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### **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<sup>i</sup> 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

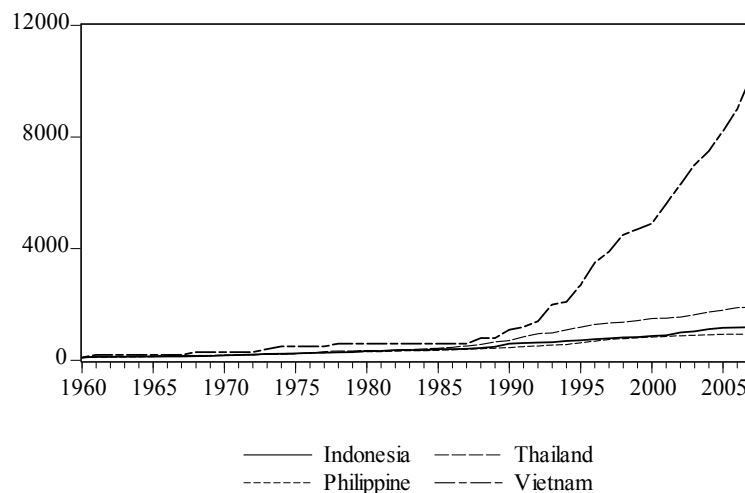
## 2. FACTORS OF AGGLOMERATION

### 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.

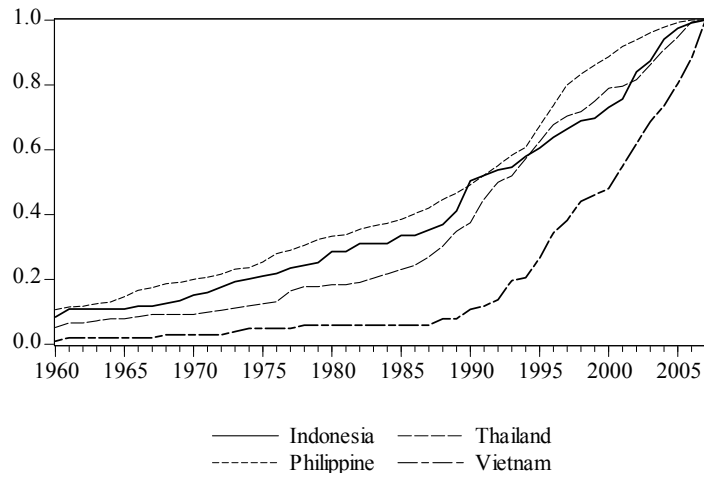
Figure 1 shows the number of firms established in the four ASEAN countries since 1960, with a notably sharp increase occurring during the late 1980s. The data for the different countries cannot be directly compared because the total number of firms differed among them. The number of firms established 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**



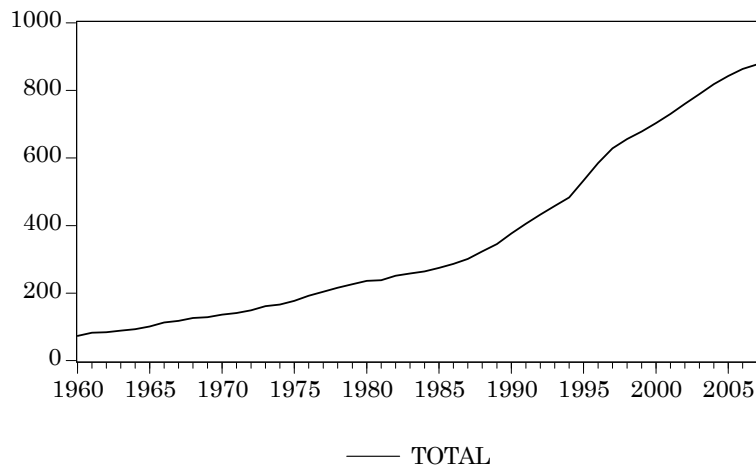
Source: Authors

**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.<sup>ii</sup>

## **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.<sup>iii</sup> 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
<b>Dependent Variables</b>						
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
<b>Independent Variables</b>						
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.<sup>iv</sup> 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.<sup>v</sup> 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	Selecte d model	Full model	Selecte d model	Full model	Selecte d 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.<sup>vi</sup> 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)			[+]					
Q1) Dummy (1998-2007=1, other=0)		[+]	[*]					
Q4) Manufacturing	+	**	*		+	**		
Business	*	**			*	*	[**]	[**]
Q5) Exporters	*	**						
Q5) Dummy (Indonesia=1, other countries=0)				[**]			[**]	[**]
Q5) 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.<sup>vii</sup> 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, infrastructure (telecommunications, IT)							[*]	
7) Infrastructure (electricity, water supply, other government institutional infrastructure	[+]	[**]			[+]	[+]		
8) Financial system		**			**	*		
9) 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 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)			[+]				+	
Q4) Dummy (1998-2007=1, other=0)		[+]	[*]	[*]				
Business	+	**	*		+	**		
Exporters	*	**			*	*	[**]	[**]
Q5) Dummy (Indonesia=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.

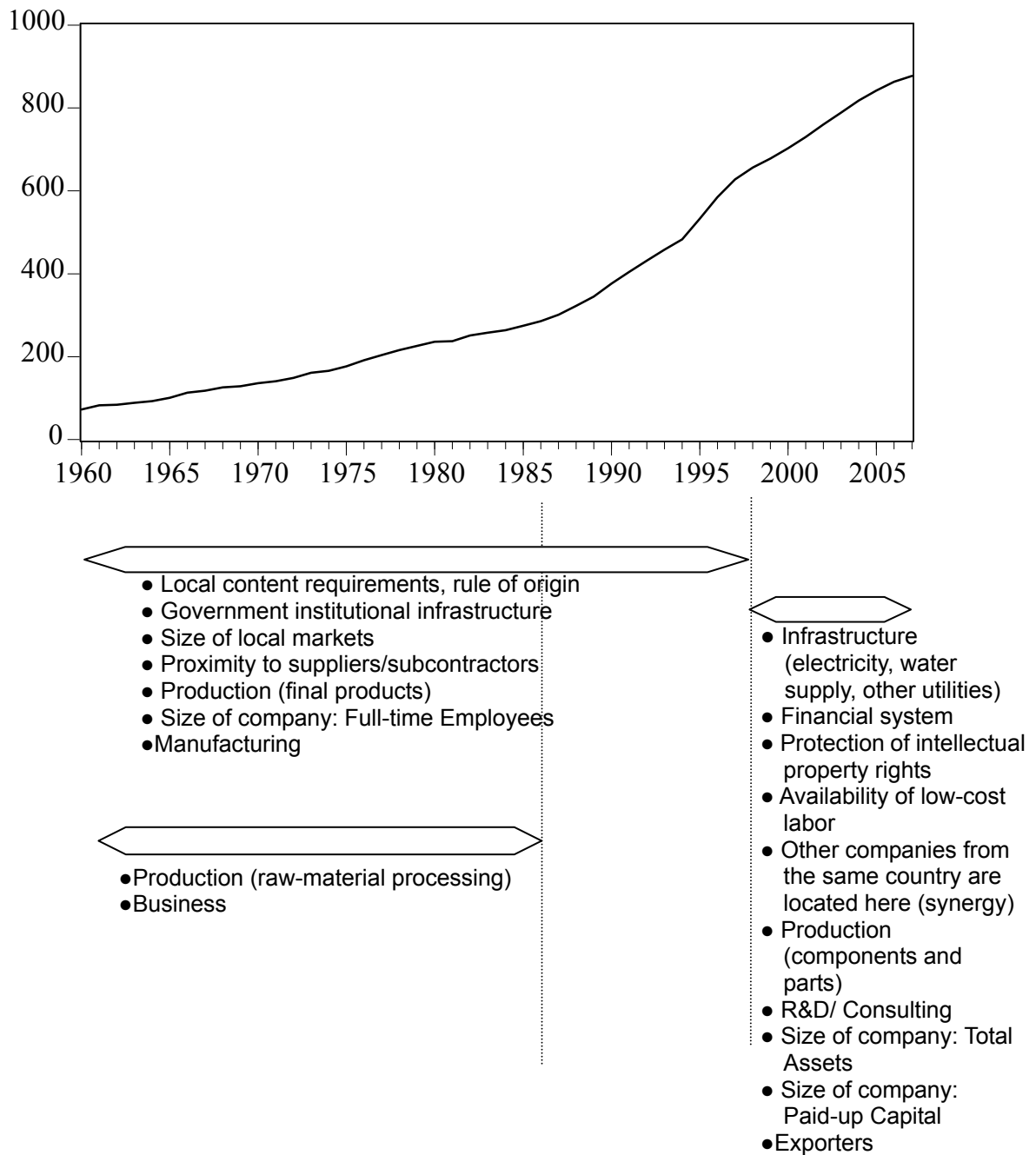
#### *(a) Factor of agglomeration*

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).<sup>viii</sup> 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).<sup>ix</sup> 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).<sup>x</sup>

**Figure 4 Summary of Agglomeration**



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.<sup>xi</sup> 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

- <sup>i</sup> 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.
- <sup>ii</sup> To determine the years of transformation, the step-wise Chou test was used.
- <sup>iii</sup> In this construction, three estimates were made based on the three definitions of firm size.
- <sup>iv</sup> 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.
- <sup>v</sup> Refer to Schumpeter (1934).
- <sup>vi</sup> 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.
- <sup>vii</sup> In this estimation, the Ordered Logit Model was also used, and “yes” replies were taken as standard for normalization purposes.
- <sup>viii</sup> 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.
- <sup>ix</sup> In addition, “legal system” is greater than -120 and was found only in the Full Model.
- <sup>x</sup> Figures for factors other than “protection of intellectual property rights” were only in the Full Model.
- <sup>xi</sup> 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	0.078	2.180
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	-0.126	-1.910 *	-0.134	-2.010 **	-0.130	-1.960 *
2) Liberal trade policy						
3) Customs procedures			0.123	1.350 +		
4) Local content requirements, rule of origin	0.171	1.890 *			0.124	1.370 +
5) Physical infrastructure (roads, highways, ports, airports, etc.)	-0.335	-3.830 **	-0.338	-3.870 **	-0.332	-3.770 **
6) Infrastructure (telecommunications, IT)	0.145	1.550 +	0.167	1.730 *	0.184	1.950 *
7) Infrastructure (electricity, water supply, other utilities)						
8) Government institutional infrastructure						
9) Financial system						
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						
15) Request by large/related company						
16) Availability of low-cost labor	-0.167	-2.440 **	-0.158	-2.280 **	-0.167	-2.410 **
17) Availability of skilled labor and professionals						
18) Other companies from the same country are located there	0.129	1.990 **	0.092	1.400 +	0.114	1.730 *
19) Access to cutting-edge technology and information						
20) Living conditions	0.113	1.840 *	0.114	1.830 *		
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 **		
Q4) Manufacturing	-0.572	-2.680 **	-0.675	-3.100 **	0.077	2.310 **
Business	-0.837	-3.410 **	-0.762	-3.100 **	-0.721	-3.240 **
Exporters	0.471	2.720 **	0.299	1.710 *	-0.837	-3.300 **
Dummy (Indonesia=1, other countries=0)	-0.440	-1.610 +			0.372	2.120 **
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	t-value	Coefficient	t-value	t-value	Coefficient	t-value	t-value
Q7) 1) Investment incentives, including tax incentives	-0.019	-0.270		-0.067	-0.960		-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 larger/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-9.9M / 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						
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 there						
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) 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 / 1M-4.9M / 1M-4.9M						
1,500 - 1,999 / 5M-9.9M / 5M-9.9M						
Dummy (Indonesia=1, other countries=0)						
Dummy (the Philippines=1, other countries=0)						
Dummy (Vietnam=1, other countries=0)						
/cut1						
/cut2						
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 +
Q4) Dummy (1998-2007=1, other=0)	-0.582	-1.230	-0.715	-1.780 *	-0.069	-0.150	0.371	0.900
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.)	-0.344	-2.150 **			-0.262	-1.560 +		
6) Infrastructure (telecommunications, IT)	-0.325	-1.850 *			0.305	1.870 *		
7) Infrastructure (electricity, water supply, other utilities)	0.443	2.480 **			-0.422	-2.200 **		
8) Government institutional infrastructure					0.340	1.880 *		
9) Financial system					0.239	1.320 +		
10) Legal system								
11) Protection of intellectual property rights	-0.364	-1.890 *			-0.336	-1.810 *		
12) Size of local markets	0.365	2.050 **			0.266	1.440 +		
13) Access to export markets			0.177	1.290 +				
14) Proximity to suppliers/subcontractors			0.237	1.840 *				
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								
19) Access to cutting-edge technology and information	-0.282	-1.580 +	-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)								
5) Purchasing/Procurement/Logistics					-1.342	-3.140 **		
6) R&D/Consulting			0.470	1.350 +				
7) Human resources development			-0.674	-1.370 +	1.865	2.510 **		
Q1) Dummy (1986-1997=1, other=0)	-0.412	-1.390 +	-0.438	-1.760 *				
Q4) Dummy (1998-2007=1, other=0)	0.980	2.720 **			0.788	2.260 **		
Business	0.863	2.210 **			0.721	1.810 *		
Q5) Exporters	0.733	1.970 **						
Dummy (Indonesia=1, other countries=0)			-0.645	-2.240 **				
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.)	-0.414	-2.360 **			-0.298	-1.830 *	-0.221	-1.510 +
6) Infrastructure (telecommunications, IT)	-0.298	-1.760 *			0.261	1.670 *		
7) Infrastructure (electricity, water supply, other utilities)	0.362	2.080 **			-0.304	-1.690 *	-0.354	-2.380 **
8) Government institutional infrastructure					0.276	1.640 +		
9) Financial system								
10) Legal system								
11) Protection of intellectual property rights								
12) Size of local markets	-0.243	-1.450 +			-0.253	-1.600 +	0.316	2.110 **
13) Access to export markets	-0.306	-1.730 *					0.332	2.170 **
14) Proximity to suppliers/subcontractors	0.301	1.720 *						
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			-0.251	-1.470 +				
18) Other companies from the same country are located there			-0.185	-1.350 +			-0.244	-1.590 +
19) Access to cutting-edge technology and information								
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 *	-0.836	-1.710 *
When did your company establish its first office?	-0.018	-1.750 *			-0.021	-1.940 *		
Dummy (Indonesia=1, other countries=0)			-0.022	-2.580 **				
Dummy (Vietnam=1, other countries=0)			-0.683	-2.500 **				
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.