417)	(0.566)	(0.734)	(0.702)	(0.754)	(1.129)	(0.590)
D5: Physical Infrastructure	0.029	0.028	0.039	0.039	0.039	0.033	0.029
	(0.977)	(0.960)	(1.319)	(1.321)	(1.318)	(1.083)	(0.923)
D6: ICTs	-0.03	-0.039	-0.052	-0.053	-0.053	-0.051	-0.048
	(0.838)	(1.083)	(1.396)	(1.420)	(1.414)	(1.359)	(1.238)
D7: Utilities	0.023	0.035	0.027	0.028	0.027	0.038	0.034
	(0.742)	(1.105)	(0.853)	(0.886)	(0.832)	(1.164)	(1.013)
D8: Government Institution	-0.038	-0.036	-0.026	-0.023	-0.025	-0.019	-0.031
	(1.279)	(1.214)	(0.835)	(0.746)	(0.794)	(0.606)	(0.949)
D9: Financial System	0.003	0.001	-0.008	-0.009	-0.011	-0.016	-0.01
	(0.084)	(0.022)	(0.209)	(0.242)	(0.310)	(0.436)	(0.242)
D10: Legal System	-0.004	-0.011	-0.023	-0.023	-0.021	-0.021	-0.013
	(0.131)	(0.324)	(0.690)	(0.671)	(0.611)	(0.601)	(0.353)
D11: Protection of IPRs	0.024	0.026	0.024	0.024	0.026	0.015	0.01
	(0.889)	(0.937)	(0.865)	(0.875)	(0.933)	(0.554)	(0.328)
D12: Size of Local Markets	-0.028	-0.033	-0.031	-0.028	-0.025	-0.036	-0.038
	(0.804)	(0.947)	(0.895)	(0.820)	(0.712)	(0.936)	(0.967)
D13: Access to Export Markets	0.012	0.017	0.022	0.019	0.019	0.032	0.029
	(0.405)	(0.576)	(0.723)	(0.613)	(0.590)	(0.990)	(0.863)
D14: Proximity of Suppliers	0.022	0.022	0.012	0.012	0.013	0.015	0.007
	(0.649)	(0.647)	(0.330)	(0.348)	(0.366)	(0.383)	(0.176)
D15: Request by Large Companies	0	0.003	0.014	0.014	0.011	0.027	0.016
	(0.007)	(0.092)	(0.379)	(0.380)	(0.294)	(0.668)	(0.401)
D16: Lower Costs of Labor	-0.041	-0.037	-0.043	-0.043	-0.042	-0.047	-0.028
	(1.496)	(1.342)	(1.582)	(1.570)	(1.519)	(1.643)	(0.961)
D17: Skilled Labor	0.002	0.004	-0.003	-0.003	-0.001	0.006	0.004
	(0.073)	(0.125)	(0.092)	(0.091)	(0.040)	(0.171)	(0.127)
D18: Synergy	-0.071	-0.074	-0.083	-0.083	-0.079	-0.097	-0.103
	(2.350)**	(2.486)**	(2.778)***	(2.743)***	(2.540)**	(3.004)***	(3.136)***
D19: Cutting-Edge Technology	0.055	0.053	0.052	0.052	0.05	0.038	0.048
	(1.612)	(1.520)	(1.476)	(1.480)	(1.432)	(1.063)	(1.340)
D20: Living Conditions	0.084	0.081	0.079	0.079	0.078	0.088	0.073
	(2.721)***	(2.639)***	(2.484)**	(2.500)**	(2.442)**	(2.766)***	(2.261)**
Manufacturing		-0.116	-0.094	-0.097	-0.103	-0.093	-0.104
		(1.821)*	(1.420)	(1.457)	(1.544)	(1.314)	(1.472)
Multinationals			-0.285	-0.29	-0.305	-0.249	-0.324
			(4.269)***	(4.326)***	(4.449)***	(3.424)***	(4.373)***
Exporters				0.033	0.037	0.052	0.03
				(0.435)	(0.495)	(0.669)	(0.379)
Full-time Employees					Yes		
Total Assets (US$)						Yes	
Paid-up Capital (US$)							Yes
Observations	292	292	292	292	291	274	261

Note: Robust z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Source: ERIA Research Project Mail Survey 2007.

Table 20: Results: Technical Cooperation with Local Business Organization
(Restricted Sample)

	Pool (three countries)								
	Non Multinationals			Multinationals			Non Exporters		
Sample Restriction	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Probit Regression (Marginal Effects)	Dependent: Technical cooperation with local business organization =1, otherwise 0								
D1: Tax Incentives	-0.055	-0.055	-0.055	0.068	0.028	0.023	-0.021	-0.022	-0.022
	(1.839)*	(1.820)*	(1.796)*	(1.172)	(0.478)	(0.394)	(0.666)	(0.716)	(0.706)
D2: Liberal Trade Policy	0.021	0.021	0.022	0.002	0.032	0.029	0.043	0.043	0.042
	(0.550)	(0.552)	(0.579)	(0.031)	(0.471)	(0.415)	(1.133)	(1.129)	(1.106)
D3: Customs Procedures	0.018	0.018	0.019	-0.111	-0.085	-0.087	0.008	0.011	0.012
	(0.623)	(0.619)	(0.659)	(2.322)**	(1.783)*	(1.871)*	(0.273)	(0.382)	(0.390)
D4: Local Content	0.062	0.062	0.063	-0.168	-0.205	-0.205	0.024	0.028	0.03
	(2.160)**	(2.172)**	(2.164)**	(2.640)***	(3.001)***	(3.047)***	(0.762)	(0.904)	(0.943)
D5: Physical Infrastructure	0.026	0.026	0.024	0.109	0.104	0.12	0	0.002	0.001
	(0.838)	(0.838)	(0.738)	(1.759)*	(1.668)*	(2.020)**	(0.005)	(0.049)	(0.019)
D6: ICTs	-0.079	-0.08	-0.079	0.004	-0.027	-0.024	-0.007	-0.017	-0.016
	(1.836)*	(1.826)*	(1.804)*	(0.066)	(0.412)	(0.360)	(0.166)	(0.399)	(0.375)
D7: Utilities	0.065	0.065	0.064	-0.116	-0.077	-0.088	0.032	0.045	0.043
	(1.895)*	(1.883)*	(1.838)*	(1.659)*	(1.057)	(1.211)	(0.878)	(1.209)	(1.149)
D8: Government Institution	-0.028	-0.028	-0.024	-0.058	-0.021	-0.035	-0.048	-0.049	-0.048
	(0.769)	(0.780)	(0.671)	(1.133)	(0.412)	(0.633)	(1.266)	(1.309)	(1.270)
D9: Financial System	-0.054	-0.054	-0.059	0.128	0.101	0.108	0.005	0.007	0.003
	(1.280)	(1.280)	(1.371)	(1.714)*	(1.366)	(1.450)	(0.114)	(0.162)	(0.061)
D10: Legal System	0.017	0.017	0.015	-0.09	-0.119	-0.108	-0.03	-0.033	-0.033
	(0.461)	(0.460)	(0.410)	(1.352)	(1.795)*	(1.612)	(0.838)	(0.919)	(0.909)
D11: Protection of IPRs	0.003	0.003	0.004	0.049	0.001	-0.017	0.037	0.04	0.041
	(0.089)	(0.091)	(0.129)	(0.619)	(0.008)	(0.206)	(1.088)	(1.163)	(1.200)
D12: Size of Local Markets	-0.022	-0.022	-0.018	-0.047	-0.013	0.001	-0.031	-0.042	-0.037
	(0.621)	(0.630)	(0.491)	(0.635)	(0.164)	(0.011)	(0.765)	(1.038)	(0.910)
D13: Access to Export Markets	0.018	0.018	0.016	0.117	0.134	0.133	-0.001	0.007	0.006
	(0.543)	(0.543)	(0.495)	(1.916)*	(2.209)**	(2.210)**	(0.042)	(0.207)	(0.158)
D14: Proximity of Suppliers	0.009	0.009	0.01	0.006	0.033	0.037	0.055	0.053	0.054
	(0.254)	(0.250)	(0.261)	(0.084)	(0.454)	(0.494)	(1.288)	(1.257)	(1.272)
D15: Request by Large Companies	0.01	0.01	0.011	0.038	0.071	0.055	-0.035	-0.03	-0.031
	(0.223)	(0.224)	(0.242)	(0.558)	(0.995)	(0.754)	(0.769)	(0.682)	(0.700)
D16: Lower Costs of Labor	-0.051	-0.051	-0.05	-0.048	-0.003	0.001	-0.02	-0.018	-0.015
	(1.585)	(1.588)	(1.560)	(0.929)	(0.062)	(0.016)	(0.581)	(0.518)	(0.447)
D17: Skilled Labor	0.011	0.011	0.011	-0.058	-0.094	-0.092	-0.024	-0.021	-0.02
	(0.326)	(0.332)	(0.332)	(0.851)	(1.279)	(1.222)	(0.668)	(0.572)	(0.563)
D18: Synergy	-0.058	-0.058	-0.062	-0.141	-0.122	-0.083	-0.076	-0.079	-0.079
	(1.699)*	(1.705)*	(1.807)*	(2.423)**	(2.133)**	(1.242)	(2.168)**	(2.274)**	(2.225)**
D19: Cutting-Edge Technology	0.066	0.066	0.068	0.057	0.053	0.03	0.086	0.08	0.082
	(1.739)*	(1.733)*	(1.774)*	(0.760)	(0.665)	(0.370)	(2.101)**	(1.941)*	(1.986)**
D20: Living Conditions	0.103	0.103	0.105	0.065	0.018	0.008	0.141	0.139	0.14
	(3.026)***	(3.024)***	(3.040)***	(1.081)	(0.278)	(0.118)	(3.878)***	(3.863)***	(3.842)***
Manufacturing		-0.004	-0.002		-0.375	-0.385		-0.128	-0.125
		(0.059)	(0.032)		(2.779)***	(2.805)***		(1.645)	(1.588)
Full-time Employees			Yes			Yes			Yes
Observations	186	186	185	106	106	106	220	220	219

Note: Robust z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Source: ERIA Research Project Mail Survey 2007.

5.5. Technical Cooperation with Local University or R&D Institute

According to Table 21, if the D-score for "Physical infrastructure" decreases one point, the possibility of technical cooperation with local university or R&D institute increases about eight percentage points. In the same way, about six percentage points are derived for "Availability of low-cost labor." Positive marginal effect is estimated for "Local content requirements." A one-point increase in the D-score for this factor results in increasing the possibility by about five percent. Again, "Multinationals" get less cooperation from local university.

By firm-level attribute, "Physical infrastructure" is significantly negative for non-MNCs and non-exporters, while "Availability of low-cost labor" is negative for MNCs and non-exporters. Among other factors, non-MNCs emphasizing "Customs procedures" and "Local content requirements" tend to be active in technical cooperation with local R&D institutes. MNCs have a positive marginal effect of "Financial system" (about 0.13) and a negative one of "Legal system" (about -0.16). A characteristic of non-exporter is those putting importance on "Living conditions" are likely partners for local universities.

Table 21: Results: Technical Cooperation with Local University or R&D Institute (Full-sample)

Probit Regression (Marginal Effects)	Pool (three countries)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent: Technical cooperation with local univeristy or R&D insitutes =1, otherv							
D1: Tax Incentives	0.032	0.031	0.028	0.027	0.027	0.024	0.027
	(1.156)	(1.155)	(1.033)	(0.983)	(0.958)	(0.824)	(0.858)
D2: Liberal Trade Policy	-0.01	-0.01	-0.003	-0.003	-0.004	-0.009	0.014
	(0.334)	(0.334)	(0.082)	(0.083)	(0.110)	(0.263)	(0.389)
D3: Customs Procedures	0.029	0.029	0.037	0.037	0.038	0.038	0.033
	(1.185)	(1.186)	(1.457)	(1.451)	(1.483)	(1.472)	(1.216)
D4: Local Content	0.047	0.047	0.05	0.049	0.052	0.044	0.056
	(1.777)*	(1.780)*	(1.848)*	(1.820)*	(1.935)*	(1.528)	(1.870)*
D5: Physical Infrastructure	-0.078	-0.078	-0.075	-0.075	-0.077	-0.074	-0.079
	(2.619)***	(2.618)***	(2.503)**	(2.500)**	(2.532)**	(2.370)**	(2.422)**
D6: ICTs	0.036	0.035	0.03	0.029	0.033	0.035	0.012
	(1.023)	(1.000)	(0.830)	(0.820)	(0.914)	(0.968)	(0.326)
D7: Utilities	0.028	0.028	0.023	0.024	0.02	0.021	0.035
	(0.894)	(0.878)	(0.729)	(0.755)	(0.617)	(0.625)	(1.019)
D8: Government Institution	-0.029	-0.029	-0.022	-0.021	-0.023	-0.018	-0.023
	(0.953)	(0.950)	(0.718)	(0.660)	(0.719)	(0.560)	(0.698)
D9: Financial System	0.061	0.061	0.059	0.058	0.054	0.055	0.082
	(1.703)*	(1.701)*	-1.64	-1.617	-1.511	-1.462	(2.127)**
D10: Legal System	-0.019	-0.019	-0.026	-0.026	-0.024	-0.016	-0.036
	(0.587)	(0.591)	(0.795)	(0.792)	(0.736)	(0.483)	(1.045)
D11: Protection of IPRs	0.019	0.019	0.016	0.017	0.018	0.014	0.015
	(0.690)	(0.691)	(0.602)	(0.615)	(0.668)	(0.498)	(0.496)
D12: Size of Local Markets	0.034	0.034	0.035	0.037	0.044	0.043	0.063
	(1.008)	(1.003)	(1.033)	(1.070)	(1.288)	(1.146)	(1.613)
D13: Access to Export Markets	0.031	0.031	0.036	0.033	0.033	0.043	0.038
	(1.060)	(1.061)	(1.207)	(1.111)	(1.105)	(1.314)	(1.138)
D14: Proximity of Suppliers	0.032	0.032	0.025	0.026	0.026	0.033	0.018
	(0.948)	(0.948)	(0.727)	(0.744)	(0.746)	(0.880)	(0.455)
D15: Request by Large Companies	-0.005	-0.005	0.001	0.002	-0.004	0.004	0.003
	(0.147)	(0.144)	(0.039)	(0.049)	(0.108)	(0.111)	(0.073)
D16: Lower Costs of Labor	-0.064	-0.064	-0.068	-0.068	-0.065	-0.064	-0.072
	(2.393)**	(2.389)**	(2.576)***	(2.569)**	(2.439)**	(2.279)**	(2.497)**
D17: Skilled Labor	0.002	0.002	-0.001	-0.001	0.004	0.002	-0.025
	(0.068)	(0.070)	(0.023)	(0.025)	(0.135)	(0.070)	(0.778)
D18: Synergy	0.013	0.013	0.012	0.012	0.022	0.007	-0.004
	(0.424)	(0.423)	(0.373)	(0.380)	(0.695)	(0.219)	(0.113)
D19: Cutting-Edge Technology	-0.04	-0.04	-0.042	-0.042	-0.048	-0.051	-0.035
	(1.174)	(1.175)	(1.220)	(1.225)	(1.393)	(1.443)	(0.969)
D20: Living Conditions	0.05	0.049	0.047	0.047	0.043	0.044	0.061
	(1.625)	(1.624)	(1.505)	(1.512)	(1.366)	(1.381)	(1.861)*
Manufacturing		-0.004	0.008	0.006	-0.003	0.003	-0.048
		(0.060)	(0.127)	(0.098)	(0.051)	(0.041)	(0.694)
Multinationals			-0.158	-0.161	-0.194	-0.142	-0.206
			(2.405)**	(2.429)**	(2.851)***	(1.937)*	(2.713)***
Exporters				0.026	0.031	0.038	0.047
				(0.332)	(0.410)	(0.471)	(0.573)
Full-time Employees					Yes		
Total Assets (US$)						Yes	
Paid-up Capital (US$)							Yes
Observations	292	292	292	292	291	274	261

Note: Robust z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.
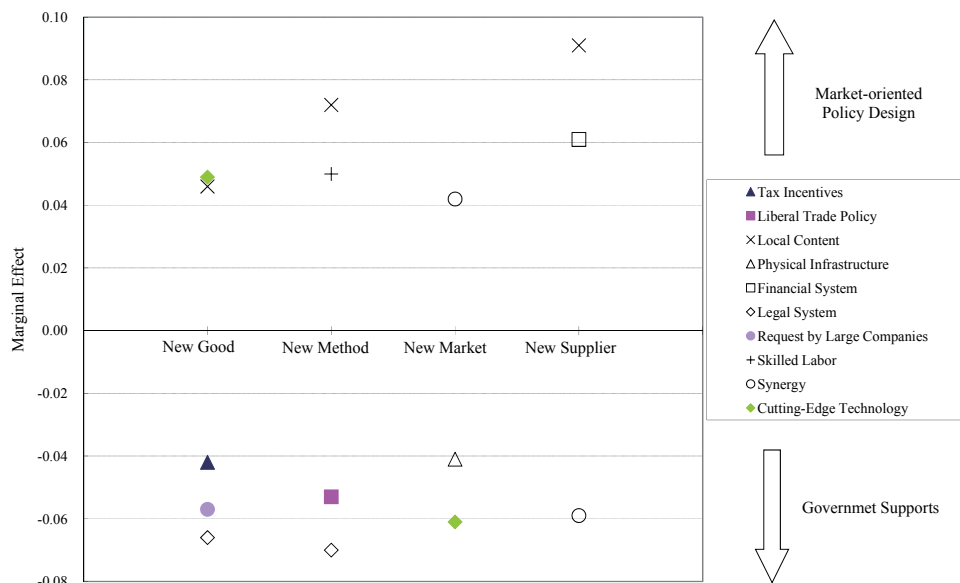
Source: ERIA Research Project Mail Survey 2007.

Table 22: Results: Technical Cooperation with Local University or R&D Institute (Restricted Sample)

	Pool (three countries)								
	Non Multinationals			Multinationals			Non Exporters		
Sample Restriction	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Probit Regression (Marginal Effects)	Dependent: Technical cooperation with local univeristy or R&D insitutes =1, otherwise 0								
D1: Tax Incentives	0.002	0.001	-0.001	0.098	0.08	0.093	0.018	0.018	0.019
	(0.057)	(0.019)	(0.037)	(1.797)*	(1.424)	(1.575)	(0.567)	(0.577)	(0.612)
D2: Liberal Trade Policy	0.008	0.008	0.01	0.004	0.013	0.012	-0.026	-0.026	-0.027
	(0.187)	(0.182)	(0.233)	(0.070)	(0.212)	(0.189)	(0.692)	(0.693)	(0.732)
D3: Customs Procedures	0.058	0.059	0.061	0.006	0.019	0.009	0.036	0.035	0.036
	(1.784)*	(1.805)*	(1.842)*	(0.128)	(0.410)	(0.216)	(1.231)	(1.216)	(1.239)
D4: Local Content	0.087	0.086	0.09	-0.083	-0.09	-0.089	0.053	0.052	0.055
	(2.765)***	(2.723)***	(2.816)***	(1.324)	(1.401)	(1.493)	(1.651)*	-1.644	(1.729)*
D5: Physical Infrastructure	-0.076	-0.079	-0.085	-0.058	-0.07	-0.048	-0.074	-0.074	-0.076
	(2.164)**	(2.258)**	(2.396)**	(1.022)	(1.238)	(0.891)	(1.983)**	(1.988)**	(2.032)**
D6: ICTs	-0.006	0.001	0.002	0.105	0.094	0.106	0.013	0.014	0.017
	(0.135)	(0.013)	(0.043)	(1.609)	(1.460)	(1.602)	(0.333)	(0.346)	(0.419)
D7: Utilities	0.019	0.013	0.011	0.071	0.087	0.066	0.061	0.06	0.057
	(0.517)	(0.327)	(0.288)	(1.129)	(1.331)	(1.042)	(1.692)*	(1.600)	(1.508)
D8: Government Institution	-0.049	-0.047	-0.041	-0.047	-0.031	-0.049	-0.019	-0.019	-0.017
	(1.215)	(1.168)	(0.995)	(1.022)	(0.710)	(1.022)	(0.519)	(0.517)	(0.473)
D9: Financial System	0.055	0.056	0.048	0.135	0.13	0.153	0.051	0.051	0.045
	(1.166)	(1.180)	(1.006)	(1.968)**	(1.951)*	(2.278)**	(1.217)	(1.212)	(1.070)
D10: Legal System	0.014	0.015	0.013	-0.152	-0.16	-0.164	-0.005	-0.005	-0.005
	(0.324)	(0.372)	(0.321)	(2.385)**	(2.520)**	(2.704)***	(0.135)	(0.128)	(0.147)
D11: Protection of IPRs	0.028	0.024	0.026	-0.026	-0.054	-0.076	0	0	0.001
	(0.842)	(0.735)	(0.781)	(0.367)	(0.744)	(1.057)	(0.009)	(0.013)	(0.030)
D12: Size of Local Markets	0.031	0.037	0.046	0.043	0.059	0.079	0	0	0.007
	(0.750)	(0.896)	(1.094)	(0.650)	(0.894)	(1.272)	(0.010)	(0.011)	(0.168)
D13: Access to Export Markets	0.062	0.057	0.053	0.024	0.028	0.028	0.048	0.048	0.046
	(1.602)	(1.472)	(1.378)	(0.445)	(0.518)	(0.526)	(1.394)	(1.368)	(1.324)
D14: Proximity of Suppliers	0.018	0.02	0.02	0.003	0.014	0.011	0.012	0.012	0.013
	(0.438)	(0.488)	(0.477)	(0.039)	(0.200)	(0.148)	(0.313)	(0.317)	(0.333)
D15: Request by Large Companies	-0.02	-0.019	-0.017	0.076	0.092	0.079	0.045	0.045	0.043
	(0.429)	(0.405)	(0.368)	(1.040)	(1.212)	(1.053)	(1.055)	(1.044)	(1.010)
D16: Lower Costs of Labor	-0.053	-0.053	-0.051	-0.109	-0.089	-0.085	-0.095	-0.096	-0.093
	(1.510)	(1.549)	(1.472)	(2.468)**	(1.966)**	(1.702)*	(2.719)***	(2.749)***	(2.657)***
D17: Skilled Labor	-0.008	-0.01	-0.01	0.011	0.002	0.015	0.023	0.023	0.024
	(0.218)	(0.271)	(0.275)	(0.178)	(0.031)	(0.231)	(0.698)	(0.693)	(0.723)
D18: Synergy	0.024	0.024	0.018	-0.021	-0.008	0.047	-0.021	-0.021	-0.021
	(0.626)	(0.610)	(0.457)	(0.396)	(0.158)	(0.776)	(0.596)	(0.596)	(0.592)
D19: Cutting-Edge Technology	-0.045	-0.044	-0.042	-0.006	-0.013	-0.051	-0.063	-0.063	-0.062
	(1.101)	(1.059)	(1.015)	(0.089)	(0.208)	(0.794)	(1.605)	(1.594)	(1.586)
D20: Living Conditions	0.051	0.053	0.055	0.082	0.064	0.041	0.065	0.065	0.066
	(1.331)	(1.389)	(1.445)	(1.472)	(1.104)	(0.714)	(1.779)*	(1.792)*	(1.801)*
Manufacturing		0.087	0.085		-0.166	-0.185		0.011	0.016
		(1.071)	(1.029)		(1.413)	(1.538)		(0.148)	(0.208)
Full-time Employees			Yes			Yes			Yes
Observations	185	185	184	107	107	107	220	220	219

Note: Robust z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Source: ERIA Research Project Mail Survey 2007.

5.6. Technology Transfer from or Cooperation with Local Companies

Let us examine the factors promoting technology transfer from local firms in the full-sample model. According to Table 23, "Tax incentives," "Customs procedures," and "Multinationals" have negative marginal effects, while "Liberal trade policy," "Access to export market," and "Living conditions" have positive marginal effects. Among these, a one-point increase of D-score for "Living conditions" increases the probability of technical transfer from local firms by 11 percentage points. This suggests that technology transfer from local firms will be promoted by encouraging firms to be more localized. The negative sign for "Multinationals" implies again the less possibility of technological cooperation between MNCs and local firms.

Even after dividing the complete data set into three according to firm-level attributes, "Access to export market" and "Living conditions" have the same signs as the full-sample model. "Tax incentives" is not significant for MNCs; however, "Customs procedures" and "Liberal trade policy" are significant only for MNCs and non-exporters, respectively. "Size of local market" has a significant impact on technology transfer from local firms to non-exporters. The probability of linkage for technological cooperation between MNCs in the "Manufacturing" sector is at least 30 percent less than in other sectors.

Table 23: Results: Technology Transfer from Local Companies (Full-sample)

Probit Regression (Marginal Effects)	Pool (three countries)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
pendent: Technology transfer from or cooperation with local companies =1, otherwis							
D1: Tax Incentives	-0.054	-0.055	-0.059	-0.055	-0.058	-0.055	-0.048
	(2.044)**	(2.049)**	(2.157)**	(2.035)**	(2.115)**	(1.972)**	(1.662)*
D2: Liberal Trade Policy	0.064	0.064	0.072	0.072	0.072	0.082	0.071
	(1.991)**	(1.978)**	(2.216)**	(2.189)**	(2.210)**	(2.349)**	(2.005)**
D3: Customs Procedures	-0.069	-0.067	-0.062	-0.061	-0.062	-0.055	-0.061
	(2.545)**	(2.498)**	(2.318)**	(2.301)**	(2.326)**	(2.011)**	(2.115)**
D4: Local Content	0.001	0.004	0.006	0.007	0.007	0	-0.002
	(0.055)	(0.159)	(0.213)	(0.269)	(0.268)	(0.014)	(0.085)
D5: Physical Infrastructure	-0.008	-0.01	-0.007	-0.007	-0.007	-0.005	0.01
	(0.259)	(0.345)	(0.224)	(0.231)	(0.224)	(0.168)	(0.321)
D6: ICTs	0.055	0.047	0.044	0.045	0.044	0.042	0.017
	(1.527)	(1.300)	(1.211)	(1.255)	(1.212)	(1.156)	(0.456)
D7: Utilities	-0.023	-0.012	-0.017	-0.019	-0.018	-0.016	-0.012
	(0.740)	(0.361)	(0.523)	(0.593)	(0.550)	(0.479)	(0.334)
D8: Government Institution	-0.01	-0.008	-0.003	-0.009	-0.014	-0.007	-0.018
	(0.321)	(0.247)	(0.107)	(0.276)	(0.443)	(0.213)	(0.561)
D9: Financial System	-0.002	-0.005	-0.007	-0.004	0.003	0.007	0.011
	(0.051)	(0.122)	(0.187)	(0.108)	(0.067)	(0.181)	(0.263)
D10: Legal System	0.002	-0.002	-0.007	-0.008	-0.005	-0.014	-0.006
	(0.057)	(0.070)	(0.199)	(0.217)	(0.132)	(0.392)	(0.159)
D11: Protection of IPRs	0.015	0.016	0.016	0.014	0.014	0.011	0.027
	(0.542)	(0.568)	(0.552)	(0.502)	(0.496)	(0.371)	(0.905)
D12: Size of Local Markets	-0.039	-0.044	-0.043	-0.048	-0.05	-0.062	-0.074
	(1.083)	(1.211)	(1.179)	(1.300)	(1.362)	(1.560)	(1.761)*
D13: Access to Export Markets	0.082	0.087	0.091	0.098	0.1	0.095	0.106
	(2.726)***	(2.861)***	(2.982)***	(3.128)***	(3.211)***	(2.808)***	(3.103)***
D14: Proximity of Suppliers	0.015	0.016	0.01	0.007	0.008	0.026	0.038
	(0.418)	(0.449)	(0.295)	(0.208)	(0.218)	(0.690)	(0.963)
D15: Request by Large Companies	-0.025	-0.021	-0.019	-0.019	-0.025	-0.03	-0.029
	(0.656)	(0.567)	(0.507)	(0.519)	(0.659)	(0.775)	(0.720)
D16: Lower Costs of Labor	-0.024	-0.02	-0.022	-0.022	-0.021	-0.019	-0.031
	(0.911)	(0.756)	(0.812)	(0.821)	(0.784)	(0.656)	(1.095)
D17: Skilled Labor	-0.001	0	-0.004	-0.004	-0.003	0.004	-0.009
	(0.021)	(0.003)	(0.136)	(0.120)	(0.101)	(0.132)	(0.278)
D18: Synergy	-0.012	-0.014	-0.016	-0.017	-0.009	-0.023	-0.019
	(0.382)	(0.440)	(0.477)	(0.529)	(0.273)	(0.643)	(0.537)
D19: Cutting-Edge Technology	0.022	0.018	0.017	0.017	0.014	0.001	0.004
	(0.602)	(0.505)	(0.458)	(0.449)	(0.381)	(0.038)	(0.106)
D20: Living Conditions	0.115	0.112	0.112	0.11	0.106	0.115	0.111
	(3.366)***	(3.293)***	(3.239)***	(3.206)***	(3.083)***	(3.266)***	(3.110)***
Manufacturing		-0.104	-0.09	-0.085	-0.099	-0.07	-0.113
		(1.592)	(1.371)	(1.274)	(1.470)	(0.988)	(1.608)
Multinationals			-0.124	-0.114	-0.134	-0.042	-0.085
			(1.881)*	(1.721)*	(1.934)*	(0.585)	(1.158)
Exporters				-0.078	-0.082	-0.069	-0.082
				(1.008)	(1.055)	(0.867)	(1.008)
Full-time Employees					Yes		
Total Assets (US$)						Yes	
Paid-up Capital (US$)							Yes
Observations	293	293	293	293	292	275	262

Note: Robust z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Source: ERIA Research Project Mail Survey 2007.

Table 24: Results: Technology Transfer from Local Companies (Restricted Sample)

	Pool (three countries)								
	Non Multinationals			Multinationals			Non Exporters		
Sample Restriction	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Probit Regression (Marginal Effects)	Dependent: Technology transfer from or cooperation with local companies =1, otherwise 0								
D1: Tax Incentives	-0.085	-0.087	-0.087	0.045	0.002	0.008	-0.091	-0.093	-0.101
	(2.643)***	(2.694)***	(2.643)***	(0.803)	(0.037)	(0.136)	(3.009)***	(3.053)***	(3.279)***
D2: Liberal Trade Policy	0.062	0.062	0.062	0.055	0.079	0.082	0.069	0.068	0.063
	(1.541)	(1.544)	(1.543)	(0.820)	(1.164)	(1.162)	(1.854)*	(1.826)*	(1.678)*
D3: Customs Procedures	-0.041	-0.042	-0.044	-0.144	-0.12	-0.129	-0.043	-0.04	-0.04
	(1.231)	(1.246)	(1.287)	(2.858)***	(2.367)**	(2.574)**	(1.411)	(1.310)	(1.307)
D4: Local Content	0.026	0.025	0.022	-0.057	-0.078	-0.073	0.011	0.013	0.02
	(0.877)	(0.842)	(0.724)	(0.908)	(1.208)	(1.137)	(0.357)	(0.435)	(0.644)
D5: Physical Infrastructure	-0.007	-0.007	-0.002	0.001	-0.017	-0.005	-0.008	-0.007	-0.008
	(0.198)	(0.191)	(0.059)	(0.016)	(0.275)	(0.085)	(0.210)	(0.197)	(0.210)
D6: ICTs	0.049	0.053	0.053	0.048	0.025	0.032	0.037	0.03	0.028
	(1.113)	(1.181)	(1.169)	(0.685)	(0.377)	(0.469)	(0.894)	(0.712)	(0.660)
D7: Utilities	-0.023	-0.029	-0.027	-0.013	0.022	0.011	0	0.01	0.011
	(0.631)	(0.743)	(0.695)	(0.205)	(0.325)	(0.156)	(0.000)	(0.261)	(0.305)
D8: Government Institution	-0.021	-0.019	-0.026	-0.034	-0.001	-0.008	-0.013	-0.014	-0.026
	(0.521)	(0.474)	(0.651)	(0.647)	(0.021)	(0.150)	(0.373)	(0.392)	(0.679)
D9: Financial System	-0.009	-0.008	0.001	0.037	0.022	0.026	-0.02	-0.021	-0.009
	(0.204)	(0.184)	(0.025)	(0.467)	(0.273)	(0.327)	(0.471)	(0.470)	(0.202)
D10: Legal System	0.017	0.018	0.02	-0.063	-0.08	-0.076	-0.008	-0.009	-0.001
	(0.419)	(0.424)	(0.488)	(0.909)	(1.141)	(1.100)	(0.196)	(0.213)	(0.015)
D11: Protection of IPRs	-0.002	-0.004	-0.006	0.112	0.064	0.056	-0.006	-0.004	-0.006
	(0.074)	(0.127)	(0.187)	(1.436)	(0.793)	(0.679)	(0.173)	(0.116)	(0.170)
D12: Size of Local Markets	-0.037	-0.034	-0.043	-0.073	-0.053	-0.045	-0.067	-0.074	-0.079
	(0.880)	(0.802)	(1.008)	(0.977)	(0.686)	(0.566)	(1.620)	(1.755)*	(1.839)*
D13: Access to Export Markets	0.105	0.103	0.107	0.103	0.119	0.117	0.084	0.09	0.096
	(2.896)***	(2.797)***	(2.886)***	(1.620)	(1.880)*	(1.864)*	(2.317)**	(2.465)**	(2.632)***
D14: Proximity of Suppliers	0.043	0.043	0.043	-0.108	-0.087	-0.09	0.001	0.001	0.001
	(0.957)	(0.959)	(0.943)	(1.440)	(1.145)	(1.159)	(0.021)	(0.013)	(0.020)
D15: Request by Large Companies	-0.057	-0.058	-0.06	0.03	0.058	0.048	-0.009	-0.006	-0.014
	(1.253)	(1.262)	(1.319)	(0.434)	(0.803)	(0.643)	(0.206)	(0.137)	(0.326)
D16: Lower Costs of Labor	0.008	0.008	0.006	-0.095	-0.052	-0.05	-0.05	-0.046	-0.041
	(0.237)	(0.221)	(0.185)	(1.719)*	(0.928)	(0.888)	(1.452)	(1.341)	(1.151)
D17: Skilled Labor	0.004	0.003	0.002	-0.008	-0.038	-0.037	0.017	0.019	0.019
	(0.132)	(0.087)	(0.067)	(0.123)	(0.569)	(0.543)	(0.491)	(0.538)	(0.547)
D18: Synergy	0.017	0.018	0.023	-0.096	-0.078	-0.048	-0.033	-0.033	-0.021
	(0.391)	(0.416)	(0.552)	(1.717)*	(1.408)	(0.739)	(0.855)	(0.847)	(0.541)
D19: Cutting-Edge Technology	0.02	0.022	0.02	0.034	0.03	0.008	0.026	0.022	0.023
	(0.472)	(0.519)	(0.472)	(0.472)	(0.388)	(0.100)	(0.619)	(0.522)	(0.539)
D20: Living Conditions	0.126	0.127	0.125	0.151	0.116	0.11	0.154	0.152	0.148
	(3.052)***	(3.046)***	(3.034)***	(2.313)**	(1.685)*	-1.583	(3.787)***	(3.749)***	(3.625)***
Manufacturing		0.057	0.056		-0.333	-0.341		-0.103	-0.132
		(0.692)	(0.665)		(2.469)**	(2.525)**		(1.320)	(1.675)*
Full-time Employees			Yes			Yes			Yes
Observations	186	186	185	107	107	107	221	221	220

Note: Robust z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Source: ERIA Research Project Mail Survey 2007.

6. SUMMARY AND POLICY IMPLICATIONS

6.1. Stimulating Factors for Innovation

We show the ways fostering innovation based on empirical results. Let us first summarize the empirical results of the full-sample models. Figure 2 illustrates the significant marginal effects for four categories of innovation, which are obtained from the estimations (3) in Tables 5, 7, 9, and 11 as an experiment. In total, 10 of 20 D-scores are significant in at least one of the four innovation models. This enables to simplify interpretation on the result of estimations. Based on Figure 2, it is difficult to identify a common factor that explains all four categories of upgrading. Some variables are positive in a model, but they are not significant or negative in other models. Among these 10 factors, "local content requirements" has significantly positive marginal effects on all but the opening of new market. Another important result excluded from Figure 2 is that the manufacturing sector tends to result in a higher rate of innovations than other sectors.

Figure 2 also reveals policy directions and priorities obvious at a glance. Policy priorities should be placed on variables with larger absolute values of marginal effect, if we do not consider costs of policy implementation. In the figure, these are "Local content requirements" or "Rules of origin" and "Legal system." Policy directions depend on the signs of marginal effect. A negative marginal effect of a variable suggests government support or intervention to increase the level of satisfaction with the variable because it will result in increasing the possibility of generating innovation. This is a widely accepted idea on industrial or cluster policy. On the other hand, a positive marginal effect of a variable suggests the importance of business environments and

market circumstances, notably stiffer market competition fueled by market forces. Appropriate institutional arrangements or mechanism to encourage market competition is a key policy issue, although this may not necessarily lead to deregulation.

Figure 2: Marginal Effects on Innovations (Full-sample)

Source: ERIA Research Project Mail Survey 2007.

The results of the estimation of sample restriction models provide detailed information indispensable to examine policy issues from a more practical point of view. Figure 3 presents in a graph the significant marginal effects for MNCs and local firms (non-MNCs) of the estimations (3) in Tables 6, 8, 10, and 12. The design of these figures is almost the same as in Figure 2. A key finding is that legal system has a negative impact on all innovation types carried out by MNCs. Another is that significantly positive coefficients are conspicuous especially in the figure for local firms, so that we expect market competition as one of the key driving forces for innovation.

However, promoting factors are different among the types of upgrading and among capital structure. That there are significant differences in the probability of innovation between MNCs and non MNCs is a very important finding.

6.2. Stimulating Factors for Accessing Sources of New Technologies or Information

We derive ways in finding sources of new technologies or information based on empirical results. Let us first summarize the results of the full-sample models of sources of new technologies or information. It is obvious from Figure 4, which is developed from the estimations (5) in Tables 13, 15, 17, 19, 21, and 23, that only one or two variables are significant for each model except technology transfers from local universities or R&D institute and from local firms. On the other hand, the marginal effects of "Multinationals" are relatively robust although the estimated coefficients are not presented in Figure 4. The estimated signs for the dummy variable for MNCs are significantly positive in the models of technology transfers from MNCs and foreign agencies, and negative in the other models. This implies that networks for technology transfer between MNCs and foreign bodies and those between local firms and local bodies separately co-exist in a country.

The results of the estimation (3) of sample restriction models are depicted in Figure 5, which is based on the significant marginal effects for MNCs and local firms (non-MNCs). This picture clarifies the complete differences in factors affecting access to new technologies between MNCs and local firms. Only two variables are identified as common. One is "Financial system" for the model of technology transfer from foreign agencies and the other is "Access to export market" for the model of technology transfer from local firms.

Figure 3: Marginal Effects on Innovations (Sample-restricted)

(1) MNCs

Figure 3 (continued)

(2) Non-MNCs

Figure 4: Marginal Effects on Sources of New Technologies (Full-sample)

Note: The coefficient on "Low-cost of labor" of technology transfer from MNCs is not significant.
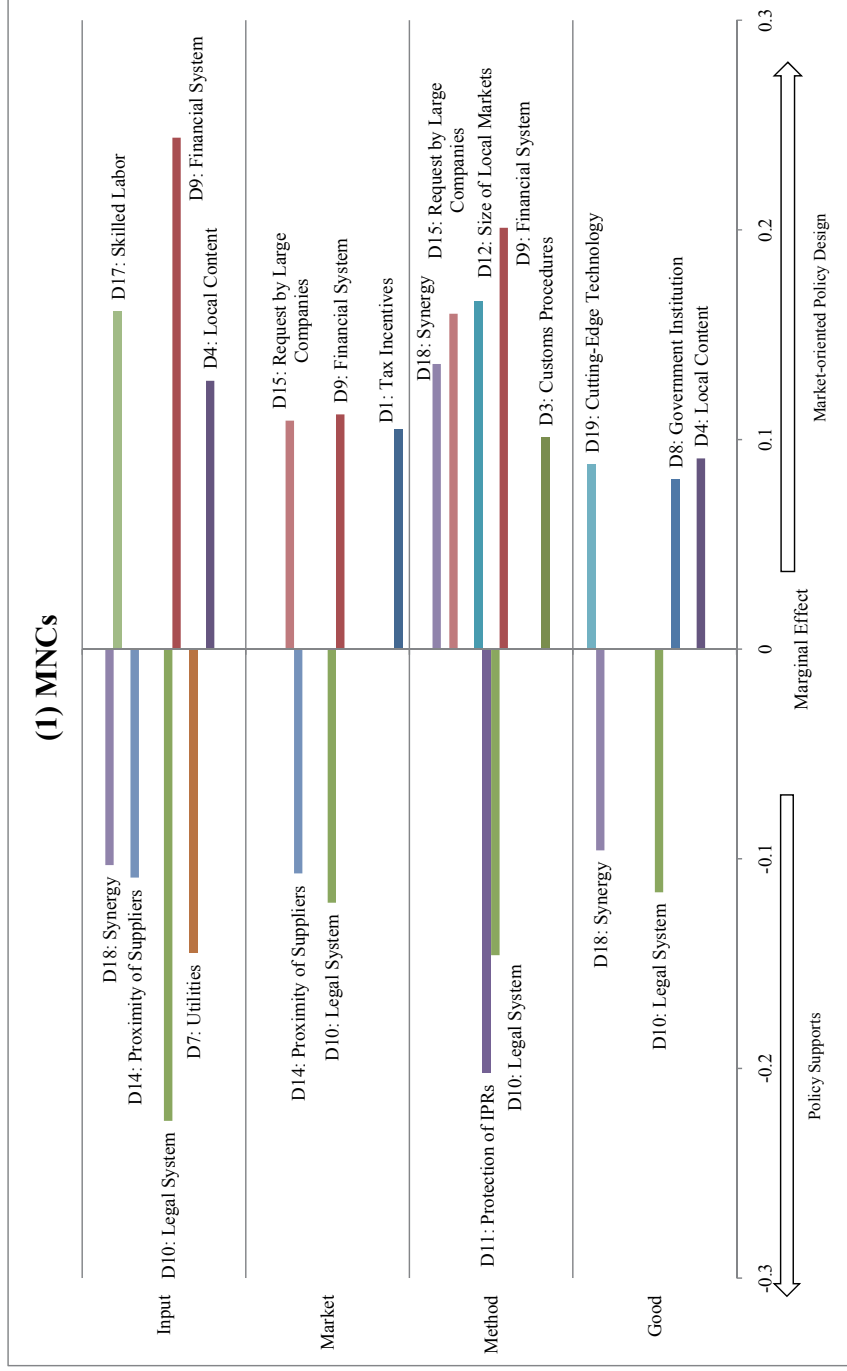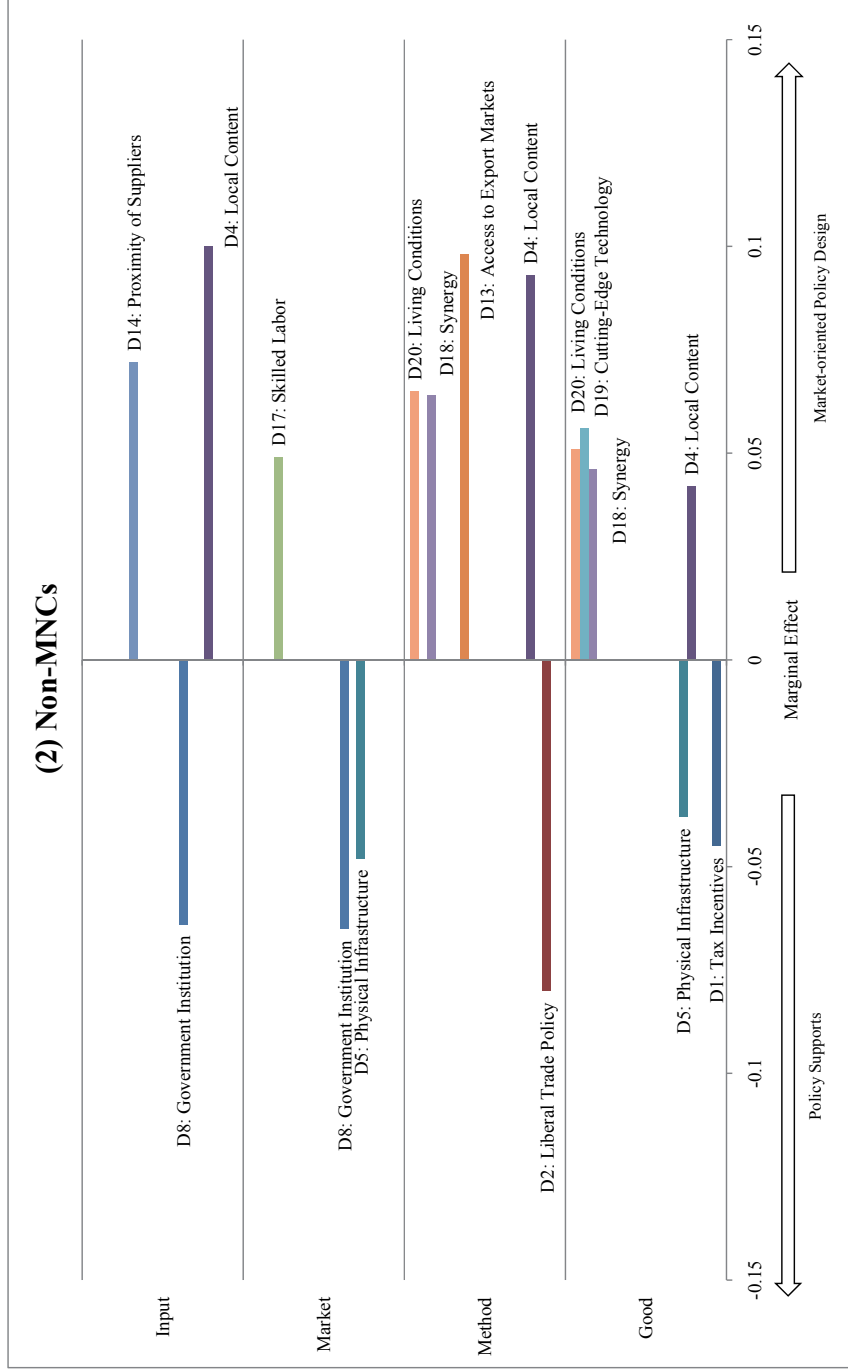
Source: ERIA Research Project Mail Survey 2007.

Figure 5: Marginal Effects on Sources of New Technologies (Sample-restricted)

(1) MNCs

Figure 5 (continued)

(2) Non-MNCs
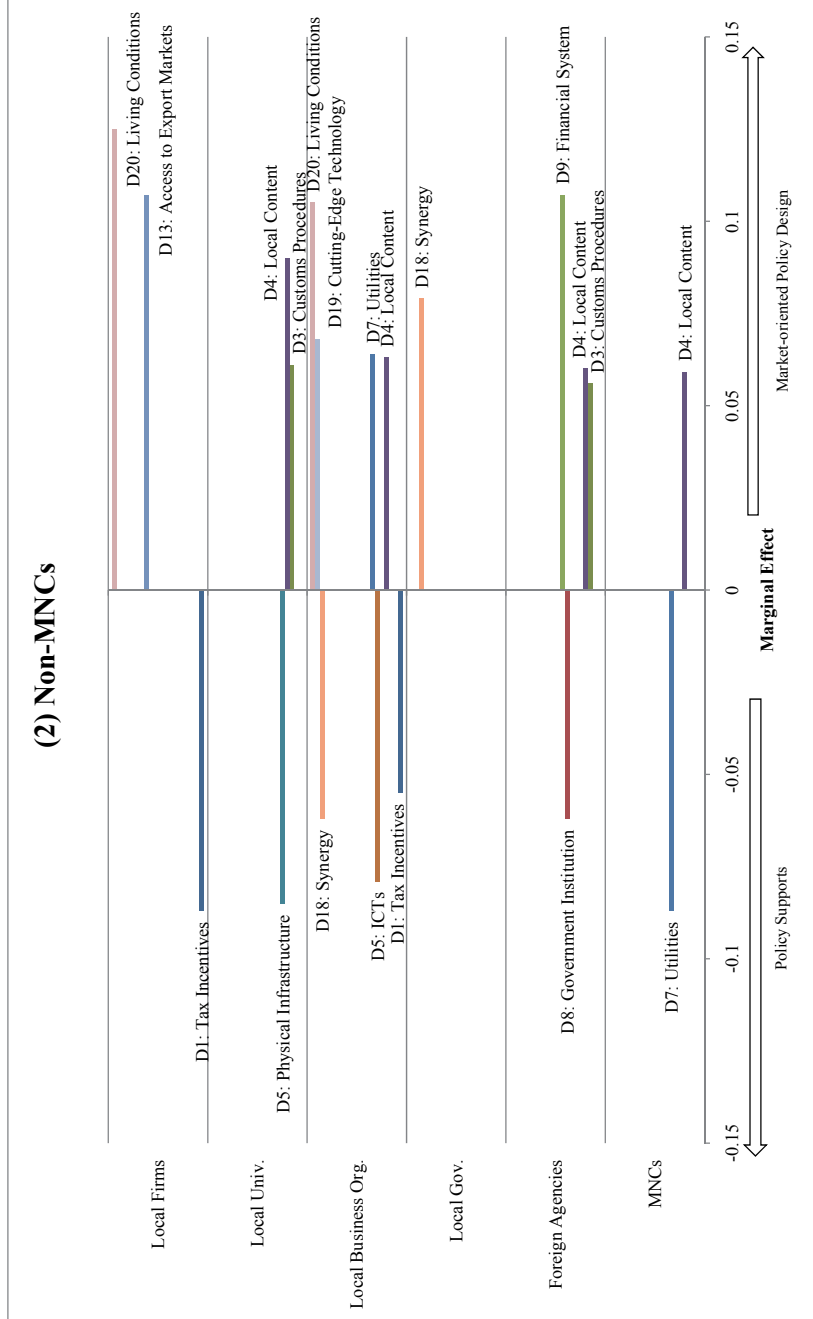
Source: ERIA Research Project Mail Survey 2007.

6.3. Policy Implications

In the section of empirical results, we analyze the following specific issues: (1) factors promoting access to sources of new technologies and information and industrial upgrading and (2) the effects of these factors on emergence of product and process innovation in each establishment and linkage between related parties. We are going to explore ways to tighten the causal relationship between industrial agglomeration and fostering innovation systems using evidence-based policymaking based on economic theory and empirical results.

As pointed out by Duranton (2008), it will be difficult for local firms to manipulate the factors that affect the formation of industrial cluster. It will not be easy as well for local governors to manipulate the factors that affect the upgrading of industrial cluster. It is very difficult to find common factors consistently affecting innovations and sources of new technologies by MNCs and local firms. According to the results of the estimations, it is almost impossible for a government to achieve both innovation and business linkages for technology transfer simultaneously through a policy instrument, although the creation of business linkages is not a goal of the policy.

If we pay attention to the finding that MNCs and local firms seem to have separate networks, we can get another perspective. Tables 25 and 26 are tabulated results of estimation (3) of both innovation and technology source models, respectively. We can find several combinations of innovation and sources of new technologies with the same signs of marginal effects for a specific D-score. For example, in Table 26, a one-point decrease of D-score for tax incentives increases the possibilities of introduction of new goods, technical cooperation with local business organization, and technology transfer

from local firms by local firms. This means that by defining policy targets by economic entities, it seems possible for governments to design and implement cluster policies more cost effectively and efficiently. However, the policy issue related to linkage between MNCs and local firms to encourage technology transfer from MNCs is remained.

7. CONCLUDIND REMARKS

We examine factors affecting decisionmaking on innovation at the firm level. The pooled data, composed of sub-data sets of Indonesia, Thailand, and Viet Nam, are used for these analyses. Specifically, four categories of industrial upgrading or innovation are defined according to Schumpeter's concept, and access to different sources of new technologies and information necessary for upgrading are regressed on a "D-score," which is a simple difference between these degrees of importance and of satisfaction with factors promoting industrial agglomeration and innovation.

From these analyses, it can be inferred that MNCs tend to transfer technologies to other MNCs but have less technical cooperation or assistance from local governments in comparison with local companies. MNCs that are not satisfied with the local financial system tend to receive technical assistance from foreign agencies including official development assistance (ODA). However, those who have problems with physical infrastructure tend to depend on technical cooperation or assistance from local business organizations that are familiar with the local situation.

Table 25: Results: Multinational Companies (Restricted Sample: Estimation (3))

	Innovation				MNCs	Sources of New Technologies or Information				
								Local		
Sample Restriction	Goods	Method	Market	Input	MNCs	Foreign Agencies	Local Gov.	Business	Local Univ.	Local Firms
Probit Regression (Marginal Effects)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
D1: Tax Incentives										
D2: Liberal Trade Policy			0.105		-0.076	-0.101	0.099			
D3: Customs Procedures		0.101					-0.058	-0.087		-0.129
D4: Local Content	0.091			0.128				-0.205		
D5: Physical Infrastructure								0.120		
D6: ICTs										
D7: Utilities				-0.145	0.046		0.110			
D8: Government Institution	0.081						-0.090			
D9: Financial System		0.201	0.112	0.244		0.138			0.153	
D10: Legal System		-0.146	-0.121	-0.225		-0.126			-0.164	
D11: Protection of IPRs	-0.116	-0.202			-0.098		-0.110			
D12: Size of Local Markets		0.166			0.155					
D13: Access to Export Markets					-0.082			0.133		0.117
D14: Proximity of Suppliers			-0.107	-0.109	0.071					
D15: Request by Large Companies		0.160	0.109		-0.060				-0.085	
D16: Lower Costs of Labor					-0.066					
D17: Skilled Labor	-0.096			0.161						
D18: Synergy	0.088	0.136		-0.103	0.165					
D19: Cutting-Edge Technology										
D20: Living Conditions										
Manufacturing	0.231	0.231		0.439				-0.385		-0.341
Full-time Employees	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	113	113	113	113	108	107	107	106	107	107

Source: ERIA Research Project Mail Survey 2007.

Table 26: Results: Non-multinational/Local Companies (Restricted Sample: Estimation (3))

Sample Restriction	Goods	Method	Market	Input	non-MNCs MNCs	Foreign Agencies	Local Gov.	Local Business	Local Univ.	Local Firms
Probit Regression (Marginal Effects)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
D1: Tax Incentives	-0.045							-0.055		-0.087
D2: Liberal Trade Policy		-0.080								
D3: Customs Procedures						0.056			0.061	
D4: Local Content	0.042	0.093		0.100	0.059	0.060		0.063	0.090	
D5: Physical Infrastructure	-0.038		-0.048						-0.085	
D6: ICTs					-0.087			-0.079		
D7: Utilities								0.064		
D8: Government Institution			-0.065	-0.064		-0.062				
D9: Financial System						0.107				
D10: Legal System										
D11: Protection of IPRs										
D12: Size of Local Markets										
D13: Access to Export Markets		0.098								0.107
D14: Proximity of Suppliers				0.072						
D15: Request by Large Companies										
D16: Lower Costs of Labor										
D17: Skilled Labor			0.049							
D18: Synergy	0.046	0.064					0.079	-0.062		
D19: Cutting-Edge Technology	0.056	0.065						0.068		
D20: Living Conditions	0.051							0.105		0.125
Manufacturing	0.183			0.263						
Full-time Employees	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	200	199	199	199	185	185	185	185	184	185

Source: ERIA Research Project Mail Survey 2007.

On the other hand, local firms that face problems with infrastructure and financial system acquire technologies and information through technical assistance from foreign agencies. However, a well-designed government institutional infrastructure is an important factor for non-MNCs to encourage firms to receive technical assistances from foreign agencies. Technical cooperation or assistance from local universities or R&D institutes is also important for firms unsatisfied with the financial system.

These findings partly reflect the present situation of MNCs and non-MNCs having different networks to obtain new technologies and information. In other words, MNCs are carefully observing the capabilities of local firms before making a decision on whether to establish closer linkage with them.

Another key issue is that we have to show how to extend our approach to characterize counterfactual evidence using the estimated model to estimate the impacts of local public policy related to fostering industrial agglomeration on the emergence of innovation. This will enable us to have comparable characteristics of each industrial cluster and show alternative policy recommendations.

NOTE

[i] In the other models, in addition to the number of full-time employees, the current amounts of total assets and paid-up capital are included as control variables and most of them are not statistically significant.

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7

Industrial Agglomeration, Production Networks, and Foreign Direct Investment Promotion: Cambodia's Experience

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Abstract

The key strategy of the Royal Government of Cambodia (RGC) with its industry policies is to expand the economic linkages between agriculture and industry to improve the industrial sector and to lessen its dependence on the textile industry. The Royal Government continues to provide the necessary physical infrastructure and highly qualified support services to enhance the investment climate, promote transfer of technology, increase professional training, and establish industrial zones. The legal framework is also being strengthened to ensure efficiency and transparency in the implementation of laws and regulations.

The major issues that industries in Cambodia have to contend with are the high compliance costs, weak legal framework, and business environment. Such conditions have produced uncertainties and risks, which have resulted in high barriers to entry, limited access to finance, poor access to market infrastructure and information, and outright lack of market information. All of these hinder manufacturers' access to markets.

The government has developed a plan of action aimed at reducing the cost of doing business in Cambodia, attracting foreign direct investment (FDI), and developing infrastructure and the industrial sector. The garment industry plays a major role in poverty reduction by providing employment and producing export products with a comparative advantage in the international market. However, the industry seriously lacks backward linkages and associated support industries.

Creating linkages is an important way to improve industry competitiveness. It enhances specialization and helps overcome the disadvantages of being small. Developing clusters, business associations, and value chains are key ways for industries to foster business linkages and increase market access.

To promote industrial development, the following measures are recommended:

- Overcome negative issues that existing investors and manufacturers have to contend with;
- Diversify markets by expanding export markets to Japan, Russia, the Middle East, and other Asian countries;
- Enhance the quality of labor with a view to increasing productivity;
- Simplify import-export procedures;
- Establish human resource development (HRD) and develop technical training; and,
- Build linkage-capacity programs (training courses, workshops)

INTRODUCTION

Cambodia's economy has undergone dramatic changes over the past two decades, the most significant of which is the shift from central planning to a market economy. In 1989, private property rights were reintroduced, price control was abolished, state-owned enterprises were privatized, and investments were liberalized. The Paris Peace Agreement in 1991 led to UN-sponsored elections in 1993 and the establishment of the Royal Government of Cambodia (RGC) in September 1993.

From 1994 to 2006, annual growth rate of gross domestic product (GDP) averaged 8.4 percent per annum (World Bank 2007:1). Growth continues to be driven by garment exports, tourism, construction, and agriculture expansion. In the meantime, industrial development faces numerous challenges. Cambodia's industrial base is narrow, relying on a small set of products (mainly garments and footwear) and markets. At the same time, there are significant constraints that hinder private investments, both domestic and

foreign. These include weak infrastructure, lack of transparency and accountability in the legal and regulatory framework, limited financing resources, lack of industrial and managerial skills, and poor support infrastructure (road and port infrastructure, electricity, water and telecommunications).

A joint research case study with the Japan External Trade Organization (JETRO) titled "Analysis of Industrial Agglomeration, Production Networks and FDI Promotion: Developing Practical Strategies for Industrial Clustering in Cambodian Context" offers a clearer insight into the current status of Cambodia's industry and government policies on industrial development. The study also identifies the critical issues and constraints that Cambodia needs to overcome for its further development. The study was based on previous studies of many institutions, including government and private, national and international, as well as individual and collective studies.

This report consists of three sections: (1) policy overview, which examines RGC's industrial policies, regulatory framework for business operations, support infrastructure, incentive policy to promote FDI, trade and customs and investment, and special economic zones; (2) description of the garment industry in terms of its current status of development, productivity, management, and competitiveness; and (3) policy implications and recommendations for an action plan to promote FDI and accelerate industrial development in Cambodia.

1. OVERVIEW OF POLICIES

1.1. Industrial Policies

Cambodia's political situation and the economic condition changed for the worse before November 1993. Operations of nearly all existing factories and enterprises were paralyzed. Production efficiency was affected, and manufacturers produced low-quality, high-priced goods that could not compete with foreign products. Thus, they were forced to close shop and temporarily stop production.

Fortunately, the establishment of the RGC in November 1993 broughtpolitical stability, generating full support from the United Nations and the international community.

This development encouraged the Ministry of Industry, Mines and Energy (MIME) to set up a two-year plan (1994 to 1995) to increase local production which would improve employment opportunities and raise Cambodians' standard of living. Out of the 79 existing factories in Cambodia, 66 state-owned factories have already been privatized.

To meet the objectives of the two-year plan, MIME has endorsed the following well-defined and clear-cut policies:

- Privatize all remaining factories that are unable to apply the autonomy policy
- Enhance the operations, management, and control of the remaining factories and enterprises
- Encourage the development of private industry in the city provinces by providing infrastructure and bureaucratic efficiency especially for industries that:

  a) produce goods for export or import-substitution goods;

  b) provide services that can promote income in foreign exchange;

  c) construct infrastructure, e.g., public facilities, hydroelectric stations;

  d) utilize raw materials and natural resources existing in the country; and

  e) absorb labor

Moreover, the Royal Government has set up the Industrial Development Action Plan,[i] 1998-2003, which focuses on two goals. The first goal is to prioritize the development of export-oriented industry; the second is to prioritize the development of import-substituting production of selected consumer goods. Seven subsidiary objectives have also been identified:

- promotion of labor-intensive industry
- promotion of nature resource-based industry
- promotion of small-scale industry and handicrafts
- promotion of agro-industry
- promotion of technology transfer and upgrading the quality of industrial products
- promotion of the establishment of industrial zones
- promotion of import-substitution of selected consumer goods industries

The outward-oriented industrial development strategy is given first priority for four reasons. First, the small size of the domestic market in terms of population and purchasing power limits the opportunities for efficient production. Second, Cambodia does not have sufficient financial resources or managerial expertise to fully utilize its natural resource base. Third, access to technological innovations that underpin increased efficiency and wider consumer choice can only come from integration with regional and global economies. Fourth, no country has a comparative advantage in producing everything, and all countries can therefore benefit from cooperating and trading with others.

The promotion of labor-intensive manufacturing will continue to focus on the textile and garment sectors where the ready supply of mostly female workers supports cost-competitiveness. However, the Royal Government recognizes that retaining and increasing market share in an increasingly competitive international environment requires upgrading product quality and increasing productivity through improvements in technology and management. It is essential that better industrial relations within the established legal framework are developed and ways of increasing the multiplier effect of garment manufacturing are investigated. Currently, most garment manufacturers operate on cut, manufacture, and tailor basis. They import fabric and accessories (e.g., zippers, buttons, thread) and avail themselves of local services such as transportation and freight clearing, construction, and utility-type services to run and build factories.

The promotion of natural resource-based industry will focus on identifying and exploiting opportunities in processing natural resources, including nonmetallic mineral resources, timber, and fisheries. The development of animal- and fish-breeding facilities may permit their supply as a raw material for reprocessing factories.

With regard to small-scale industries and handicraft production, the Royal Government will prioritize the promotion of traditional arts and crafts for the tourist market in both rural and urban areas. Again, it will be important to ensure sustained product quality. In addition, a microfinance scheme will be set up for small-scale businesses that have little access to credit agencies.

The core strategy for agro-industry development is to grant concessional lands to both domestic and foreign companies on a long-term basis and to encourage contract

growing by smallholders who supply raw materials to a processing factory constructed on-site. The main companies identified include:

- textile factories created for the purpose of dying traditional cloth or silk (to increase the above-mentioned multiplier effect of garment production);

- jute factories based on jute growing near the Tonle Sap River;

- sugar factories in Battambang and Kampong Speu, which raise two to three crops of sugar cane a year. Waste sugar from milling will be used for power generation, fertilizer production, molasses production, and alcohol production;

- palm oil refineries;

- cashew nut-processing factories that draw supplies from concessional and other lands;

- rubber-processing factories (involving incorporation and privatization of state-owned rubber farms and processing factories); and,

- other factories producing tapioca starch, flour, and fruit products (juice, canned fruit, dried fruits).

These agro-industry initiatives require close coordination between the ministries of industry, mines and energy, agriculture, fisheries and forestry as well as the local authorities. These also entail technical assistance in the full assessment of development potential. Strengthening the economic linkage between agriculture and industry within the context of sound environmental management is seen as essential to the creation of income and employment.

The promotion of technology transfer and the upgrading of products will require the Ministry of Industry to design and implement a quality control system for export products that sets internationally accepted standards and includes laboratory control. In addition, the transfer of technology must be encouraged by establishing an appropriate legal and regulatory framework covering copyright, trademarks, and so on.

The creation of industrial zones is aimed at facilitating export development and creating employment by providing the high-quality infrastructure and utilities needed to encourage investment. Zones in suburban Phnom Penh and Sihanoukville would provide transport and communications, power and water, waste management, education and health facilities, and shopping complexes along with minimal customs formalities

and duty-free importation of business inputs.

The promotion of import-substitution of selected consumer goods must be undertaken on the basis of carefully prepared feasibility studies, which establish whether or not there is a genuine prospect of a proposed industry becoming internationally competitive.

Areas proposed for such investigation are the following:

- development of the paper industry through the use of specific domestic raw materials (bamboo in Kratie; paper mulberry in the northeast and northwest; old rubber trees in Kampong Cham; hay, and waste from sugar mills)
- development of chemical industry producing fertilizer, caustic soda, sulphuric acid, and aluminum sulphate
- production of a range of consumer goods, including soap products, toothpaste, paints, plastic ware, and electrical accessories
- development of metal processing starting with the assembly-line production of vehicles, water pumps, motor aggregates, and agricultural equipment. This will eventually evolve into a small and medium enterprise (SME) production of spare parts for bicycles, motorcycles, boats, ferries, and tractors

In general, the government will support broad-based industrial development by:

- encouraging the expansion of the SME sector, especially by providing microfinance schemes;
- improving the performance of state-owned enterprises through incorporation and privatization;
- stemming the flow of illegally imported products;
- reducing barriers to export such as export taxes and inefficient provision of trade facilitation services (e.g., licensing);
- reducing barriers to importation of business inputs;
- providing infant-industry protection in carefully selected cases;
- establishing a national laboratory with technical capacity to undertake physical, chemical, microbiological, and mechanical analyses to help establish product quality and specifications;

- establishing an industrial property rights bureau that would protect new products, designs, and technologies from copyright infringement;
- promoting vocational training locally and overseas;
- upgrading the legal framework in the areas of factory law, industrial zone law, patent and industrial design law, weights and measures, and industrial safety; and,
- encouraging the involvement of private sector organizations in identifying industrial development opportunities and constraints, participating in the policy formulation and monitoring processes, and promoting domestic and foreign private investment.

However, in order to improve the industrial structure, the key strategy of the industry policy of the Royal Government is to expand the economic linkages between agriculture and industry via the promotion of agro-industry as the core industry. This will wean the country from overdependence on the textile subsector (Office of the Council of Ministers 2004:29).

1.1.1. Regulatory Framework Relating to the Business Operation

The RGC has been updating laws and regulations and introducing new laws and regulations in the field of investment, trade, and business. This is being undertaken to improve the business and investment climate in Cambodia in compliance with the regulations of the World Trade Organization (WTO) and to keep the promises Cambodia made upon accession to the WTO.

Such essential laws and regulations as shown in Table 1 were enacted in the last five years.

Table 1: Recently Enacted Laws and Regulations Relevant to Trade and Investment

- Sub-Decree No. 84 on Creation of Anti-Corruption Entity (2006)
- Civil Procedure Code (2006)
- Sub-Decree on Risk Management (2006)
- Law on Commercial Arbitration (2006)
- Law on Management of Factories and Handicrafts (2006)
- Sub-Decree No.148 on the Establishment and Management of the Special Economic Zone (2005)
- Law on Negotiable Instruments and Payment Transactions (2005)
- Sub-Decree No.111 on the Implementation of The Amendment to the Law on Investment (2005)
- Law on Commercial Enterprises (2005)
- Law on WTO Accession (2004)
- Law on the Patents, Utility Model Certificates, and Industrial Design (2003)
- Law on the Copyright and Related Rights (2003)
- Law on the Amendment to the Law on Investment (2003)
- Law on the Amendment to the Law on Investment (2003)
- Law on the Amendment to the Law on Taxation (2003)
- Law on Marks, Trade Names and Acts of Unfair Competition (2002)
- Law on Land (2001)

Source: CDC (2007), p.10.

Nevertheless, there are still some vital laws that have yet to be enacted in the area of business laws. These include, but are not limited to, the following:

- Law on Commercial Contracts
- Law on Secure Transactions
- Law on Insolvency (Bankruptcy)
- Law on Antidumping, Countervailing Duties, and Safeguards
- Customs Code
- Law on Industrial Standards
- Law on Anticorruption

a) Taxation

The assessment of the tax on profit shall be made according to the taxation system of the real regime, simplified regime, or estimated regime. The taxpayers' regime shall be determined according to the form of the company, type of business activities, and the level of turnover (Article 4, Law on Taxation).

b) Labor

Cambodian labor relations, employment and work terms, and other labor-related matters are basically regulated by the Constitution and the 1997 Labor Law. The 1997 Labor Law, which was enacted in March 1997 and which brought significant modification to the socialistic 1992 Labor Law, is quite liberal and considerably protects the rights of laborers and unions.

c) Land

Land Law was first promulgated in 1992 and amended in August 2001 (2001 Land Law). The 2001 Amendment to the Land Law is especially aimed at determining the regime of ownership for immovable properties in Cambodia for the purpose of guaranteeing the rights of ownership and other rights related to immovable properties. It also intends to establish a modern system of land registration that guarantees the rights of people to own land.

d) Environment Protection

In 1996, the Law on Environment Protection and Natural Resource Management (LEPNRM) was enacted, followed by the Sub-Decree on Management of Solid Waste (1999), the Sub-Decree on the Water Pollution Control (1999), and the Sub-Decree on the Control of Air Pollution and Noise Disturbance (2000). Numerical standards for environmental quality are set in each subdecree but they are said to be very strict compared to those in neighboring countries.

e) Intellectual Property Rights (IPR)

Although Cambodia became a member of the World Intellectual Property Organization (WIPO) in 1995 and joined the Paris Convention in 1998, it had a weak regulatory framework for protecting IPR. But since the turn of the century, the Cambodian government has passed a series of laws and crafted a regulatory framework to protect IPRs in the country. It has made progress in protecting IPRs and has so far been able to comply with its WTO obligations. The laws that have been enacted recently include the following:

- Law on Marks, Trade Names, and Acts of Unfair Competition (2002)

- Law on the Copyright and Related Rights (2003)

- Law on the Patents, Utility Model Certificates, and Industrial Design (2003)

Furthermore, the Royal Government is now working on the enactment of the following laws:

- Law on the Protection of Undisclosed Information and Trade Secret

- Law on the Protection of Layout Design of IC

- Law on the Protection of Geographical Indications

- Law on Breeder Rights and Plant Varieties Protection.

f) Dispute Settlement

The Draft Law on Commercial Arbitration, about four-fifths of which was extracted from the Model Law of the United Nations Commission on International Trade Law (UNCITRAL), was adopted in 2003 and enacted into law in May 2006. The purpose of the law is to facilitate the impartial and prompt resolution of economic disputes, to safeguard the legal rights and interests of the parties, and to promote sound economic development.

1.1.2. Infrastructure

a) Electricity

The Electricity Law was promulgated in February 2001 with the view to regulating the power sector. The Electricity Authority of Cambodia (EAC) was established as a legal public entity to act as the regulator and the arbitrator of business activities in the power sector. In Cambodia, electricity is generated and/or distributed by the following entities:

- Electricite Du Cambodge (EDC), a government enterprise
- private entities, including independent power producers (IPP) in the provincial towns
- licensees in smaller towns.
- rural electricity enterprises (REEs) in the rural areas

The electricity supply still does not meet the basic demand for electricity, especially in rural areas where a 24-hour supply of electricity is not assured, and the quality of electricity is not reliable. There can only be reliable supply of electricity when the construction of transmission infrastructure and the Kamchay hydropower plants, which have a capacity of 193.2 MW, are completed. For the meantime, Cambodia will have to rely on the electricity supplied by neighboring countries, mainly Thailand and Viet Nam, and later Laos, to meet its increasing demand for electricity in the future.

During its midterm planning, the RGC came up with a master plan to develop all the potential hydropower plants and diversify the source of energy by establishing bigger coal- and gas-powered plants, which are expected to reduce dependency on expensive oil and the cost of electricity.

b) Telecommunications

Cambodia's Ministry of Posts and Telecommunications (MPTC) is a policymaking and regulating body in the field of telecommunications. The MPTC used to operate a fixed-line network. However, in January 2006, it spun off its telecom operations arm and established a new public enterprise called Telecom Cambodia. It provided its own assets equivalent to US$40.3 million and 700 staff members to provide fixed-line service with the 023 prefix. Telecom Cambodia will be privatized in 2008.

Although the telephone density in Cambodia has tripled in the last five years, the fixed-line subscriber base has been experiencing slow growth. Cambodia is the first country in the world where the number of mobile phone subscribers exceeds the number of fixed-line subscribers. This is simply because there is a continuous shortage in fixed-line telephone service.

c) Water Resource

The Ministry of Water Resources and Meteorology is responsible for developing and managing water resources in Cambodia. In Phnom Penh, the Phnom Penh Water Supply Authority (PPWSA), a public enterprise, is responsible for providing water since 1996. Its network expands to some 320 km but needs rehabilitation work. In other parts of the country, the Ministry of Water Resources and Meteorology is primarily

responsible for urban water supply but in many cases, it provides private companies with a license to supply water on a commercial basis. In Sihanoukville, the Sihanoukville Water Supply Authority supplies water to the city, but in rural areas, people mostly depend on groundwater, river water, and/or rainwater.

Although Cambodia's annual average precipitation is around 4,000 mm, the difference between the rainy season and the dry season is big. On top of that, the irrigation system is incomplete, which makes it difficult to secure stable water supply for agriculture.

d) Aviation

The number of airlines flying into Cambodia has steadily increased in recent years, thanks to the government's open air policy. Nonstop international flights to nine destinations in eight countries/regions are currently being operated at the Phnom Penh International Airport. Siem Reap Airport also operates some international flights.

These two major operating airports are managed and operated by Cambodia Airport Services Ltd. (CAMS), a France-Malaysian joint-venture company, on behalf of another French-Malaysian joint venture named SCA. The latter is a concessionary company that invested in a 25-year Build-Operate-Transfer (BOT) project to develop the Phnom Penh International Airport.

e) Roads

The road network in Cambodia covers a total area of approximately 30,268 km. This consists of 4,695 km of national roads, 6,615 km of provincial roads, and about 18,958 km of rural roads. There is currently no divided expressway in Cambodia although there are plans to construct three international highways that will traverse the country: the Asian Highway, the ASEAN (Association of Southeast Asian Nations) Highway, and the Great Mekong Subregion Roads. Twenty percent of the total length of these three highways will be asphalt or cement-paved two-lane roads. About half of the total length will be narrow double bituminous coal-paved two-lane roads, and the remaining 30 percent will be on inferior quality.

f) Railways

Cambodia has two railway systems in operation, namely, the Northern Line (386 km) and the Southern Line (264 km), both of which start from Phnom Penh. The trains carry mainly fuel for generators, cement, and rice on their inbound service to Phnom Penh and wood and stones on their outbound service to Sihanoukville.

To improve the railway systems, the Asian Development Bank (ADB) is now implementing a $20-million project called the "Study for the Rehabilitation of the Railway in Cambodia." This project will upgrade the railway system within three years, increasing the maximum service speed to 50 kilometers per hour (kph).

g) Seaport

There is only one deep-water port in Cambodia, which is in Sihanoukville. Phase I expansion of the port's container yard, which measures 240 m, is already completed. It is now implementing the second-phase expansion of its 160 m berth. Statistics from the Port Authority of Sihanoukville (PAS) show that the throughput volume of containers at the port increased continuously from 2001 to 2005.

Due to the open-sea policies of the Cambodian government, another small port was opened at the nearby Sihanoukville Port. This small port absorbs a considerable volume of cargo delivered by smaller vessels. It also offers lower port charges, easier customs clearance, and lower duties because unofficial fees occasionally substitute for duties.

Figure: 1 Volume of Container Throughput in Sihanoukville Port (TEU)
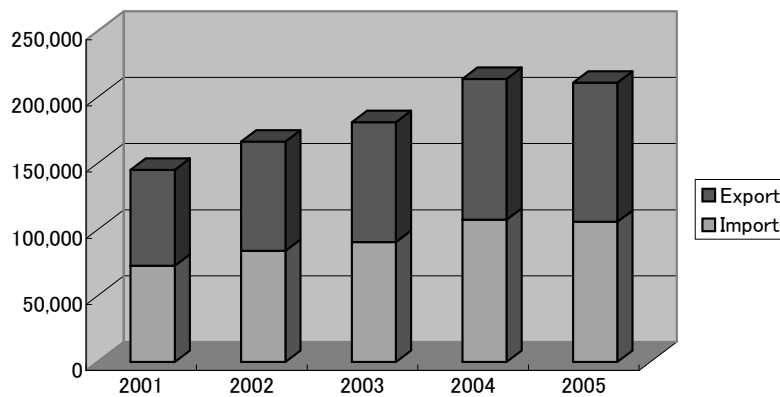
Source: CDC (2007): p.28.

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Information from the PAS) show that the current maritime routes connect Sihanoukville Port with the United States, the European Union (EU), China, Hong Kong, Indonesia, Japan, Malaysia, the Philippines, Singapore, South Korea, Thailand, and Viet Nam, although much of the cargo carried on these routes is transshipped in Singapore.

(h) Inland Water Transportation

The Cambodian inland water network consists mainly of the Mekong River, Tonle Sap River, and Bassac River. The total length of this water network is approximately 1,750 km during the rainy season and may decrease to 580 km during the dry season when navigation is limited.

There are seven major river ports in Cambodia:

- Phnom Penh Port

- Kampong Cham Port, on the mainstream of the Mekong 105 km up from Phnom Penh

- Kratie Port, on the mainstream of the Mekong 115 km up from Kampong Chham Port

- Stung Treng Port, on the mainstream of the Mekong 150 km up from Kratie Port

- Neak Loeang Port, on the mainstream of the Mekong 60 km down from Phnom Penh Port

- Kampong Chnang Port, on Tonle Sap River 90 km up from Phnom Penh

- Chong Khneas (Siem Reap) Port, on Tonle Sap River

1.1.3. Institutional Capacity

Many institutions in Cambodia were barely functioning when the government began its first mandate in 1993. Although Cambodia has made important progress in rebuilding institutions, the country continues to operate far below its economic and

social potential due to weak governance (World Bank 2005:6). Key areas of governance requiring reforms include addressing corruption, the legal and judicial system, public financial management, public administration, and local governance. The government is well aware of these challenges and has proposed reforms in key policy documents. Such reforms include the Government Action Plan (GAP), the Socioeconomic Development Plan (SEDP) II, the National Poverty Reduction Strategy (NPRS), and the Rectangular Strategy (RS).

However, despite much effort devoted to policy formulation, the implementation of reforms has been slow. There is also a need for an enhanced participation of ordinary citizens in public decision making so as to improve accountability and reduce corruption.

1.2. Trade and Customs and Investment

1.2.1. Trade and Customs

To simplify and improve trade-related procedures, the Trade Facilitation Program is now being implemented. The core of the program consists of the implementation of the Single Administrative Document (SAD) based on Automated System for Customs Data (ASYCUDA), a comprehensive electronic customs clearance system, and the Risk Management System for trade-related applications, customs clearance, and audits. For this purpose, a Sub-Decree on Risk Management and Ministerial Order #607 (MEF) on Establishment and Putting into Operation the Office of Risk Management and Audit of Customs and Excise were issued in 2006. The Law on Customs and the Law on the Rule of Origin are also due to be enacted soon.

a) Export and Import Procedures

The Ministry of Commerce grants export approval and the permission for duty-free imports for Qualified Investment Projects. These processes are administered by the Cambodian Investment Board (CIB) of the Council for Development of Cambodia (CDC). No license is required for the usual imports.

Inspection of exports and imports is carried out by the Customs and Excise Department (CED) of MEF and the Cambodia Import Export Inspection and Fraud Repression Department (CAMCONTROL) of the Ministry of Commerce (MOC).

Inspections are conducted at the factory and the export port for exports and the import port for imports. At present, all inbound and outbound cargo are examined in Cambodia. The Royal Government's plan was to reduce the ratio to 50 percent by the end of 2006 and to 25 percent by the end of 2007. By the end of 2010, the Royal Government expects to have this ratio reduced to 5 percent. A nonintrusive examination method using X-ray detection equipment will be installed in customs areas at Sihanoukville Harbor.

Preshipment inspection (PSI) is required for imports of goods with a value of $5,000 or more in the original exporting country. PSI was introduced in October 2000 by virtue of Prakas (Ministerial Order) of MEF No. 500 on the Implementation of the Preshipment Inspection Service with the aim of implementing the rational valuation of duties and taxes on imported commodities. BV（Bureau Veritas）now carries out the inspection.

More than 20 kinds of documents are currently required and two days to one week are needed to complete the export and import processes. However, with the introduction of a single-window mechanism in which only a SAD will be used, the Royal Government expects to reduce the number of documents and days required to only one.

b) Export Privileges as a Least Developed Country

Cambodia has been granted Most Favored Nation (MFN) status by the U.S., the EU, and other developed countries. As a least developed country (LDC), Cambodia approved and put in effect in February 2001 a tariff- and quota-free access under the Everything-But-Arms Initiative (EBA), which is part of the EU's Generalized System of Preferences (GSP) program for LDCs. Cambodia is also entitled to privileges under the U.S. and Japan GSP programs.

c) Local Content for Exports and the Rules of Origin (ROO)

There is currently no local content requirement in Cambodia. That means there is no restriction on the use of imported materials, parts, and components unless they are harmful to the health, the environment, or society. However, Cambodian exporters should take into account the rules of origin requirements (ROO) for the GSP, including the EBA scheme for exports to the EU market. The EBA provides special arrangement

for LDCs, including Cambodia. Practically all products (except arms and ammunition) covered by the EBA are granted duty-free access (zero duty rate) to the EU market if they fulfill the ROO requirements.

d) Incentives, Limitations, and Taxation on Exports

Under the Amended Law on Investment, Export Qualified Investment Projects (Export QIPs) can import production equipment, construction materials, and production materials free from customs duty, unless Export QIPs operate under the customs bonded warehouse mechanism. Export QIPs are also granted a tax holiday or special depreciation scheme. For exports, value-added tax (VAT) is refunded or credited to the materials for exported products.

Several items are prohibited or strictly restricted for export. These include antiques, narcotics, toxic materials, logs, precious metals and stones, and weapons. An export tax of 10 percent is required for products such as semiprocessed or processed woods, rubber, raw or processed leather, fish (fresh, chilled, or fillet), and live animals.

e) Duty-exempt Imports

Qualified Investment Projects (QIPs) under the Amended Law on Investment are granted the privilege to import production equipment, construction materials, raw materials, intermediate goods and/or production input accessories free of duty, depending on the category under which the project is classified. In order to obtain approval for duty-free importation for the production of raw materials, the importing companies have to submit annually to the Cambodian Investment Board (CIB) a master list containing the volume, kinds, and value of the imported materials. The processing time for an import application or the amendment of an import plan is around three working days.

f) General Tariff Rates

Import duties are levied on all imported goods at the point of entry in Cambodia, unless the imported goods are subject to duties exemption treatment under the Law on Investment or other special regulations. Tariffs on imports to Cambodia principally consist of the following four rates: 0 percent, 7 percent, 15 percent, and 35 percent.

g) Preferential Tariff Rates under the AFTA

Under the Common Effective Preferential Tariff (CEPT) scheme for the ASEAN Free Trade Agreement (AFTA), lower tariff rates can be applied to imported products from other ASEAN countries.

h) Free Trade Agreements of the ASEAN

As a member of the ASEAN, Cambodia is, and will continue to be, subject to tariff reductions set in the free trade agreements (FTAs) between the ASEAN and other countries. As of June 2006, two FTAs (with China and South Korea) took effect. Three more FTAs are under negotiation and will bring about trade liberalization.

i) Improvement on Customs Control

The World Customs Organization (WCO) adopted a Protocol of Amendment (Revised Kyoto Convention) in June 1999, which was enforced on February 3, 2006. The key governing principle of the Revised Kyoto Convention is the commitment by Customs administrations to provide transparency and predictability for all those involved in international trade. To realize simple, efficient, transparent, and predictable customs administration, the Revised Kyoto Convention adopted such principles as follows:

- Apply minimum controls necessary to ensure compliance. Customs control shall be limited to that necessary to ensure compliance with the Customs law; and,

- Use risk management in the application of Customs control.

1.2.2. Foreign Direct Investment
    a) Policies toward FDI

As stated in the Second Socio-Economic Development Plan 2001-2005, the RGC regards foreign direct investment (FDI) as a major engine for economic growth. From the viewpoint of Cambodia's legal framework, laws and regulations governing FDI in the country are basically designed to encourage investments. As the Law on Investment

stipulates, FDIs are treated in a nondiscriminatory manner except for land ownership. Also, investments are allowed in many areas. Under the current Law on Investment, the investors who are given Final Registration Certificates are entitled to various incentives.

The Royal Government has been improving investment facilitation services. For example, it decided in 2005 to establish the Cambodian Special Economic Zone Board (CSEZB) under the Council for the Development of Cambodia (CDC) to promote the special economic zone (SEZ) scheme. Administered by the CSEZB, the Special Economic Zone Administration will be established in authorized SEZs and provide one-stop services (OSS) to zone investors, from the registration of investment projects to routine export-import approvals.

b) Regulatory Framework for Investment

In Cambodia, FDIs can be freely implemented, except in areas prohibited to or restricted for foreign investors. In this case, foreign investors have to register with the Ministry of Commerce and obtain relevant operating permits. However, if foreign investors seek investment incentives, they have to apply for investment registration, which can be obtained through the CDC or the Provincial-Municipal Investment Sub-Committee (PMIS). The application for the investment registration can be made either before or after the incorporation (or a registration within the Ministry of Commerce).

The investment license scheme was originally regulated by the Law on Investment, which was promulgated in August 1994. In March 2003, in order to make the licensing schemes simpler and more transparent, predictable, automatic, and nondiscretional, the original Law on Investment was amended by the Law on the Amendment to the Law on Investment. In addition, the Sub-Decree on the Establishment of the Sub-Committee on Investment of the Provinces-Municipalities of the Kingdom of Cambodia was issued in February 2005 to regulate the licensing scheme for investments of less than US$2 million. The Sub-Decree No. 111 on the Implementation of the Law on the Amendment to the Law on Investment was also issued in September 2005.

c) Outline of Investment Licensing Scheme
- The Law on the Amendment to the Law on Investment of 2003 was made in order to facilitate the automatic approval system of investment projects.

Approval must be completed within 31 working days of the CDC's or PMIS' receipt of the investment application, unless the projects fall under the list of prohibited projects or those that may compromise national interest or are environmentally sensitive in nature.

- An investment license or approval will be issued not to an investor or investing enterprise but to a project. A project that receives the investment license is called a Qualified Investment Project or QIP.

- The Law on the Amendment to the Law on Investment of 2003 governs all Qualified Investment Projects (QIPs) and defines the procedures by which any person establishes a QIP.

- Investment incentives are granted automatically.

- The CDC is expected to serve as a one-stop shop and obtain all the necessary licenses required from relevant ministries listed in the conditional registration certificate (CRC) for investment on behalf of the investment applicant.

- A QIP may be in the form of a joint venture. A joint venture may be formed between Cambodian entities, between Cambodian entities and foreign entities, or between foreign entities. There is no limitation based on nationality or the shareholding proportion of each shareholder, except if a joint venture owns or intends to own land or an interest in land in Cambodia. In such case, the maximum combined shareholding of all foreign parties must not exceed 49 percent.

d) Responsible Organization

The CDC is the sole and one-stop service organization responsible for the rehabilitation, development, and oversight of investment activities. It is responsible for the evaluation of, and all decision making related to, rehabilitation, development, and investment project activities.

However, the CDC shall seek the approval of the Council of Ministers (COM) for any of the following types of investment projects:

- Projects with a capital investment of $US50 million and above
- Projects involving politically sensitive issues

- Projects involving the exploration and exploitation of mineral and natural resources
- Projects with a possible negative impact on the environment
- Project with a long-term development strategy
- Infrastructure projects such as Build-Own-Transfer (BOT), Build-Own-Operate-Transfer (BOOT), Build-Own-Operate (BOO), or Build-Lease-Transfer (BLT) projects

e) Qualified Investment Projects

To be admitted as a QIP, the investor has to register the investment project with the CDC or PMIS and receive a Final Registration Certificate (FRC) under the Law on Investment.

 f) Investment Incentive

1) Investment Incentives Granted to QIPs

QIPs are entitled to the following investment incentives:

- Profit tax exemption or special depreciation. QIPs may choose to receive one of these two incentives.
- Profit tax exemption (selective). A tax holiday period is composed of a "Trigger Period" + three years + Priority Period
  - Maximum Trigger Period is either the first year of profit or three years after the QIP has earned its first revenue, whichever is sooner
  - Priority Period will be determined by the Financial Management Law
- Profit tax exemption. To get this incentive, the QIP has to obtain an annual Certificate of Obligation Satisfaction.
- A QIP shall be subject to a profit tax rate after its tax exemption period, as determined in the Law on Taxation.
- Special depreciation (Selective): 40 percent special depreciation allowance on the value of new or used tangible properties used in production or processing
- Duty-free importation of production equipment, construction materials, etc.
- A QIP located in a designated SPZ or export processing zone (EPZ) is entitled

to the same incentives and privileges granted to other QIPs as stipulated in the Amendment to the LOI.

- A QIP shall be entitled to 100 percent exemption from export tax, except for activities stipulated in laws in effect

- The rights, privileges, and entitlements of a QIP can be transferred or assigned to a person who has acquired or merged a QIP subject, with the approval of the CDC or PMIS.

2) Projects Eligible for Incentives

The minimum amount and other conditions of investment in various fields, which are required for the provision of the incentives, are listed in Table 2.

Table 2: Minimum Conditions Required for the Provision of Incentives

Field of Investment	Requirement for Investment (in US Dollars)
Support industry, which has its entire production (100%) supplied to export industry	$100,000 or more
Production of animal feeds	$200,000 or more
Production of leather products and related products Production of all kinds of metal products Production of electrical and electronic appliances and office materials Production of toys and sporting goods Production of motor vehicles, parts, and accessories Production of ceramic products	$300,000 or more
Production of food products and beverages Production of products for textile industry Production of garments, textiles, footwear, and hats Production of furniture and fixtures that do not use natural wood Production of paper and paper products Production of rubber products and plastic product Clean water supplies Production of traditional medicines Freezing and processing of aquatic products for export Processing of any kind of cereals and crop products for export	$500, 000 or more
Production of chemicals, cement, fertilizer, and petrochemicals Production of modern medicines	$1,000,000 or more
Construction of modern market or trade center	$2,000,000 or more More than 10,000 square meters Adequate space for car park
Training and educational institutes that provide training for skill development, technology, or polytechnology that serves industries, agriculture, tourism, infrastructure, environment, engineering, sciences, and other services	$4,000,000 or more
International trade exhibition center and convention halls	$8,000,000 or more

Source: CDC (2007), p.32.

1.3. The Special Economic Zones

1.3.1. Legal Frame for the Special Economic Zone (SEZ) Scheme

Scrutiny of the concept of having economically promoted zones/areas in Cambodia started back in the 1960s. The SEZ scheme finally introduced for the first time in December 2005 (CDC 2007:34). Sub-Decree No.147 on the Organization and Functioning of the CDC was issued on December 29, 2005 to restructure the organization of the CDC. A new wing of the CDC, called the Cambodian Special Economic Zone Board (CSEZB), was set up to manage the SEZ scheme. To govern the SEZ scheme, Sub-Decree No. 148 on the Establishment and Management of the Special Economic Zone (The SEZ Sub-Decree) was issued on December 29, 2005.

1.3.2. Basic Concept and Conditions for the SEZ

The basic concept and conditions for the SEZ are defined in the SEZ Sub-decree.

- SEZ refers to a special area for the development of the economic sectors, which brings together all industrial and other related activities and may include General Industrial Zones and/or Export Processing Zones. Each SEZ shall have a production area which may include Free Trade Area, Service Area, Residential Area, and Tourist Area.

- It must occupy a lot measuring more than 50 hectares, with precise location and geographic boundaries.

- It must have a surrounding fence (for Export Processing Zone, the Free Trade Area, and for the premises of each investor in each zone).

- It must have a management office building and zone administration offices. All the necessary infrastructure must be provided.

- It must have water sewage network, wastewater treatment network, location for storage and management of solid waste, environment-protection measures, and other related infrastructures as deemed necessary.

1.3.3. Approved and Planned SEZs

The Cambodian government has so far officially approved six SEZs (Stung Hao, Manhattan, Chhay Chhay O'Neang, Doung Chhiv Phnom Den, Phnom Penh, and

Sihanoukville) by the SEZ Sub-Decree. Five other SEZs have been licensed by the CSEZB. Tai Seng Bavet SEZ, Oknha Mong SEZ, and Goldfame Pak Shun SEZ have also applied for CSEZB approval.

Among the SEZs, the Phnom Penh SEZ began project implementation on July 6, 2006. The first phase of the project was expected to be completed by the end of 2007. Although the Manhattan SEZ has not received the SEZ Sub-Decree, it already has three investors operating in the zone. Sub-Decree # 135 on the Establishment of MANHATTAN (Svay Rieng) Special Economic Zone was issued on November 29, 2006.

2. CURRENT SITUATION OF THE GARMENT INDUSTRY AS SELECTED INDUSTRY

2.1. General Overview

The private sector accounts for 90 percent of employment in Cambodia. The agricultural sector has the largest share of this percentage, providing 70 percent of total employment. It is followed by the services sector at 15 percent and the industrial sector at 8 percent. However, the agricultural sector accounts for only 35 percent of total GDP, while the services sector and the industrial sector account for 35 percent and 20 percent, respectively.

The Cambodian economy has demonstrated a comparative advantage in the production of labor-intensive goods for export, and there is a big potential for further growth. The pool of relatively cheap, unskilled labor will continue to grow rapidly, underpinning the country's wage cost advantage. In the case of the textile and garments industry, there are opportunities to diversify into nonquota markets, and for the promotion of upstream activities such as textile production. Other labor-intensive activities, such as toy and footwear production and the assembly of consumer and industrial electrical and electronic products, are also potential growth areas. In the agro-processing sector, there may also be opportunities for developing rubber products and furniture. Likewise, there may be opportunities for import-substitution, although experience has shown that caution must be exercised in order to avoid the development

of chronically inefficient, and therefore costly, production.

There are about 27,000 small companies with less than 50 employees in the industrial sector; in the medium and large enterprises, about 300. Approximately 80 percent of large companies are into the textile and apparel business.

2.2. Garment Industry

Cambodia's garment industry, the country's largest industry, accounts for almost 80 percent of Cambodia's total exports. It was the leading export revenue earner in 2006, generating a total of US$2.5 billion in garment exports and employing 330,000 workers in the same year. Majority of these workers are poor women from the rural areas who support extended families.

In total, about 1.7 million people depend on the garment industry directly and indirectly.[ii] According to the report "Export Diversification and Value Addition for Human Development" published by the Economic Institute of Cambodia (EIC) in June 2007, garment industry workers receive an average of $73 per month, 29 percent of which comes from overtime work.

The garment sector is crucial to Cambodia's economy. However, increasing global competition makes the industry vulnerable. A variety of approaches are needed to help the industry sustain itself.

The garment-manufacturing industry covers a broad range of products, including clothing, footwear, socks, gloves, hats and caps, pillow cases, cushions, towels, bed sheets, curtains, hand towels, tents, bags, carpets, and fishing nets. Cambodia does not have state-owned garment companies, and indigenous garment makers cannot produce the required volume for export. Thus, the operations of wholly owned subsidiaries of foreign companies were allowed, which resulted in foreign companies producing and exporting garment products.

2.2.1. Firms' Location

The list of firms maintained by the CDC and Garment Manufacturers Association in Cambodia (GMAC) shows that most of the export-oriented garment companies are located in Phnom Penh Municipality and Kandal Province. Companies located in other areas, such as Sihanoukville, account for not more than 10 percent of the total. A

significant concentration of export-oriented garment firms can be found in four subregions in Phnom Penh Municipality-Kandal Province area: the area along Road No. 5, the Toulkkork area and along Road No. 4, the Steung Mean Chey area and along Veng Sreng Street, and the area along Road No.2. Almost an equal number of firms are located in each of the four subregions.

2.2.2. Management

Most of the top managers in export-oriented garment companies in Cambodia are foreign nationals. The Chinese nationals account for the largest number of top managers. Thirty percent of top managers are from mainland China, while 15 percent and 21 percent are from Hong Kong and Taiwan, respectively. The rest are from South Korea, Singapore, Malaysia, and the United States, in that order. Only 8 percent of top managers are Cambodians (Yamagata 2006:8).

More than 90 percent of top managers obtained education beyond high school. More than a quarter obtained a master's degree, including Masters in Business Administration.

As to work experience, more than a quarter of these top managers have worked for textile-related firms, but majority of them have not worked for any other firms before.

Majority of these foreign-owned companies have contributed substantially to Cambodia's export-oriented garment industry. Foreign garment makers in Cambodia maximize profits through the mass production of low-margin basic items, against the backdrop of abundant, cheap labor. Since small-lot orders are not conducive to profit maximization despite the fact that they require more work, foreign garment makers in Cambodia do not aim for small-lot production of high-margin luxury items.

The degree of technological advancement and managerial sophistication among garment companies in Cambodia varies widely. Although some companies have shown technical improvements, majority of garment factories still require both technical and managerial training.

2.2.3. Production

A major feature of the export-oriented garment industry in Cambodia is that most companies do not produce fabrics but instead specialize in producing garments using

imported fabrics. Most companies only sew fabrics and produce finished products.

Such feature contrasts markedly with outstanding garment exporters in other LDCs. In order to receive a preferential tariff exemption from the EU in accordance with the GSP, garment exporters in other LDCs have been adopting vertical integration since the middle of the 1990s. Although a similar system has been applied to Cambodia as an LDC and considering that knitwear is a major category of garment export, Cambodia has not undertaken the same action that other LDCs have.

Cambodia's garment makers focus mainly on knitted products. These do not require large investments, and shipping cost is low due to their light weight. Additionally, production efficiency in knitted products can improve quickly, even though production does not require high-level skills. Generally, the production efficiency of knitted products is approximately 10 percent higher than that of woven-fabric products. In 2005, exports of woven-fabric products accounted for a mere 30 percent of garment exports.

Cambodia's garment products are classified into three categories: outer garments (uniforms, training wear, jackets, blouses, trousers, and skirts), middle garments (pajamas, T-shirts, white shirts, and sweaters), and undergarments (underwear). The country started with the manufacture of undergarments, which are easy to produce and and for which quality standards are not very rigorous. It has gradually been shifting to middle garments and outer garments. However, as Cambodia has not acquired sufficient skills for the manufacture of business wear, factories have focused their specialization in the manufacture of undergarments and middle garments.

Cambodia is highly dependent on imports for all of its raw materials, accessories, and auxiliary material needs, because of the absence of the upstream sector (which produces yarn and fabrics) and supporting industries (which produce accessories and auxiliary materials) within the country. As a result, although production in Cambodia has the benefit of comparative low wages, the shipping cost of imported materials, accessories, and auxiliary materials is a demerit. Taking these factors into consideration, the garment industry can only rely on production efficiency for its profits.

Due to the difficulty in purchasing materials and inability to respond quickly to market needs, operations in Cambodia are devoted primarily to sewing commissions for U.S. brand items. As a result, there are not very many businesses operating under the

develop-and-export scheme, under which companies purchase materials at their discretion, develop markets for their own brands, and offer diverse fashions of their own.

2.2.4. Employment and Wages

The export-oriented garment companies in Cambodia tend to specialize in the final production process of apparel. The composition of the workforce reflects this tendency, with most of the total workforce in garment firms allocated to the garment section where garments are made from imported fabrics, or sweaters and socks are knitted from imported yarn. There are relatively fewer workers engaged in other production sections such as knitting, weaving, dying, and finishing.

A significant feature of the export-oriented garment industry in Cambodia is the very high ratio of female workers employed. This high reliance on female labor reflects the same situation the garment industry in other Southeast Asian countries had been into two or three decades ago. The development of the industry empowers women economically by providing them with large-scale employment opportunities that also pay remarkably high wages. One notable concern is the high number of female supervisors. To a certain extent, this is due to the immigration of Chinese female supervisors from subsidiaries located in other countries. Many supervisors are female Chinese who have had long experience in the garment industry before they came to Cambodia. Thus the large number of Chinese female supervisors offers a slim chance for the Cambodian female operators and quality controllers to be readily promoted to supervisory positions.

In general, garment workers in Cambodia earn relatively high wages. The average wages are far higher than those of garment workers in Bangladesh, where per capita income is higher than Cambodia's. The wage rate for an entry-level garment worker is around twice as high as that in Bangladesh.

Entry barriers in terms of educational attainment for people seeking employment in garment companies are not high. Employers do not require a high level of education from factory-floor garment workers.

In sum, female workers in Cambodia can get a high-paying job in a garment factory even without a high level of education.

(a) Technology and Human Resource Training

Technical training is lacking at all personnel levels: senior managers, middle managers, technicians, supervisors, sewing operators, cutting-room personnel, and pressing, folding, and packing operators. Although sewing machine mechanics usually receive some basic training, this training needs to be supplemented to ensure effectiveness and competitiveness.

Some local training options already exist. For example, there is the Cambodia Garment Training Center, which is operated by GMAC. Small, private training institutes for basic sewing skills are also in place. However, these training centers have been ineffective in attracting middle management trainees or turning out industrially competent supervisors and operators.

Supervisors, the first level of management, ensure that a production plan is successfully executed. They are, therefore, at the nucleus of a company's success. Supervisors are responsible for making things happen and seeing to it that things are done correctly in terms of quality, cost, and timeliness. Very few companies have trained their supervisors. Rather, it is the section and line supervisors and experienced operators with little formal education that are usually trusted.

In the middle management level, Cambodian factories lack trained administrators, production planners, and method engineers. Accurate costing, good planning and programming, and realistic time standards are key to any productive garment business. Few companies have an industrial engineer. Industrial engineering is vital to the progress of the Cambodian garment industry.

2.2.5. Productivity and Price Competitiveness

From 1995 to 2003, productivity of Cambodia's garment industry significantly increased. On average, the productivity of worker in US dollars rose by 14 percent per year during these periods.

a) Efficiency and Competitiveness for the Production of Major Garment Items by Country

Category 341 (W/G Cotton Blouse) is one of the most exported Cambodian products to U.S. markets. Thus, it is beneficial to analyze the comparison of Cambodian

and other countries' cotton blouses in the U.S. market in terms of cost competitiveness. It should be noticed that comparing by purchasing prices in consuming countries is more significant than comparing by FOB (free-on-board) price in producing countries, because it is important to compare the competitiveness in the end retail market of export destination for evaluating export competitiveness. From this viewpoint, the FOB prices in Cambodia are strongly competitive compared to those in other countries. However, the purchasing prices of U.S. retailers for Cambodian goods are not significantly competitive, compared to the prices given to same items exported by other countries (JICA 2007:5-17).

Table 3: Cost Competitiveness of Imported W/G Cotton Blouse in US Market in 2005 (US$/piece)

Exporting Country	Cambodia	Thailand	China	Viet Nam	Myanmar
Raw materials (including transportation)	2.7	2.2	2	2.5	2.7
Labor cost	0.6	1.4	1.3	0.8	0.3
Subtotal	3.3	3.6	3.3	3.3	3
Power charges	0.5	0.3	0.3	0.3	0.4
Depreciation	0.4	0.5	0.5	0.5	0.4
Overhead cost	0.4	0.7	0.6	0.6	0.4
Total production costs	4.7	5.1	4.7	4.7	4.2
Profits	0.3	0.5	0.4	0.5	0.3
FOB price	4.9	5.6	5.1	5.2	4.5
Shipping cost	2.7	2.2	2.1	2.2	2.6
Import tariff	0.2	0.4	0.4	0.4	0.4
Purchasing price	7.8	8.2	7.6	7.8	7.5
Sales price	15	15	15	15	15
Profit on sales	7.2	6.8	7.4	7.2	7.4

Source: Compiled by JICA Study Team from various sources

The average FOB prices between Cambodian and Chinese products are more or less the same, having a difference of only 20 cents. However, there is a significant difference in the FOB prices of Cambodian products and those from other countries such as Thailand and Myanmar. Such difference is mainly due to the costs associated with raw material imports and labor costs, which take up a major portion of production costs. Raw material costs take up about 60 percent of FOB price in Cambodia as these raw materials are imported from various countries, especially China, Taiwan, Korea, Indonesia, Malaysia, etc. In comparison, the inexpensive raw materials used by Chinese garment manufacturers, which take up only 40 percent of FOB price, are locally

available in China since domestic backward linkage is already developed in this country.

Power charges, unless the air-conditioning units are turned off, take up only 3 percent of FOB price.

Looking at the labor cost in order to analyze productivity (see Table 4), it will be noted that Cambodia's monthly average labor cost is lower than Viet Nam's, China's, and Thailand's. However, the average productivity of Cambodian workers is lower than that of Viet Nam, Thailand, and China, leading to a situation where labor cost per piece does not make much difference with that of Viet Nam, after the inexpensive labor cost in Cambodia has been taken into consideration. However, the largest problem for foreign-invested companies is that jobs in garment companies in Viet Nam, China, and Thailand do not appeal to skilled workers anymore. As such, in the medium to long term, Cambodia has the potential for development because its garment industry only has a small labor-force bottleneck (JICA 2007:5-18).

Table 4: Labor Cost Performance Comparison of One-Piece W/G Cotton Blouse in 2005

	Myanmar	Viet Nam	Thailand	China (Shanghai)	Cambodia
Production Pieces/ Per one person day (one day=9 hours)	6 pieces	9 pieces	9 pieces	10 pieces	7 pieces
Labor Cost/ month (in US dollars)	$35	$100	$200	$180	$70
Labor Cost Performance (in US dollars; labor cost/piece)	$0.23	$0.44	$0.88	$0.72	$0.40

Source: Compiled by JICA Study Team from data from various factories

(b) An Analysis of Select Items in which Cambodia has Export Competitiveness

The selection of the items which are suitable for production in Cambodia is a critical prerequisite for the development of projects, as it is impossible for Japanese garment makers to make a business plan (sewing-on-commission, develop and export, investment projects, etc.) unless items suitable for production are identified. Companies will start operations in Cambodia only if such selection has been done.

Cambodian factories can also address competitiveness through management decisions. However, they must do this without lowering wages, restricting benefits, or

negatively affecting the working environment. Any of these three may result to worker strikes and reduced product quality as well as deter foreign investments.

The central challenge to Cambodian producers' continued success and competitiveness is to remain socially responsible manufacturers while improving productivity and efficiency. In the postquota environment, however, filling the social responsibility niche cannot compensate for lack of competitiveness on other fronts. To remain in the pool of acceptable suppliers, Cambodian factories must remain competitive and work with authorities to address red tape and corruption. Toward this end, Cambodia is committed to improving the investment climate by introducing streamlined trade facilitation procedures.

2.2.6. Garment Export

All garment products are exported. Most favored destinations are the U.S., which buys roughly two-thirds of Cambodia's exports and the EU, which buys most of the rest.

Cambodia began exporting garments in 1995. As the country has kept its promise to the U.S. to abide by the standards of the International Labor Organization (ILO), it has enjoyed one of the highest export growth rates in the world in the past 10 years. Its technical skills, though, may not be as advanced as Viet Nam's and Bangladesh's. This has allowed the good performance of the knitwear garment industry over the years because the machines required are less expensive and the process employed is simpler than that used in woven garments.

The 1999 U.S.-Cambodia Bilateral Textile Agreement links quota access in the U.S. market to factories' compliance with international labor standards, as monitored by the ILO. Cambodia has earned a reputation among buyers as having a socially responsible manufacturing platform, an ideal setup for sourcing garments.

Cambodia's textile exports grew rapidly from 1990 to 2005 due mainly to Cambodia's MFN and GSP status offered by the U.S. and the E.C. Along with that, ministries and institutions took measures to streamline trade facilitation processes, including overlaps in papers requirements and inspections carried out by authorities; reduced clearing times; increased official revenues; and automated some processes.

However, Cambodia's exports in terms of value and quantity remain small compared to the other countries in the region, except Laos. Moreover, Cambodian

workers contribute only a small fraction of value-added taxes, as most of the inputs used to produce garment products are imported. Cambodia imports almost everything, including semifinished products (panels) that simply need stitching together before being re-exported.

2.2.7. Investment Climate

In order to promote textile manufacturing (including weaving and the manufacture of other garment products) and footwear exports, export-oriented companies are given incentives. These include an annual duty exemption on the importation of machineries and inputs, such as raw materials and accessories directly used in production.

The garment manufacturing business is a leading exporting industry in Cambodia. In the near future, the Cambodian Investment Board-Council for the Development of Cambodia (CIB/CDC), with support from FIAS/World Bank, will put in place the Duty Suspension Scheme (DSS), an automation system for import-duty exemption of production inputs. The scheme will tremendously shorten the time spent in administration procedures and will facilitate investors' online application for a master list of imported items.

The government has endeavored to carry out export-promotion policies similar to those adopted by most developing countries, such as tax deductions on export earnings and tariff exemptions on imported machinery. Cambodian garment manufacturers enjoy tax-deduction schemes for exports and tariff exemptions on imported machinery.

In general, the investment climate in Cambodia is viewed as being not particularly favorable even though the Royal Government has been able to attract FDIs in the garment industry. There are a number of constraints yet to be addressed—inconsistent taxes and regulations, immature financial market, political instability, corruption, high crime rates, and poor infrastructure (Yamagata 2006:14). Cambodia's physical and institutional infrastructures are poorly developed. The problem of governance still creates serious challenges in many areas of development activities.

2.3. Related and Supporting Industry

It is argued that Cambodia is significantly weak in terms of building up a support industry for its local businesses. The role of related and supporting industries in

improving competitiveness is largely nonexistent in Cambodia. Local supplies are perceived as very limited in terms of quantity and quality. More than 85 percent of firms acknowledge that processing equipment and machinery for their business are almost always imported, while 63 percent of firms argue that specialized research and training services are somewhat unavailable in Cambodia.

Some would still argue that quality and quantity issues among local suppliers are the most comparative disadvantages of Cambodia compared to the other five benchmarked countries (EIC 2005:39).

2.4. Linkages

Creating linkage is an important way to improve industry competitiveness. This will improve areas of specialization and help in overcoming the disadvantages of being small. Developing clusters, business associations, and a value chains are key ways for industry to foster business linkages and increase market access.

Cluster development is in place in Cambodia, with the help of business associations. The United Nations Industrial Development Organization (UNIDO) has begun taking stock of the existing SME clusters in Cambodia and is eyeing to develop a program to further assist the development of SMEs. Initial stocktaking by UNIDO in selected provinces has identified three potential clusters for which it proposes to provide technical assistance. These are:

1. Rice milling cluster spread in nine districts of Battambang Province;
2. Thbong Khmom Cassava Processing Cluster in Kampong Cham Province; and,
3. Handloom weaving cluster (textiles handlooms) spread in three districts in Takeo Province (SME Secretariat 2006:22).

The proposed project places a special focus on women in these clusters. For example, in those clusters where the concentration of women is higher (e.g., handloom and cassava), women's self-help group will be formed and/or strengthened as part of the cluster strategy. The project also proposes to offer assistance for the dialogue process among the cluster actors to improve the exchange of information and identify common strategic objectives.

While the proposed project provides a good starting point for cluster development

in Cambodia, additional work is needed to identify more clusters with the potential to support industry and provide necessary assistance to enable their development.

Strengthening business associations also has a great potential for creating business linkages. The associations provide a wide range of information services to members and all other industries in Cambodia, including information on business contacts for buying and selling products or services and sector-specific statistical information from the public sector such as taxation, customs regulations, and business registration procedures.

Improving value chains is another way to improve linkages for industry and small and medium enterprise development. The project is working to improve the bankability of micro, small, and medium enterprises to improve their access to finance and to link them with appropriate financial institutions. The project is also working to strengthen local business associations in the areas of policy advocacy as well as to make these associations a stronger force in building business linkages.

Business linkages can be promoted through the development of high-quality, updated business directories where industries are able to find the partners both inside and outside Cambodia. Assisting private-sector providers of such business information is an ideal way to help industry build business linkages.

3. POLICY IMPLICATION FOR INDUSTRIAL AGGLOMERATION AND NETWORKING

Several problems in business and industrial development have been identified. Some of these problems and the government countermeasures and improvement efforts are shown in Table 5.

Table 5: Issues Challenged in Doing Business in Cambodia

Business Issue	Improvement
Trade procedures are complicated and take more time than in Viet Nam. (Shoe manufacturer)	Trade facilitation projects supported by the World Bank have been implemented.
Cambodia's domestic market is very small. (Shoe manufacturer)	In line with the ASEAN Common Effective Preferential Tariff (CEPT) scheme, a company in Cambodia can regard the ASEAN-wide market as a "domestic market."
Corruptive behavior of tax offices and smuggling are rampant. (Shoe manufacturer, transport equipment manufacturer)	The Cambodian government has tightened control over smuggling.
Industrial infrastructures are underdeveloped. (Various industries)	Development projects have been and will be implemented through the support of various international donors. (e.g., Sihanoukville Port and SEZ)
Incentives for small and medium enterprises are not the same as those for large enterprises. (Electrical equipment manufacturer)	SME development is regarded as an important component of national economic development strategies. It will be materialized through projects in the future.
Labor disputes frequently occur. (Industrial association)	Unchanged
Level of skills and knowledge of workers is low. (Industrial association)	At the SEZ, zone developers have to provide the workers with vocational training.
Due to the lack of protection for design rights, imitation products flow into the Cambodian market. (Transport equipment manufacturer)	The National Assembly has passed the Law on the Protection of Patents and Industrial Design.
A company in Cambodia has to pay corporate tax in advance but the refund is sometimes delayed or not made. (Apparel manufacturer)	Unchanged

Source: CDC (2007) p.38.

Several studies have been carried out to identify and diagnose the major issues facing the industry in Cambodia. High costs and uncertain business environment can be separated into the following key issues:

(i) High regular compliance costs: Cambodian industries face a weak legal and business environment that create uncertainties and risks, resulting in the development of high barriers to entry.

(ii) Lack of clear and market-oriented framework for industry development: While it recognizes that the industrial sector remains one of the core engines of growth, the government has been unable to come up with a framework for its development.

(iii) Limited access to finance: Local commercial banks provide only 1 percent of working capital and 1.7 percent of investment capital overall. Despite the high

liquidity of the banking system, banks do not easily give access to loans due to the weak financial infrastructure, which makes enforcing loan agreements and liquidating collateral very uncertain.

(iv) Poor market access infrastructure and information: A lack of market information inhibits local manufacturers from gaining access to markets. It is difficult for local producers to meet both domestic and foreign market demands due to poor road conditions, limited access to the Internet and other telecommunication services, and lack of groups to assist in gathering information about quality and design requirements (SME Secretariat 2006:7).

4. CONCLUSION

Having recognized some of the factors that deter industry growth, the Royal Government started to take steps and develop a plan of action aimed at reducing the cost of doing business in Cambodia and made some improvements, particularly industrial and infrastructural development, to attract FDIs.

The areas in the manufacturing business being developed in Cambodia are extremely limited. The garment industry plays a major role in contributing to poverty reduction by providing employment for the poor and undereducated people and offering high-wage schemes for entry-level workers.

Cambodia has been able to maintain its comparative advantage in the international export market for garment products, but it seriously lacks backward linkages and associated supporting industries. Creating linkages is an important way to improve industry competitiveness by improving specialization and overcoming the disadvantages of being small. Developing clusters, business associations, and a value chains are key ways for industry to foster business linkages and increase market access.

Recommendations to Promote Industrial Development

To promote industrial development, the following are thus recommended:

• Overcome negative issues that existing investors and manufacturers have to contend with;

- Diversify market by expanding Cambodia's export market to Japan, Russia, the Middle East, and other Asian countries. There should be a training course on quality control in CGTC, which should be particularly designed to enhance export competitiveness in the U.S. and the EU, and ultimately, Japan.

- Enhance the quality of labor with a view to increasing productivity. Ensure that guidance, mainly in production process analyses and standardization, is provided to guarantee the optimum arrangement of machinery and productivity management and realize improvements on productivity;

- Put in place a system for inventory financing and plant and equipment financing. These are prerequisites for accelerating the transition from sewing-on-commission to develop-and-export;

- Simplify import-export procedures;

- Introduce additional measures to cut lead time with a view to enhancing Cambodian competitiveness vis-à-vis its neighboring countries;

- Encourage both foreign and domestic investments for the development of backward linkages and supporting industries. This will further shorten the lead time and will result in a higher level of competitiveness;

- The SEZ will have to clearly establish the standard for EPZ functions and other elements of the management scheme as well as industrial infrastructural elements, such as electrical power, water, and wastewater treatment;

- Provide the major infrastructure required for industrial development and FDI promotion, including development of SEZs, electricity, telecommunications, roads, aviation, railways, seaports and water resource infrastructure; and,

- Develop and carry out Human Resource Development (HRD) and technical training.

Recommendations for Regional Support

- Build Linkages-Capacity Programs (training courses, workshops, etc.) in late-coming countries such as Viet Nam, Laos, Cambodia, and Myanmar

- Evaluate geographical cluster establishment based on the cluster schemes in developed countries, in order to experience sharing

- Continued survey of emerging industries in order to establish cooperation or create linkages in the ASEAN area
- Build Linkages-Capacity Programs (trainings, workshops)

NOTES

[i] Second Five year Socioeconomic Development Plan 2001-2005, RGC, Phnom Penh, Page 192.

[ii] World Bank "Garment Sector Competes and Thrives in Cambodia." Phnom Penh, August 5, 2007. www.worldbank.org/kh (accessed February 5, 2008).

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8

Korean Automobile Industry's Production Network in China[i]

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Abstract

This paper examines the characteristics of the production network of Korean carmakers in China. It was found that Korean automotive firms in China are forming production networks around Beijing where Hyundai Motors is located. The production network of Korean automotive firms has changed from the vertical and closed structure into a more horizontal and open structure with the intensifying competition. This paper suggests that the government needs to select and raise the Korean firms' performance to enhance their competitiveness in China.

INTRODUCTION

In 2006, the Korean automobile industry ranked fifth largest automobile producer in the world, following Japan and the United States after making dramatically rapid progress since it started with almost no foothold in the industry about fifty years ago. Furthermore, the Korean automobile industry holds a prominent position in the national

economy. As of 2005, it accounted for 8.9 percent of the total employees, 11.5 percent of the gross output, 10.2 percent of the value added amount and 10.3 percent of the total export amount in Korea's manufacturing sector. Direct and indirect employment creation effects reached up 1.57 million employees, accounting for 10.38 percent of the total employment. Moreover, the trade surplus from the industry recorded 29.9 billion US dollars in 2006, making it the largest exporting industry of Korea.

Table 1: A Summary of Korean Automobile Industry

Year	Number of establishments		Number of workers		Gross output		Value of shipment		Export amount		Value added amount	
	firms	%	thousand	%	Bil. KW	%	Bil. KW	%	Bil. US$	%	Bil. KW	%
1985	882	2	81.7	3.35	3.3	4.26	3.3	4.26	5.4	1.8	1	3.87
1990	2,138	3.1	186.3	6.17	16.2	9.16	16.1	9.18	19.1	2.94	5.8	8.23
1995	3,070	3.19	220.6	7.47	35.1	9.62	34.5	9.62	82.9	6.63	13.1	8.2
2000	3,200	3.26	204	7.69	53.9	9.54	53.4	9.54	131	7.61	20.6	9.38
2005	3,848	3.28	253.5	8.85	97.8	11.48	97.9	11.54	293	10.3	32	10.24

Note: All the percentage figures present the proportions in the manufacturing sector except for the export amount in the whole industry.

Source: The Korea Automobile Manufacturers Association (2007).

In 1990s, the Korean automobile industry suffered from the restructuring process prompted by the bankruptcy of KIA automobile company and further catalyzed by the 1997 financial crisis. This process has been considerably changing the component procurement structure which occupies a core position in the car industry production network or value chain. In other words, a certain change has been taking place in the exclusive and single layer structure of division of labor caused by the vertical integration policy between domestic carmakers and the component suppliers since the

1980s.

At the same time, there is an indication of another change in overseas production network of the automobile industry. Recent years have witnessed Korean carmakers aggressively seeking out production bases overseas, especially in China. However, there are few actual analyses on the types of network structure in which these foreign invested carmakers are doing their component procurement, production, sales, research and development (R&D), and various value chain activities.　Therefore, this study attempts to figure out the actual conditions of the production network of Korean carmakers in China.

To analyze the current situations and characteristics of the automobile components suppliers in China, this study utilized existing information on the current state (as of the end of 2006) of 126 automobile components suppliers invested in China and registered with the Korea Auto Industries Coop. Association (KAICA). Field research was also conducted by interviewing Hyundai Motors and several component suppliers in Beijing – taking into consideration that Korean auto companies are forming a production cluster in the said city. This field research provided this study with a rich resource to examine the production network of Korean companies in China and its characteristics.

This paper is mainly composed of three parts as follows: The first part,deals with the features of the domestic production network of Korean automobile industry and its recent changes. It was necessary to first look into the domestic production network because this could be the prototype used for the overseas production networks of the foreign invested companies. This section also discusses the drastic changes of the domestic production network after the economic crisis in 1997.

The second part includes basic information on the current situation of automobile

component suppliers in China based on data regarding main production bases, number of companies, location of industries, and features of the business relationships, among others.

The last part presents the result of the field interviews with the automakers and component suppliers in Beijing to examine their strategies in material sourcing, sales and production, and R&D.

1. THE DOMESTIC PRODUCTION NETWORK OF KOREAN AUTOMOBILE INDUSTRY

The Korean automobile industry has been showing a dramatic amount of growth since Sin Jin Motors started knock-down assembling in the 1960s. The automakers were first established, followed by the component suppliers, under the firm support of the government. Automakers were always in the lead over the component suppliers in terms of capital accumulation and technical capabilities so that the former nurtured the latter by training them on technologies and management skills. The Korean automobile industry greatly owed its success to efficient technical learning from foreign countries.

Component suppliers learned the general technologies such as business management and quality controls; meanwhile they received special technologies on the relevant components directly from their foreign affiliate companies. Under this kind of development process, the relationship between the carmakers and the component suppliers became a vertical transaction relationship where the carmakers built strong controls over the component suppliers. The accumulation of chronic problems such as exclusiveness of component supply structure and small scales of component suppliers

was the result of the vertical systematization policy.

The contract structure of Korean automobile industry before the financial crisis is basically characterized by the carmakers' component sourcing from their affiliates or subsidiaries, the exclusive structure of the vertical systematization, and single layer structure of division of labor.

First, before the financial crisis, core automotive components were procured by the *chaebol*[ii] affiliates and subsidiaries. Affiliates mean the companies that belong to the same company group and are directly related to each other in the group in terms of the capital ownership. Subsidiaries, on the other hand, are the component suppliers that belong to and are run by the relatives of the founders or controlling stockholders of the *chaebols* but have no ownership relations. Examples of the subsidiaries of the Hyundai group are Mando Machinery Cooperation, Halla Climate Control Corporation, and SungWoo Group. These affiliates and subsidiaries extensively dealt with related auto parts such as air conditioners, audio components, batteries, and the like as well as the capital intensive components such as gear, steering, braking and electrical parts. As of 1995, the supply from the affiliates and subsidiaries accounted for 41 percent- 46 percent of the total component supply (Cho, S.J. et. al. 2004).[iii] The carmakers maintained a very closed component sourcing structure where they procured the core and related parts only through their affiliates and subsidiaries.

Second, the exclusive transactions were formed between the assembling companies and the component suppliers through the vertical systematization during the stage of passenger car development for export in 1980s. In 1995, 657 out of 1,150 component suppliers transacted with only one carmaker which means 57.1 percent of the total component suppliers were involved in exclusive transactions. Another 21.3 percent of

the component suppliers transacted with only two carmakers. The carmakers' strong control over the component suppliers resulted in this exclusive transaction structure. This system resulted in low benefit of scale and the component suppliers remained in small scale because each carmaker had its own set of exclusive component suppliers.

Table 2: The Number of Parent Companies of Component Suppliers Before the Financial Crisis

Unit: number of companies (%)

	1 company	2 companies	3 companies	4 companies	5 companies	6 companies or more	Total
1990	682 (66.9)	188 (18.4)	87 (8.5)	39 (3.8)	24 (2.4)	-	1,020 (100.0)
1995	657 (57.1)	245 (21.3)	109 (9.5)	59 (5.1)	40 (3.5)	40 (3.5)	1,150 (100.0)
1996	649 (58.2)	238 (21.3)	93 (8.3)	58 (5.2)	39 (3.5)	39 (3.5)	1,116 (100.0)
1997	619 (57.4)	236 (21.9)	87 (8.1)	59 (5.5)	37 (3.4)	41 (3.8)	1,079 (100.0)
1998	510 (55.0)	212 (22.8)	74 (8.0)	59 (6.4)	32 (3.4)	41 (4.4)	928 (100.0)
1999	570 (65.9)	158 (18.3)	80 (9.2)	57 (6.6)	-	-	865 (100.0)

Source: The Korea Automobile Manufacturers Association (2007).

Third, the division of labor had a tendency to a single layer structure before the 1997 financial crisis. In the past, the division of labor of Korean automobile industry appeared to form a two-tier structure where the primary and the secondary component suppliers were classified and incorporated around the carmakers. However in reality, the primary component suppliers that directly transacted with the carmakers were large in number. Before the financial crisis, Hyundai had 384 primary component suppliers, Kia had 265, Daewoo (Heavy Industries) had 415; these figures were much more than what the Japanese carmakers had: Toyota, 234 and Nissan, 191. Moreover, as of 1997 only 4.7 percent or 60 out of 1,276 primary component suppliers were large firms; meanwhile the most of them were small to medium enterprises, and 589 companies

(46.2%) even had less than 50 employees. The reason that the primary component suppliers were mostly small to medium firms was that the carmakers placed their orders by units and not by systems. Furthermore, the domestic component industry was weak in technological capabilities so that they could not produce system components.[iv]

Thus, the contract structure of Korean automobile industry before the financial crisis was built on the vertical systematization and characterized by the exclusive transaction of single layered and closed structure. And yet considerable changes happened to the Korean automotive component industry and its supply structure. The depression of the automotive industry caused by the bankruptcy of Kia Motors in 1997 followed the restructuring of the carmakers, active investment of foreign capitals into the domestic component suppliers, reorganization of subsidiaries, modularization, and diversification of the business channel by the component suppliers.

First of all, the restructuring of the eight carmakers before the financial crisis ended up with only five, namely, Hyundai, Kia, GM Daewoo, Renault Samsung and Ssangyong. This big merger and acquisition among the carmakers changed the exclusive transaction structure which had been pointed out as a chronic problem of the Korean automobile industry. Also after the financial crisis, another factor contributed to the change of competition structure of the domestic automotive component industry; many foreign special component suppliers entered the Korean market which began to actively invest into the domestic component suppliers. The number of foreign invested firms (primary component firms) continued to grow; it was 148 in 2003, 176 in 2006.[v]

Table 3: Number of Foreign Invested Firms

Year	Foreign invested firms (Primary component suppliers)	Domestic Firms	Total
2003	148	730	878
2004	163	750	913
2005	173	749	922
2006	176	726	902

Note: The classification of the foreign invested firms over the primary component suppliers began in 2003. Before 2003, the classification of primary or secondary suppliers was not applied to the foreign invested firms.

Source: The Korea Automobile Manufacturers Association (2007).

In addition, the previous component supply system run by the affiliates and subsidiaries was changed into the affiliates system and the modularization system at the same time. In case of Hyundai Motors that had many subsidiary transactions in the past, the subsidiary system has drastically been weakened after the bankruptcy of the Halla group that had control over the core component suppliers such as Mando Machinery Cooperation and Halla Climate Control Corp. Hyundai Mobis became the biggest component supply subsidiary of Hyundai Motors in place of Mando Machinery Cooperation. As a result, the component supply structure centered by the subsidiary based on the ownership has been formed such as Hyundai Kia Automotive Group with Hyundai Mobis, and GM Daewoo with Delphi (GM's 100% subsidiary). On the basis of this new subsidiary-centered component supply system, the production system began to be modularized.

Hyundai and Kia Motors began to promote the modularization of production system in 1999. This means delivering the assembled goods in modules which enables the common use, large scale production and outsourcing of the components.

Modularization propels the two-tier structure of component supply because the component firms disqualified as primary component suppliers can become the secondary component suppliers contracted by the bigger component suppliers. This new structure of component supply will become more distinctive if the modularization of domestic production system makes progress in the future.

Lastly, the diversification of the transaction channel of the component suppliers shows the eased tendency of exclusive transaction structure after the financial crisis. In 1990, the component suppliers of the four carmakers that had only one transaction partner reached 66.9 percent, but this proportion declined to 55.4 percent in 2001. By 2005, among the component suppliers of the seven carmakers (Hyundai, Kia, GM Daewoo, Ssangyong, Renault Samsung, Daewoo Bus, Tata Daewoo) half or 50 percent contracted with only one carmaker.

Four main factors led to the reduction of exclusive transaction in the automobile industry and diversification of the transaction channels: 1) Kia's merger with Hyundai promoted the opening of the transaction channel between the two carmakers' component suppliers so that the suppliers for Hyundai can take orders from Kia and vice versa; 2) GM and Renault which acquired Daewoo and Samsung fostered the transactions of their own component suppliers with the other domestic carmakers in order to introduce incentives for the self-development of the suppliers; 3) As the foreign special component suppliers advanced into the Korean market, the component suppliers themselves carved out new delivery channels; and, 4) The automotive component imports from developed countries like Japan and Germany, and including China have increased. In 2005, the import of automotive components recorded 3 billion US dollars, a 12.2 percent increase over the previous year. Most of the imports were mainly

composed of universal parts with low price and high-tech components of which the domestic suppliers lack the technological capabilities to develop.

Although the diversification of the transaction channel means the heightened competition in the component market, the phenomenon itself does not translate to strengthened autonomy or increased negotiation power of the component suppliers. Above all, the crossing component supply by the component suppliers of Hyundai and Kia that is attributed to the recent diversification of the transaction channel cannot be considered as real diversification because Hyundai and Kia are interrelated through ownership.[vi]

Table 4: The Number of Parent Companies of Component Suppliers After the Financial Crisis

Unit: number of companies (%)

Year	1 company	2 companies	3 companies	4 companies	5 companies	6 companies or more	Total
1999	570 (65.9)	158 (18.3)	80 (9.2)	57 (6.6)	-	-	865 (100.0)
2000	528 (58.3)	209 (23.1)	95 (10.5)	74 (8.1)	-	-	906 (100.0)
2001	488 (55.4)	215 (24.4)	102 (11.6)	76 (8.6)	-	-	881 (100.0)
2002	427 (50.4)	210 (24.8)	102 (12.0)	62 (7.3)	30 (3.5)	17 (2.0)	848 (100.0)
2003	450 (51.3)	217 (24.7)	94 (10.7)	61 (6.9)	34 (3.9)	22 (2.5)	878 (100.0)
2004	459 (50.3)	222 (24.3)	111 (12.2)	63 (6.9)	36 (3.9)	22 (2.4)	913 (100.0)
2005	461 (50.0)	228 (24.7)	109 (11.8)	62 (6.7)	41 (4.4)	21 (2.3)	922 (100.0)
2006	460 (51.0)	218 (24.2)	98 (10.9)	68 (7.5)	39 (4.3)	19 (2.1)	902 (100.0)

Note: The numbers until 2000 represent only 4 carmakers: Hyundai, Kia, Daewoo and Ssangyong.

Source: The Korea Automobile Manufacturers Association (2007).

As the Daewoo group collapsed and the Hyundai group was divided after the financial crisis, the *chaebol* characteristics of the carmakers were weakened so that the long lasting business system of carmakers' transaction with affiliate companies

gradually disintegrated. Thus the old affiliate transaction system was changed into subsidiary/invested company's supply system to improve the transparency of contract deals. Consequently, the exclusive and single layered structure of division of labor in the past was eased. Also, the single layered division of labor was rapidly changed into a two-tier structure. However, with the stronger control of Hyundai motor group over the component market and the promoted modularization centered on the subsidiary companies, it does not seem that the vertical relationship between the carmakers and the component suppliers is developing into equal relations or the autonomy and negotiation power of the component suppliers are enhanced.

Table 5: Changes of the Component Supply Structure Before and After the Financial Crisis

Before the crisis	After the crisis
▪ Component supply by the carmakers' subsidiary/affiliate companies	▪ Decline in transactions of affiliate firms due to the automobile industry restructuring and the establishment of component production systems centered around the subsidiary, invested companies based on ownership
▪ Exclusive structure by the vertical systematizaiton	▪ Reduced exclusive dealings and increased diversification of the transaction channel of the component suppliers
▪ Single layered structure of division of labor	▪ Two-tier structure of component supply system by the modularization of production system after 1999

2. KOREAN AUTOMOTIVE COMPANIES' PRODUCTION NETWORK IN CHINA

2.1. Korean Automotive Companies' Advance into China and their Production

We will first look at the Korean carmakers' entry into the Chinese market. Hyundai

Motors which ranked seventh in the world automotive market in terms of car sales entered the Chinese market by establishing a joint venture, Wuhanwantong (武漢萬通) Automotive Limited Company with Dongnanqiche (東南汽車). In 2002, however, Hyundai withdrew from the Woohanwantong partnership, transferred all the shares to Dongfengjituan (東風集團) and established a new joint venture Dongfeng Yueda Kia (東風悅達起亞).

Meanwhile, Kia Motors set up a joint venture, Yueda Kia Motor Limited Company (悅達起亞自動車有限會社) with the Yueda group in 1997 where each company owned a 50 percent stake. After Hyundai Motors' acquisition of Kia Motors, it acquired 20 percent share of Yueda Kia in September 2000. In March 2002, Hyundai, Kia, Dongfeng and the Yueda group agreed to set up a new joint venture named Dongfeng Yueda Kia Motors; Kia Motors owned a 50 percent stake, with Yueda and Dongfeng owning 25 percent each. By the end of 2002, Dongfeng Yueda Kia launched Qianlima (千里馬) modeled after Hyundai Motor's ACCENT.

On the other hand, in May 2002, Hyundai Motors established another joint venture, Beijing Hyundai Automotive Limited Company (北京現代汽車有限公司) with Beijingqiche (北京汽車) on a fifty-fifty share to try independently entering the Chinese automotive market. The new joint venture started production of SONATA in December 2002.[vii,viii] Also for its global strategy 2010, Hyundai Motors plans to develop regional strategic car models by building a full line-up in China, managing self-sufficient plants including research institutes and sharing the platforms.

Table 6: Automotive Companies of Hyundai Motors Group in China (as of 2005)

		Shares	Starting Year	Main Models	Production capability in 2005
Hyundai	北京現代汽車 (BHMC)	Hyundai 50% 北京汽車 50%	2002	SONATA AVANTE TUCSON	300 thousand (600 thousand in 2008)
	合肥工淮汽車	Technology offer	2003	STAREX	90 thousand (plan to cooperate in commercial vehicle)
	榮成華泰汽車	Technology offer	2000	GALLOPER TERRACAN	70 thousand (100 thousand in 2007)
	広州現代汽車	n.a.	2007 (plan)	Truck, Bus	(20 thousand, plan)
Kia	東風悅達起亞	Kia 50% 東風 25% 悅達 25%	2002	千里馬, OPTIMA CARNIVAL	130 thousand (plan to establish second plant in 2007, 430 thousand)

Note: Rongchenghuatai Motors(榮成華泰汽車) is located in Shandong province and Jianghui Motors (江淮汽車) in Anhui province.

Source: The Korea Automobile Manufacturers Association (2007) p. 13; FOURIN (2006), p. 302.

Beijing Hyundai (北京現代) grew rapidly so that the annual sales recorded 290,000 in 2006 (sales ranking 5th, market share 7.2%). In 2005, sales reached 233,000 – ranking 4th and recording 7.4 percent market share. In terms of sedan passenger car, the company's sales ranked first in the Chinese market. It also took 73 percent market share in the Beijing taxi car business recording 22,500 in sales in 2005. Thus the Korean automotive companies' (Hyundai and Kia) market share in China rose to 12 percent. In contrast to the fast shrinking market share of EU in the Chinese automotive market, Korea and Japan are making a remarkable progress in recent years as shown in Figure 1.

Table 7: Production and Sales of Beijing Hyundai (北京现代)

Unit: number of cars

		2002	2003	2004	2005	2006
	SONATA	1,046	54,348	41,451	47,175	49,379
	Elantra	-	765	108,707	173,756	168,268
Production	Tucson	-	-	-	9,754	27,973
	ACCENT	-	-	-	3	44,468
	TOTAL	1,046	55,113	150,158	230,688	290,088
	SONATA	1,002	51,950	41,342	48,072	49,945
	Elantra	-	178	102,748	176,589	169,716
Sales	Tucson	-	-	-	9,007	28,176
	ACCENT	-	-	-	-	42,174
	TOTAL	1,002	52,128	144,090	233,668	290,011

Source: Interview with Beijing Hyundai.

Figure 1: Market Shares of Various Countries in Chinese Automotive Market
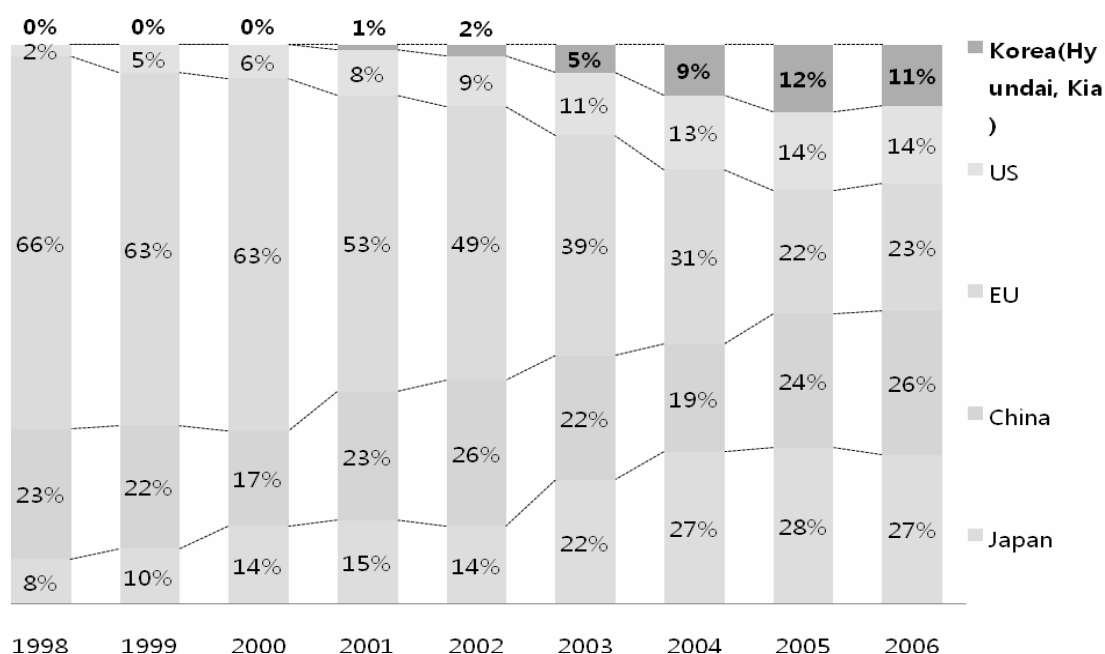
Note: By October for 2006.

Source: A.T. Kearney (2007).

The remarkable development of the Korean carmakers in China like Beijing Hyundai（北京现代）may be attributed to the following factors: 1) expedient construction of the plants. For example, Beijing Hyundai could finish the construction of the plants and start production within three months after the ratification of its joint venture in September 2002; 2) capacity to immediately establish more plants and produce more cars to cope with the abrupt increase in demand. Five more models were produced in only four years from the first production of SONATA in December 2002 to the end of 2006. Over the years, production continuously increased so that in February 2003 it produced 50,000 cars; in March 2004, 150,000;, and in July 2005, 300,000; 3) value was placed on automation and operation efficiency The car body process automation reached 100 percent and hours per vehicle (HPV) representing the productivity of the assembly lines ranked first in all the Hyundai automotive plants overseas.[ix]; 4) advance into the market jointly with the component suppliers. Therefore, the companies could build up competitive production base within a short time. This strategy was similar to the typical market entry strategies of Japanese carmakers into the North American automobile market.

In 2007, however, Beijing Hyundai was facing difficulties in car sales. Its sales goal in 2007 was originally 310,000 cars but had to be readjusted to 260,000, a reduction by 50,000 because the total car sales until August had reached only 146,000 (car sales ranking 8th). Several internal and external factors caused Beijing Hyundai to fall into this difficult situation. Internal factors were: inferiority in brand value, low accountability due to inconsistent price policy (delayed purchase with the expectation of lower price in the future), price positioning strategy lacking differentiated points (price differentiation problem among the cars in the same category produced by Beijing

Hyundai and DongfengYueda Kia), among others.

External factors were: the intensified competition among the carmakers in the Chinese market such as the preemptive price cut-down by GM and VW (Volkswagen),[x] strengthening sales service by Toyota, aggressive strategies by introducing various models into the Chinese market, and catch-up of Chinese carmakers.

In order to cope with the hardship, Beijing Hyundai's strategies included price cutting for the short term; training of car dealers and expanding localized marketing, introducing new models by establishing second plants and enhancing the localization for the mid-term. For its long-term strategy, the company will pursue a dual price system divided into luxury and ordinary cars by enhancing the brand power and improving consumer satisfaction.[xi]

Table 8: Lowering Prices of Several Carmakers in China

Carmaker	Model	Date	Lowering amount (Yuan)	Lowering percentage	Market price after lowering (Yuan)	Beijing Hyundai Market price(Yuan) / car model in rivalry
上海 GM	Rover	07. 1. 3	6,900	8.4%	74,900	79,800 / ACCENT
	Acceler	07. 3. 2	10,000	8.5%	99,000	
一汽 VW	Jetta	07. 3. 6	6,000	6.3%	69,000	99,800 / Elantra
	Bora		8,000	6.2%	123,800	
上海 VW	Santana	07. 3. 15	10,000	11.1%	79,800	
	San 3000		11,000	10.1%	97,800	120,000 / EF
東風 Nissan	TIENA	07. 3. 26	23,000	9.8%	205,800	107,800 / NF
	Tida		10,000	8.3%	104,800	99,800 / Elantra

Source: Beijing field research interview

2.2 The Networking Structure in China

By the end of 2006, there were 126 component suppliers registered in the Korea Automobile Manufacturers Association that entered the Chinese market. Using the establishment of Beijing Hyundai in 2002 as the reference point, 33 companies went to China before then and 90 companies afterwards; the entry dates of the remaining 3 companies are unknown. Now we look at the networking structure among the carmakers and component suppliers in China mostly by examining the data of the above mentioned companies.[xii]

The number of component suppliers entering the Chinese market sharply increased in the watershed year of 2002 (refer to Figure 2). This is the same period Hyundai Motors started its operations in China. Therefore it can be interpreted that the component suppliers accompanied Hyundai Motors' entry into the country. Eighty (80) or 65 percent of the total component suppliers entered the Chinese market from 2002 to 2004.

By region, Korean component suppliers are concentrated in Beijing and the provinces of Shandong and Jiangsu (refer to Table 9). Hyundai and Kia motors entered into Beijing and Jiangsu, so it can be considered that the component suppliers went with them to these regions. The component suppliers in Shandong province are delivering to Hyundai and Kia Motors as well as exporting back to Korea. Fifteen (15) suppliers went to Shandong, 25 to Beijing, and 23 to Jiangsu from 2002 to 2004.

Figure 2: Automotive Component Suppliers' Entering Chinese Market by Period
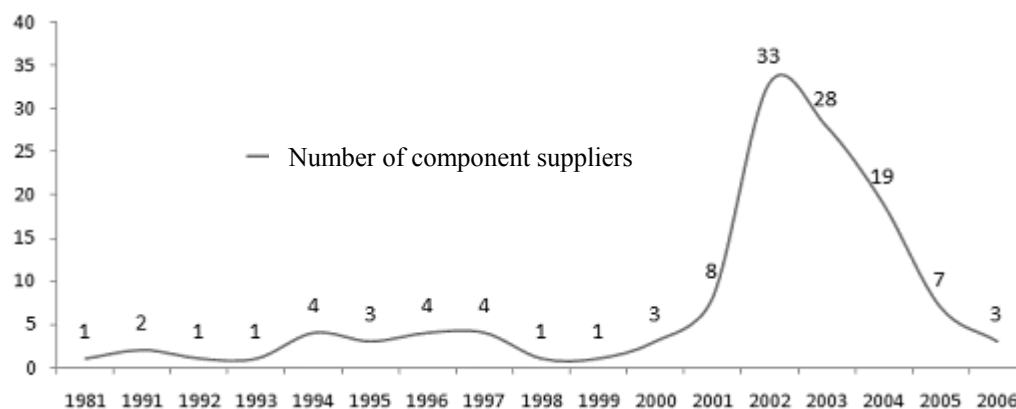
Note: Three companies whose date of entering is unknown were excluded.

Source: Korea Auto Industries Coop. Association (KAICA).

Table 9: Regional Distribution of the Korean Auto Component Suppliers in Chinese Market (As of the End of 2006)

Unit: company (%)

	Shan dong	Beijing	Jinagsu	Tianjin	Shang hai	Liao ning	Guang dong	Zhe jiang	Hebei
Number of companies	33 (26.2)	30 (23.8)	27 (21.4)	8 (6.3)	5 (4.0)	5 (4.0)	4 (3.2)	3 (2.4)	3 (2.4)
	Gui zhou	Jilin	Hebei	Heilong jiang	Guang xi	Hong Kong	Total		
Number of companies	2 (1.6)	2 (1.6)	1 (0.8)	1 (0.8)	1 (0.8)	1 (0.8)	126 (100.0)		

Note: percentages in the parentheses.

Source: Korea Auto Industries Coop. Association (KAICA)

By employment scale, medium enterprises with 50-299 employees predominated, accounting for 54.7 percent of the total component suppliers; medium firms with 100-299 employees make up 35.7 percent; and large firms with more than 300 employees accounted for 21.4 percent. Compared to the number of domestic auto component

suppliers by the employment scale in the previous part of this paper,[xiii] small companies take a large proportion in the domestic suppliers (domestic firms 28.7% > firms entering China 19.0%); meanwhile, there are more medium and large firms entering into China compared to their domestic counterparts (firms entering China medium firms 54.7% + large firms 21.4% > domestic medium firms 53.2% + large firms 18.1%). The reason that the big scale component suppliers entering China is relatively large in numbers is that they are actively taking advantage of cheap and sufficient human capital within country and also it seems that the component suppliers expanded their scale as Beijing Hyundai rapidly grew.

Table 10: Number of Firms by Employment Scale

Unit: number of companies (%)

	Small firms	Medium firms		Large firms	n.a.	Total
	Less than 50 employees	50-99	100-299	More than 300 persons		
Number of companies	24 (19.0)	24 (19.0)	45 (35.7)	27 (21.4)	6 (4.8)	126 (100.0)

Note: Classification of scale using the criteria of KAICA.

Source: KAICA

Considering the component firms going to China by the structure of shares, there are 76 companies with 100 percent shares (60.3%), and 21 firms which own 51-99 percent shares (16.7%). Taken together, we can see that the companies holding the right of management control reached 77.0 percent. Before 2002, 16 out of 33 invested firms had 100 percent shares (48.5%); after 2002, 60 out of 89 companies (67.4%) owned 100 percent (excluding 4 companies whose percentage of shares is unknown). It seems that

guaranteed sales channel by accompanying with the carmakers increased the cases of full investment.

Table 11: Distribution of the Firms Entering China by the Percentage of Shares

Unit: number of companies (%)

	1-49%	50%	51-99%	100%	n.a.	Total
Number of companies	18 (14.3)	7 (5.6)	21 (16.7)	76 (60.3)	4 (3.2)	126 (100.0)

Source: KAICA

According to the data on the number of transaction channels of 126 component suppliers, 58 companies (46.0%) have two channels and 53 (42.1%) have only one channel. Meanwhile a much smaller number, 7 companies, are doing business with 3 channels, and another 3 are dealing with 4 channels. Taking out the 5 companies whose business channels and entry dates are not known, the 121 component suppliers have 1.7 transaction channels on the average.

Table 12: Number of Transaction Channel of Korean Component Suppliers Entering into China

Unit: number of companies (%)

	1 company	2 companies	3 companies	4 companies	n.a.	Total
Total	53 (42.1)	58 (46.0)	7 (5.5)	3 (2.4)	5 (4.0)	126 (100.0)

Note: n.a. represents the case where the entry date and the number of transaction channels are not presented in the data source.

Source: KAICA.

However, it is necessary that we break down the transaction channels of these suppliers shown in Table 12 because the channels include other primary component suppliers and export overseas in addition to the carmakers. As shown in Table 13, in the transaction channels of 121 component suppliers in China, carmakers make up 71.3 percent, other primary component suppliers 14.8 percent, domestic export (buy-back) 8.4 percent, and foreign export 2.0 percent. The delivery percentage to Hyundai and Kia recorded 58.4 percent and the proportions of Chinese local firms, foreign carmakers in China and primary component suppliers made up 5.0 percent, 7.9 percent, and 14.35 percent respectively.

There were 33 auto component suppliers before 2002 having an average transaction channel of 1.8. After 2002, as many as 88 new auto component suppliers entered the Chinese market with an average transaction channel of 1.6. Hyundai and Kia requested the latter group suppliers to go out with them from the early stage of Chinese business. Hyundai and Kia may have given a guarantee to them that they will buy much of the components produced in local area. This guarantee is thought to be one of the reasons for a lower transaction channel. In contrast to the latter group, the former group had longer time to pioneer much more local customers.

Table 13: Korean Component Suppliers Entering into China by Transaction Channels

Unit: number of companies (%)

	Entered before 2002	Entered after 2002	Total	Percent of Total
Carmakers				
Hyundai	15	51	66	32.7
Kia	10	42	52	52
Chinese local firms	7	3	10	5.0
Foreign firms within China	3	13	16	7.9
Primary component suppliers				
Korean firms	1	15	16	7.9
Chinese local firms	1	0	1	0.5
Foreign firms within China	6	7	13	6.4
Buy-back	8	9	17	8.4
Export	3	1	4	2.0
Others	6	1	7	3.5
Total	60	142	202	100

Note: 1) Including the multiple transactions of each company.

      2) Others represent the cases of difficult classification.

      3) Excluding 5 companies whose business channels and entry dates are not known.

Source: KAICA.

As of 2006, on the other hand, there were 89 firms doing business with Beijing Hyundai including 65 Korean component suppliers entering into China. In the early stage, 10 suppliers accompanied Beijing Hyundai and those that had entered the market before 2002 also became the company's local component suppliers. There were 35 companies located within Beijing, and 54 outside Beijing. If the companies in the vicinity of Beijing like Tianjin and Hebei provinces are taken into consideration, 49 companies (55 percent of the total firms are located within 40 km radius) are located near the Beijing production facility. Considering Beijing alone, 15 firms were in Shunyi (顺义) district where Beijing Hyundai is located.

In 2006, Beijing Hyundai's 89 component suppliers are hiring 40 thousand employees with a total purchase amount from these suppliers reaching 18.5 billion yuan. The localization percentage representing the component sourcing within China reached 80 percent due to the high modularization of component supply. Fifty percent (50%) of the total supply of 65 Korean component suppliers in China are components imported from Korea. The components produced by the suppliers in China are concentrated on functional parts with low price at the moment. Therefore Beijing Hyundai confronting the challenge of cut-throat price competition in the Chinese auto market is urged to promote component sourcing from local Chinese component suppliers.[xiv]

Table 14: Beijing Hyundai's Component Suppliers in 2003~2006

		2003	2004	2005	2006
Number of partner companies		44	62	69	89
Number of employees		12 thousand	25 thousand	32 thousand	40 thousand
Purchase amount		27.2	96.6	136	185
Localization	EF SONATA	72%	77%	79%	81%
	ELANTRA	-	77%	79%	86%
	NF SONATA	-	-	67%	77%
	TUCSON	-	-	61%	70%
	ACCENT	-	-	-	82%

Note: Number of partner companies includes Chinese local firms.

Source: Source book of Beijing Hyundai Motors Limited Company.

3. CASE STUDY: BEIJING PRODUCTION NETWORK

3.1. Overview

In September 2007, we carried out a field research on the Korean automotive firms invested into China by interviewing one carmaker, Beijing Hyundai(BHMC), and seven

auto parts suppliers to find out the companies' overview, their strategies for sourcing and sales, R&D, and production.. Primary component suppliers were located in Shunyi and Pinggu districts within Beijing and as shown in Table 15, component suppliers that accompanied Beijing Hyundai are A, C, D, and F companies. The characteristics of sourcing, sales, R&D, and production will be argued on the basis of the interview results from the seven component suppliers.[xv]

Table 15: General Information on the Interviewed Companies

(As of September 2007)

Company	Location	Year of establishment	Shares (%)	Employees (persons)	Main parts	Sales channels
A	Pinggu	2002.10	100	375	Wheel Bearing, Ball Joint etc.	Hyundai (Hyundai Mobis), Kia, buy-back (5%)
B	Pinggu	2003.07	80	280	Intake Manifold, Cylinder Head	Hyundai, Kia
C	Pinggu	2002.11	100	350	Front & Rear Cross Member	Hyundai, Hyundai Mobis
D	Chaoyang	2002.09	100	20	Representative office (6 wholly owned corporations, 1 joint venture; total employees 1,200 persons)	Hyundai, Kia, GM, VW, etc.
E	Shunyi	2004.07	40	181	Seat	Hyundai
F	Shunyi	2002	100	929	Chassis & Driving Seat Module, I/P	Hyundai
G	Pinggu	2005.10	100	100	Power Steering Oil Pump	Hyundai (Hyundai Mobis), GM, Kia, Korean primary component suppliers
BHMC	Shunyi	2002.10	50	4,664	5 models including EF, NF etc.	

Note: Eight auto parts suppliers were interviewed but no meaningful interview result was obtained from one omitted firm

Source: Interview.

3.2 Sourcing Strategies

The sourcing structures of the seven interviewed component suppliers had the following characteristics:

- The local sourcing percentages recorded a relatively high 60-90 percent. The rest of the 10-40 percent components are mostly high tech components imported from Korea. Local sourcing here means both the sourcing from Korean firms invested into China and the local Chinese firms. From the interviews, we found that the proportion of the former type of local sourcing is higher that the latter (see Figure 3).[xvi]

- As the price competition gets tougher, it is recommended to raise the local sourcing proportion, especially changing sourcing channels to local Chinese firms. In terms of the present product quality, Chinese local firms have little reliability, but in the future the sourcing channel conversion will be realized if the competitive Chinese firms are selected and raised.

- The sourcing structure between the carmakers and the component suppliers will be changed from vertical structure to an open one. With the intensified competition in the Chinese auto market, both the carmakers and the auto parts suppliers seem to recognize the probable change of the system well enough.

Figure 3: Sourcing Structure of the Automotive Component Suppliers in China
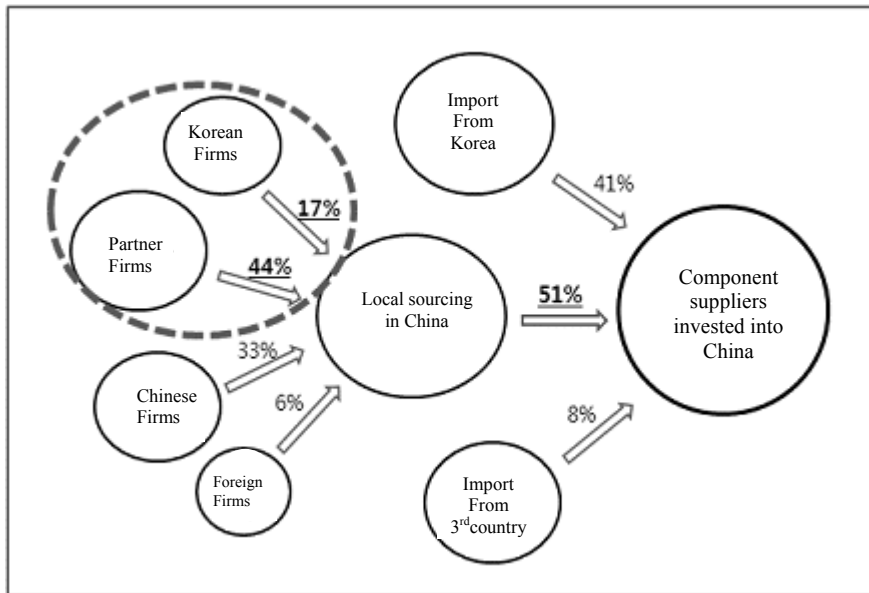
Source: Yang P.S. et al. (2007).

Table 16: Characteristics of the Sourcing Structure of Interviewed Component Supply Firms

	Sourcing Strategies
A	▪ Sourcing 40 percent from Korea and 60 percent within China. Mostly sourcing from Korean component suppliers in China (Hisco, Northeast Steel, Chinese top 3 or 4 steel companies) ▪ Actively implementing localization under the guidance of the carmakers. 100 percent localization goal is not easy to achieve. ▪ To nurture the local firms by training the employees
B	▪ From 2004 promoted localization of Korean components (90%), and imported the rest of 10 percent from Korea which could not be localized due to technological problems ▪ Doing business with 3 Chinese local firms and searching for additional local firms (no Japanese firms as business partners) ▪ Achieved 20 percent cost reduction by localization
C	▪ 40 percent imports from Korea, 60 percent local sourcing (1 Chinese firm, and the rest (7) are Korean firms such as Hisco, Pyeonghwa Industry, etc.); no sourcing business with Japanese firms (tried in vain in 2005) ▪ Having difficulties in sourcing from Korean firms due to high cost ▪ Having difficulties in changing into local Chinese firms to reduce costs because the facilities and designs should be changed. Due to pressure to reduce costs, Korean component suppliers trying localization but will be realized only in 2008 when the new models will be launched.
D	▪ Chinese local sourcing 80 percent, imports from Korea 20 percent (ultra precise products etc.) Among 80 percent of local Chinese sourcing, 70 percent from Korean secondary vendors (raw materials), 30 percent from Chinese local firms (steel plates). Steel plates are to be sourced from local firms. ▪ 7 corporations sourcing from 71 suppliers (35 Korean firms, 20 Chinese firms, 16 American and Germany foreign invested companies; no Japanese firm due to the high price and closed business style) ▪ Local Chinese firms offering 10-20 percent lower price, but not reliable in terms of quality and delivery. Foreign firms offering high price. Trying a group negotiation with the multiple raw material partner companies in order to cut down cost. ▪ Training the quality controls by dispatching engineers to the partner companies. ▪ No business done with Japanese firms though investigating the possibility of changing the sourcing channel into Japanese firms
E	▪ Local sourcing 90 percent , knock down imports 10 percent. Products not necessarily reliable are first localized. ▪ Sourcing from 9 Korean firms such as KOLON, 4 local firms such as Qingdao Huata, and 3 foreign firms including Delphi (total 16companies) ▪ Localizing sourcing for cost reduction ▪ Big gap exists between Chinese central government laws and local regulations
F	▪ Component suppliers such as Sejong, Dimos, Halla Climate Control Industy, KCC, Hanil Ehwa, Samlip etc. entered Beijing with the carmakers. Only 2 companies out of 32 sourcing firms are genuinely local Chinese firms (Shandong Shuixing, Jinzhou Hanluo). 90 percent of localization. ▪ The competitiveness of the cars lies in the material (sash) and due to the time problem, mostly relied on Korean firms. The competitiveness of local Chinese firms is weak in sash, but after developing a new model, planning to select and raise the local firms. ▪ Pursuing the change of sourcing strategy from vertical structure to an open one in the future
G	▪ Korean invested firms in China 60 percent (located in Tianjin), importing the rest of the 40 percent (60% localization at the moment will be increased to 80%) ▪ Price and quality are the difficulties in sourcing. Chinese materials at the moment are not reliable in quality. ▪ No sourcing from Japanese firms

Source: Interviews

3.3 Sales Strategies

The sales structure of the seven interviewed component suppliers, on the other hand, was characterized as follows

- The proportion of sales to Hyundai and Kia is very high. In case of D company that is equipped with its own R&D institute and G company whose headquarter develops the sales channels, however, they are selling products to foreign firms in China and Chinese local firms in addition to Hyundai and Kia. On the other hand, the above mentioned survey result of 22 Korean auto parts suppliers in China showed that the sales in the Chinese domestic market accounted for 73 percent, with sales to the Korean carmakers and the component suppliers making up 76 percent, 2 percent respectively. To sum up, the sales is composed of buy-back 22 percent, Korean carmakers and component suppliers in China 56.9 percent, foreign firms in China 8.8 percent, Chinese local firms 7.3 percent and export overseas 5 percent (see Figure 4).

- Each component supplier is trying to develop new sales channels as Beijing Hyundai that grew rapidly until 2006 slowed down in business performance in 2007. However, it does not seem easy to find new sales channels because of the conservative features of the carmakers, lack of information, and the unreasonable demand of Chinese firms to compromise the price. Another big difficulty on the sales is the cost reduction.

Figure 4: Sales Channels of Auto Parts Suppliers in China
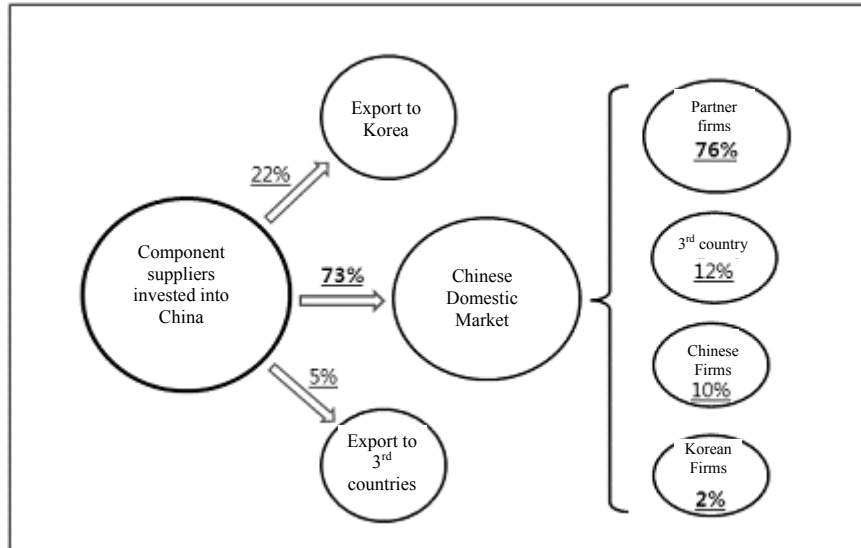
Source: Yang P.S. et al. (2007).

Table 17: Characteristics of the Sales Structure of the Interviewed Component

Suppliers in China

	Sales Strategies
A	95 percent sales to Hyundai and Kia. 1.5 percent for buy-back to Korea, and 3.5 percent for global export. - Trying to sell to Daimler Chrysler(BBDC), 奇瑞 Automobile, GM, Suzuki etc. - Difficulties in developing sales channels due to the following: . Carmakers maintaining their existing partners suppliers . Lack of information . Price compromising and cultural differences in doing business with Chinese local firms - Pessimistic outlook for sales to Japanese firms. Japanese firms doing business only among themselves.
B	- Mostly sales to Hyundai and Kia, starting sales to local Chinese firm (Anhui province Hefei Automobile). Developing sales channels. - Bad conditions of Chinese local firms' payment (3-6 months for bill clearing) - No business with Japanese firms
C	99 percent sales to Beijing Hyundai and Hyundai Mobis; the rest small amount to buy-back. - Developing new customers (not easy due to the conservative automobile industry). Chinese local firms demanding unreasonably low price. - Having intention to sell to Japanese firms but not likely to happen.
D	- Hyundai 40 percent, Kia 25 percent, Shanghai GM 20 percent, Shanghai VW, Ha'erbin Hefei Automobile, Zhang'an, Qirui etc. (Expanding sales to Shanghai GM). 100 percent Chinese domestic sales. - The biggest problem in sales is cost reduction. Sourcing localization and design change needed. The risk factor is the competitive relations with Korean primary vendors. - Planning to expand exports to Korea, the US (GM Global project), EU etc. (30% expected in 2010) - No sales to Japanese firms, and not likely to happen in the future
E	100 percent sales to Beijing Hyundai (Daewoo and JCI sales to Kia). Sales to Beijing Hyundai with JCI according to the car models. No plans to export to Korea. - Having difficulty in the price cut-down - Planning to expand the sales channels
F	Depending on Beijing Hyundai for about 95 percent of its sales. Assembling module sales to Daimler Chrysler, Air bag sales to Nanjing Automobile
G	- Direct sales to Hyundai (30%), Hyundai Mobis, GM, Mando, Dongfeng Yueda Kia, Beijing Benz (BBDC). The headquarter contracting with these firms. Less than 10 percent of buy-back. - Doing business with Hyundai is more secure than developing other sales channels such as Chinese local firms who can abruptly break the business relations. Ultimately planning to develop new sales routes to Chinese firms and global firms like GM, etc. - Difficulties in sales are cost reduction. But the competitiveness enhanced as complying with cost reduction. - No sales to Japanese firms

Source: Interviews

3.4 R&D and Production Strategies

The R&D and production structure of the seven interviewed component suppliers was characterized as follows:

- Except for D company, the component suppliers are not equipped with R&D institutes. In other words, most of the firms have their R&D functions in Korea, and doing mass production of the components in China. It is said that the R&D function in China will be needed if the Korean carmakers production of cars in China reaches 1 million cars.

- The component suppliers have the capacity-lagging strategies that they follow with the carmakers' increase in production capacity in order to avert the risk. Thus the component suppliers expanded their production capacity as Beijing Hyundai grew. And most of them secured enough factory sites.

Table 18: Characteristics of the R&D and Production Structure of the Interviewed

Component Suppliers in China

	R&D and Production Strategies
A	▪ Production goal of 500 thousand cars in 2008, separately producing with the parent firm in Korea (No division of labor in the process) ▪ Primarily carrying out R&D with the carmaker together, and having 23 employees in the development department. ▪ Test taken in Korea and production done in Beijing ▪ With the production goal of quality equal to Toyota, price level equal to Chinese local firms, developing the models that are tailored for the demand of the Chinese domestic market
B	▪ 100,000 in 2003; planning to produce 500,000 in 2007 ▪ B company owns 80 percent shares and Chinese Xinggufazhangongsi owns 20 percent. Set up a joint venture considering the possibility of listing. ▪ The quality problems in the early stage overcome by the training and technology enhancement with the support from Korean headquarter. ▪ R&D center in Korea. New product development in H/Q and mass production in Beijing. Local R&D center will be needed if 1 million cars are to be produced.
C	▪ Division of labor with Korea H/Q in the production process (importing semi-finished products ▪ No self R&D function, and production only in Beijing. ▪ Cost reduction compensation method: Transferring the CR when purchasing, promoting localization, and suggesting CR plans to the carmakers ▪ Have intentions of dealing with Chinese local firms or foreign firms but retaining the plan in the case of Chinese local firms due to many risks
D	▪ Having R&D institutes (7 expatriates, 80 engineers, 2 test fields) ▪ Production design in Korea H/Q, application to Chinese market in Beijing ▪ Easily recruited good employees in Beijing. ▪ No division of labor of with Korea H/Q, full production system in China. ▪ At the moment, market shares in Chinese auto taken up 7 percent by Korea, 30 percent by Chinese local firms, 27 percent by Japan, 23 percent by EU and 13 percent by the United States. Chinese local firms are expected to take more than 50 percent with the support of the Chinese government. This will bring about the shrinking in market shares of Korea and the US, etc. ▪ Secured factory site for 1 million production capacity, and established 600,000 production capacity around Beijing.
E	▪ located within 5 km from Beijing Hyundai ▪ Annually producing 250,000 as of now; capability of producing 400,000 cars maximum
F	▪ Annual production capability of 300,000 cars (module factory 300,000/year; I/P factory 600,000/year)
G	▪ Annual production capability of 1.4 million cars

Source: Interviews.

4. CONCLUSIONS

The outlook for the Chinese automobile market is that cut-throat competition among around 110 joint ventures and local automotive companies left the carmakers with a huge oversupply brought about by the aggressive expansion of production facilities. Thus the average purchase price of passenger cars is projected to continue to drop until 2010 (see Figure 5). In this scenario, the high quality and cost competitiveness of the vehicles and automotive components will be the decisive factors for business success. And these success factors will be largely dependent on the extent of localization of the automotive firms.

Figure 5: The Outlook for Price Cut-down in Chinese Automotive Market
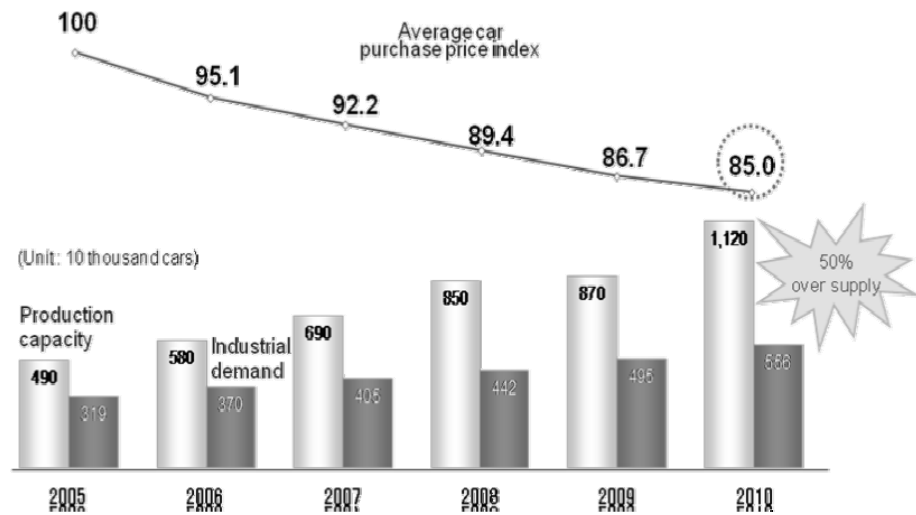
Source: Interview with Hyundai Motors.

On the other hand, the carmakers entering into China plan to expand their production capacity according to an increment of the Chinese market demand and this

will change the structure of component sourcing in the end. In other words, enlarged production capacity will demand more component suppliers so that the carmakers can expand or change their sourcing firms. At this time, the imperative points for selecting sourcing firms will be the localization of the component sourcing for price competitiveness. However, Chinese local firms cannot meet the quality specifications as of now. Therefore it is necessary to select and raise the local firms.

Also, the Korean component suppliers that accompanied the carmakers into China need to localize their sourcing firms and diversify the sales channels as the conditions of the carmakers are changing. Especially concerning the diversification of the sales channels, they should develop new sales routes to the Chinese local firms with rapid growth, to foreign enterprises with global network, and expand the exports overseas.

The Korean government should also intervene for the joint advance of small and medium enterprises (SMEs) into China, provide the necessary field information, and support the business matchmaking fairs to select and nurture the superior local firms.

In terms of the cooperation between Korea-Japan firms in China, it is not likely for Korean component suppliers to sell their products to Japan carmakers because of the great distance from Beijing to Guangzhou where Japanese companies are establishing clusters and there are many Japanese components suppliers accompanying the Japanese carmakers. And yet certain types of cooperative models should be found to avoid excessive competition between the two countries in Chinese market in the future. In addition, regional economic integration like Korea-China-Japan free trade agreement should be achieved to reduce the trade cost within the region.

Lastly, in terms of the changes in the production network of the automobile industry, the trend will be very similar both at home (Korea) and in China in the future.

This means that the production network with strong exclusiveness will be changed into more open or western style production network. The reason is that in the early stage of investment of Korean automotive industry into China, the domestic production network was transplanted into China the way it was, but it seems that with the rapid changes in the business environment, the production network in China is also experiencing the reduction in exclusive dealings and the expansion of component sourcing partners just as the domestic production network.

NOTES

[i] This paper is the modified and completed version of Chapter 5 in Jung and Lee (2007).

[ii] Korean term for a conglomerate of many companies clustered around one parent company.

[iii] See Cho, S.J. et al. (2004), pp. 137-138.

[iv] On the other hand, Bok, D.K. (2002) found that foreign investment into Korean component firms was not significantly related to the change of component supply structure, i.e., increase of the number of firms the component suppliers transacted with, since the foreign firms invested into component suppliers that were already transacting with multiple assembling companies.

[v] Cho, S.J. et al. (2004), pp. 152-154.

[vi] Daewoo Motors established joint ventures in Guilin (桂林) in 1994 and in Yantai (煙台) in 1996. But owing to the bankruptcy of the group, the automotive business of the Daewoo group was acquired by General Motors and other companies.

[vii] Mostly referenced from Lim, K.T. (2003), pp. 214-219.

[viii] There are two Korean carmakers in China, Beijing Hyundai and 東風悅達起亞, but due to information access limitations, this paper only deals with Beijing Hyundai.

[ix] HPV (Hours Per Vehicle) is the value of total hours spent on the production, production management, maintenance, quality control and support, etc. divided by the total number of produced cars; the lower the value is, the higher the productivity.

[x] The field research in Beijing found that the prices of 49 models in China were lowered 7.9 percent on the average.

[xi] Oh J.S. (2007)

xii Korean export of automotive components to China has a very high annual growth of 102.6 percent on the average after 2001, and has shown a 34-fold increase from 2001 to 2006. The imports recorded an increase of 22.7 times over the same period. This owes very much to Hyundai Motors' and its related component suppliers entry into the rapidly growing Chinese car market.

xiii The criteria for the SME of domestic auto component suppliers are 50-299 employees or less than 8 billion KW of capital stock; for firms entering China, only the number of employees is considered. Therefore, the comparison to the domestic firms just takes the employment scale into account.

xiv Beijing Hyundai Motors interview

xv On the interview result of one carmaker (BHMC), refer to the chapter 2 'Korean Automotive Companies' Production Network in China'.

xvi Another survey result showed that 22 auto component suppliers' localization of material sourcing was 51% on the average and the proportion of Korean component suppliers reached 61%. The localization percentage reflected in this interview is higher than that of the survey because the interviewed firms mainly doing business with Beijing Hyundai had to increase local sourcing proportion to keep up with the demand of the rapidly growing Beijing Hyundai. Please see Yang P.S. et al. (2007).

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9

New Perspectives on Industry Clusters in Malaysia

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1. OVERVIEW

The promotion of industry clusters has become an integral part of Malaysia's industrial policy, as enshrined in the country's Second Industrial Master Plan (1996-2005). This strategy continues to stay with Malaysia's Third Industrial Master Plan (2006-2020). Several industrial clusters have emerged, driven by the private sector and supported by the government, in different parts of the country. Thus, for example, electronics industries tend to cluster in Penang, furniture and palm oil in Johor, and ICT and machinery in the Klang Valley.

Export-oriented industries, such as electrical and electronics (E&E) as well as textiles, were formed in the 1970s. This was facilitated by the availability of cheap workforce, the establishment of free trade zones, and various investment incentives. As the economy progressed, policy was shifted towards higher value-added products. To enable this, various measures to encourage foreign direct investment (FDI) to strategic sectors were implemented.

Together VISION 2020, IMP2, and IMP3 frameworks led to the creation of eight industry groups identified as growth-enhancing sectors. These groups are: (a) E&E, (b) textiles and apparel, (c) resources, (d) chemicals, (e) materials, (f) agro-based products, (g) transportation, and (h) machinery. The first two industry groups (a & b) are mainly MNCs-driven. Their products are mainly for the global market, while their growth and sustainability rely on external determinants. The third to sixth industry groups (c − f) listed above are natural resource-based clusters. The extent of indigenous involvement and ownership are high in these industries, supported by local research and development

(R&D) institutions. Examples of such industries are wood-, rubber-, and palm oil-based, petrochemicals, polymers, and composites products. Finally, the last two groups (g & h) are technology-driven. They are identified through government policy initiatives and are critical for the development of particular capabilities, industries, and competencies within the country. Examples of such industries include automotive, marine transportation, and aerospace.

Moreover, to move towards higher value-added production, indigenous technological development becomes crucial. Measures carried out include (1) acquisition of foreign technology firms, (2) purchasing of technology, (3) establishment of R&D facilities, and (4) setting up of technology incubation centers. Additional projects, such as (i) E&E, (ii) ICT, (iii) petrochemical, (iv) palm oil, (v) automotive, (vi) various manufacturing, and (vii) new economic corridors were created to attain higher value-added production.

Both E&E and ICT industries shared similar success factors, namely strategic location with good physical infrastructure, increasing trend in global outsourcing, skilled workforce, efficient telecommunication systems, and ongoing research and development (R&D) activities. However, most of these companies are small in size and in their capital outlay. As a result, policy designed to relocate them to special zones, such as the Multimedia Super Corridor (MSC) compound had failed, as they could not afford the high rentals, and hence the new MSC National Rollout policy to create suitable cybercities and cybercenters across the country.

Five cybercities and six cybercenters were identified base on eight factors: (i) commitment of the state authority, (ii) broadband and infrastructure readiness, (iii) customer-centric management with key performance index, (iv) competitive environment to attract investment, nurture start-ups or SMEs, and house knowledge workers, (v) availability of talent pool professionals, (vi) proximity to universities and R&D centers, (vii) relevant flagship applications to improve service delivery, and (viii) adherence to State ICT Blueprint, which provides value propositions for the local sector.

To meet these determinants, MDeC (the governing body of MSC) leverages on comparative advantages of each state by creating nuclei of value formation, whilst bridging the digital, mind, and economic gaps via ICT. Furthermore, MSC National Rollout is focusing on socio-economic readiness and economic potential of each state in

order to create impact. Finally, to raise volume, value, and success rate of this procedure, there is a need to foster synergistic joint ventures (JVs) among cybercities and cybercenters domestically, regionally, and internationally.

Cluster development has also assisted SMEs in building core competencies, to be part of the global production networks and supply chains. A number of SMEs in the E&E sector have progressed to become global suppliers to MNCs. Nevertheless, the prevalence of MNCs, which depend mainly on their respective parent companies for technology, restricts the technological capabilities of local supplier firms. Local firms do not regard universities and research organizations as a source of R&D, and do not invest in in-house R&D. This impedes the presence of local firms in export markets. The development of an indigenous knowledge-based industrial cluster presents a major challenge to the government.

The prosperity of the petrochemical sector depends on strategic location, such as close proximity to China. This is made possible through the formation of Asean Free Trade Area (AFTA), which has enlarged the market size of domestic petrochemical industry. Moreover, the availability of skilled technical manpower, stable supply of feedstock, and excellent integrated infrastructure also matter significantly.

The attractiveness of the palm oil industry clusters lies in its renewable energy source and cost competitiveness compared to crude oil. The key success factors of the biodiesel industry are technology and quality. Malaysia has the first integrated biodiesel plant in the world, capable of producing biodiesel and related derivatives. Various incentives such as tax waiver, R&D, special industrial building allowance, and reinvestment deduction are given to promote this industry.

Although the automotive industry was initiated much earlier, it has failed due to several reasons. The shortages of skilled labor accounted for the bulk of dissatisfaction on part of the Japanese manufacturers. Moreover, frequently changing policy measures designed to insulate the domestic car industry has impeded FDI flow into this sector. While the newly formulated National Auto Policy (NAP) attempts to promote a competitive automotive sector in Malaysia, inert second-hand market has dampened its prospect.

More recently, the government has acted as an enabler to reinvigorate some of the existing high-growth potential areas and industries. This includes the promotion of five

new economic corridors, namely Iskandar Development Region (IDR), Northern Corridor Economic Region (NCER), Eastern Corridor Economic Region (ECER) Sabah Development Corridor (SDR), and Sarawak Corridor of Renewable Energy (SCORE). These corridors cover several existing industry clusters. For example, the IDR in Johor encapsulates various resource-based industries, E&E (extension from Singapore), furniture, and textiles. However, large capital expenditures may be needed to sustain activities in these corridors. Accordingly, attractive investment packages, facilities, and tax concessions are in the works to attract more FDI flows to manage these corridors.

Finally, results from the mail survey to 20 manufacturing companies in the Klang Valley suggest that factors that promoted initial establishment have continued to prevail. These factors were (a) the availability of investment incentives, (b) liberal trade policy, (c) good physical infrastructure, and (d) the availability of general utilities. Nevertheless, barring the small sample size, these responses seem to be consistent with those of other industry clusters discussed above. The major impediments identified, include the lack of skilled labor and rigid custom procedures. Thus, there is a need for policies to correct these deficiencies. In addition, the lowering of corporate taxes should encourage more investment into Malaysia. The setting up of more training facilities for the training and retooling of the workforce would help ease the shortage of skilled workers. Lastly, the creation of a regional networking center, business parks, and certification center may also expedite cluster formation across the country.

2. POLICY FRAMEWORK

The Malaysian economy has arrived at a new crossroads. The meteoric rise of China and India and the rapid pace of globalisation have forced Malaysia to reinvent itself so that it can remain competitive and relevant. Unskilled labour-intensive manufacturing activities have migrated to countries where labour is cheaper. Malaysia has to move up the value chain away from labour-intensive low value-added production to skill-intensive and knowledge-intensive, high value-added production.

The shift to the K-Economy offers enormous opportunities through improved productivity and economic performance. However, it also brings with it formidable

adjustment challenges with implications for individuals, firms and the government. Already, the notion of a post-industrial era or a knowledge-based export-led industrialization, based predominantly on services and ICT, is causing uneasiness among certain businesses, especially the traditional and protected ones.

We need to bear in mind that Malaysia is in a catching-up situation, at least when it comes to the new growth areas. Given the scarce resources, Malaysia needs to keep its focus on areas that will soon have a profound impact on the economy. As such, the following areas, biotechnology, ICT, resources-based industries, nanotechnology and SMEs, have been chosen for a broad discussion.

3. BIOTECHNOLOGY

Biotechnology, defined as the use of living organisms or their products to modify foods, agriculture and human health, has existed in one form or another for ages. In this sense, biotechnology is not new. The fermentation of fruit juices into wine, the transformation of milk into yogurt, and the use of animal breeding techniques to produce desirable traits in animals are all instances of biotechnology. Tremendous achievements have been made in the field of biotechnology and new technologies have been developed in recent years making the face of biotechnology almost unrecognisable.

This new face of biotechnology is of sufficient importance to be adopted by the 1992 United Nations Conference on Environment and Development as part of Agenda 21. Agenda 21, which was signed by world leaders, was ambitious enough to claim that biotechnology would:

"make a significant contribution in enabling the development of, for example, better health care, enhanced food security through sustainable agricultural practices, improved supplies of potable water, more efficient industrial development processes for transforming raw materials, support for sustainable methods of aforestation and reforestation, and detoxification of hazardous wastes."

Not all that was supposed to have been achieved by Agenda 21 has seen fruition. Yet, there is no doubt that biotechnology has made inroads into most areas of human activity. Biotechnology has applications in the fields of medicine, agriculture, environment, industrial production, and criminology, to name a few areas. In addition to its pervasiveness, biotechnology is an integral part of the world trading system. This is a mark of its viability as a commercial project. The economic aspect of biotechnology has far-reaching consequences and it promises to be an engine for economic growth.

Developing countries can play an important role in the emerging field of biotechnology and participate in the applications of modern biotechnology in diverse areas that include agriculture, medicine, environmental management and industry. Since industries that use biological resources are likely to be affected by the recent advances in biotechnology, the interrelation between biotechnology and industry will give rise to what may be called the "new bio-economy." In this context, Malaysia will be left out of global developments if it does not create the right pre-conditions for the development of biotechnology in this country. In fact, failure to actively participate in these advances will result in a 'genetic divide', and create technological disparities as well as disadvantage those countries without the necessary expertise from gaining access to niche markets in the new bio-economy.

It is crucial for Malaysia to be well-equipped in biotechnology-related fields such as genomics, genetic engineering, chemical engineering and cell technology. These disciplines are transforming industrial and environmental processes and they are making an impact in the global economy and the international trading system. At present, the cutting-edge knowledge and skills in these disciplines are concentrated in a small number of countries. Malaysia with its vast agricultural resources, long exposure to research in tropical diseases and involvement in food and beverage production will find it beneficial to gain the necessary expertise in biotechnology so that it can be productively applied in these areas. This will help Malaysia create a niche for itself in these fields and establish itself, in the time to come, as a market-leader in these sections of the global economy. The challenge for Malaysia is to employ the generic nature of biotechnology techniques to create a new bio-economy, which has prospects for commercialisation.

3.1. Status of Biotechnology in Malaysia

The Malaysian government supports the development of biotechnology. A clear sign of this interest in biotechnology can be found in the fact that biotechnology was held-out for advancement under the Eighth Malaysia Plan (2001-2005). Further, the Ministry of Science, Technology and Environment (MOSTE) founded the National Biotechnology Directorate (BIOTEK) in 1995. BIOTEK was set up with the express aim of coordinating the growth and diffusion of biotechnology research. One of the activities that BIOTEK has undertaken has been the establishment of seven biotechnology cooperative centres (BCCs). These BCCs have been created in key functional areas covering plant and animal applications, food production, molecular biology, biopharmacy and medicine.   Also included are the applications of biotechnology to environmental management and industrial processes.

Another noteworthy achievement is the Malaysia-MIT Biotechnology Partnership Programme (MMBPP). This is a collaborative effort supported by MOSTE to foster links between Malaysian research institutions (including public universities and government organisations), the BCCs and MIT. The MMBPP was launched in 1999 and has two crucial research items on its agenda:

- natural product discovery from indigenous medical plants, and
- oil palm technology.

In 2001, the launching of the BioValley initiative by the then Prime Minister Mahathir Mohamad, showed the keen interest that the government has in promoting the advancement of biotechnology. BioValley was envisaged as a cluster of biotechnology research institutions, universities and companies within the Multimedia Super Corridor (MSC). Among other areas, BioValley will conduct research in the following fields:

- genomics
- molecular biology
- nutraceuticals
- pharmaceuticals, and
- agricultural biotechnology.

BioValley is not purely an academic enterprise. In fact, it is expected that the

research from BioValley will have commercial value. It is in this direction that it will have a business directorate to commercialise its research products.

Malaysia has tremendous potential to harness by participating more aggressively in biotechnology developments. The activities to be engaged in include academic research, applications development, innovations in techniques and the commercialisation of products and processes. Along with these activities there is also a need to introduce and implement an appropriate industrial policy that supports the development and use of biotechnology for industrial and commercial purposes. An effort to supplement biotechnology research and applications with an appropriate industrial policy is required in order to encourage R&D and to spur the commercial potential of the industry.

It is useful for Malaysia to focus its attention on the following areas in the development of biotechnology:

- the pharmaceutical industry
- agriculture
- the chemical industry
- environmental applications

3.1.1. Pharmaceutical Industry

The pharmaceutical industry is one that is characterised by the presence of multinational corporations and strong barriers to entry. Nevertheless, given the vast biodiversity available in Malaysia, the huge pool of traditional knowledge in indigenous medical systems, and the long experience in traditionally used medical plants, Malaysia can make a foray into this area.

Much of the knowledge of indigenous medical systems and traditional medical plants can benefit from advances in biochemistry and biotechnology since it is now possible to obtain information at the molecular and cellular level. Conventional screening of natural and synthetic chemical compounds is a long, random and time-consuming effort. This has increasingly been overtaken by rational drug design. Malaysia should direct more efforts to rational drug design. However, a feasible model is needed to facilitate this development.

Most research in biotechnology with pharmaceutical applications is carried out by

the large corporations, which enjoy a dominant global presence. These corporations have large R&D budgets that allow research to be conducted in a field that has high risks and equally high returns. An alternate model is required in the Malaysian case. The proposed model is to support the creation of 'dedicated biotechnology companies' (DBCs). DBCs are companies that begin as research institutions. Unlike established companies they will pursue R&D in niche markets, concentrating on specific technologies or particular products. The markets that Malaysia should choose to focus on would be those where the country has an advantage, either in terms of traditional knowledge or medicinal plant resources.

The government can establish new research institutions or encourage existing research institutions to explore specific ideas or possibilities. These institutions can function as DBCs by forming collaborative links with established pharmaceutical companies or biotechnology companies. Funding for DBCs can come from the government as seed money, through venture capital, stock offerings, or through relationships with established pharmaceutical companies.

3.1.2. Agriculture

Malaysia is a net importer of food. Nevertheless, an active agriculture sector exists and the Prime Minister has earmarked the sector for improvement. Although the agriculture sector in its traditional sense ceases to be an engine of growth, it is possible to modernise the sector in the light of biotechnology. The agriculture sector can be transformed into a knowledge-based sector by promoting the use of biotechnology.

There are many applications that biotechnology has in the sphere of agriculture. A brief list of such applications is as follows:

- reproductive technologies
- animal health products
- growth hormones
- transgenic animals
- microbial pesticides and other micro-organisms
- plant research
- cell culture

- transgenic plants

- food processing

- seed development

Many of these applications are being explored in the public institutions of higher learning and in other public research organisations. The large firms in the agriculture industry are also conducting their own R&D. There is no need for the government to further duplicate these efforts. Instead, there is a need to focus efforts at encouraging small firms to focus on certain key areas so that they render themselves profitable either by developing a specialisation in niche markets (e.g. isolating genes), by developing new technology, or by forming alliances with larger firms and functioning in a manner that supplements the efforts of the larger firms. Again, the government can play a very useful role by encouraging and providing a suitable incentive structure that will make possible collaborative efforts between public research institutions, small private companies, large firms and venture capitalists.

3.1.3. The Chemical Industry

The main function for biotechnology in the chemical industry is to produce chemicals that are presently produced through the use of fermentation. Biotechnology can help the chemical industry through the production of industrial enzymes and in the synthesis of complex chemicals. The following are the main applications for biotechnology in the chemical industry:

- fermentation products (e.g. amino acids, industrial enzymes)

- biosensors (e.g. for detection of biological materials such as cholesterol, narcotics, to monitor the presence of toxic substances in water and organic solvents in air)

- chemical synthesis.

The use of biotechnology in the chemical industry most often goes unnoticed. Nevertheless, the use of biotechnology has stretched as far back as the early 1980s in Germany, the US and Japan. Japan is at the forefront in the development of amino acids such as Aspartame and monosodium glutamate (MSG). It is also in the lead as far as biosensors are concerned. Most existing biosensors have limitations due to their bulkiness, short lifespan and the need for frequent calibration. There are on-going R&D

projects in many developed countries to rectify these drawbacks.

The area that is most suitable for Malaysia to concentrate on is in the production of fermentation products. Since there is a significant food and beverage production industry, this is an area that Malaysia should focus on. The second point of focus should be on disseminating research outcomes to the small and informal firms engaged in food processing and packaging.

3.1.4. Environmental Applications

There is scope in Malaysia for the use of biotechnology in the following areas:

- pollution control
- agriculture
- microbial enhanced oil recovery

Biotechnology, through the use of recombinant DNA (rDNA), can develop microbes with capabilities for waste degradation. In fact, pollution control and toxic waste treatment are areas in which abundant applications can be found. Biotechnology can be used to degrade toxic compounds and slimes, for sludge dewatering, and to decrease regulatory uncertainty. There are also environmental applications of genetically engineered organisms in agriculture. Finally, it has been estimated that more than 300 billion barrels of US oil cannot be recovered through conventional techniques. Instead, it has been suggested that biotechnology can be used to enhance oil production.

3.2. Future Directions and Policy Measures

Most developed countries such as France, the UK, the US and Japan have had well-developed biotechnology policies that go back to the 1980s. Malaysia cannot afford to lag behind in this field. One has only to look at Japan which has utilised biotechnology from sake and miso production to pharmaceuticals. Japan, like France, adopted a policy that involved considerable state participation.

Investment in biotechnology has several features that make state intervention imperative for a country like Malaysia. The following are some of the characteristics of biotechnology research:

- the multi-disciplinary nature of the area

- the long gestation period of research in applications
- the uncertain commercial viability of research in biotechnology
- high costs of training and equipment in some areas of biotechnology research

In view of these considerations, it is necessary that Malaysia adopt a strategy that involves government support and risk-taking. Several models have been pursued in the development of biotechnology by developed countries. In the United States, for example, biotechnology has been largely a private enterprise endeavour. On the other hand, in Japan there has been some government support, with private sector participation. Even in the case of Japan there have been false starts, with large corporations such as Kawasaki realising that it was not financially viable to pursue biotechnology with a view to making profits. In the United Kingdom, on the other hand, the universities have been the main locus for research in biotechnology. These examples point out that one can conceptualise a model for the development of biotechnology with three axes determined, respectively, by the government, universities, and the private sector. In the Malaysian case, it would be prudent to propose a model that is heavily tilted towards research being developed with considerable government support, but with strong links among the government, research institutions, and the private sector.

With the Biotechnology Master Plan in place, the Malaysian model must emphasise the following elements in implementing it:

- provide a role for small firms
- encourage collaborative efforts between biotechnology firms, research institutions, industry and the relevant ministries and government agencies
- offer incentives for biotechnology firms with commercially viable ideas
- enhance the role of research institutions as providers of biotechnology research
- encourage international exchange and foster creativity and originality in government-sponsored biotechnology centres
- support positive research outcomes with incentives (e.g. good equipment, research grants, links with world-class research institutes, adequate financial remuneration)
- select a small number of core areas for high funding and good staff training

The Malaysian model for the development of biotechnology may not wish to be as ambitious as in the South Korean case where a biotechnology-economy or B-economy has been proposed. In any case, Malaysia must capitalise on its abundant biodiversity, its possible niche in food production, oil production and renewed emphasis on agriculture in developing its biotechnology strategies. Malaysian biotechnology companies should seek strategic tie-ups with emerging Indian global pharmaceutical company with proven research capabilities such as Ranbaxy and Dr Reddy's Laboratories Limited.

4. ICT SERVICES

4.1. MSC the Catalyst

Since the mid 1990s, the government has acknowledged that productivity gains in the manufacturing sector have been facilitated by increased sophistication of imported production equipments that are also available to competitors. The problem of productivity has also been aggravated by rising wages. Continuous wage increase that exceeds the productivity growth has gradually eroded Malaysia's advantage as a low-cost production centre. Competitiveness can no longer depend on low wages but requires a critical mass of creativity and innovative potential that could only be achieved by transforming Malaysia from a production-based economy (P-economy) into a knowledge-based economy (K-economy).

In this Information Age, ICT services have been recognised as the most strategic enabler for the successful transition of Malaysia to a K-economy. The ICT revolution set with the formulation of the National IT Agenda in 1996 and it aims to enable Malaysia moving rapidly into an information and knowledge based nation. The two key initiatives for leapfrogging Malaysia into a K-economy are the Multimedia Super Corridor (MSC), a world test-bed for ICT development, and the enactment of a set of cyber-laws. In this era of phenomenal change, undoubtedly a strong commitment towards the application of ICT in the strategic functions of the manufacturing industry such as product design, quality control, process planning, production and materials planning, is prerequisite to achieve the fourth phase of industrial development, which is

vital for the realisation of industrialised nation status by 2020.

While a S&T parks can be generally catered for technology-based R&D, high technology manufacturing or software and ICT services, the government has chosen to position the MSC as a regional hub just for ICT and multimedia technologies. This has distinguished it from many other S&T parks in the region which mostly focus on high technology manufacturing. This probably explains why the MSC has not failed to attract world-class ICT companies to be located in it, although it is a new kid on the block in this region.

4.2. Emerging Opportunities, Potential Niches and Growth Areas

Online gaming is fast becoming a favourite form of entertainment for children and working adults. With the establishment of Terra ICT (M) Sdn Bhd in 2003, the MSC is now potentially developed into an online game development hub. Terra ICT is a joint venture between Terra Corporation of Japan and Bintai Kinden Corporation Bhd of Malaysia. As an online game aggregator and developer, the company is the first English language massive multi-player on-line role-playing games portal. Different players can log on and play a role-playing game together, irrespective of their locations. Terra ICT predicts that the global market for online gaming is presently worth US$970 million, of which Malaysia contributes between US$20 million and US$30 million. Meanwhile, research firm IDC estimates that online gaming in Asia Pacific alone was worth US$533 million in 2002, with South Korea and Taiwan leading the pack (Ganapathy, 2004). Nevertheless, considering that this is made possible only by high-speed Internet access, the underdeveloped broadband infrastructure in Malaysia would undermine the growth of the online gaming industry. In fact, as in the case of South Korea, Taiwan, China, Japan and Singapore, there is a high possibility that Malaysia will be a promising market once broadband really takes off.

Another emerging opportunity that the MSC can tap into is application services, particularly in the realm of customer relationship management (CRM). More specifically, there is a need to nurture more home-grown application service providers (ASPs) to deliver CRM software to small and medium-sized industries via the Internet. The ASP model is one where the software is delivered as a service over the Internet or any other wide-reaching network, and clients would subscribe to the software as

opposed to buying it. Surprisingly, such a business model has yet to take off successfully in Malaysia. It is reasoned that there is a big potential for the model to grow, considering that most customers now have to pay large sum of money in the traditional client/server approach (software is hosted on the company's server and the application is dished out to clients).

While offshore services are widely characterised as a non-strategic and low-value activity, Malaysia has in fact a beneficiary of the offshore outsourcing in developed countries, particularly the US. Besides R&D, it is reasoned that the MSC can also focus on the shared services and outsourcing (SSO) areas. To-date, over RM1 billion has been invested in the SSO industry in the MSC. While the R&D revolution forms the thrust of the MSC's long-term strategy, at its foundation is an evolutionary process that is changing Malaysia from a manufacturing base into a global hub for ICT-enabled services through SSO. In other words, R&D and SSO combined will help deliver the MSC's value proposition: new high-value jobs, greater exports and the transformation of the ICT industry into a major export earner (Ariff, 2004).

The microelectronics industry is crucial to the success of the industrial capability of the manufacturing sector, as it has been contributing about 30 per cent of the total manufactured exports in Malaysia over the past 20 years. Nevertheless, the efforts to move the industry up the value chain seem to be less remarkable, especially in the area of integrated circuit (IC) or chip design. Understandably, one of the biggest hindrances to start-up companies in this field is the high cost of electronic design automation tools. It is vital that the government helps Malaysian companies start their own design centres by setting up exclusive training centres in the MSC to provide hands-on experience to local design engineers.

4.3. Challenges Ahead

It is reasoned that the MSC really needs to tread its way around very carefully and strategically so as not to compete just in software development, for that is India's forte. As a matter of fact, India has gained credibility in enterprise software especially for outsourcing and call centres (customer relationship management), which Malaysia has not been able to achieve thus far. After all, it might be already too late for Malaysia to venture into the field of business process outsourcing, considering that India is already a

major player in the region. At this point in time, it is imperative that the Malaysian MSC status companies form strategic partnerships with world-class Indian ICT and software companies such as Wipro Technologies Limited, Satyam Computer Services Limited and Infosys Technologies Limited, which are reportedly going on a spree to acquire Asian ICT companies.

5. RESOURCE-BASED INDUSTRIES

Resource-based industries have been around for many years. What is more important is that it has seen some structural transformation where attention is no longer on primary exports but on downstream activities related to developing high value-added products targeted for the export market. Malaysia cannot rely on exports of primary commodities as where are steadily facing higher cost with higher wages and land prices. It is included in the emerging industry section not because it is new, but because there has been some significant progress in developing relatively higher value-added products in industries such a furniture, palm oil and food processing.

Resource-based industries are considered an important part of the Malaysian industrial sector because they can provide a cushion for the economy to fall back on if the main export-oriented manufacturing sectors face difficulty arising from the sometimes uncertain external demand. The resource-based industries have enabled the Malaysian economy to be more diversified and this has accorded more resilience to the economy. The abundant supply of natural resources is the main advantage that Malaysia has and is the driving factor in advancing the resource-based industries. The main sectors in this industry are the wood-based sector, rubber-based, palm oil-based and the food processing sectors.

Over the years, there has been a noticeable progress in the downstream activities as more and more marketable products are being developed. Nonetheless, there is a need to accelerate the production of higher value-added products for the export markets. This will require further upgrading of technology and more market-driven product development activities. There has to be acceleration in the development of downstream products with Malaysian brand names. But all this will require a sustainable supply of

raw materials.

Table 1: Manufacturing Value Added 2000-2010

Industry	Share of Total Value Added (per cent)				Average Annual Growth Rate (per cent)	
	2000	2003	2005	2010	8MP	9 MP
Resource-Based	**41.9**	**43.4**	**43.7**	**42.3**	**5.0**	**6.0**
Vegetables and Animal Oils & Fats	3.8	4.2	4.4	4.9	7.6	9.1
Other Food Processing, Beverages & Tobacco	6.0	5.9	5.8	5.6	3.6	5.7
Wood Products including Furniture	4.4	3.7	3.6	3.3	0.3	4.8
Paper & Paper Products, Printing & Publishing	3.4	3.3	3.2	2.9	2.9	4.4
Industrial Chemical including Fertilizer & Plastic Products	10.1	11.5	12.2	12.6	8.3	7.2
Petroleum Products including Crude Oil Refineries & Coal	6.7	6.8	6.4	6.6	3.1	7.4
Rubber Processing & Products	2.7	2.9	3.5	2.8	9.7	2.3
Non-Metallic Mineral Products	5.0	5.1	4.5	3.6	2.2	2.1
Non-Resource Based	**56.3**	**54.7**	**54.2**	**55.4**	**3.3**	**7.1**
Textile, Wearing Apparel & Leather	3.5	3.0	2.2	1.8	-4.8	2.0
Basic Metal Industry	0.9	0.9	0.8	0.7	2.6	4.8
Metal Products	4.3	3.6	4.9	5.8	7.1	10.2
Manufacture of Machinery Except Electrical	4.6	5.2	4.2	3.1	2.4	0.2
Electronics	29.5	26.5	28.0	29.4	3.0	7.7
Electrical Machinery	2.6	1.8	1.2	1.0	-11.3	4.1
Transport Equipment	11.0	13.7	12.9	13.7	7.5	7.8
Others	1.7	1.9	2.1	2.2	8.4	7.7
Total	**100.0**	**100.0**	**100.0**	**100.0**	**4.1**	**6.7**

Source: The Mid-Term Review of 8MP, 2000-2005, The Ninth Malaysia Plan 2006-2010
e = estimated

Table 1 above shows the importance of the resource-based industries in the economy. Although the main contributor in terms of value-added in the manufacturing sector is the non-resource-based industries accounting for a 54.2 per cent share of total in 2005, the value added contribution of the resource-based industry is still significant at 43.7 per cent share. The main contributors in the resource-based industries are the petroleum products including refinery, industrial chemicals, and food processing with shares of 6.4 per cent, 12.2 per cent and 5.8 per cent respectively.

The wood-based sector is still dominated by primary processing activities such as

saw-milling, veneer and plywood production. But over the years, there has been a marked increase in downstream activities such as the manufacture of furniture and fixtures have increased markedly. The share of veneer and plywood in total wood exports had decreased in 2006 (32.2 per cent) from 68.6 per cent in 1994. Furniture exports had grown at an average rate of 19.9 per cent during the last ten years up to 2006, much faster than the growth in veneer and plywood 8.1 per cent. The furniture industry has made significant progress advancing from a traditional cottage based into an export income earner.

The major export markets for Malaysian furniture are in USA, Japan and United Kingdom. This shows that the Malaysian furniture exports were competitive enough for the markets in developed countries, and this is a good sign. Export growth to Middle East countries have been rapid, showing that entry into new markets have been expanding rapidly. Malaysia has to continue searching for new markets so that the furniture industry will continue to make further progress.

What the furniture manufacturers are somewhat lacking is the expertise in design innovations, furniture components and fitting. Some of the components are imported from Italy and Germany. What the furniture industry needs are more furniture designers. The Malaysian Furniture Promotion Council is setting up its own design centre where foreign trainers are invited to train locals for the period of 6 months. We need to be able to come with indigenous designs that are acceptable through technological upgrade, R&D and product design. There is also a need to increase the effectiveness of marketing for Malaysian furniture. The challenging part for the furniture industry is how to ensure that the supply of logs is secure and sustainable. The government has put in efforts to ensure that timber supply are not depleting.

Malaysia continues to be the largest producer and exporter of palm oil. In 2006 Malaysia produced 43.2 per cent of global palm oil and 50.2 per cent of world palm oil exports. Palm oil exports had grown at an average rate 10.3 per cent in the last ten years up to 2006. High prices in the past year or so was due to a shortage in the supply of soybean oil he back of uncertain whether conditions. The major markets for Malaysia's palm oil are in China, India, Holland, Pakistan and Egypt. The two main determinants for palm oil consumption are income and population size. As the income in China and India rise further, there is a good chance that they will consume more palm

oil.

Malaysia cannot continue to rely on primary trading of palm oil. There is a need to focus the efforts on marketing and producing downstream products. Palm oil can be marketed as a "halal" vegetable oil to other Muslim countries. There should continue to be more R&D for downstream products that can be commercialised once new products are developed. Many food products have come out of palm oil and more efforts should be put in promoting these products. As a by-product of palm oil in the non-food sector, oleochemicals have become an important export items. Oleochemicals are used in the production of soap, detergent, cosmetic products and other industrial applications. Malaysia was a leading exporter of oleochemical in 2006, with exports amounting to RM5.60 billion, up more than double from RM2.61 billion in 2002. Changing consumer preferance for natural or plant-based products for cosmetics and personal care products has led to higher export demand for oleochemicals. There areas such as biomass and biotechnology that can be tapped further through intensive R&D activities. In the palm-based biotech sub-areas, there are potential new products that can be extracted from palm oil.

The rubber products industry is dominated by the production of latex examination gloves. Medical gloves now have higher quality and there are specialty gloves such as low protein, safety gloves and powder-free medical gloves. The top three export markets are USA, UK, and Japan. Although there is still market for glove due to SARS epidemic and other diseases, this industry is facing labour shortage problem and the technology has matured. There is an urgent need to move to higher value-added rubber products. This can be achieved by engaging in R&D to find high value-added products. The demand for rubber products can be enhanced, by increasing its linkages with the automotive sector and other relevant industries.

In line with efforts to have downstream processing of high value-added products, the processed food exports had grown at an average of 10.1 per cent in the past ten years. Quality, safety and compliance to international standards remain top priority, if we want to penetrate other markets as well. The main export category is other processed food, which include sauces, seasoning and condiments, animal feed, margarine and other edible preparations. Major export markets for processed food are Singapore, Indonesia and USA. There is potential in promoting certain processed food as "halal" to

the Middle Eastern countries.

It is often said that resource-based industries are outmoded industries and do not belong in a knowledge based economy. Some would argue that natural resources have a diminished role to play in the new information-driven universe because they have not kept up with the times. The reality is very different. The value of Malaysia's natural resources, especially the very nature of the industry, is often misunderstood. There is a need to understand that the resource-based sector builds strong links to other sectors, and the technology used in this sector today are as sophisticated and innovative as any other. Thus, there is profit in promoting the innovative nature of the country's natural resources sector, and invest in the new technologies to maintain a competitive edge and remain a truly sustainable industry for the future.

One thing for sure, Malaysia can no longer rely on the traditional trading of primary commodities. The most important future direction for all the resource-based sectors is to come up with high-value added products that are marketable worldwide. To achieve this, more efforts in R&D for product development and production processes are required. Some degree of success is already evident in the furniture industry. More automation is required in the harvesting of raw material, given the increasing labour costs. There are niche areas that can be venture into in the resource-based industries. Resource-based industries will continue to be important because the country needs the diversity and breadth to make the Malaysian economy more resilient towards external shocks, given the strong linkages which it has with other industries. More importantly, measures to ensure a sustainable supply of raw materials is critical to the development of this sector.

6. MALAYSIA'S FUTURE DIRECTION: NANOTECHNOLOGY AND PHOTONICS

While many definitions for nanotechnology exist, the United States (US) National Nanotechnology Initiatives[i] (NNI) calls it "nanotechnology" only if it involves all of the following: (available at http://www.nano.gov/html/facts/whatIsNano.html)

1. Research and technology development at the atomic, molecular or macromolecular levels, in the length scale of approximately 1 - 100 nanometer range.

2. Creating and using structures, devices and systems that have novel properties and functions because of their small and/or intermediate size.

3. Ability to control or manipulate on the atomic scale.

At the nanoscale, physics, biology, chemistry, materials science, and engineering converge towards the same principles and tools. As a result, progress in nanotechnology is surely going to have far reaching effects, although it is still in its infancy. This emerging industry will enhance technologies of all types with applications in biotechnology, manufacturing, aerospace, information systems and many other fields, which covers such nanotechnology business topics as micro-electro-mechanical systems (MEMS), micro-engineering, microsystems, microsensors, carbon nanotubes and much more. That is, nanotechnology has the potential to change our comprehension of nature and life, develop unprecedented manufacturing tools and medical procedures, and even change societal and international relations.

6.1. The Malaysian Context: Current Scenario and Future Prospects

Since the announcement of the NNI in January 2000, governments around the globe, started to plan and have placed nanotechnology as one of the priority areas in their respective science and technology planning. Malaysia is no exception. Nanotechnology is categorised under *Strategic Research* of the Intensification of Priority Research Areas (IRPA) programme under the Eighth Malaysian Plan (2001-2005) funded by the Ministry of Science, Technology and Environment (MOSTE, currently Ministry of Science, Technology and Innovation, MOSTI). A budget of RM 1 billion was allocated under this Plan, of which 35 per cent or RM 350 million is evenly distributed to *Strategic Research*. As of May 2004, the amount approved thus far for Nanotechnology and Precision Engineering over the 5-year period of 2001-2005 is around RM 149.05 million. Photonics, which could come under the category of nanotechnology and precision engineering or optical technology, saw an approved amount of RM 51.7 million.

In addition, the Second National Science and Technology Policy (STP II), launched

in 2003, included nanotechnology and photonics as priority areas in building competencies for specialisation in key emerging technologies. Besides prioritising research programmes in these two areas, the STP II also recommended the setting up of national focal points that serve as the research and development (R&D) hub for each technologies as well as enhancing the exposure to international developments in the technologies and exploitation of foreign research expertise where necessary.

Apart from MOSTI, the Malaysian Industry-Government Group for High Technology (MIGHT), the Academy of Sciences Malaysia (ASM), various centres in the institutes of higher learning, government research agencies and institutes (GRIs), and to a lesser extent, the private sector are also playing their respective roles in supporting the development of this new industry[ii]. These collaborations with the committed support from the government have led to some research and development works in nanotechnology.

Even within nanotechnology, there is a need for Malaysia to focus on selected areas which she finds comparative and competitive advantage. Judging from the current projects undertaken using IRPA funding and the MOSTE/I awards won by scientists, one can form an opinion about the potential niche areas that Malaysia can venture, that is, MEMS, nanomedicine, photonics and advanced materials. Apart from MEMS[iii], according to Malaysian Institute of Microelectronic Systems (MIMOS) Semiconductor Sdn Bhd former chief executive officer H.J. Lim, a Frost & Sullivan study prepared for Mimos has "identified advanced electronic displays, photonics, high density data storage, and conductive polymers as among emerging technologies Malaysia could consider", as quoted in the Star (2004a). Nevertheless, the decision to pursue MEMS is a natural progression towards upgrading the local electronics industry due to its close relation to the semiconductor technology as well as the fact that "a lot of low-value production works have now been relocated to China, where cheap and low-skilled labour is easily available" (Lim, as quoted in the Star, 2004a).

At present, Mimos Bhd vice-president (strategic interventions) Dr K.J. John said "Mimos was working with the Malaysian Industrial Development Authority, Collaborative Research and Resource Centre, Penang Skills Development Centre, and Penang Development Corporation to formulate a strategic plan to develop a cluster of companies (believed to be between 10 to 20 companies) in MEMS research and

development and production" (The Star, 2004a). What is lacking is the participation of the private sector in these collaborations. Thus far, MemsTech is the only company to have invested significantly in MEMS technology. As the Minister of International Trade and Industry, Datuk Seri Rafidah Aziz, pointed out in an Associated Press article by Jennifer Jacobs (2002) "venture capitalists (needs to) be more innovative and flexible… (and function as) proactive catalysts" rather than risk-averse investors.

6.2. Strategies for Nanotechnology Development in Malaysia

The short to medium term strategy of Malaysia should be geared towards "identifying researchers in various areas of nanotechnology with specific expertise; and upgrading and equipping nanotechnology laboratories with state-of-the-art facilities" (Hamdan, 2002). Moreover, it is important "to prepare a comprehensive human resource development programme for producing nanotechnologists" (Hamdan, 2002). For the longer horizon, there is a need for a coherent, long-term (5 to 10 years) vision or plan. Such a plan should be of the magnitude of the biotechnology programme.

The government can play the key role to assure that Malaysia realises the enormous benefits of nanotechnology. Investments must be made in the basic science and technologies that will enable scientists and engineers to invent totally new technologies and stimulate Malaysian industrial competitiveness in the emerging nanotechnology areas. The government should invest in the infrastructure necessary for Malaysia to lead and benefit from the revolution that is coming. It should support the expansion of university and Government/national laboratory facilities, help build the workforce skills necessary to staff future industries based on nanotechnology, encourage cross-disciplinary networks and partnerships, ensure the dissemination of information, and encourage small businesses to exploit commercial opportunities.

Moreover, the goals of nanotechnology research are too fundamental, long-term (greater than ten years), transdisciplinary, and high-risk for industry to take an immediate leadership role. Given the expectations of potential investors and the competitiveness of the global marketplace, the Malaysian industry is unable to invest significantly in long-term and risky research that takes many years to develop into products. As such, the university and government research systems must fill this gap. Government agencies will need to foster the nanotechnology teamwork because of its

transdisciplinary nature, which calls for a national nanotechnology directorate or a national institution for the development of nanotechnology.

The increasing pace of technological innovation and commercialisation demands continual compression of the discovery-invention-development time scales, which in turn requires parallel and coordinated work in both basic research and commercial product development. The requirements for and from nanotechnology transcend anything that can be supplied by traditional academic disciplines, national laboratories, or even entire industries. For all of these reasons, a national initiative is critical to establishing an effective national effort in nanotechnology as a worldwide competition is already underway in this area.

In this new millennium, innovations in science and technology will be key not only to the health of the environment, but also to the miraculous improvements in the quality of our lives and advances in the economy. One must not lose sight of the fact that it was government-funded research that brought the Internet, communications satellites, etc. into being. A major question is how can Malaysia embrace and facilitate the nanotechnology revolution to maximise the benefit to all Malaysians.

7. SME DEVELOPMENT

7.1.   Malaysian SMEs' Future Direction

The phenomenal growth of the manufacturing sector over the past three decades has led SMEs into occupying an important position in the Malaysian economy. The SMEs assume such critical role through the strengthening of both forward and backward industrial linkages with the Second Industrial Master Plan (IMP2) providing the basis for the achievement of a broad based, resilient and internationally competitive industrial sector, with various policies and programmes in place.

Although large in terms of the number of establishments (more than 90 per cent of total manufacturing establishments), SMEs contribute a relatively small proportion of the total employment, total output and total value-added of all manufacturing establishments. The relatively small contribution of the SMEs to the economy warrants serious concern and attention. Several reasons were identified, and these included the

problem of funding, the high import content of the products, a lack of entrepreneurship, and the fact that most production is of original manufacturing equipment (OEM) type, where the value-added is captured by the MNCs.

While the government-assisted programmes for SMEs, such as the Global Supplier Programme and the factory audit scheme, are appropriately aimed at preparing Malaysian SMEs to develop and grow into a strong and viable enterprise capable and ready to meet the challenges of liberalisation and globalisation, much more needs to be done with the delivery mechanism. Furthermore, in the efforts to create efficient SMEs, there should be a benchmark to gauge the relative performances of SMEs on an international basis, complementing the Enterprise 50 Programme, which identifies the role models. The government has also designed the SMI Development Plan (1999-2005) to assist SMEs to adapt to new challenges brought about by the changing business environment. This complements the Second and Third Industrial Master Plans (IMP2 and 3) and will focus on the specific needs, requirements and problems of the SMEs sector.

The presence of such an impressive set of programmes to assist SMEs is, without doubt, an excellent beginning to develop highly efficient and competitive SMEs. Despite this, much more needs to be done to ensure that the growth trajectory of SMEs remains vibrant. With the change in the landscape of world trade and industrialisation, Malaysian SMEs need to adapt and adjust their mode of operations and attitude. A two-pronged strategy is required to: (i) nurture world-class SMEs and (ii) develop and enhance entrepreneurship, especially building a large pool of middle class entrepreneurs (and technopreneurs).

7.2. Nurturing World-Class SMEs

When it comes to being a low-cost base for labour intensive manufacturing sector, Malaysia is losing its comparative advantage, with the rise of Vietnam, India and China. This raises the question of whether the roots grown by the SMEs are resilient enough to hold multinational corporations in Malaysia for a sustainable period, which could imply a shift towards increasingly independent SMEs. The greatest challenge ahead to businesses worldwide will come not from low-cost producers but from low-cost and effective innovators. In other words, there is a need to reduce over-dependence on a

single parent/anchor company and to invent the future instead of replicating the past.

Moving ahead, there is a great deal of uncertainty regarding how to assist SMEs to be World Class. Experimentation with innovative pilot projects and policy instruments, which try out alternative approaches, may yield a great deal of useful information that could provide indications of what works and what does not. Furthermore, widespread dissemination of the results would greatly extend the efforts to assist the SMEs.

The simplest way is to replicate successful policies elsewhere. But workable policies and institutional arrangements from elsewhere needs to be adapted rather than adopted wholesale, as there is no such thing as a 'one size fits all' policy. Successful policies elsewhere may define a possible destination, but not the path, which needs to be taken to reach it. Nevertheless it is important to discover, first, whether there exists such a destination and if so is there one possible destination or many, and, second, the means of moving along the path(s) to the destination(s). Choosing the optimal trajectories entails experimentation as mentioned earlier.

SME development policies need to be re-examined so as to increase SMEs' absorptive capabilities and maximise the "pull factors" that will bring large corporations voluntarily into linkages with SMEs. Support measures should include improving infrastructure (physical, finance, and human resources development) and export financing. These should focus on increasing capabilities, improving firm infrastructures, and arranging institutional skills training, particularly focusing on technology skills.

One common practice in formulating SME policy is that there is too much emphasis on finance. Bearing in mind that finance is only part of a whole package, a first step in designing policies to develop SMEs is to broaden SME policy, away from the more common financial focus, towards a systemic approach, which sees SME issues as part of a broader approach to economic development and poverty alleviation. Furthermore, incentives alone only alleviate some of the problems faced by SMEs and do not solve them.

Then there is the non-financial assistance. Anecdotal evidence suggests that less progress has been made in this area. First, non-financial programmes are too supply-oriented, that is, overly focused on inputs for production (skills, technology, raw materials) and not sufficiently concerned with who would buy the outputs. Second, they are rarely sustainable. This has two components: the high cost in reaching out to a

multitude of SMEs[iv] and the low concern with cost recovery for support services. Third, they have at best a one-off effect on the performance of the assisted enterprise but rarely lead to a capacity for self-help and continuous upgrading.

Lall (2000a) points out that "support by influencing the enterprise environment: capital markets, advisory services, links with support institutions and the science, engineering and technology (SET) base, can prove to be more effective." The experience of Taiwan suggests that the best way to provide these services is by combining them in an attractive package rather than delivering them piecemeal.

There is no doubt that SMEs in general need some kind of institutional support. For these institutions to be effective, they have to be kept decentralised and well coordinated. Although SMIDEC is the main institution overlooking SMEs, there are many other agencies that are involved in SME development. Having a complementary role between these institutions are thus essential. If the loan is open to participation from SMEs, there should be coordination between various parties involved. SMEs tend to avoid going to support institutions where a lot of time and formalities are involved in getting assistance. They often cannot identify and define their own needs clearly enough to seek the best remedies. Thus, a service that can reach out, help firms to define their problems and devise a package of measures, as mentioned earlier, that deals with these problems has the best chance of success.

8. THE CHALLENGES OF REGIONAL INITIATIVES

How will the competitiveness of SMEs be affected once all aspects of the CEPT agreement have been fully implemented? Measures to respond to this problem could include (a) upgrading of the products and processes; (b) shedding off of unprofitable products, processes or activities; (c) relocating costly products, processes and activities to a more profitable and competitive location within the country, or in other ASEAN countries; and (d) forming strategic alliances with other businesses taking advantage of the ASEAN Industrial Co-operation Scheme and the ASEAN Investment Area programme. Greater information sharing and dissemination among relevant parties, however, must precipitate these measures, as currently there is still a lack of

appreciation among local businesses of the significance of AFTA and WTO commitments to them as individual entities.

8.1.   Enhance Entrepreneurship

Ironically, the role of the government is very important in fostering private sector entrepreneurship in Malaysia. Nevertheless, although there are many programmes and financial support systems for entrepreneurs, they have not been as effective as they should. A common critique is that, due to the fact that most of the programmes for entrepreneurs are organised and offered by government agencies, there is a high amount of bureaucracy or "red tape" involved, thus causing delays of several months just to get approval for applications. This curtailed the level of uptake among genuine entrepreneurs who often end up feeling very frustrated with the system.

On a more positive note, the government does seem to be aware of the need to address certain pressing issues that affect entrepreneurs. Among the more salient are ensuring a healthy, conducive, and stable political and economic climate, matching the most appropriate funding models to suit the needs of businesses, making funds available to stop the liquidity crunch, having guidelines and regulations regarding intellectual property rights, and corporate governance. The need for entrepreneurs to receive more guidance and training from business incubators has also been recognised. This bodes well for the strengthening of entrepreneurship in Malaysia. Recent government efforts to improve the delivery system have contributed much to the ease of doing business in the country.

In order to finance high-technology companies, Malaysia is looking toward adopting the venture capitalist model of funding which has been proven in other industrialised countries.   The Malaysian government, under the Multimedia Development Corporation (MDC), has set up MSC Venture Capital Company to provide risk capital to start-up IT-related ventures to promote, and feed into, its Multimedia Super Corridor (MSC) projects.   While VC funding has been attained relatively successful by manufacturing companies, however, there are some problems associated with adopting this model of funding for high-tech start-ups in Malaysia. Specifically, there is currently what is now being termed a "funding mismatch" between the needs of Malaysian "technopreneurs" and the funding criteria of venture capitalists.

Moreover, venture capital companies, far too often, adopted a conservative approach to investing. This is evident in the treatment of lagging ventures, where venture capitalists often stop funding to failing firms because they want to devote their limited resources to firms with the greatest promise and potential. Venture capitalists, on the other hand, have frequently been unwilling to write off unsuccessful ventures, lest they incur the reputational repercussions that a failure would entail.

Malaysia has a vibrant entrepreneurial base with a huge potential to become global players. Considering the impact of globalisation, perhaps the time is ripe to begin to expand the common view of entrepreneurship from one that is centred on domestic needs and environment, to one that is more global in its outlook. In that sense, policies should be centred on how best to build resilient and competitive global entrepreneurs, and hence the need for more information sharing on entrepreneurship among regional countries and beyond on what works, why, and how to adapt it to the local context.

Since resources are scarce relative to the needs of SMEs and entrepreneurs/technopreneurs, it is important to have a strategy to guide the deployment of available resources in directions that provide maximum leverage. An important message is that there is no magic wand or single policy, which once applied, can dramatically transform the SME sector onto a high growth path. Nevertheless, there is much that can be accomplished to assist both the SME sector as well as the economy as a whole to raise long run potential growth.

8.2.   What Lies Ahead?

Moving forward, there is a need to make assessments and comparisons of Malaysia's strengths and weaknesses with trade and investment opportunities, as well as providing up-to-date information on the market trends and the competitive environment in these areas. Moreover, many countries now have "foresight" programmes of various kinds. These are designed to put together the key actors and thinkers in the new fields to consider future and recommend actions on the part of policy makers and firms. The focus of such programmes is to identify trends, draft action plans and build networks. Malaysia too should initiate a foresight programme that suits its needs. Part of this could be aimed at the knowledge upgrading of foreign and local firms in order to define and meet Malaysia's future directions and targets.

NOTES

[i] The NNI "provides a multi-agency framework to ensure US leadership in nanotechnology that will be essential to improved human health, economic well being and national security", as well as "invests in fundamental research to further understanding of nanoscale phenomena and facilitates technology transfer".

[ii] See Table 2 for some of the NCCs or institutions involved in nanotechnology.

[iii] MEMS technology has a diverse range of applications: as pressure sensors, accelerometers, microphones, and thermopiles in motor vehicles, in health and life sciences products, consumer electronics, industrial and aerospace navigation systems, scientific analytical instruments and in the telecommunications industry (The Star, 2004b).

[iv] It is hoped that there will be some domino effects taking place here. Thus, the private support mechanism and industrial linkages are important to deliver the transfusion of knowledge.

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