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## **An Empirical Analysis of Connectivity in Technology Transfers among Local Firms in ASEAN Four Economies**

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### **Abstract**

This study aims to analyze the innovation process in four ASEAN economies; Indonesia, Thailand, the Philippines, and Vietnam. Since new information on technology, consumer's needs, etc. necessary for innovation mainly comes from outside the firm, it is first required to obtain such information and then integrate it with indigenous resources that the firm owns. This innovation process consists of the absorptive and assimilating processes. The firm has to enhance two types of capabilities. In particular, in the absorptive process, two types of employees are examined such as those who have working experience with MNCs and those indigenous to the

firm. In the assimilating process, the organizational learning process is focused such as QC (quality control) and cross-functional team, which converts outside information to firm's innovation capability. This study is based on mail surveys of firms conducted from 2013 to 2014 in four ASEAN economies such as Vietnam, Indonesia, the Philippines, and Thailand. Based on the data, SEM (structural equation modeling) is employed, which enables to examine the complicated relationships among various latent variables that are related to each other. The analysis demonstrates that MNCs have the largest impact on innovation and regarding the connectivity with MNCs, public organizations and universities, the best mediators are top management and factory managers who have working experience with MNCs/JVs, whereas for connectivity with locals, indigenous employees such as local engineers, managers, and line leaders are the best mediators. In the assimilating process, cross-functional team has larger impact on innovation than QC.

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**Keywords:** absorptive capability, assimilating process, organizational learning, cross-functional team, indigeneity

## **INTRODUCTION**

This study aims to analyze the role of human factor in innovation process in local as well as global firms located in four ASEAN economies, namely Indonesia, Thailand, the Philippines, and Vietnam. The innovation process inside the firm consists of absorptive and assimilating processes. Since new information related to technology, consumer's needs, etc. necessary for innovation mainly comes from outside the firm (Chesbrough 2003), it is first required to obtain such information, and then integrate it with indigenous resources that the firm owns for successful innovation. The collaboration with entities outside the firm, such as other firms, universities, and local research institutions in the innovation process came to be the center of research and are analyzed in the framework of "open innovation" (Chesbrough, 2003, 2006a, 2006b). In developing countries, MNCs have superiority in technology, knowledge, and management, and local firms have to absorb those capabilities from them. Before absorbing new information, local firms have to initiate the connectivity to MNCs through which locals obtain the necessary information. Our previous studies attempted to identify such routes, which are referred to as "transmission channels" (Tsuji et al, 2013, 2014; Machikita and Ueki, 2015). More concrete examples include accepting "guest engineers" from MNCs or "dispatching engineers" to MNCs to participate in training or R&D activities. Even before these agreements, locals have to establish the connectivity. In the earlier studies on the innovation process back in the 1960s or 1970s, the persons who fulfilled those functions were termed as "gatekeepers." In those studies, the establishment of connectivity between providers and recipients of information via communication has been focused. In other words, "trustworthiness" between them is required for transferring information, which is based on their intimacy and mutual

respect regarding their ability, common thought or values, etc., (Allen, 1977; Leven and Cross 2001; Colquitt and Rodell, 2011; Myers and Marquis, 1969). The most important obstacle of establishing connectivity is lack of mutual understanding caused by differences in organizational culture including terms of language, way of thinking, which is referred to as “semantic noise (Allen, 1977).” Gatekeepers thus have enough professional skills and knowledge to avoid misunderstandings and can connect organizations by dissolving barriers between them. In this sense, this study primarily aims to identify these persons from the survey data.

Once local firms obtain information related to innovation, it should be transformed into innovation process of the firms. The ability to achieve this is referred to as “internal innovation capability” or “internal capability,” and related factors have been categorized into groups by numerous researchers. Mariano and Pilar (2005), for example, categorize as follows: (1) communication with the external environment, (2) level of knowledge and experience within the organization, (3) diversity and overlaps in the knowledge structure, and (4) strategic positioning. The causality among these categories is one of the major research questions in this area, particularly to identify the causes and results (Lawson and Samson, 2001; Perdomo-Ortiz, Benito, Galende, 2009). Our previous studies define this as an integrated ability of a firm to create innovation, which consists of all resources, core competence, or competitiveness (Tsuji et al, 2011, 2013, 2014). More specifically, internal capability includes technological level (number of patents, production, and R&D facilities), human resources (number of engineers with higher degrees or skills, level of craftsmanship, and work ethics), and organizational nature (communication between workers and top management, speed of decision making, and leadership of top management). Traditionally, on the other hand, a part of internal

capability was focused on and referred to as “absorptive capability” by Cohen and Levinthal (1990), Zahra and George (2002), and Christensen and Kaufman (2009), for example. Christensen and Kaufman define it as a firm’s ability to reorganize the value of new external knowledge and assimilate to commercial ends. They also recognize that the innovation process is a learning process, which consists of four dimensions: acquisition, assimilation, transformation, and exploitation.

This study focuses on learning process inside the firm and refers it to the “organizational learning process,” that is, the learning process for assimilation, transformation, and exploitation. Note that the absorbing and assimilating process are not exclusive notion as they are also correlated with each other.

The remainder of this paper is as follows. After introduction, hypotheses are presented based on previous studies and survey data. The summary of data is provided in Section 3 based on questions related to this study. The methodology based on SEM (structural equation model) or CSA (covariance structural analysis) and the models to be estimated are discussed in Section 4. The estimation results and their implications are presented in Section 5. Brief conclusions and policy implications are provided in the last chapter.

## **2. HYPOTHESIS TO BE TESTED**

This section discusses hypotheses to be tested. The hypotheses are constructed based on our previous studies.

As stated in the introduction, this study assumes that new information related to innovation obtained outside of the firm. The agents that own this information is referred

to as “external linkages,” which are identified by the following three categories: MNCs, locals, and public organizations and universities. These are generic definitions and how they are generated from the questionnaire will be discussed in Section 4. The issues of external linkages are related to the question as to whether internal innovation capability is a result of external linkages, or vice versa. Our answer to this question obtained by our previous studies is the former (Tsuji et al, 2011, 2013, and 2014). This therefore postulates the first hypothesis:

**Hypothesis I:** External linkages promote internal innovation capability and accordingly enhance innovation.

In the framework of analysis, this study does not discuss how firms establish the ties with other firms avoiding the issue of firm-to-firm matching. Even the underlying assumption does not exclude some persons who take initiatives to introduce new information. They are referred to as human factor in this paper, and typical examples are gatekeepers of early studies in the 1970s, while they are dispatched or guest engineers, and top management who used to worked in MNCs/JVs in our previous studies (Tsuji et al, 2011, 2013, 2014; Machikita and Ueki, 2015). Based on these discussions, this study proposes two different categories of connectivity depending on the level of intimacy, proximity, ability, or expertise. Accordingly, the following hypothesis is postulates as the first category:

**Hypothesis II:** Top management or factory managers who experienced working with MNCs/JVs are key factors to construct the connectivity to MNCs/JVS.

This hypothesis includes factory managers as gatekeepers, since they are more concerned with technology than top management. The hypothesis is thus related to the

global trend of regions, since Western MNCs invested heavily in the regions indicating technology transfers through the human factor. On the other hand, some locality or proximity among human factor can be considered, that is, local employees of both firms can easily develop intimacy. This proximity of human factor leads to the following second category of hypothesis:

**Hypothesis III:** Indigenous employees assist to construct the connectivity to local firms.

Observing the process after information is introduced in the above process, new information has to be diffused and shared among suitable employees engaged in R&D sections. The research on the diffusion process, particularly to whom and how new information is diffused is based on who talks to whom or who organizes research meetings and by examining the number of conversations, etc. Personnel who conduct these activities are referred to as “transformer” or “mediator” (Freeman, 1979). In particular, gatekeepers and transformers are the same persons. Thus, the following hypotheses are proposed:

**Hypothesis IV:** Working experience with MNCs/JVs promotes organizational learning.

**Hypothesis V:** Indigenous employees promote organizational learning.

The following hypothesis shows the relationship between organizational learning and innovation. Since organizational learning plays an important function in the innovation process, as Cohen and Levinthal (1990), Zahra and George (2002), and Christensen and Kaufman (2009) emphasized, this postulates the last hypothesis.

**Hypothesis VI:** Organizational learning enhances innovation.



In what follows, the hypotheses are examined by using SEM.

### **3. SUMMARY**

The summary of data obtained from the surveys is presented here. In this study, questions related to the funding of investment and the nationalities of employees are newly added.

#### **3.1. Surveys**

This study is based on mail surveys and phone interviews, which were conducted with 1,232 companies in the Hanoi area and 1,000 in the Ho Chi Minh City area, Vietnam; 239 in the Batangas and other areas in the Philippines; 437 in the Jabodetbek area, Indonesia; and 878 in Greater Bangkok, Thailand. The surveys were conducted from 2012 to 2013. The numbers of valid responses were 149 from the Hanoi area (12.09%), 171 from Ho Chi Minh City (17.10%), 157 from Indonesia (35.93%), 237 from the Philippines (99.16%), and 284 from Thailand (32.35%).

#### **3.2. Profile of firms' responses**

##### **(1) Year of establishment**

Table 1 indicates that 50.5% of Vietnamese, 23.7% of Indonesian, 26.1% of Filipino, and 22.7% of Thai firms replied that they started operating between 2001 and 2010. Those that had started between 1991 and 2000 included 44.6% Filipino, 32.0% Thai, 29.7% Vietnamese, and 36.0% Indonesian firms.

#### **[Table 1: Year of Establishment]**

##### **(2) Type of Establishment**

Table 2 shows the type of establishment.

**[Table 2: Type of Establishment]**

(3) Capital structure

Table 3 shows that most firms are 100% locally owned in all countries: Vietnam (76.9%), Indonesia (66.2%), the Philippines (40.2%), and Thailand (84.0%). The second biggest category is 100% foreign-owned (MNC): Vietnam (17.5%), Indonesia (19.4%), the Philippines (34.8%), and Thailand (11.4%).

**[Table 3: Capital Structure of Establishment]**

(4) Major foreign investors

Table 4 shows that Japanese are the major foreign investors in Indonesia (21.6%) and the Philippines (30.4%), whereas in Vietnam, Taiwanese are the major investors (7.5%) and Japanese are second (6.1%). Besides Japanese, South Korean and Filipino investors are notable in the Philippines (13.0%).

**[Table 4: Major Foreign Investors]**

(5) Number of full-time employees

Table 5 illustrates the distribution of firm size in terms of full-time employees. Almost half of the firms have 20 to 199 employees, except Vietnamese firms.

**[Table 5: Number of Full-Time Employees]**

(6) Total assets

Table 6 shows the distribution of firm size in terms of total assets.

**[Table 6: Total Assets]**

(7) Main business activity

Table 7 shows the main business activity. For Vietnam, this consists of “metal products” (12.7%), “plastic and rubber products” (11.8%), and “food, beverages, and tobacco” (11.3%), whereas in Indonesia, “other business activities” (21.6%) is the largest. The Philippines has “food, beverages, and tobacco” (14.1%), “plastic, rubber products” (12.0%), whereas Thailand has “other business activities” (16.4%), “automobile, auto parts” (13.6%), and “other electronics and components” (10.0%).

**[Table 7: Main Business Activity of Establishment]**

(8) Product innovation

This paper categorizes innovation as table 8 shows.

**Table 8: Categories of Innovation**

**Q13.1.** Introduced a new product, redesigning packaging or significantly changing appearance design of your existing products

**Q13.2.** Introduced a new product, significantly improving your existing products with respect to its capabilities, user friendliness, components, subsystems, etc.

**Q13.3.** Development of a totally new product based on the “existing” technologies for your establishment

**Q13.4.** Development of a totally new product based on “new” technologies you’re your establishment

Tables 9-12 show the details of product innovation for the last two years (2011–12). The percentages of Vietnamese firms that responded to “redesigning packaging or significantly changing appearance design” with “achieved” and “tried” was 91.0%, “significantly improving existing products” 75.9%, “new product based on existing technologies” 57.1%, and “new product based on new technologies” 36.0%. In Indonesia, “redesigning packaging or significantly changing appearance design” was 48.9%, “significantly improving existing products” 56.1%, “new product based on existing technologies” 47.5%, and “new product based on new technologies” 42.4%. In

the Philippines, “redesigning packaging or significantly changing appearance design” was 90.2%, “significantly improving existing products” 95.7%, “new product based on existing technologies” 81.5%, and “new product based on new technologies” 70.7%. Thailand reported that “new product based on existing technologies” was 48.6%, “significantly improving existing products” 47.7%, “redesigning packaging or significantly changing appearance design” 46.4%, and “new product based on new technologies” 44.1%.

**[Table 9: Redesigning Packaging or Significantly Changing Appearance Design in Last Two Years (2012–13)]**

**[Table 10: Significantly Improving Existing Products in Last Two Years (2011–12)]**

**[Table 11: New Product Based on Existing Technologies in Last Two Years (2012–13)]**

**[Table 12: New Product Based on New Technologies in Last Two Years (2011–12)]**

Table 13 summarized the situation of innovation by country, and Figure 1 depicts the achievement rates in each country regarding the product innovation shown in Tables 9-12. The Philippines exceeds in three categories other than “redesigning packaging or significantly changing appearance design” compared with the total rate of achievement, whereas Vietnam exceeds in only “redesigning packaging or significantly changing appearance design.”

**[Table 13: Situation of innovation by Country]**

**[Figure 1: Product Innovation]**

(9) Cross-functional teams

Table 14 shows the percentages of firms which own different categories of

cross-functional teams inside the firm to produce innovation. A “manufacturing department” is found in Vietnam (40.6%), Indonesia (38.8%), and Thailand (12.6%). A “sales and marketing department” exists in Indonesia (49.6%), the Philippines (50.0%), and Thailand (22.5%). A “development department” is in Vietnam (48.1%), Indonesia (29.5%), and the Philippines (27.2%). A “research department” is found in Vietnam (44.8%), whereas a “quality control department” is in Vietnam (31.1%) and Indonesia (50.4%).

**[Table 14: Cross-Functional Team]**

(10) QC (Quality Control)

Table 15 summarizes the questions on QC. “Adopted 3S or 5S,” and “Operate a QC circle” are the largest items in all countries. “Operate a QC circle” is large in Indonesia (86.3%) and the Philippines (79.3%). This data shows that QC activity has already become popular in these countries.

**[Table 15: QC (Quality Control)]**

(11) Top management (CEO)

Table 16 shows that “experience of top management having worked for MNCs/JVs” is the largest in the Philippines (43.5%). About 33% of top management has working experience with MNCs/JVs.

**[Table 16: Working Experience of Top Management with MNCs/JV]**

(12) Employees

Table 17 shows that “factory managers working for MNCs/JVs” is about 88% in all the economies. In Vietnam and Indonesia, all the factory managers have work experience with other firms.

**[Table17: Factory Managers with Working Experience in Other Firms]**

(13) Percentage of indigenous employees

The percentages for indigenous employees such as “engineers,” “line managers,” and “managers” ranges from “20%–39%” to “100%” in Vietnam (Table 18-20). In Indonesia and the Philippines, their firms are polarized between “0% and 19%” and “100%.” While Thailand also has such a polarization, its distribution is more evenly placed in the middle percentages.

**[Table 18: Percentage of Indigenous Engineers]**

**[Table 19: Percentage of Indigenous Line Managers or Leader Class]**

**[Table 20: Percentage of Indigenous Managers]**

**3. METHODOLOGY AND MODELS: SEM (STRUCTURAL EQUATION MODELING)**

**3.1 Objective of the study**

This study focuses on the innovation process of firms in four ASEAN economies, namely Vietnam, Indonesia, the Philippines, and Thailand. Our previous research demonstrated that external linkages promote internal innovation capability of firms (Tsuji et al, 2011, 2013, 2014; Machikita and Ueki, 2015). Internal innovation capability was assumed to comprise organizational learning, capital goods (or technology), and ICT use. The ultimate resources for innovation lie in human resources who play essential roles in every segment of the innovation process inside the firm. Our previous studies identified some channels that showed how outside information related to

innovation is obtained, observed, and transformed for innovation inside the firm (Tsuji et al, 2013, 2014; Machikita and Ueki, 2015). One such channel is through guest engineers dispatched by MNCs or sent to MNCs from local firms; those engineers obtain new technology, which leads to innovation. This study aims to identify more specifically particular persons in the local firms that build networks with MNCs, which own advanced technology or knowledge. In addition, this study attempts to identify particular processes, which transform outside information into the origin of innovation. We refer this process as organizational learning. Thus, internal innovation capability consists of human and organizational factors.

### **3.2 Methodology**

This study employs SEM (structural equation model) or CSA (covariance structural analysis), which enables a study of the relationship among various variables that are related to each other. SEM is said to be a mixture of factor analysis and regression analysis; the former constructs latent variables from observed variables by using factor analysis, whereas the latter examines the causal relationship between latent variables by regression analysis. Thus, SEM analysis can be used even for cases in which the variables are endogenous and the usual least squares cannot be applied. The idea of SEM was initially proposed as CSA by Bock (1960) and developed by Bock and Bargmann (1966) in order to solve issues related to multivariate analysis. Later, Bagozzi (1980) and Bollenn (1989) termed this as SEM.

The merits of SEM are summarized as follows: Regression analysis enables the causal relationship between variables and can handle only the observed variables, that is, endogenous variables, which are referred to as “latent variables” in SEM. Factor

analysis can construct latent variables, which are common nature behind observed variables, but it cannot analyze their causal relationship. SEM can thus solve the issues related to factor and regression analysis and integrate these two methods. In other words, SEM introduces latent variables that are not observable, and by fixing the causal relationship between latent and observed variables, it statistically examines the social as well as natural phenomena.

### **3.3 Models**

To analyze the above research question, the following hypotheses are postulated:

**Model I:** External linkages promote organizational learning, which enhances product innovation.

**Model II:** Working experience of top management and factory managers with MNCs/JVs assists the connectivity with MNCs, and working experience with MNCs/JVs enhances organizational learning and therefore innovation.

**Model III:** Indigenous employees assist the connectivity with local firms, and indigenous employees promote organizational learning and therefore innovation.

**Model IV:** External linkages can have influence on working experience with MNCs/JVs and indigenous employees, and then both promote organizational learning and innovation.

### **3.4 Construction of variables**

The variables used for estimation are constructed in the following manner from the questionnaires.



### **(1) Outcome variables: product innovation**

The construction of variables related to product innovation is based on Q13 of Section II, B.

The respondents are asked whether they achieved, tried, or not tried yet. In the case of achieved, two points are given; if they tried, one point is given; and those who have not tried yet are indicated by zero. With respect to the above four questions, factor analysis of promax rotation is employed. Consequently, it converges to one factor, which is named as “product innovation.” The result of the factor analysis is shown in Table 20.

#### **[Table 21: Result of Factor Analysis: Product Innovation]**

### **(2) External linkages**

Question II, D are used for the construction of latent variables which show external source for upgrading technology and innovation, which is shown in Table 22.

#### **Table 22: External Source of Technologies and Information**

##### **Q23. Does the external source important for upgrading/innovation?**

**Q23.1.** Final Consumer

**Q23.2.** Competitor

**Q23.3.** Buyer or trading company

**Q23.4.** Consultant

**Q23.5.** Local customer (100% local capital)

**Q23.6.** Local supplier

**Q23.7.** MNC (100% non-local capital)/Joint Venture (JV) customer located in your country

**Q23.8.** MNC/JV supplier located in your country

**Q23.9.** MNC/JV customer located in a foreign country

**Q23.10.** MNC/JV supplier located in a foreign country

**Q23.11.** Public organization (government, public agency, public financial institution)

**Q23.12.** Local business organization

**Q23.13.** University or public research institute

The related latent variables are constructed in the following manner. The respondents are asked to rate according to five scales: 4. Very important, 3. Somewhat important, 2. Not very important, 1. Not important, and 0. Not practice. The scores are scaled from 0 to 4 points. The result of factor analysis is shown in Table 23. Three factors, that is, “local firms,” “MNCs,” and “public organization and university” are extracted.

**[Table 23: Result of Factor Analysis: External Sources]**

**(3) Internal innovation capability**

**(3-1) Organizational learning**

The variable for organizational learning consists of the two questions: QC (quality control) and cross-functional team. The questions regarding QC are provided in Table 24.

**[Table 24: Quality Control]**

If respondents replied “Yes,” then the score is 1, if otherwise, it is 0. Accordingly, this variable takes values from 0 to 5.

**(3-2) Cross-functional team**

This variable is constructed from Q21, and the questions are limited to the areas related to product innovation, namely 2. Market Research, 3. Research, 4. Development, 11. Sales and Marketing. These are shown in Table 25. If respondents replied “Yes,” then the score is 1, if otherwise, it is 0. Accordingly, this variable takes values from 0 to 5.

**[Table 25: Questions related to Cross-functional Team]**

### **(3-3) Working experience with MNCs/JVs**

The questions concerning backgrounds of top management and factory managers include Q30 and Q31–Q43 shown in Section II, G, which are as follows:

**Q30.10.** Does the top management have working experience with MNCs/Joint Ventures (JVs)?

**Q31.3.** Does the factory manager have working experience with for MNCs/Joint Ventures (JVs)?

If respondents reply “Yes,” then a score of 1 is given, and 0 otherwise.

### **(3-4) Indigenous employees**

This variable is based on Q32: “What percent of engineers/line managers/managers are indigenous?” This is shown in Table 26.

#### **[Table 26: Questions related to Indigeneity of Engineer/Manager]**

The scores of these questions coincide with the number of answers, that is, 100% is given 5, and so on. This variable takes values from 0 to 5. The basic statistics of the variables discussed above is shown in Table 27.

#### **[Table 27: Basic Statistics]**

## **4. ESTIMATION RESULTS**

Here, the results of SEM are presented. Model I to Model IV are examined one by one.

### **4.1 Model I**

First, Model I examines that external linkages promote organization learning, and organizational learning enhances product innovation. The flow of the causality and the result of estimation by SEM is shown in Table 28.

**[Table 28: Result of Structural Equation Modeling: Model I]**

As seen in Table 15 of the result of factor analysis regarding external linkages, the correlations among three variables seem to be large. Since it is better that the correlations are small, the following correlation analysis is conducted implying that the actual correlation is low enough, which is indicated in Table 29.

**[Table 29: Correlation Analysis]**

Finally, the above results shown in Tables 30 and 31 can be summarized in the following manner: Model I implies that the connectivity with local firms and MNCs provides positive and significant effect on organizational learning, which promotes innovation, whereas public organization and university does not provide any significant impact.

**[Table 30: Result of Structural Equation Modeling: Model I]**

**[Table 31: Correlation Analysis of Model I]**

**[Figure 3: Path Diagram of Model I]**

## **4.2 Model II**

Model II indicates that the working experience of top management and factory managers with MNCs/JVs assists the connectivity with MNCs, and the working experience with MNCs/JVs enhances organizational learning and therefore innovation. The result of estimation by SEM is shown in Table 32.

**[Table 32: Estimation Results: Model II]**

Again, the correlation among external linkages is examined, as seen in Model I, implying that the correlations are small enough (Table 33).

**[Table 33: Correlation Analysis of Model II]**

The results are summarized in Figure 4, implying that the connectivity with MNCs and public organization and university are positively significant, whereas local firms are negatively significant. The former connectivity is as expected, but as for the latter, to collaborate with local firms does not require working experience with MNCs.

**[Figure 4: Path diagram of estimation: Model II]**

**4.3 Model III**

Here, we examine Model III, which suggest that indigenous employees assist the connectivity with local firms, and then indigenous employees promote organization learning. Product innovation is enhanced by organization learning (see Table 34).

**[Table 34: Estimation Results: Model III]**

Again, the correlations among external linkages are examined in Table 35, showing no correlations. The path diagram shown in Figure 5 summarizes the results indicating that indigenous employees significantly promote the connectivity with locals, whereas MNCs are negatively significant. No relationship was found between indigeneity and public organizations and universities. This implies that indigenous employees are not useful for connecting with MNCs. These results are also as expected.

**[Table 35: Correlation Analysis: Model III]**

**[Figure 5 Path Diagram of Estimation: Model III]**

**4.4 Mode IV**

Let us present the integrated model, which includes all three previous models. The estimation results are shown in Tables 36 and 37 in the same manner as in previous models.

**[Table 36: Structural Equation Modeling Results: Model IV]**

**[Table 37 Correlation Analysis: Model IV]**

**[Figure 6: Path Diagram of Estimation: Model IV]**

Model IV is comprehensive and includes all kinds of connectivity and relationships. For example, working experience with MNCs/JVs is a significant factor for connecting to MNCs and public organizations and universities, whereas indigenous employees are mediators for connecting with locals. The relationship between locals and working experience with MNCs/JVs, and that between MNCs and indigenous employees are not significant. Other latent variables such as working experience with MNCs/JVs, indigenous employees, and organizational learning are positively significant to innovation. These are consistent with the previous models. To select the best model, the fitness of these models is examined in what follows.

#### **4.5 Selection of the best model**

Tables 38–41 indicate the fitness of four models of SEM. GFI (goodness-of-fit index) and AGFI (adjusted goodness-of-fit index) take the value between 0 and 1 indicating criteria of the explanatory power of the model. If  $GFI \geq AGFI$  and both indices are 0.9 or more, the model can be judged as proper. CFI (comparative fit index) evaluates the model in terms of goodness-of-fit showing how much the model is improved in comparison with the independent model estimated under the assumption that there is no correlation among the observed variables. It takes the value from 0 to 1, and the model

is judged as being good fit if CFI is 0.9 or more. Moreover, RMSEA (root mean square error of approximation) is an index that expresses the divergence between the estimated and actual distribution of the model expressed in terms of the amount of degrees of freedom. The model can be judged as good fitness, if it is 0.10 or less.

Selecting a better model depends on which index is chosen, and in terms of AIC, Model I seems to be the best, since it includes the smallest number of variables. However, Model I has the smallest coefficient between organization learning and innovation, and other three have larger coefficients. This implies that between external linkages and organizational learning there must be some variables. Other three have human factor between these two. Among the three, Model II that has working experience with MNCs/JVs as human factor shows the largest coefficient, and thus Model II seems to be better. On the other hand, Model III that has indigenous employees as human factor indicates larger coefficient than Model I, implying that indigenous employees is also important. Based on these observations, Model IV that has these two variables together as human factor is considered to satisfy all these conditions. Hence, Model IV shows the best fitness.

**[Table 38: Fitness of Model I]**

**[Table 39: Fitness of Model II]**

**[Table 40: Fitness of Model III]**

**[Table 41: Fitness of Model IV]**

## **5. DIRECT AND INDIRECT EFFECTS ON INNOVATION**

### **5.1 Calculation of effects**

The analysis thus far focuses only on the direct effects, but there also exist other indirect effects. Total effects are the sum of direct and indirect effects. Let us take an example of MNCs. MNCs has two direct effects on working experience with MNCs/JVs and indigenous employees in case of Model IV Working experience with MNCs/JVs and indigenous employees have effects on innovation via organizational learning, which are indirect effects from the view of MNCs. The amount of indirect effects of MNCs on organizational learning can be calculated in the following manner:

- a. [MNCs → Working experience with MNCs/JVs] × [Working experience with MNCs/JVs → Organizational learning]

Since the coefficient of the first term is (0.498) and the second term is (0.493), the amount of this route is:  $(0.498) \times (0.493) = 0.246$

- b. [MNCs → Indigenous employees] × [Indigenous employees → Organizational learning]

With the same calculation as in a.,  $(-0.183) \times (0.201) = -0.038$  yields the indirect effects of this route. The total indirect effects of MNCs on organizational learning are 0.208. The indirect effects of locals can be calculated in the same way. The detailed calculations of direct effects and indirect effects are shown in Table 42 and Table 43, respectively, and the total effects are shown in Table 44.

**[Table 42: Standardizing Direct Effects: Model IV]**

**[Table 43: Standardizing Indirect Effects: Model IV]**

**[Table 44: Standardizing Total Effects: Model IV]**

## 5.2 Verification of Hypotheses



It follows from Table 36 that the total effects of external linkages of MNCs and public organization and universities, except locals, are positively significant, implying that Hypothesis I is partially satisfied. According to Figure 6, the path diagram shows that MNCs has a positive significant path to working experience with MNCs/JVs, indicating that Hypothesis II is satisfied. Again, the path from locals is positively significant to indigenous employees, implying that Hypothesis III is verified. The paths from working experience with MNCs/JVs and indigenous employees to organizational learning are positively significant, indicating that Hypotheses IV and V are verified. Finally, the path from organizational learning to innovation is positively significant, demonstrating that Hypothesis III is verified. Except the hypotheses related to external linkages from working experience with MNCs/JVs to locals and from indigenous employees to MNCs, all others are fully verified.

### **5.3 Important factors to innovation**

The previous analysis of direct and indirect effects has an important implication to the innovation process of local firms in the regions. The innovation process is divided into two parts: absorption and integration sub-process. Among three external linkages, comparing the total effects on innovation, MNCs has the largest impact, followed by public organizations and universities. Locals have a negative effect. From this, it follows that the connectivity with MNCs are the most important to achieve innovation. This finding is consistent with our previous reports.

Regarding absorption of information related to innovation, this study focuses on gatekeepers, that is, persons who mediate between external linkages and firms. This study identifies two kinds of human factors such as top management and factory

managers who have working experience with MNCs/JVs and indigenous employees such as managers, engineers, and line managers, or leaders class who are of the same nationalities. The conclusion obtained from the analysis indicates that the best gatekeepers corresponding to external linkages for the connectivity with MNCs and public organizations and universities are top management and factory managers who have working experience with MNCs/JVs, whereas for the connectivity to locals, indigenous employees such as local engineers, managers, and line leaders are the best.

Regarding the integration process, the learning process such as organizational learning has the largest impact on innovation, although it is directly related to innovation. This study focused on QC and cross-functional team in the R&D process and found to be an important factor, which has the largest impact on innovation. Knowledge management inside the firm is essential.

## **5. CONCLUSION**

As discussed in the previous sections, by employing SEM, the innovation process of firms in the ASEAN countries are analyzed. In particular, the analysis shows two channels, or matching between working experience with MNCs/JVs and MNCs, and between indigenous employees and locals. The total effects of two channels on innovation are opposite: the former has a positive value, whereas the latter has a negative value. Based on these results, the policy implications indicate that MNCs are important sources of innovation, and therefore, central as well as local governments will have to invite them to their regions. This is a traditional policy that developing countries have been targeting. The analysis here provides a theoretical and empirical background.

Another policy implication comes from the analysis of public organizations and universities, which has a positive total effect on innovation, but it has an effect via working experience with MNCs/JVs. A policy has to target to develop a channel between public organizations and universities and locals. This is a construction of open innovation system in the regions. Table 46 shows the percentages of locals that consider public organizations and universities as important source of information. The figures are different in countries, but “very important” is less than 10% on average.

**[Table 45: How Locals consider Public Organizations and Universities as Important]**

The analysis has some limitations, which are expected to be overcome in the future research. In particular, the assimilating process inside the firms needs further development. This study examines cross-functional team and QC as latent variables, but there must be more ways to conduct R&D activities inside the firm. Previous studies such as Freeman (1979) analyze how R&D activities are conducted, particularly how information flows from gatekeepers to individual researchers inside one firm (Freeman, 1979). This study analyzes the data of whole country, and it is much more difficult to identify the information flow.

Our interviews with engineers of MNCs located in ASEAN regions show that local engineers tend to move from MNCs to local firms to seek better working conditions, although MNCs wish to retain these good engineers. This is a pattern of traditional technology transfers, but through this channel, the number of such engineers becomes less than what locals require. In order for the regions to transform to knowledge-based economy, this is an obstacle to be solved.

## REFERENCES

- Allen, T. J. *Managing the flow of technology*, MIT Press, Cambridge, 1977.
- Bagozzi, R. P. *Causal models in marketing*. New York: Wiley, 1980.
- Bock, R. D. "Components of variance analysis as a structural and discriminant analysis for psychological tests," *British Journal of Statistical Psychology*, Vol. 13, pp. 151-163, 1960.
- Bock, R. D. and Bargmann, R. E. "Analysis of covariance structures," *Psychometrika*, Vol. 31, pp. 507-533, 1966.
- Bollen, K. A. *Structural Equations with latent Variables*, John Wiley & Sons: New York, 1989.
- Chesbrough, H. W. *Open innovation: the new imperative for creating and profiting from technology*, Boston, MA: Harvard Business School Press, 2003.
- Chesbrough H. W. Open innovation: a new paradigm for understanding industrial innovation. In H. W. Chesbrough, Vanhaverbeke, W. & West, J. (Eds.) *Open innovation researching a new paradigm* (pp.1-12), Oxford, UK: Oxford University Press, 2006a.
- Chesbrough, H. W. *Open business model: how to thrive in the new innovation landscape*, Boston, MA: Harvard Business School Press, 2006b.
- Christensen, C. M. and S. P. Kaufman "Assessing Your Organization's Capabilities: Resource, Process and Priorities," in Burgelman, R. A., C. M. Christensen, and S. C. Wheelwright (Eds.) *Strategic Management of Technology and Innovation*, 5th ed., McGraw-Hill, pp.153-164, 2009.
- Cohen, W. M. and D. A. Levinthal "Absorptive capacity: A new perspective on learning and innovation," *Administrative Science Quarterly*, Vol. 35, No. 1, pp. 128-152, 1990.

- Colquitt, J. A., J. B. Rodell "Justice, trust, trustworthiness: A longitudinal analysis integrating three theoretical perspectives," *Academy of Management Journal*, Vol. 54, No. 6, pp. 1183-1206, 2011.
- Freeman, L. C. "Centrality in Social Networks: Conceptual Clarification," *Social Networks*, Vol. 1, No. 3, pp. 215-239, 1979.
- Lawson, B. and D. Samson "Developing innovation capability in organisations: a dynamic capabilities approach," *International Journal of Innovation Management*, Vol. 5, No. 3, pp. 377-400, 2001.
- Leven, D. Z., R. Cross "The strength of weak ties you can trust: The mediating role of trust in effective knowledge transfer, *Management Science*, Vol. 50, No. 11. pp. 1477-1490, 2004.
- Machikita, T., Y. Ueki "Measuring and Explaining Innovative Capability: Evidence from Southeast Asia," *Asian Economic Policy Review*, Vol. 10, pp. 152-173, 2015.
- Myers, S., D. Marquis *Successful Industrial Innovation*, National Science Foundation, Washington, DC, 1969.
- Perdomo-Ortiz, J., J. G. Ibez-Benito, J. Galende "The intervening effect of business innovation capability on the relationship between Total Quality Management and technological innovation," *International Journal of Production Research*, Vol. 47, No. 18, pp. 5087–5107, 2009.
- Tsuji, M., K. Minetaki, Y. Akematsu "Empirical Study of the Formation of Internal Innovation Capability and External Linkages in ASEAN Economies," in *How to Enhance Innovation Capability with Internal and External Sources*, ed. by Patarapong Intarakumnerd, ERIA Supporting Study Project Report 2010, ERIA, Jakarta, Indonesia, pp.316-362, 2011.

Tsuji, M., Y. Ueki, H. Idota, Y. Akematsu, “The Formation of Internal Innovation Capability and External Sources in ASEAN Economies,” *Proceedings of 6th Annual Conference of the Academy of Innovation and Entrepreneurship (AIE) 2013*, Oxford University, UK, 2013.

Tsuji, M., Y. Ueki, H. Idota, “Innovation in ASEAN Economies: Internal Capability, External Linkages and Funding Sources,” *Proceedings of EAEA 2015*, Bangkok, Thailand, 2014.

Zahra, H. and G. George “Absorptive Capacity: A Review, Reconceptualization, and Extension,” *Academy of Management Review*, Vol. 27, No. 2, pp.185-203, 2002.

## Tables and Figures

**Table 1: Year of Establishment**

| Year of establishment | Vietnam    |              | Indonesia  |              | Philippines |              | Thailand   |              | Total      |              |
|-----------------------|------------|--------------|------------|--------------|-------------|--------------|------------|--------------|------------|--------------|
|                       | Freq.      | %            | Freq.      | %            | Freq.       | %            | Freq.      | %            | Freq.      | %            |
| - 1970                | 14         | 6.6          | 6          | 4.3          | 3           | 3.3          | 28         | 14.4         | 51         | 8.0          |
| 1971 - 1980           | 11         | 5.2          | 19         | 13.7         | 6           | 6.5          | 12         | 6.2          | 48         | 7.5          |
| 1981 - 1990           | 14         | 6.6          | 29         | 20.9         | 18          | 19.6         | 34         | 17.5         | 95         | 14.9         |
| 1991 - 2000           | 63         | 29.7         | 50         | 36.0         | 41          | 44.6         | 62         | 32.0         | 216        | 33.9         |
| 2001 - 2010           | 107        | 50.5         | 33         | 23.7         | 24          | 26.1         | 44         | 22.7         | 208        | 32.7         |
| 2011 -                | 3          | 1.4          | 2          | 1.4          | 0           | 0.0          | 14         | 7.2          | 19         | 3.0          |
| <b>Total</b>          | <b>212</b> | <b>100.0</b> | <b>139</b> | <b>100.0</b> | <b>92</b>   | <b>100.0</b> | <b>222</b> | <b>100.0</b> | <b>637</b> | <b>100.0</b> |

*Source:* ERIA Establishment Survey

**Table 2: The Type of your Establishment**

| Type of establishment      | Vietnam    |              | Indonesia  |              | Philippines |              | Thailand   |              | Total      |              |
|----------------------------|------------|--------------|------------|--------------|-------------|--------------|------------|--------------|------------|--------------|
|                            | Freq.      | %            | Freq.      | %            | Freq.       | %            | Freq.      | %            | Freq.      | %            |
| Headquarters/Main office   | 63         | 29.7         | 13         | 9.4          | 0           | 0.0          | 74         | 33.9         | 150        | 22.7         |
| Regional Headquarters      | 16         | 7.5          | 3          | 2.2          | 0           | 0.0          | 8          | 3.7          | 27         | 4.1          |
| Factory/Plant              | 131        | 61.8         | 120        | 86.3         | 91          | 98.9         | 98         | 45.0         | 440        | 66.6         |
| Branch Office/Sales Office | 2          | 0.9          | 3          | 2.2          | 1           | 1.1          | 38         | 17.4         | 44         | 6.7          |
| <b>Total</b>               | <b>212</b> | <b>100.0</b> | <b>139</b> | <b>100.0</b> | <b>92</b>   | <b>100.0</b> | <b>218</b> | <b>100.0</b> | <b>661</b> | <b>100.0</b> |

*Source:* ERIA Establishment Survey

**Table 3: Capital Structure of Establishments at Present**

| The capital structure of your establishment at present | Vietnam    |              | Indonesia  |              | Philippines |              | Thailand   |              | Total      |              |
|--|------------|--------------|------------|--------------|-------------|--------------|------------|--------------|------------|--------------|
|  | Freq.      | %            | Freq.      | %            | Freq.       | %            | Freq.      | %            | Freq.      | %            |
| 100% Locally-owned                                     | 163        | 76.9         | 92         | 66.2         | 37          | 40.2         | 184        | 84.0         | 476        | 71.9         |
| 100% Foreign-owned (MNC)                               | 37         | 17.5         | 27         | 19.4         | 32          | 34.8         | 25         | 11.4         | 121        | 18.3         |
| Joint Venture (JV, Locally and Foreign-owned)          | 12         | 5.7          | 20         | 14.4         | 23          | 25.0         | 10         | 4.6          | 65         | 9.8          |
| <b>Total</b>   | <b>212</b> | <b>100.0</b> | <b>139</b> | <b>100.0</b> | <b>92</b>   | <b>100.0</b> | <b>219</b> | <b>100.0</b> | <b>662</b> | <b>100.0</b> |

*Source:* ERIA Establishment Survey

**Table 4: The Major Foreign Investors**

| The major foreign investors | Vietnam |     | Indonesia |      | Philippines |      | Thailand |     | Total |      |
|-----------------------------|---------|-----|-----------|------|-------------|------|----------|-----|-------|------|
|                             | Freq.   | %   | Freq.     | %    | Freq.       | %    | Freq.    | %   | Freq. | %    |
| Indonesian investors        | 0       | 0.0 | 7         | 5.0  | 1           | 1.1  | 1        | 0.5 | 9     | 1.4  |
| Filipino investors          | 0       | 0.0 | 0         | 0.0  | 12          | 13.0 | 5        | 2.3 | 17    | 2.6  |
| Thai investors              | 0       | 0.0 | 1         | 0.7  | 1           | 1.1  | 9        | 4.1 | 11    | 1.7  |
| Vietnamese investors        | 0       | 0.0 | 0         | 0.0  | 0           | 0.0  | 3        | 1.4 | 3     | 0.5  |
| Malaysian investors         | 1       | 0.5 | 0         | 0.0  | 0           | 0.0  | 2        | 0.9 | 3     | 0.5  |
| Singaporean investors       | 2       | 0.9 | 3         | 2.2  | 2           | 2.2  | 2        | 0.9 | 9     | 1.4  |
| Chinese investors           | 4       | 1.9 | 0         | 0.0  | 4           | 4.3  | 5        | 2.3 | 13    | 2.0  |
| Japanese investors          | 13      | 6.1 | 30        | 21.6 | 28          | 30.4 | 17       | 7.7 | 88    | 13.3 |
| South Korean investors      | 6       | 2.8 | 5         | 3.6  | 12          | 13.0 | 2        | 0.9 | 25    | 3.8  |
| Taiwanese investors         | 16      | 7.5 | 0         | 0.0  | 7           | 7.6  | 2        | 0.9 | 25    | 3.8  |
| American investors          | 4       | 1.9 | 2         | 1.4  | 4           | 4.3  | 2        | 0.9 | 12    | 1.8  |
| European investors          | 5       | 2.4 | 5         | 3.6  | 1           | 1.1  | 3        | 1.4 | 14    | 2.1  |
| Other investors             | 1       | 0.5 | 1         | 0.7  | 0           | 0.0  | 6        | 2.7 | 8     | 1.2  |

Note: \*multiple answers

Source: ERIA Establishment Survey

**Table 5: Number of Full-Time Employees**

| No. of full-time employees | Vietnam |       | Indonesia |       | Philippines |       | Thailand |       | Total |       |
|----------------------------|---------|-------|-----------|-------|-------------|-------|----------|-------|-------|-------|
|                            | Freq.   | %     | Freq.     | %     | Freq.       | %     | Freq.    | %     | Freq. | %     |
| 1 - 19 persons             | 3       | 1.4   | 11        | 7.9   | 5           | 5.4   | 49       | 22.8  | 68    | 10.3  |
| 20 - 49                    | 12      | 5.7   | 13        | 9.4   | 12          | 13.0  | 37       | 17.2  | 74    | 11.2  |
| 50 - 99                    | 28      | 13.2  | 22        | 15.8  | 22          | 23.9  | 29       | 13.5  | 101   | 15.3  |
| 100 - 199                  | 42      | 19.8  | 31        | 22.3  | 17          | 18.5  | 27       | 12.6  | 117   | 17.8  |
| 200 - 299                  | 31      | 14.6  | 14        | 10.1  | 8           | 8.7   | 11       | 5.1   | 64    | 9.7   |
| 300 - 399                  | 11      | 5.2   | 11        | 7.9   | 4           | 4.3   | 7        | 3.3   | 33    | 5.0   |
| 400 - 499                  | 9       | 4.2   | 12        | 8.6   | 4           | 4.3   | 8        | 3.7   | 33    | 5.0   |
| 500 - 999                  | 22      | 10.4  | 11        | 7.9   | 10          | 10.9  | 17       | 7.9   | 60    | 9.1   |
| 1,000 - 1,499              | 17      | 8.0   | 3         | 2.2   | 5           | 5.4   | 5        | 2.3   | 30    | 4.6   |
| 1,500 - 1,999              | 7       | 3.3   | 5         | 3.6   | 3           | 3.3   | 1        | 0.5   | 16    | 2.4   |
| 2,000 and above            | 30      | 14.2  | 6         | 4.3   | 2           | 2.2   | 24       | 11.2  | 62    | 9.4   |
| Total                      | 212     | 100.0 | 139       | 100.0 | 92          | 100.0 | 215      | 100.0 | 658   | 100.0 |

Source: ERIA Establishment Survey



**Table 6: Total Assets**

| Total assets         | Vietnam |       | Indonesia |       | Philippines |       | Thailand |       | Total |       |
|----------------------|---------|-------|-----------|-------|-------------|-------|----------|-------|-------|-------|
|                      | Freq.   | %     | Freq.     | %     | Freq.       | %     | Freq.    | %     | Freq. | %     |
| Less than 10,000     | 2       | 0.9   | 3         | 2.2   | 2           | 2.2   | 3        | 1.5   | 10    | 1.5   |
| 10,000 - 24,999      | 4       | 1.9   | 1         | 0.7   | 1           | 1.1   | 5        | 2.4   | 11    | 1.7   |
| 25,000 - 49,999      | 3       | 1.4   | 5         | 3.6   | 3           | 3.3   | 17       | 8.3   | 28    | 4.3   |
| 50,000 - 74,999      | 6       | 2.8   | 11        | 7.9   | 2           | 2.2   | 4        | 1.9   | 23    | 3.5   |
| 75,000 - 99,999      | 13      | 6.1   | 3         | 2.2   | 3           | 3.3   | 7        | 3.4   | 26    | 4.0   |
| 100,000 - 499,000    | 14      | 6.6   | 24        | 17.3  | 18          | 19.6  | 36       | 17.5  | 92    | 14.2  |
| 500,000 - 999,999    | 33      | 15.6  | 15        | 10.8  | 11          | 12.0  | 27       | 13.1  | 86    | 13.3  |
| 1 million - 4.9 mil. | 60      | 28.3  | 26        | 18.7  | 19          | 20.7  | 37       | 18.0  | 142   | 21.9  |
| 5 mil. - 9.9 mil.    | 35      | 16.5  | 13        | 9.4   | 12          | 13.0  | 25       | 12.1  | 85    | 13.1  |
| 10 million and above | 42      | 19.8  | 38        | 27.3  | 21          | 22.8  | 45       | 21.8  | 146   | 22.5  |
| Total                | 212     | 100.0 | 139       | 100.0 | 92          | 100.0 | 206      | 100.0 | 649   | 100.0 |

Source: ERIA Establishment Survey.

**Table 7: Main Business Activity of Your Establishment at Present**

| Main business activity at present         | Vietnam |       | Indonesia |       | Philippines |       | Thailand |       | Total |       |
|---|---------|-------|-----------|-------|-------------|-------|----------|-------|-------|-------|
|   | Freq.   | %     | Freq.     | %     | Freq.       | %     | Freq.    | %     | Freq. | %     |
| Food, beverages, tobacco                  | 24      | 11.3  | 24        | 17.3  | 13          | 14.1  | 21       | 9.5   | 82    | 12.4  |
| Textiles                                  | 17      | 8.0   | 9         | 6.5   | 2           | 2.2   | 10       | 4.5   | 38    | 5.7   |
| Apparel, leather                          | 2       | 0.9   | 6         | 4.3   | 9           | 9.8   | 4        | 1.8   | 21    | 3.2   |
| Footwear                                  | 6       | 2.8   | 2         | 1.4   | 1           | 1.1   | 0        | 0.0   | 9     | 1.4   |
| Wood, wood products                       | 4       | 1.9   | 3         | 2.2   | 1           | 1.1   | 13       | 5.9   | 21    | 3.2   |
| Paper, paper products, printing           | 13      | 6.1   | 5         | 3.6   | 2           | 2.2   | 12       | 5.5   | 32    | 4.8   |
| Chemicals, chemical products              | 9       | 4.2   | 5         | 3.6   | 4           | 4.3   | 3        | 1.4   | 21    | 3.2   |
| Plastic, rubber products                  | 25      | 11.8  | 20        | 14.4  | 11          | 12.0  | 14       | 6.4   | 70    | 10.6  |
| Other non-metallic mineral products       | 0       | 0.0   | 1         | 0.7   | 7           | 7.6   | 4        | 1.8   | 12    | 1.8   |
| Iron, steel                               | 6       | 2.8   | 2         | 1.4   | 3           | 3.3   | 20       | 9.1   | 31    | 4.7   |
| Non-ferrous metals                        | 3       | 1.4   | 0         | 0.0   | 0           | 0.0   | 3        | 1.4   | 6     | 0.9   |
| Metal products                            | 27      | 12.7  | 4         | 2.9   | 4           | 4.3   | 11       | 5.0   | 46    | 6.9   |
| Machinery, equipment, tools               | 15      | 7.1   | 9         | 6.5   | 9           | 9.8   | 4        | 1.8   | 37    | 5.6   |
| Computers & computer parts                | 1       | 0.5   | 0         | 0.0   | 5           | 5.4   | 8        | 3.6   | 14    | 2.1   |
| Other electronics & components            | 18      | 8.5   | 7         | 5.0   | 9           | 9.8   | 22       | 10.0  | 56    | 8.4   |
| Precision instruments                     | 2       | 0.9   | 1         | 0.7   | 2           | 2.2   | 1        | 0.5   | 6     | 0.9   |
| Automobile, auto parts                    | 12      | 5.7   | 5         | 3.6   | 4           | 4.3   | 30       | 13.6  | 51    | 7.7   |
| Other transportation equipments and parts | 12      | 5.7   | 3         | 2.2   | 2           | 2.2   | 4        | 1.8   | 21    | 3.2   |
| Handicraft                                | 14      | 6.6   | 3         | 2.2   | 1           | 1.1   | 0        | 0.0   | 18    | 2.7   |
| Other business activity                   | 2       | 0.9   | 30        | 21.6  | 3           | 3.3   | 36       | 16.4  | 71    | 10.7  |
| Total                                     | 212     | 100.0 | 139       | 100.0 | 92          | 100.0 | 220      | 100.0 | 663   | 100.0 |

Source: ERIA Establishment Survey

**Table 9: Redesigning Packaging or Significantly Changing Appearance Design in Last 2 Years (2012-13)**

| Redesigning packaging or significantly changing appearance design | Vietnam |       | Indonesia |       | Philippines |       | Thailand |       | Total |       |
|---|---------|-------|-----------|-------|-------------|-------|----------|-------|-------|-------|
|   | Freq.   | %     | Freq.     | %     | Freq.       | %     | Freq.    | %     | Freq. | %     |
| Achieved  | 149     | 70.3  | 54        | 38.8  | 60          | 65.2  | 63       | 28.4  | 326   | 49.0  |
| Tried   | 44      | 20.8  | 14        | 10.1  | 23          | 25.0  | 40       | 18.0  | 121   | 18.2  |
| not tried yet   | 19      | 9.0   | 71        | 51.1  | 9           | 9.8   | 119      | 53.6  | 218   | 32.8  |
| Total   | 212     | 100.0 | 139       | 100.0 | 92          | 100.0 | 222      | 100.0 | 665   | 100.0 |

Source: ERIA Establishment Survey

**Table 10: Significantly Improving Existing Products in Last 2 Years (2011-12)**

| Significantly improving existing products | Vietnam |       | Indonesia |       | Philippines |       | Thailand |       | Total |       |
|---|---------|-------|-----------|-------|-------------|-------|----------|-------|-------|-------|
|   | Freq.   | %     | Freq.     | %     | Freq.       | %     | Freq.    | %     | Freq. | %     |
| Achieved                                  | 77      | 36.3  | 62        | 44.6  | 62          | 67.4  | 65       | 29.3  | 266   | 40.0  |
| Tried                                     | 84      | 39.6  | 16        | 11.5  | 26          | 28.3  | 41       | 18.5  | 167   | 25.1  |
| not tried yet                             | 51      | 24.1  | 61        | 43.9  | 4           | 4.3   | 116      | 52.3  | 232   | 34.9  |
| Total                                     | 212     | 100.0 | 139       | 100.0 | 92          | 100.0 | 222      | 100.0 | 665   | 100.0 |

Source: ERIA Establishment Survey

**Table 11: New Product Based on Existing Technologies in Last 2 Years (2012-13)**

| New product based on the existing technologies | Vietnam |       | Indonesia |       | Philippines |       | Thailand |       | Total |       |
|--|---------|-------|-----------|-------|-------------|-------|----------|-------|-------|-------|
|  | Freq.   | %     | Freq.     | %     | Freq.       | %     | Freq.    | %     | Freq. | %     |
| Achieved                                       | 39      | 18.4  | 43        | 30.9  | 48          | 52.2  | 63       | 28.4  | 193   | 29.0  |
| Tried  | 82      | 38.7  | 23        | 16.5  | 27          | 29.3  | 45       | 20.3  | 177   | 26.6  |
| not tried yet                                  | 91      | 42.9  | 73        | 52.5  | 17          | 18.5  | 114      | 51.4  | 295   | 44.4  |
| Total  | 212     | 100.0 | 139       | 100.0 | 92          | 100.0 | 222      | 100.0 | 665   | 100.0 |

Source: ERIA Establishment Survey

**Table 12: New Product Based on New Technologies in Last 2 Years (2011-12)**

| New product based on new technologies | Vietnam |       | Indonesia |       | Philippines |       | Thailand |       | Total |       |
|---------------------------------------|---------|-------|-----------|-------|-------------|-------|----------|-------|-------|-------|
|                                       | Freq.   | %     | Freq.     | %     | Freq.       | %     | Freq.    | %     | Freq. | %     |
| Achieved                              | 17      | 8.0   | 36        | 25.9  | 36          | 39.1  | 55       | 24.8  | 144   | 21.7  |
| Tried                                 | 61      | 28.8  | 23        | 16.5  | 29          | 31.5  | 43       | 19.4  | 156   | 23.5  |
| not tried yet                         | 134     | 63.2  | 80        | 57.6  | 27          | 29.3  | 124      | 55.9  | 365   | 54.9  |
| Total                                 | 212     | 100.0 | 139       | 100.0 | 92          | 100.0 | 222      | 100.0 | 665   | 100.0 |

Source: ERIA Establishment Survey

**Table 13: Situation of Innovation by Country**

|  |               | Vietnam |       | Indonesia |       | Philippines |       | Thailand |       | Total |       |
|--|---------------|---------|-------|-----------|-------|-------------|-------|----------|-------|-------|-------|
|  |               | Freq    | %     | Freq      | %     | Freq        | %     | Freq     | %     | Freq  | %     |
| Tried to introduce a new product in last 2 years   | Yes           | 198     | 93.4  | 90        | 64.7  | 91          | 100.0 | 117      | 52.7  | 496   | 74.7  |
|  | No            | 14      | 6.6   | 49        | 35.3  | 0           | 0.0   | 105      | 47.3  | 168   | 25.3  |
|  | Total         | 212     | 100.0 | 139       | 100.0 | 91          | 100.0 | 222      | 100.0 | 664   | 100.0 |
| <b>Type I</b><br>Redesigning packaging or significantly changing appearance design           | Achieved      | 149     | 70.3  | 54        | 38.8  | 60          | 65.2  | 63       | 28.4  | 326   | 49.0  |
|  | Tried         | 44      | 20.8  | 14        | 10.1  | 23          | 25.0  | 40       | 18.0  | 121   | 18.2  |
|  | Not tried yet | 19      | 9.0   | 71        | 51.1  | 9           | 9.8   | 119      | 53.6  | 218   | 32.8  |
|  | Total         | 212     | 100.0 | 139       | 100.0 | 92          | 100.0 | 222      | 100.0 | 665   | 100.0 |
| <b>Type II</b><br>Introduced a new product, significantly improving existing products        | Achieved      | 77      | 36.3  | 62        | 44.6  | 62          | 67.4  | 65       | 29.3  | 266   | 40.0  |
|  | Tried         | 84      | 39.6  | 16        | 11.5  | 26          | 28.3  | 41       | 18.5  | 167   | 25.1  |
|  | Not tried yet | 51      | 24.1  | 61        | 43.9  | 4           | 4.3   | 116      | 52.3  | 232   | 34.9  |
|  | Total         | 212     | 100.0 | 139       | 100.0 | 92          | 100.0 | 222      | 100.0 | 665   | 100.0 |
| <b>Type III</b><br>Development of a totally new product based on the "existing" technologies | Achieved      | 39      | 18.4  | 43        | 30.9  | 48          | 52.2  | 63       | 28.4  | 193   | 29.0  |
|  | Tried         | 82      | 38.7  | 23        | 16.5  | 27          | 29.3  | 45       | 20.3  | 177   | 26.6  |
|  | Not tried yet | 91      | 42.9  | 73        | 52.5  | 17          | 18.5  | 114      | 51.4  | 295   | 44.4  |
|  | Total         | 212     | 100.0 | 139       | 100.0 | 92          | 100.0 | 222      | 100.0 | 665   | 100.0 |
| <b>Type IV</b><br>New product based on new technologies                                      | Achieved      | 17      | 8.0   | 36        | 25.9  | 36          | 39.1  | 55       | 24.8  | 144   | 21.7  |
|  | Tried         | 61      | 28.8  | 23        | 16.5  | 29          | 31.5  | 43       | 19.4  | 156   | 23.5  |
|  | Not tried yet | 134     | 63.2  | 80        | 57.6  | 27          | 29.3  | 124      | 55.9  | 365   | 54.9  |
|  | Total         | 212     | 100.0 | 139       | 100.0 | 92          | 100.0 | 222      | 100.0 | 665   | 100.0 |

Source: ERIA Establishment Survey

**Table 14: Cross-Functional Team**

| Cross-functional team  | Vietnam |      | Indonesia |      | Philippines |      | Thailand |      | Total |      |
|------------------------|---------|------|-----------|------|-------------|------|----------|------|-------|------|
|                        | Freq.   | %    | Freq.     | %    | Freq.       | %    | Freq.    | %    | Freq. | %    |
| No team                | 61      | 28.8 | 37        | 26.6 | 15          | 16.3 | 88       | 39.6 | 201   | 30.2 |
| Market Research        | 81      | 38.2 | 32        | 23.0 | 12          | 13.0 | 35       | 15.8 | 160   | 24.1 |
| Research               | 95      | 44.8 | 36        | 25.9 | 17          | 18.5 | 14       | 6.3  | 162   | 24.4 |
| Development            | 102     | 48.1 | 41        | 29.5 | 25          | 27.2 | 20       | 9.0  | 188   | 28.3 |
| Production Engineering | 67      | 31.6 | 41        | 29.5 | 35          | 38.0 | 21       | 9.5  | 164   | 24.7 |
| Manufacturing          | 86      | 40.6 | 54        | 38.8 | 0           | 0.0  | 28       | 12.6 | 168   | 29.3 |
| Quality Control        | 66      | 31.1 | 70        | 50.4 | 0           | 0.0  | 25       | 11.3 | 161   | 28.1 |
| Procurement            | 18      | 8.5  | 32        | 23.0 | 0           | 0.0  | 18       | 8.1  | 68    | 11.9 |
| Accounting             | 7       | 3.3  | 20        | 14.4 | 0           | 0.0  | 21       | 9.5  | 48    | 8.4  |
| Human Resources        | 10      | 4.7  | 29        | 20.9 | 14          | 15.2 | 19       | 8.6  | 72    | 10.8 |
| Sales & Marketing      | 21      | 9.9  | 69        | 49.6 | 46          | 50.0 | 50       | 22.5 | 186   | 28.0 |
| Logistics/Distribution | 17      | 8.0  | 20        | 14.4 | 16          | 17.4 | 4        | 1.8  | 57    | 8.6  |
| IT System              | 4       | 1.9  | 13        | 9.4  | 7           | 7.6  | 11       | 5.0  | 35    | 5.3  |
| Others, specify        | 3       | 1.4  | 2         | 1.4  | 2           | 2.2  | 0        | 0.0  | 7     | 1.1  |

Note: \*multiple answers.

Source: ERIA Establishment Survey

**Table 15: QC (Quality Control)**

| QC and delivery management   | Vietnam |      | Indonesia |      | Philippines |      | Thailand |      | Total |      |
|--|---------|------|-----------|------|-------------|------|----------|------|-------|------|
|  | Freq.   | %    | Freq.     | %    | Freq.       | %    | Freq.    | %    | Freq. | %    |
| Adopted 3S or 5S (Seiri, Seiton, Seisou, Seiketsu, Shitsuke)   | 116     | 54.7 | 109       | 78.4 | 74          | 80.4 | 161      | 72.5 | 460   | 69.2 |
| Operate a QC circle  | 130     | 61.3 | 120       | 86.3 | 73          | 79.3 | 148      | 66.7 | 471   | 70.8 |
| To disseminate successful experiences of a QC circle across your establishment                         | 82      | 38.7 | 98        | 70.5 | 69          | 75.0 | 115      | 51.8 | 364   | 54.7 |
| To learn from successful experiences of a QC circle group  | 52      | 24.5 | 86        | 61.9 | 71          | 77.2 | 131      | 59.0 | 340   | 51.1 |
| To share successful experiences of a QC circle group of your establishment with your customer/supplier | 29      | 13.7 | 75        | 54.0 | 66          | 71.7 | 117      | 52.7 | 287   | 43.2 |
| Employee suggestion programs   | 102     | 48.1 | 123       | 88.5 | 77          | 84.6 | 171      | 77.0 | 473   | 71.2 |
| Provide groups of employees with rewards for suggestions/QC circle activities                          | 86      | 40.6 | 91        | 65.5 | 54          | 58.7 | 136      | 61.3 | 367   | 55.2 |
| Provide individual employees with rewards for suggestions/QC circle activities                         | 90      | 42.5 | 96        | 69.1 | 55          | 59.8 | 142      | 64.0 | 383   | 57.6 |

Note: \*multiple answers.

Source: ERIA Establishment Survey

**Table 16 Experiences Working for MNCs/JVs of the Top Management**

| Experiences Working for MNCs/JVs of the Top Management | Vietnam |       | Indonesia |       | Philippines |       | Thailand |       | Total |       |
|--|---------|-------|-----------|-------|-------------|-------|----------|-------|-------|-------|
|  | Freq.   | %     | Freq.     | %     | Freq.       | %     | Freq.    | %     | Freq. | %     |
| Yes  | 70      | 33.0  | 35        | 25.2  | 40          | 43.5  | 73       | 32.9  | 218   | 32.8  |
| No   | 142     | 67.0  | 104       | 74.8  | 52          | 56.5  | 149      | 67.1  | 447   | 67.2  |
| Total  | 212     | 100.0 | 139       | 100.0 | 92          | 100.0 | 222      | 100.0 | 665   | 100.0 |

Source: ERIA Establishment Survey

**Table 17: Factory Manager Has Experiences Working for Other Firm**

| Experiences of factory manager working for MNCs | Vietnam |       | Indonesia |       | Philippines |       | Thailand |       | Total |       |
|---|---------|-------|-----------|-------|-------------|-------|----------|-------|-------|-------|
|   | Freq.   | %     | Freq.     | %     | Freq.       | %     | Freq.    | %     | Freq. | %     |
| Yes   | 212     | 100.0 | 139       | 100.0 | 91          | 98.9  | 144      | 65.8  | 586   | 88.5  |
| No  | 0       | 0.0   | 0         | 0.0   | 1           | 1.1   | 75       | 34.2  | 76    | 11.5  |
| Total   | 212     | 100.0 | 139       | 100.0 | 92          | 100.0 | 219      | 100.0 | 662   | 100.0 |

Note: \*multiple answers

Source: ERIA Establishment Survey

**Table 18: Percentage of Indigenous Engineers**

| Percentage of indigenous engineers | Vietnam |       | Indonesia |       | Philippines |       | Thailand |      | Total |       |
|------------------------------------|---------|-------|-----------|-------|-------------|-------|----------|------|-------|-------|
|                                    | Freq.   | %     | Freq.     | %     | Freq.       | %     | Freq.    | %    | Freq. | %     |
| 0-19%                              | 0       | 0.0   | 13        | 9.4   | 25          | 27.2  | 115      | 51.8 | 153   | 23.0  |
| 20-39%                             | 33      | 15.6  | 2         | 1.4   | 3           | 3.3   | 36       | 16.2 | 74    | 11.1  |
| 40-59%                             | 67      | 31.6  | 3         | 2.2   | 0           | 0.0   | 13       | 5.9  | 83    | 12.5  |
| 60-79%                             | 48      | 22.6  | 0         | 0.0   | 2           | 2.2   | 9        | 4.1  | 59    | 8.9   |
| 80-99%                             | 31      | 14.6  | 14        | 10.1  | 5           | 5.4   | 17       | 7.7  | 67    | 10.1  |
| 100%                               | 33      | 15.6  | 107       | 77.0  | 57          | 62.0  | 32       | 14.4 | 229   | 34.4  |
| Total                              | 212     | 100.0 | 139       | 100.0 | 92          | 100.0 | 222      | 0.0  | 665   | 100.0 |

Source: ERIA Establishment Survey

**Table 19: Percentage of Indigenous Line Managers, or Leader Class**

| Percentage of indigenous line managers, or leader class | Vietnam |       | Indonesia |       | Philippines |       | Thailand |       | Total |       |
|---|---------|-------|-----------|-------|-------------|-------|----------|-------|-------|-------|
|   | Freq.   | %     | Freq.     | %     | Freq.       | %     | Freq.    | %     | Freq. | %     |
| 0-19%   | 10      | 4.7   | 12        | 8.6   | 12          | 13.0  | 75       | 33.8  | 109   | 16.4  |
| 20-39%  | 40      | 18.9  | 1         | 0.7   | 4           | 4.3   | 57       | 25.7  | 102   | 15.3  |
| 40-59%  | 87      | 41.0  | 3         | 2.2   | 2           | 2.2   | 24       | 10.8  | 116   | 17.4  |
| 60-79%  | 38      | 17.9  | 1         | 0.7   | 0           | 0.0   | 15       | 6.8   | 54    | 8.1   |
| 80-99%  | 10      | 4.7   | 14        | 10.1  | 6           | 6.5   | 12       | 5.4   | 42    | 6.3   |
| 100%  | 27      | 12.7  | 108       | 77.7  | 68          | 73.9  | 39       | 17.6  | 242   | 36.4  |
| Total   | 212     | 100.0 | 139       | 100.0 | 92          | 100.0 | 222      | 100.0 | 665   | 100.0 |

Source: ERIA Establishment Survey

**Table 20: Percentage of Indigenous Managers**

| Percentage of indigenous managers | Vietnam |       | Indonesia |       | Philippines |       | Thailand |       | Total |       |
|-----------------------------------|---------|-------|-----------|-------|-------------|-------|----------|-------|-------|-------|
|                                   | Freq.   | %     | Freq.     | %     | Freq.       | %     | Freq.    | %     | Freq. | %     |
| 0-19%                             | 3       | 1.4   | 18        | 12.9  | 17          | 18.5  | 82       | 36.9  | 120   | 18.0  |
| 20-39%                            | 28      | 13.2  | 1         | 0.7   | 3           | 3.3   | 51       | 23.0  | 83    | 12.5  |
| 40-59%                            | 81      | 38.2  | 2         | 1.4   | 3           | 3.3   | 15       | 6.8   | 101   | 15.2  |
| 60-79%                            | 54      | 25.5  | 0         | 0.0   | 6           | 6.5   | 14       | 6.3   | 74    | 11.1  |
| 80-99%                            | 17      | 8.0   | 14        | 10.1  | 8           | 8.7   | 13       | 5.9   | 52    | 7.8   |
| 100%                              | 29      | 13.7  | 104       | 74.8  | 55          | 59.8  | 47       | 21.2  | 235   | 35.3  |
| Total                             | 212     | 100.0 | 139       | 100.0 | 92          | 100.0 | 222      | 100.0 | 665   | 100.0 |

Source: ERIA Establishment Survey

**Table 21: Result of Factor Analysis: Product Innovation**

|  | Common factor<br>Product innovation |
|--|-------------------------------------|
| <b>Q13.1.</b> Introduced a new product, redesigning packaging or significantly changing appearance design of your existing products                                      | .698                                |
| <b>Q13.2.</b> Introduced a new product, significantly improving your existing products with respect to its capabilities, user friendliness, components, subsystems, etc. | .847                                |
| <b>Q13.3.</b> Development of a totally new product based on the “existing” technologies for your establishment   | .854                                |
| <b>Q13.4.</b> Development of a totally new product based on “new” technologies for your establishment  | .736                                |
| Cronbach’s $\alpha$  | .861                                |

Source: ERIA Establishment Survey

**Table 22 Result of Factor Analysis: External Sources**

|  | Common factors |       |                                     |
|--|----------------|-------|-------------------------------------|
|  | Local firms    | MNCs  | Public organizations & universities |
| <b>Q23.5.</b> Local customer (100% local capital)  | .734           | -.039 | .066                                |
| <b>Q23.6.</b> Local supplier   | .648           | .060  | .036                                |
| <b>Q23.8.</b> MNC/JV supplier located in Vietnam   | .131           | .886  | -.111                               |
| <b>Q23.7.</b> MNC (100% non-local capital)/Joint Venture (JV) customer located in your country | .141           | .916  | -.098                               |
| <b>Q23.9.</b> MNC/JV customer located in a foreign country                                     | -.248          | .766  | .184                                |
| <b>Q23.10.</b> MNC/JV supplier located in a foreign country                                    | -.047          | .784  | .095                                |
| <b>Q23.13.</b> University or public research institute   | .015           | .095  | .701                                |
| <b>Q23.12.</b> Local business organization   | .180           | -.068 | .714                                |
| <b>Q23.11.</b> Public organization (government, public agency, public financial institution)   | -.039          | .007  | .775                                |
| Factor correlation matrix  |                |       |                                     |
| 1  | 1.000          | .214  | .417                                |
| 2  | .214           | 1.000 | .495                                |
| 3  | .417           | .495  | 1.000                               |
| Cronbach’s $\alpha$  | .698           | .906  | .802                                |

Source: ERIA Establishment Survey

**Table 24: Quality Control**

- Q22.2.** Does your establishment operate a QC circle
- Q22.3.** Does your establishment have a system/practice to disseminate successful experiences of a QC circle group across your establishment?
- Q22.4.** Does your establishment have a system/practice to learn from successful experiences of a QC circle group of your customer/supplier?
- Q22.5.** Does your establishment have a system/practice to share successful experiences of a QC circle group of your establishment with your customer/supplier?

Source: ERIA Establishment Survey

**Table 25: Questions related to Cross-functional Team**

- Q21. Cross-functional team for Introduction of New Product or Process: Which departments are involved in a Cross-functional team that your establishment organizes to introduce a new product or process?  
2. Market Research, 3. Research, 4. Development, 11. Sales & Marketing

Source: ERIA Establishment Survey

**Table 26: Questions related Indigeneity of Engineer/Manager**

- Q32. How many percent of engineers/line managers/managers are indigenous?  
Q32.1. Engineers                    0. 0-19% 1. 20-39% 2. 40-59% 3. 60-79% 4 80-99% 5. 100%
- Q32.2. Line managers, or leader class                    0. 0-19% 1. 20-39% 2. 40-59% 3. 60-79% 4. 80-99% 5. 100%
- Q32.3. Managers                    0. 0-19% 1. 20-39% 2. 40-59% 3. 60-79% 4. 80-99% 5. 100%

Source: ERIA Establishment Survey

**Table 27: Basic Statistics**

| Basic Statistics   |   |     |     |     |      |           |
|--------------------|---|-----|-----|-----|------|-----------|
|                    |   | N   | Min | Max | Ave. | Std. Dev. |
| Product innovation | Q13.1. Introduced a new product, redesigning packaging or significantly changing appearance design of your existing products                                      | 665 | 0   | 2   | 1.16 | .890      |
|                    | Q13.2. Introduced a new product, significantly improving your existing products with respect to its capabilities, user friendliness, components, subsystems, etc. | 665 | 0   | 2   | 1.05 | .865      |
|                    | Q13.3. Development of a totally new product based on the “existing” technologies for your establishment   | 665 | 0   | 2   | .85  | .843      |
|                    | Q13.4. Development of a totally   | 665 | 0   | 2   | .67  | .810      |

|                                  |   | new product based on “new” technologies for your establishment |   |   |      |       |
|----------------------------------|---|--|---|---|------|-------|
| Cross functional team            | Q21.2. Market Research  | 665  | 0 | 1 | .24  | .428  |
|                                  | Q21.3. Research   | 665  | 0 | 1 | .24  | .430  |
|                                  | Q21.4. Development  | 665  | 0 | 1 | .28  | .451  |
|                                  | Q21.11. Sales & Marketing   | 665  | 0 | 1 | .28  | .449  |
| QC                               | Q22.2. Does your establishment operate a QC circle  | 665  | 0 | 1 | .71  | .455  |
|                                  | Q22.3. Does your establishment have a system/practice to disseminate successful experiences of a QC circle group across your establishment?                   | 665  | 0 | 1 | .55  | .498  |
|                                  | Q22.4. Does your establishment have a system/practice to learn from successful experiences of a QC circle group of your customer/supplier?                    | 665  | 0 | 1 | .51  | .500  |
|                                  | Q22.5. Does your establishment have a system/practice to share successful experiences of a QC circle group of your establishment with your customer/supplier? | 665  | 0 | 1 | .43  | .496  |
|                                  | Q23.5. Local customer (100% local capital)  | 665  | 0 | 4 | 3.06 | 1.071 |
| External linkage                 | Q23.6. Local supplier   | 665  | 0 | 4 | 2.85 | 1.021 |
|                                  | Q23.7. MNC (100% non-local capital)/Joint Venture (JV) customer located in your country   | 665  | 0 | 4 | 2.43 | 1.414 |
|                                  | Q23.8. MNC/JV supplier located in your country  | 665  | 0 | 4 | 2.32 | 1.338 |
|                                  | Q23.9. MNC/JV customer located in a foreign country   | 665  | 0 | 4 | 2.34 | 1.442 |
|                                  | Q23.10. MNC/JV supplier located in a foreign country  | 665  | 0 | 4 | 2.23 | 1.378 |
|                                  | Q23.11. Public organization (government, public agency, public financial institution)   | 665  | 0 | 4 | 2.39 | 1.202 |
|                                  | Q23.12. Local business organization   | 665  | 0 | 4 | 2.52 | 1.131 |
|                                  | Q23.13. University or Public Research Institute   | 665  | 0 | 4 | 2.04 | 1.251 |
| Experiences working for MNCs/JVs | Q30.10 Top management   | 665  | 0 | 1 | .33  | .470  |
|                                  | Q31.1 Factory manager   | 665  | 0 | 1 | .32  | .469  |
| Indigenous employees             | Q32.1. Engineers  | 790  | 0 | 5 | 2.84 | 1.975 |
|                                  | Q32.2. Line managers, or leader class   | 790  | 0 | 5 | 2.90 | 1.906 |
|                                  | Q32.3. Managers   | 790  | 0 | 5 | 2.90 | 1.935 |

Source: ERIA Establishment Survey



**Table 28: Result of Structural Equation Modeling: Model I**

N=655

| From                                | To  | Standardizing Coefficient | SE    | Test statistic | p value  |
|-------------------------------------|---|---------------------------|-------|----------------|----------|
| Local firms                         | Organizational learning   | 0.222                     | 0.087 | 2.593          | 0.01**   |
| MNCs                                | Organizational learning   | 0.215                     | 0.053 | 2.734          | 0.006*** |
| Public organizations & universities | Organizational learning   | 0.092                     | 0.069 | 1.03           | 0.303    |
| Organizational learning             | Product innovation  | 0.546                     | 0.075 | 5.264          | 0.000*** |
| Local firms                         | Q23.5. Local customer (100% local capital)  | 0.674                     |       |                |          |
| Local firms                         | Q23.6. Local supplier   | 0.776                     | 0.126 | 8.795          | 0.000*** |
| MNCs                                | Q23.7. MNC (100% non-local capital)/Joint Venture (JV) customer located in your country   | 0.769                     |       |                |          |
| MNCs                                | Q23.8. MNC/JV supplier located in your country  | 0.862                     | 0.037 | 28.91          | 0.000*** |
| MNCs                                | Q23.9. MNC/JV customer located in a foreign country   | 0.763                     | 0.071 | 14.315         | 0.000*** |
| MNCs                                | Q23.10. MNC/JV supplier located in a foreign country  | 0.847                     | 0.074 | 14.497         | 0.000*** |
| Public organizations & universities | Q23.11. Public organization (government, public agency, public financial institution)   | 0.783                     |       |                |          |
| Public organizations & universities | Q23.12. Local business organization   | 0.749                     | 0.052 | 17.245         | 0.000*** |
| Public organizations & universities | Q23.13. University or Public Research Institute   | 0.738                     | 0.057 | 17.117         | 0.000*** |
| Organizational learning             | QC  | 0.448                     |       |                |          |
| Organizational learning             | Cross functional team   | 0.453                     | 0.139 | 5.426          | 0.000*** |
| Product innovation                  | Q13.1. Introduced a new product, redesigning packaging or significantly changing appearance design of your existing products                                      | 0.596                     |       |                |          |
| Product innovation                  | Q13.2. Introduced a new product, significantly improving your existing products with respect to its capabilities, user friendliness, components, subsystems, etc. | 0.768                     | 0.065 | 19.511         | 0.000*** |
| Product innovation                  | Q13.3. Development of a totally new product based on the “existing” technologies for your establishment   | 0.917                     | 0.094 | 15.66          | 0.000*** |
| Product innovation                  | Q13.4. Development of a totally new product based on “new” technologies for your establishment  | 0.767                     | 0.078 | 15.098         | 0.000*** |

Note 1: \*\*\*, \*\* and \* indicate levels of significance of 1%, 5%, and 10%, respectively.

Note 2: p-values not indicated in the table cannot be calculated because path coefficients of them are fixed to 1.

Source: ERIA Establishment Survey

**Table 29: Correlation Analysis**

|             |                                     | Correlation coefficient | p value  |
|-------------|-------------------------------------|-------------------------|----------|
| Local firms | MNCs                                | 0.301                   | 0.000*** |
| MNCs        | Public organizations & universities | 0.53                    | 0.000*** |
| Local firms | Public organizations & universities | 0.5                     | 0.000*** |

Note: \*\*\*, \*\* and \* indicate levels of significance of 1%, 5%, and 10%, respectively

Source: ERIA Establishment Survey

**Table 30: Result of Estimation: Model II**

| From                                | To   | Standardizing Coefficient | SE    | Test statistic | p value  |
|-------------------------------------|--|---------------------------|-------|----------------|----------|
| Local firms                         | Experiences working for MNCs/JVs   | -0.25                     | 0.025 | -3.127         | 0.002*** |
| MNCs                                | Experiences working for MNCs/JVs   | 0.489                     | 0.019 | 5.853          | 0.000*** |
| Public organizations & universities | Experiences working for MNCs/JVs   | 0.137                     | 0.021 | 1.653          | 0.098*   |
| Experiences working for MNCs/JVs    | Organizational learning  | 0.447                     | 0.281 | 4.341          | 0.000*** |
| Organizational learning             | Product innovation   | 0.624                     | 0.1   | 4.955          | 0.000*** |
| Local firms                         | Q23.5. Local customer (100% local capital)   | 0.73                      |       |                |          |
| Local firms                         | Q23.6. Local supplier  | 0.72                      | 0.105 | 9.059          | 0.000*** |
| MNCs                                | Q23.7. MNC (100% non-local capital)/Joint Venture (JV) customer located in your country                                      | 0.769                     |       |                |          |
| MNCs                                | Q23.8. MNC/JV supplier located in your country   | 0.859                     | 0.036 | 29.126         | 0.000*** |
| MNCs                                | Q23.9. MNC/JV customer located in a foreign country  | 0.765                     | 0.065 | 15.686         | 0.000*** |
| MNCs                                | Q23.10. MNC/JV supplier located in a foreign country   | 0.849                     | 0.067 | 15.947         | 0.000*** |
| Public organizations & universities | Q23.11. Public organization (government, public agency, public financial institution)  | 0.782                     |       |                |          |
| Public organizations & universities | Q23.12. Local business organization  | 0.752                     | 0.052 | 17.282         | 0.000*** |
| Public organizations & universities | Q23.13. University or Public Research Institute  | 0.739                     | 0.057 | 17.159         | 0.000*** |
| Experiences working for MNCs/JVs    | Q30.10 Top management  | 0.521                     |       |                |          |
| Experiences working for MNCs/JVs    | Q31.1 Factory manager  | 0.635                     | 0.178 | 6.859          | 0.000*** |
| Organizational learning             | QC   | 0.409                     |       |                |          |
| Organizational learning             | Cross functional team  | 0.419                     | 0.147 | 5.216          | 0.000*** |
| Product innovation                  | Q13.1. Introduced a new product, redesigning packaging or significantly changing appearance design of your existing products | 0.599                     |       |                |          |
| Product innovation                  | Q13.2. Introduced a new product, significantly improving your existing   | 0.767                     | 0.064 | 19.599         | 0.000*** |

|                    |   |       |       |        |          |
|--------------------|---|-------|-------|--------|----------|
|                    | products with respect to its capabilities, user friendliness, components, subsystems, etc.              |       |       |        |          |
| Product innovation | Q13.3. Development of a totally new product based on the “existing” technologies for your establishment | 0.919 | 0.093 | 15.753 | 0.000*** |
| Product innovation | Q13.4. Development of a totally new product based on “new” technologies for your establishment          | 0.766 | 0.077 | 15.146 | 0.000*** |

Note 1: \*\*\*, \*\* and \* indicate levels of significance of 1%, 5%, and 10%, respectively.

Note 2: *p* values not indicated in the table cannot be calculated because pass coefficients of them are fixed to 1.

Source: ERIA Establishment Survey

**Table 31: Correlation Analysis of Model II**

|             |                                     | Correlation coefficient | <i>p</i> value |
|-------------|-------------------------------------|-------------------------|----------------|
| Local firms | MNCs                                | 0.292                   | 0.000***       |
| MNCs        | Public organizations & universities | 0.529                   | 0.000***       |
| Local firms | Public organizations & universities | 0.51                    | 0.000***       |

Note: \*\*\*, \*\* and \* indicate levels of significance of 1%, 5%, and 10%, respectively.

Source: ERIA Establishment Survey

**Table 34: Result of estimation: Model III**

| From                                | To  | Standardizing Coefficient | SE    | Test statistic | <i>p</i> value |
|-------------------------------------|---|---------------------------|-------|----------------|----------------|
| Local firms                         | Indigenous employees  | 0.25                      | 0.142 | 4.061          | 0.000***       |
| MNCs                                | Indigenous employees  | -0.183                    | 0.088 | -3.398         | 0.000***       |
| Public organizations & universities | Indigenous employees  | -0.077                    | 0.121 | -1.187         | 0.235          |
| Indigenous employees                | Organizational learning   | 0.14                      | 0.024 | 2.263          | 0.024**        |
| Organizational learning             | Product innovation  | 0.571                     | 0.099 | 4.458          | 0.000***       |
| Local firms                         | Q23.5. Local customer (100% local capital)  | 0.713                     |       |                |                |
| Local firms                         | Q23.6. Local supplier   | 0.735                     | 0.107 | 9.284          | 0.000***       |
| MNCs                                | Q23.7. MNC (100% non-local capital)/Joint Venture (JV) customer located in your country | 0.758                     |       |                |                |
| MNCs                                | Q23.8. MNC/JV supplier located in your country  | 0.848                     | 0.037 | 28.864         | 0.000***       |
| MNCs                                | Q23.9. MNC/JV customer located in a foreign country                                     | 0.778                     | 0.073 | 14.323         | 0.000***       |
| MNCs                                | Q23.10. MNC/JV supplier located in a foreign country                                    | 0.86                      | 0.076 | 14.466         | 0.000***       |
| Public organizations & universities | Q23.11. Public organization (government, public agency, public financial institution)   | 0.781                     |       |                |                |
| Public organizations & universities | Q23.12. Local business organization   | 0.755                     | 0.053 | 17.304         | 0.000***       |

|                                     |   |       |       |        |          |
|-------------------------------------|---|-------|-------|--------|----------|
| Public organizations & universities | Q23.13. University or Public Research Institute   | 0.738 | 0.058 | 17.115 | 0.000*** |
| Indigenous employees                | Q32.1. Engineers  | 0.87  |       |        |          |
| Indigenous employees                | Q32.2. Line managers, or leader class   | 0.899 | 0.032 | 31.476 | 0.000*** |
| Indigenous employees                | Q32.3. Managers   | 0.913 | 0.031 | 32.111 | 0.000*** |
| Organizational learning             | QC  | 0.418 |       |        |          |
| Organizational learning             | Cross functional team   | 0.457 | 0.17  | 4.815  | 0.000*** |
| Product innovation                  | Q13.1. Introduced a new product, redesigning packaging or significantly changing appearance design of your existing products                                      | 0.595 |       |        |          |
| Product innovation                  | Q13.2. Introduced a new product, significantly improving your existing products with respect to its capabilities, user friendliness, components, subsystems, etc. | 0.766 | 0.065 | 19.458 | 0.000*** |
| Product innovation                  | Q13.3. Development of a totally new product based on the “existing” technologies for your establishment   | 0.92  | 0.095 | 15.578 | 0.000*** |
| Product innovation                  | Q13.4. Development of a totally new product based on “new” technologies for your establishment  | 0.764 | 0.078 | 15.011 | 0.000*** |

Note 1: \*\*\*, \*\* and \* indicate levels of significance of 1%, 5%, and 10%, respectively.

Note 2: *p* values not indicated in the table cannot be calculated because pass coefficients of them are fixed to 1.

Source: ERIA Establishment Survey

**Table 35: Correlation Analysis: Model III**

|             |                                     | N=655                   |          |
|-------------|-------------------------------------|-------------------------|----------|
|             |                                     | Correlation coefficient | p value  |
| Local firms | MNCs                                | 0.288                   | 0.000*** |
| MNCs        | Public organizations & universities | 0.529                   | 0.000*** |
| Local firms | Public organizations & universities | 0.508                   | 0.000*** |

Note: \*\*\*, \*\* and \* indicate levels of significance of 1%, 5%, and 10%, respectively.

Source: ERIA Establishment Survey

**Table 36: Result of Structural Equation Modeling: Model IV**

| N=655                               |                                  |                           |       |             |          |
|-------------------------------------|----------------------------------|---------------------------|-------|-------------|----------|
| From                                | To                               | Standardizing Coefficient | SE    | t statistic | p value  |
| Local firms                         | Experiences working for MNCs/JVs | -0.252                    | 0.025 | -3.173      | 0.002*** |
| MNCs                                | Experiences working for MNCs/JVs | 0.498                     | 0.019 | 6.016       | 0.000*** |
| Public organizations & universities | Experiences working for MNCs/JVs | 0.141                     | 0.022 | 1.711       | 0.087*   |
| Local firms                         | Indigenous employees             | 0.253                     | 0.138 | 4.117       | 0.000*** |

|                                     |   |        |       |        |          |
|-------------------------------------|---|--------|-------|--------|----------|
| MNCs                                | Indigenous employees  | -0.183 | 0.088 | -3.407 | 0.000*** |
| Public organizations & universities | Indigenous employees  | -0.078 | 0.121 | -1.204 | 0.229    |
| Experiences working for MNCs/JVs    | Organizational learning   | 0.493  | 0.298 | 4.655  | 0.000*** |
| Indigenous employees                | Organizational learning   | 0.201  | 0.025 | 3.207  | 0.001*** |
| Organizational learning             | Product innovation  | 0.587  | 0.086 | 5.243  | 0.000*** |
| Local firms                         | Q23.5. Local customer (100% local capital)  | 0.734  |       |        |          |
| Local firms                         | Q23.6. Local supplier   | 0.715  | 0.097 | 9.643  | 0.000*** |
| MNCs                                | Q23.7. MNC (100% non-local capital)/Joint Venture (JV) customer located in your country   | 0.758  |       |        |          |
| MNCs                                | Q23.8. MNC/JV supplier located in your country  | 0.85   | 0.036 | 29.036 | 0.000*** |
| MNCs                                | Q23.9. MNC/JV customer located in a foreign country   | 0.774  | 0.065 | 15.955 | 0.000*** |
| MNCs                                | Q23.10. MNC/JV supplier located in a foreign country  | 0.859  | 0.068 | 16.208 | 0.000*** |
| Public organizations & universities | Q23.11. Public organization (government, public agency, public financial institution)   | 0.782  |       |        |          |
| Public organizations & universities | Q23.12. Local business organization   | 0.752  | 0.052 | 17.312 | 0.000*** |
| Public organizations & universities | Q23.13. University or Public Research Institute   | 0.739  | 0.057 | 17.169 | 0.000*** |
| Experiences working for MNCs/JVs    | Q30.10 Top management   | 0.522  |       |        |          |
| Experiences working for MNCs/JVs    | Q31.1 Factory manager   | 0.623  | 0.169 | 7.033  | 0.000*** |
| Indigenous employees                | Q32.1. Engineers  | 0.87   |       |        |          |
| Indigenous employees                | Q32.2. Line managers, or leader class   | 0.898  | 0.032 | 31.458 | 0.000*** |
| Indigenous employees                | Q32.3. Managers   | 0.913  | 0.031 | 32.122 | 0.000*** |
| Organizational learning             | QC  | 0.423  |       |        |          |
| Organizational learning             | Cross functional team   | 0.439  | 0.144 | 5.386  | 0.000*** |
| Product innovation                  | Q13.1. Introduced a new product, redesigning packaging or significantly changing appearance design of your existing products                                      | 0.599  |       |        |          |
| Product innovation                  | Q13.2. Introduced a new product, significantly improving your existing products with respect to its capabilities, user friendliness, components, subsystems, etc. | 0.769  | 0.064 | 19.618 | 0.000*** |
| Product innovation                  | Q13.3. Development of a totally new product based on the “existing” technologies for your establishment   | 0.918  | 0.093 | 15.759 | 0.000*** |
| Product innovation                  | Q13.4. Development of a totally new product based on “new” technologies for your establishment  | 0.765  | 0.077 | 15.147 | 0.000*** |

Note 1: \*\*\*, \*\* and \* indicate levels of significance of 1%, 5%, and 10%, respectively.

Note 2: p values not indicated in the table cannot be calculated because pass coefficients of them are fixed to 1.

Source: ERIA Establishment Survey

**Table 37 Correlation Analysis: Model IV**

|             |                                     | Correlation coefficient | p value  |
|-------------|-------------------------------------|-------------------------|----------|
| Local firms | MNCs                                | 0.285                   | 0.000*** |
| MNCs        | Public organizations & universities | 0.529                   | 0.000*** |
| Local firms | Public organizations & universities | 0.508                   | 0.000*** |

Note: \*\*\*, \*\* and \* indicate levels of significance of 1%, 5%, and 10%, respectively.

Source: ERIA Establishment Survey

**Table 38: Fitness of Model I**

| $\chi^2$ value | Degree of freedom | p value | GFI   | AGFI  | CFI   | RMSEA | AIC     |
|----------------|-------------------|---------|-------|-------|-------|-------|---------|
| 246.574        | 74                | 0       | 0.953 | 0.923 | 0.963 | 0.059 | 338.574 |

Source: ERIA Establishment Survey

**Table 39: Fitness of Model II**

| $\chi^2$ value | Degree of freedom | p value | GFI   | AGFI | CFI   | RMSEA | AIC     |
|----------------|-------------------|---------|-------|------|-------|-------|---------|
| 320.037        | 102               | 0       | 0.947 | 0.92 | 0.955 | 0.057 | 422.037 |

Source: ERIA Establishment Survey

**Table 40: Fitness of Model III**

| $\chi^2$ value | Degree of freedom | p value | GFI   | AGFI  | CFI   | RMSEA | AIC     |
|----------------|-------------------|---------|-------|-------|-------|-------|---------|
| 418.177        | 118               | 0       | 0.933 | 0.903 | 0.952 | 0.062 | 524.177 |

Source: ERIA Establishment Survey

**Table 41: Fitness of Model IV**

| $\chi^2$ value | Degree of freedom | p value | GFI   | AGFI  | CFI   | RMSEA | AIC     |
|----------------|-------------------|---------|-------|-------|-------|-------|---------|
| 453.066        | 149               | 0       | 0.935 | 0.909 | 0.953 | 0.055 | 575.066 |

Source: ERIA Establishment Survey

**Table 42: Standardizing Direct Effects: Model IV**

| To \ From                        | Local firms | MNCs      | Public organizations & universities | Experiences working for MNCs/JVs | Indigenous employees | Organizational learning |
|----------------------------------|-------------|-----------|-------------------------------------|----------------------------------|----------------------|-------------------------|
| Experiences working for MNCs/JVs | -0.252***   | 0.498***  | 0.141*                              | 0                                | 0                    | 0                       |
| Indigenous employees             | 0.253***    | -0.183*** | -0.078                              | 0                                | 0                    | 0                       |
| Organizational learning          | 0           | 0         | 0                                   | 0.493***                         | 0.201***             | 0                       |
| Product innovation               | 0           | 0         | 0                                   | 0                                | 0                    | 0.587***                |

Source: ERIA Establishment Survey

**Table 43: Standardizing Indirect Effects: Model IV**

| From \ To                        | Local firms | MNCs     | Public organizations & universities | Experiences working for MNCs/JVs | Indigenous employees | Organizational learning |
|----------------------------------|-------------|----------|-------------------------------------|----------------------------------|----------------------|-------------------------|
| Experiences working for MNCs/JVs | 0           | 0        | 0                                   | 0                                | 0                    | 0                       |
| Indigenous employees             | 0           | 0        | 0                                   | 0                                | 0                    | 0                       |
| Organizational learning          | -0.073***   | 0.208*** | 0.054                               | 0                                | 0                    | 0                       |
| Innovation                       | -0.043***   | 0.122*** | 0.032                               | 0.289***                         | 0.118***             | 0                       |

Source: ERIA Establishment Survey

**Table 44: Standardizing Total Effects: Model IV**

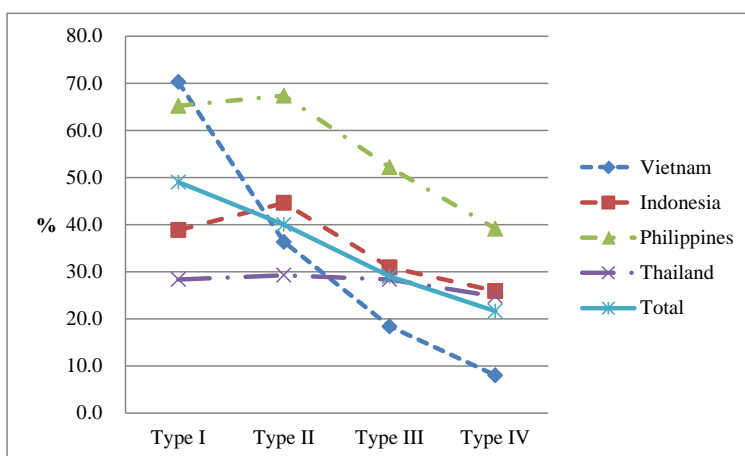
| To \ From                        | Locals    | MNCs      | Public organizations & universities | Experiences working for MNCs/JVs | Indigenous employees | Organizational learning |
|----------------------------------|-----------|-----------|-------------------------------------|----------------------------------|----------------------|-------------------------|
| Experiences working for MNCs/JVs | -0.252*** | 0.498***  | 0.141*                              | 0                                | 0                    | 0                       |
| Indigenous employees             | 0.253***  | -0.183*** | -0.078                              | 0                                | 0                    | 0                       |
| Organizational learning          | -0.073*** | 0.208***  | 0.054                               | 0.493***                         | 0.201***             | 0                       |
| Innovation                       | -0.043*** | 0.122***  | 0.032                               | 0.289***                         | 0.118***             | 0.587***                |

Source: ERIA Establishment Survey

**Table 45: How Locals consider Public Organizations and Universities as Important**

| University or Public Research Institute | Vietnum |       | Indonesia |       | Philippines |       | Thailand |       | Total |       |
|---|---------|-------|-----------|-------|-------------|-------|----------|-------|-------|-------|
|   | Freq.   | %     | Freq.     | %     | Freq.       | %     | Freq.    | %     | Freq. | %     |
| Not Practicing                          | 22      | 10.4  | 23        | 16.5  | 30          | 32.6  | 43       | 19.4  | 118   | 17.7  |
| Not important                           | 29      | 13.7  | 12        | 8.6   | 6           | 6.5   | 47       | 21.2  | 94    | 14.1  |
| Not very important                      | 73      | 34.4  | 18        | 12.9  | 12          | 13.0  | 53       | 23.9  | 156   | 23.5  |
| Somewhat important                      | 84      | 39.6  | 66        | 47.5  | 31          | 33.7  | 57       | 25.7  | 238   | 35.8  |
| Very important                          | 4       | 1.9   | 20        | 14.4  | 13          | 14.1  | 22       | 9.9   | 59    | 8.9   |
| Total                                   | 212     | 100.0 | 139       | 100.0 | 92          | 100.0 | 222      | 100.0 | 665   | 100.0 |

Source: ERIA Establishment Survey



- Type I Redesigning packaging or significantly changing appearance design
- Type II Significantly improving existing products
- Type III New product based on the existing technologies
- Type IV New product based on new technologies

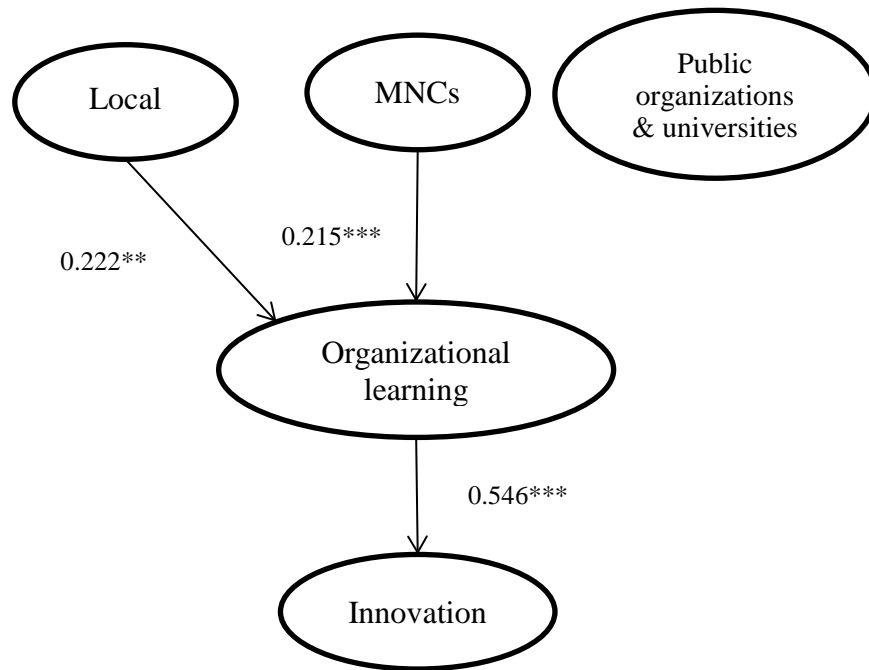
**Figure 1: Product Innovation**

Source: ERIA Establishment Survey

**Figure 2: Distribution of Innovation by country**

Source: ERIA Establishment Survey

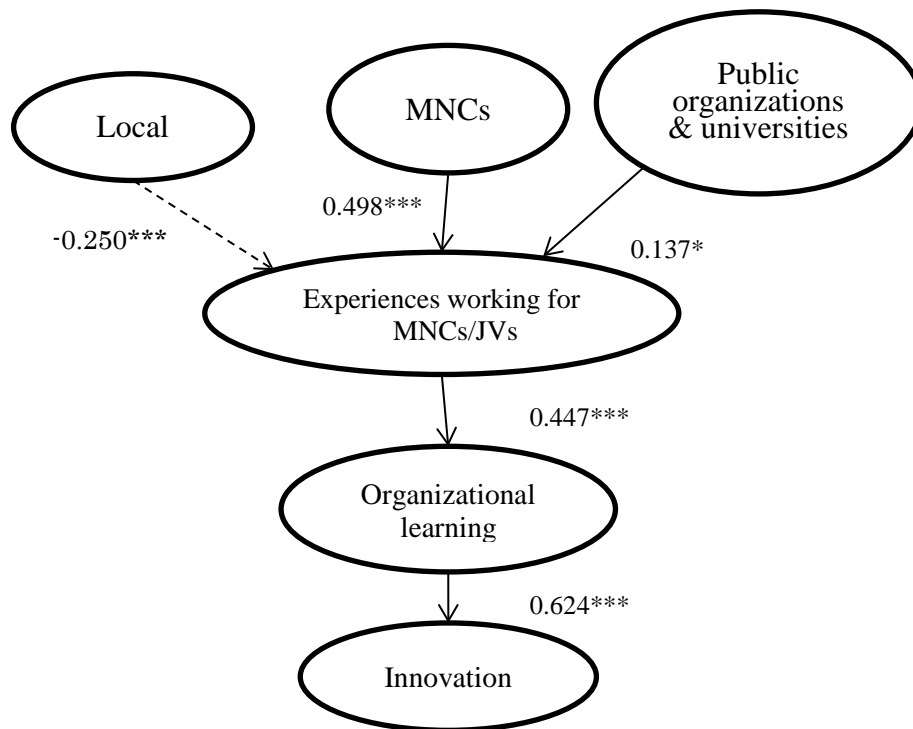




**Figure 3: Path Diagram of Model I**

*Note:* This figure shows only the latent variables of the explanatory variables and the dependent variable.

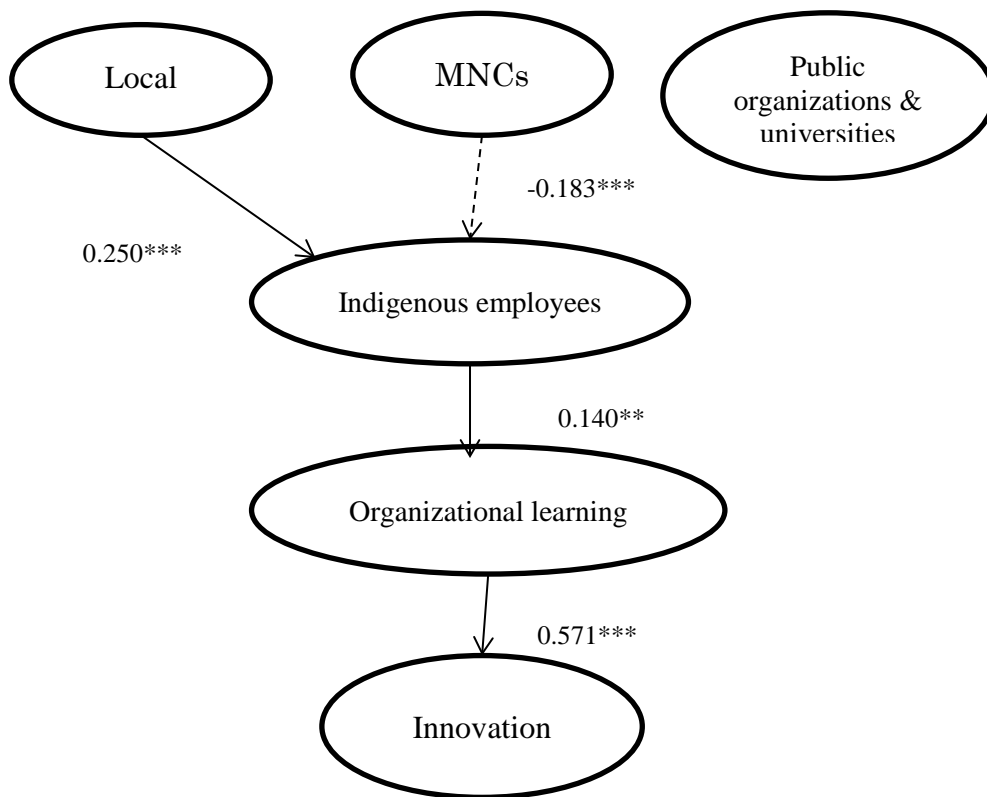
*Source:* ERIA Establishment Survey



**Figure 4: Path Diagram of estimation: Model II**

*Note:* This figure shows only the latent variables of the explanatory variables and the dependent variable.

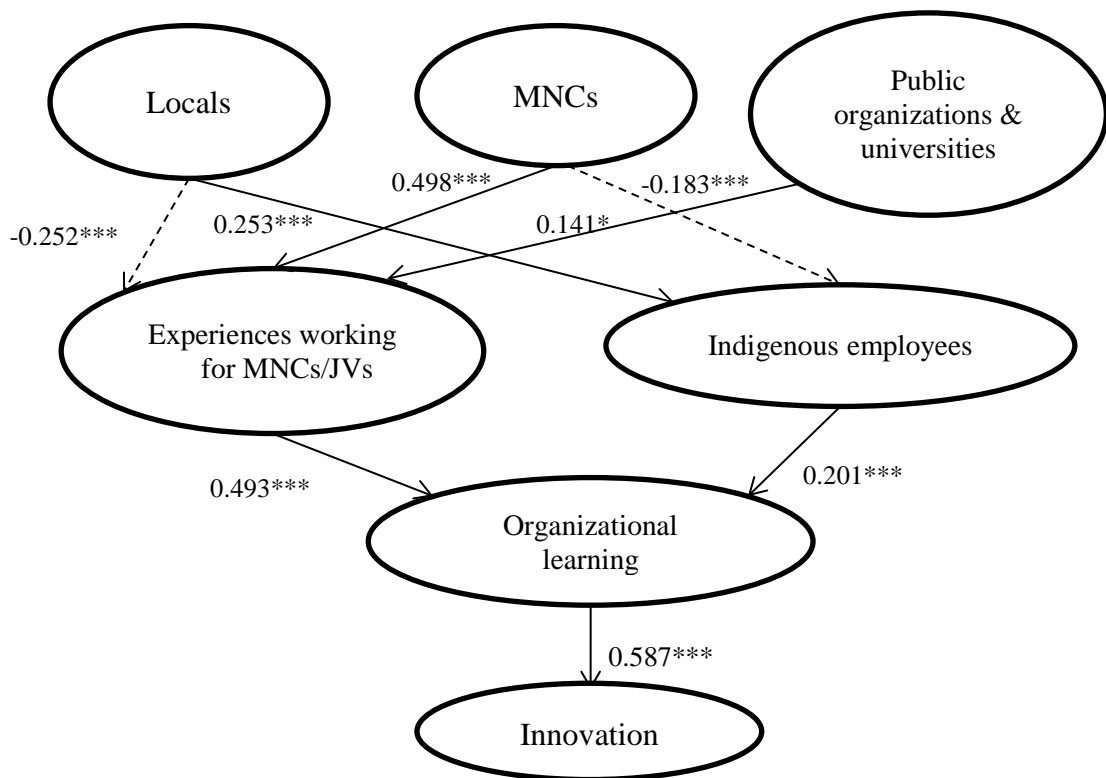
*Source:* ERIA Establishment Survey



**Figure 5: Path Diagram of Estimation: Model III**

*Note:* This figure shows only the latent variables of the explanatory variables and the dependent variable.

*Source:* ERIA Establishment Survey



**Figure 6: Path Diagram of Estimation: Model IV**

*Note:* This figure shows only the latent variables of the explanatory variables and the dependent variable.

*Source:* ERIA Establishment Survey