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March 2009

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This paper proposes a new mechanism linking innovation and network in developing economies to detect explicit production and information linkages and investigates the testable implications of these linkages using survey data gathered from manufacturing firms in East Asia. We found that firms with more information linkages tend to innovate more, have a higher probability of introducing new goods, introducing new goods to new markets using new technologies, and finding new partners located in remote areas. We also found that firms that dispatched engineers to customers achieved more innovations than firms that did not. These findings support the hypothesis that production linkages and face-to-face communication encourage product and process innovation.

Keywords: Innovation; Linkages; Engineer Mobility
JEL classification: D83, L25, O31, O32, O33, R12

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Linked versus Non-linked Firms in Innovation:

The Effects of Economies of Network in Agglomeration in East Asia*

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March 25, 2009

Abstract. This paper proposes a new mechanism linking innovation and network in developing economies to detect explicit production and information linkages and investigates the testable implications of these linkages using survey data gathered from manufacturing firms in the Indonesia, Thailand, Philippines, and Vietnam. Linkages with local firms, foreign firms, and public organizations play a role in reducing the search costs of finding new suppliers and customers. We found that firms with more information linkages tend to innovate more, have a higher probability of introducing new goods, introducing new goods to new markets using new technologies, and finding new partners located in remote areas. We also found that firms that dispatched engineers to customers achieved more innovations than firms that did not. These findings support the hypothesis that production linkages and face-to-face communication encourage product and process innovation.

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1. Introduction

This paper proposes a new mechanism linking innovations (product and process innovation and creation of new markets) and networks in developing economies to identify explicit linkages between production and information. It also investigates the empirical implications of this new mechanism using survey data gathered from manufacturing firms in four megacities in East Asia. Our sampling countries and cities are Indonesia (JABODETABEK area), the Philippines (CALABARZON area), Thailand (Greater Bangkok area), and Vietnam (Hanoi area). We collected firm-level evidence on innovations, linkages between production and information, and the respondent-firms' own characteristics using mail surveys and field interviews.

Why the particular focus on East Asia? The production network in East Asia contrasts with the innovation system in the European Union (EU) and the United States (U.S.) where universities and research institutes form the core of research and development (R&D) networks. Evidence from East Asia indicates a new role of production networks in the upgrading of industry. The approach we will take to find the answers is simple descriptive statistics and regressions.

In a model consisting of heterogeneous firms with R&D activity and linkages, the more productive firms introduce more innovations than less productive firms and are more successful in introducing new goods to market, with only the most productive firms able to introduce new goods and technologies in new markets. Linkages with local and foreign firms and public organizations help reduce the cost of finding new suppliers and customers. Firms with more information linkages tend to innovate more and are more likely to introduce new goods and technologies in new markets as well as find new partners in remote areas. These findings support the hypothesis that production and information linkages stimulate product and process innovation.

This paper also discusses the impact of small and hypothetical subsidies on the extent of upgrading knowledge-exploiting and knowledge-creation (or knowledge-exploring) activities for firms in production networks. Likewise, it discusses the policy implications of these findings and some theoretical background to evaluate the extent of production-related knowledge on industry upgrading.

There is a dearth of empirical researches that precisely capture the knowledge transmission mechanism through inter-firm communication. There is also a lack of quantitative evidence that rigorously identifies the effects on product innovation of production-related knowledge based on process innovation or creation of new markets. Since we need to quantify the contribution of production networks on innovation, this paper collects detailed information about production linkages, product and process innovation, and creation of new markets. This field survey-based information provides findings that are lacking in previous studies.

Most of the previous studies on the effects of geographic proximity on innovation used the local average of R&D expenditures or the number of R&D engineers as explanatory variable. These studies assumed that all firms in a local area benefit equally from the local average of R&D activities in their empirical specification. Even if this assumption were plausible on average, it is natural that the role of knowledge flows on production linkages and volume of interactions would vary among linkages. That is why we have to go beyond geographic proximity, collect information about linkages directly, and carefully investigate the effects of each type of production linkage on innovation.

To examine the role of local production linkages on product innovations, we need to identify the extent of companies' investment in R&D, the exact channels used to upgrade existing products, the geographic extent of new-market creation, and the emergence of local alliances to introduce a new product. We will build a simple model to explain the large variation of product innovation across firms with and without R&D activities or multiple production linkages. This simple theoretical framework will be based on the reduced-form regression model and will provide some interpretations of the empirical estimates of the effect of two factors, i.e., the variety of production linkages and engineer-level communications, on innovations. Estimating the empirical elasticity of production linkages or micro-level communications on innovation would enable us to detect the exact channels of process and product innovations and creation of new markets.

How do agglomeration economies affect firm-level productivity and any changes in this productivity? How does agglomeration affect productivity and growth in developing economies? How do geographic variations in competitiveness stimulate technological spillovers and enhance firm and industry performance? In the era of globalization, which entails reduction of trade costs across nations, the importance of geographic concentration of economic activities within a country has been growing. The main reason for this is the combination of globalization and technologies that promote increasing returns to scale (IRS). Globalization pushes industries that use IRS technologies to relocate to a small number of countries where many consumers, input suppliers, and other supporting industries are already in place. Manufacturing firms, particularly those in IRS-technology industries, are concentrated not only in a limited number of countries but also in limited geographical areas within a country. Globalization and economic integration make markets denser and more competitive.

Reduction in costs of cross-border trade forces manufacturing firms in developing countries to upgrade and innovate their products and processes.

This paper will investigate the role of production networks on industry upgrading by documenting the spatial architecture of upstream and downstream firms in developing economies and examining the network effects of innovations. Local network externalities are a mechanism for understanding the relationship between production networks and innovation. Lucas (1988) identified local knowledge spillovers as important sources of economic growth. Glaeser, Kallal, Scheinkman, and Shleifer (1992) showed city-level evidence of the role of knowledge spillovers. Conley and Udry (2009) studied the role of communication networks in determining the importance of learning from others.

This paper also focuses on production networks to quantify the extent to which information flows with customers or suppliers motivate a firm to innovate. The lack of empirical studies and the potential heterogeneity in production- network availability provide several empirical questions about the effects of innovation networks. The specific question we are trying to answer is how production networks affect firms' incentive to innovate when inter-firm linkages become dense. Do firms tend to innovate more if their innovation linkages are concentrated in single source or if their innovation sources are heterogeneous? How do firms innovate if communication with their suppliers increases? Should firms respond to information flows from their consumers? This paper empirically explores these questions.

To summarize our introduction, we present the following two statistical findings that this paper will attempt to explain. These findings are basically consistent with the network-based theory of agglomeration and innovation.

(1) There is positive effect or correlation between the variety of linkages and the variety of innovations for firms with no R&D activities while there is no significant effect for firms with R&D activities.

(2) Firms with face-to-face communications at the engineer level and firms with frequent interactions with production partners are successful in implementing innovations, particularly organizational reform toward external markets and process innovations like creation of new markets and securing new sources of input.

The next section reviews related literature. Data will be described in Section 3. Section 4 compares the characteristics of firms with many different types of linkage and firms without linkages. Determinants of firm's innovation are examined in Section 5. The effect of spatial architecture of production networks is examined in Section 6. The interpretations of the results and conclusion are discussed in Sections 7 and 8.

2. Related literature

A. Why firms agglomerate

We combine two different literatures to investigate the effects of production networks on innovation and upgrading. First, we review agglomeration economies to define the effects of production networks on a firm's performance. Second, we survey firms' product and process innovation responses to tougher market competition.

There are three kinds of forces in agglomeration economies: (1) technological externalities; (2) pecuniary externalities; and (3) competition-based selection process. The first two forces often produce knowledge and information spillovers across firms, sharing of the same intermediate goods and labor pooling (the Marshallian "thick market" effect), and IRS on the local input-output level.

Rosenthal and Strange (2004) provide a fully comprehensive review of the causes and consequences of agglomeration economies. In a recent attempt to quantify agglomeration economies, Ellison, Glaeser, and Kerr (2009) find the significant contribution of input-output linkages to co-agglomeration patterns instead of natural advantage which played a dominant role in previous studies, such as that done by Ellison and Glaeser in 1999. Through these linkages, producers in denser areas are able to obtain positive impacts from agglomeration economies.

Greenstone, Hornbeck, and Moretti (2008) present clear evidence of agglomeration spillovers in a local area, focusing on the local cost linkages between customers and suppliers to test the agglomeration-induced productivity effect. They used the "Million Dollar Plant" (i.e., a large, new manufacturing plant like Mercedes Benz or Toyota) in winning and losing counties as evidence. The corporate real estate journal Site Selection includes an article titled "The Million Dollar Plant" that describes how a large plant decided where to locate. This article presents not only the county where the "Million Dollar Plant" chose to locate (the "winning county") but also one or two "runner-up" counties (the "losing counties").

In the absence of an actual plant opening, they use the total factor productivity (TFP) of incumbent plants in losing counties as a counterfactual for the TFP of incumbent plants in winning counties. They examine agglomeration spillovers by estimating the impact of the opening of "The Million Dollar Plant" on the TFP of incumbent plants in the same county. The empirical result is consistent with theories of agglomeration and shows that the opening of the new plant induces incumbent plants in winning counties to experience a significant and sharp relative increase in TFP compared to incumbent plants in losing counties five years after plant opening.

The last force involves the competition-driven selection process of agglomeration. Denser markets here often mean markets with greater substitutability. It is relatively easier for inefficient producers in denser areas to lose their market share and exit the market than producers in less dense areas. Consequently, the average productivity of firms in denser markets is always higher. To consider this effect, Syverson (2004) provides a simple and novel starting point. The specific mechanism Syverson raised is the spatial substitutability in single product market, i.e., relatively inefficient producers find it more difficult to operate profitably when it is easier for consumers to change suppliers within a local area.

Combes, Duranton, Gobillon, Puga, and Roux (2009) present an empirical framework to distinguish the agglomeration spillover effects of productivity from the selection effects of (average) productivity improvement. This model suggests that the stronger or tougher selection effect in denser markets left-truncates the productivity distribution while stronger or positive agglomeration effect right-shifts the productivity distribution.

B. How firms innovate in low-wage countries

Tougher market competition arising from globalization and economic integration spurs firms to be innovative to escape price competition. The main aim of this research is to identify the pro-competitive effects of trade liberalization on the incentive to innovate.

Bloom, Draca, and Van Reenen (2008) find positive impacts of increases in Chinese imports on European firms' investment in the use of information technology (IT) and their innovation (based on patent counts). However, using datasets from emerging economies, Gorodnichenko, Svejnar, and Terrell (2008) find a negative association between firms' subjective perception on the toughness of competition and innovation.

Teshima (2008) distinguishes process innovation from product innovation when market competition becomes tougher. He utilizes new information about process and product innovation from Mexican plant-level datasets to estimate the effects of tariff changes on changes in expenditures for process and product R&D. He finds that increased competition arising from the reduction of tariffs causes an increase in total R&D expenditures for plants and process R&D rather than product R&D. This result suggests that trade liberalization stimulates firms to be cost-efficient, not necessarily to produce new varieties of products.

Additionally, Brambilla (2006) compares the performance of foreign and domestic firms in terms of the introduction of new varieties using firm-level data for the Chinese manufacturing sector during the country's export boom period of 1998-2000. The empirical result implies that firms with more than 50 percent foreign ownership create more than twice as many new varieties of products as private domestic firms. Foreign firms are superior to domestic firms in terms of fixed cost of development and variable cost of operation. This productivity difference between foreign and domestic firms also explains the difference in the number of new product varieties released.

C. What is the benefit of linkages?

To determine the relationship between economies of agglomeration and innovations, we investigate the role of linkages between firms and their economies of network. If applicable to our context, economies of network can be broken down into the following three categories: (1) production network; (2) transportation network and other network of utilities; and (3) innovation network. We will also consider why industries are agglomerated in a specific space, mostly a hub/node of such networks.

In addition to the traditional arguments for economies of agglomeration (input and output linkages, labor market pooling, and idea spillovers), a town's reputation in the global supply chains and the world market also plays big role in developing economies (Banerjee and Duflo, 2005). Firms in the auto parts industry, for example, may be able to find a better partner in the Eastern Seaboard area, which contains the largest agglomeration of auto industry firms in East Asia, than in other areas in Thailand or other East Asian countries. Firms in the Eastern Seaboard area are familiar with the Just-In-Time (hereafter JIT) delivery system and have a reputation for providing high-quality auto parts. Such collective reputation among producers in developing economies invites new entrants into the agglomeration.

A town's reputation is formed by the nexus of linkages or production processes between firms. If many producers have a good reputation for quality and timeliness, local and global buyers will flock to the area for high-quality goods. Other firms may ask for new and more complex products. This is the key point of industry upgrading for local firms in developing economies. Everybody benefits from producers that have linkages to local and foreign markets. Collective reputation matters especially for young producers and those located in non-established clusters. This paper will try to find the innovation impact of linkages in concentrated areas in order to pinpoint the positive and negative externalities of collective reputation in developing economies.

D. The role of MNEs

We should not forget about the presence of multinational enterprises (hereafter, MNEs) in developing economies, especially in East Asia. Since Japanese MNEs have led the formation of production networks in the region, the relationship between production networks and innovation intensity and its type should be varied according to the degree of firms' capital tie-up with MNEs.

In Indonesia and Thailand, Ramstetter and Sjoholm (2006) try to answer the following empirical questions: (1) why multinationals pay higher wages than their counterparts in their host countries and whether the entry of multinationals raise wages for domestic workers; (2) why multinationals have higher productivity and whether multinationals affect the productivity of domestic enterprises; (3) whether multinationals have a greater tendency to export than local firms. This paper investigates the role of MNEs in associating cluster-based production networks with innovation.

The empirical questions we raise are based on Ramstetter and Sjoholm's work (2006). First, do MNEs or joint-venture firms enjoy communications with customers or suppliers located in neighboring or remote areas and do such communications with MNEs or joint-venture firms increase the innovations done by local firms with connections to foreign capital firms? Second, do MNEs or joint-venture firms tend to introduce new goods or create new markets and do product and process innovations made by MNEs or joint-venture firms intensify innovations done by domestic firms?

3. Data

We used the dataset from the Establishment Survey on Innovation and Production Network for selected manufacturing firms in four countries in East Asia. We created this dataset in December 2008 in Indonesia, the Philippines, Thailand, and Vietnam. The sample population is restricted to selected manufacturing hubs in each country (JABODETABEK area, i.e., Jakarta, Bogor, Depok, Tangerang and Bekasi for Indonesia, CALABARZON area, i.e., Cavite, Laguna, Batangas, Rizal, and Quezon for the Philippines, Greater Bangkok area for Thailand, and Hanoi area for Vietnam). A total of 600 firms agreed to participate in the survey: (1) 149 firms in Indonesia; (2) 203 firms in the Philippines; (3) 112 firms in Thailand; and (4) 137 firms in Vietnam.

The sample industries consist of 17 manufacturers for each country. Since the aggregate composition of industries is different among the four countries, we focused on just three major industries for each of the four countries: food processing, apparel, and wood products for Indonesia; food processing, apparel, and electronics for the Philippines; food processing, apparel, and chemical products for Thailand; chemical products, machinery, and electronics for Vietnam.

Table 1 shows the number of observations by industry and country. The pooled dataset from the four countries also suggests that the following industries have either more than or approximately 5 percent share of our survey: apparel (105 firms), food processing (80 firms), chemical products (59 firms), electronics (54 firms), metal (37 firms), auto (32 firms), wood products (31 firms), machinery (30 firms), and paper products (27 firms).

[Table 1 here]

Table 2 presents the summary statistics of the main variables. The average age of a firm is 14 years, with a standard deviation of 12 years. Firm size is also much dispersed. Average size is 293 employees, with a standard deviation of 456. Since our sampling strategy covers whole manufacturing in each country, some firms have more than 2,000 employees while some firms are very small, with less than 20 employees. Of the total number surveyed, approximately 60 percent are local firms; 13 percent, joint-venture firms; and 25 percent, MNEs.

A firm's function is classified into any one of five categories here. Forty-six percent of the firms process raw materials. Twenty-eight percent produce components and parts while 71 percent produce final goods. A total of 24 percent procure raw materials while and 43 percent do marketing activities.

We also collected information about the firms' subjective evaluation of their current internal and external environment and their assessment of their present situation compared with the previous year's (2007). Seventy-seven percent of the firms said that the quality of products improved. Nearly 70 percent said that production defects were reduced. However, many firms in East Asia have to hurdle a number of challenges: (1) increase the value of exports; (2) increase the value of exports to developed countries; and (3) increase the number of export destinations. Less than 20 percent of sample firms felt they could achieve these export-market successes.

[Table 2 here]

Table 2 also presents our main interests: innovations and linkages. We classified innovations into the following three categories: (1) product innovation (introduction of new goods); (2) process innovations, including adoption of new technology and organizational changes to improve product quality and cost efficiency; and (3) securing new customers to sell to, and new suppliers to produce existing products for, efficiently.

While approximately 45 percent of the sample firms, on average, are able to do product innovations in general, it appears that more firms find it difficult to achieve certain kinds of product innovations. Only 9 percent said they were able to introduce new goods to new markets, while only 11 percent of were able to introduce new goods using new technology. This situation may be due to the higher fixed costs of creating new markets and using new technology in addition to the typical costs associated with product innovations.

In contrast, more than 50 percent of the firms were able to introduce process innovations, such as (1) buying new machines; (2) improving existing machines; (3) introducing new know-how on production processes; (4) earning certification from the International Standards Organization (ISO); and (5) introducing internal activities to respond to changes in the markets.

Firms reported different experiences in the task of securing new customers and suppliers depending on the locations and characteristics of the customers and suppliers. The probability of securing a new local supplier or customer in a metropolitan area in which the respondent is also located is higher (63 percent for securing a new supplier and 65 percent for securing a new customer) than the probability of securing a new supplier or customer outside the metropolitan area (56 percent for securing a new supplier and 58 percent for securing a new customer). Securing a new supplier or customer in other ASEAN countries is more difficult for the four countries involved in the study (32 percent for securing a new supplier and 27 percent for securing a new customer). Sample firms also found it difficult to buy inputs from, or sell products to, MNEs. Only 17 percent of the firms successfully secured new multinational suppliers within a metropolitan area while only 16 percent were able to do so outside the metropolitan area. Between the two tasks, however, firms found it easier to sell products to MNEs than to buy inputs from them. Nearly 30 percent of the firms successfully secured new multinational customers within an agglomeration area, while 21 percent did so outside.

The distribution of linkages is also presented in Table 2. The most striking evidence of technical transfer is that production-related linkages are more cultivated than intellectual linkages. For example, collaboration with joint ventures established by a sample firm with other local firms and collaboration with a local supplier or customer were done by 32 percent and 41 percent of the firms, respectively.

On the other hand, 27 percent of the firms accepted technical assistance financed or provided by a government or public agency while 23 percent engaged in technical cooperation projects with a local university. Technology transfer between firms is prevalent, and University-Industry Linkages (hereafter, UIL) does not play a key role in technology transfer in East Asia.

Many firms also rely on internal sources for information on upgrading and innovation. Thirty-four percent of the surveyed firms depend on their own R&D departments as a source of information and R&D initiatives while 38 percent utilize their own sales departments and sales agents as information sources. Fifty-one percent of surveyed firms use technological agreements with headquarters or affiliated firms; 62 percent look to their own production and manufacturing departments when undertaking upgrades.

Industries in the sample are primarily involved in manufacturing and exporting and are currently operating in East Asia. To keep pace with domestic demand and stay on top of international competition, the firms adopt new technology, acquire new organizational form to adapt to market changes, create new markets, find new inputs to improve product quality and cost efficiency, and introduce new products. They utilize the external environment and local/international markets to upgrade themselves. Therefore, it is reasonable to say that they are more likely to adapt new technology and undertake organizational changes in response to the external environment and the demands made by their respective local and international markets. Tables 3 and 4 show the variety of innovations and linkages across countries and industries, respectively.

There is a large cross-sectional dispersion of innovations not only across countries but also across industries within a country. The variety of innovations for each firm is the sum of product innovations, process innovations including organizational changes, and securing new customers and suppliers at firm-level. The variety of linkages here is the sum of sources of information and new technology for each firm. The sample average (median) of variety of innovations for the pooled dataset is 8.96 (9) and the standard deviation is 4.91. Firms in Thailand and Vietnam are above the sample average (median) of innovations: 12.07 (12) and 10.83 (12), respectively. Standard deviations of innovations across firms within each country are 4.58 for Thailand and 3.6 for Vietnam.

The variety of linkages is also quite different across countries. The sample average (median) of linkages is 8.04 (6) for the pooled dataset. The standard deviation of linkages is quite high at 8.77. Firms in the Philippines only have 1.9 linkages on average while firms in Thailand have an average of 19 linkages. Indonesian firms have 7.63 linkages; Vietnamese firms, 8.62. The dispersion in linkages may be explained by the difference in the composition of industries across countries and the difference in the nature of production networks across industries. However main industries are concentrated in food processing and apparel (textile and garment) in each country, there is a large dispersion of linkages across countries for food processing and apparel.

[Table 3 and 4 here]

4. Characteristics of linked versus non-linked firms' innovations

Innovative activities reflect several dimensions of industry upgrading. There is no single measure to evaluate the success or failure of a firm's policy of industry upgrading. We drew up four different groups of measures: new goods, adoption of new technologies and organizational structure, new source of procurement, and creation of new markets. We map out the firm's linkage to innovations and present univariate comparisons of the outcome of the innovations with the status of the linkages.

A. New varieties

Our first measure is the number and percentage of firms introducing new goods. We define "linked" and "non-linked" firms by the level of median linkages and found that there is no significant difference between linked and non-linked firms in terms of introducing new goods. Linked firms have different sources of information compared with non-linked firms when they develop and introduce new goods. If the cost of introducing new goods decreased as a function of the variety of linkages, linked firms would have an advantage in the area of product innovations. Panel A of Table 5 suggests that there is no significant evidence that a linked firm's success in introducing new goods can be compared with a non-linked firm's results based on mean and median differences. There is also no significant evidence that a linked firm's outcome in introducing new goods in a new market and new goods based on new technologies can be compared with non-linked firm's.

B. Adoption of new technologies and organizational structure

Aside from product innovations, the most striking evidence of industry upgrading is the implementation of plant-level process innovations. It was assumed that linked firms tend to invest in process innovations if production-related linkages reduced the cost of buying new machines, maintaining existing ones, and changing a firm's organizational form or structure. But contrary to the above-mentioned assumption, Panel B of Table 5 suggests that the percentage of improved existing machines is actually lower for linked firms than non-linked firms. It was found that there are no significant differences between linked and non-linked firms in terms of buying new machines and introducing new know-how on production methods, although non-linked firms seem to implement more process innovations.

These results suggest that it is easy for stand-alone firms to reorganize machine-based production processes. As expected, linked firms are able to implement more organizational changes than non-linked firms, and their success can be traced to getting ISO certification, using information and communication technologies (ICT), and introducing internal activities aimed at responding to changes in the market.

C. New sources of input

Finding new sources of inputs, raw materials, and parts could help upgrade production processes and product quality and reduce production costs. Ultimately, it could also result in new product varieties because it would help firms find new, possibly more cost-efficient, and higher-quality types of inputs. This measure can be considered as a market-based innovation.

Panel B of Table 5 suggests that the probability of finding new suppliers is higher for linked firms than non-linked firms. Firms with many linkages could use these existing linkages to procure new inputs. A firm's direct linkages provide information not only about its partners but also its partner's linkages (this includes both the partner's partners and its competitors). If a firm's direct linkages increase, its indirect linkages will also increase.

The probability of securing new local suppliers within a firm's immediate location and in nearby areas are also higher for linked firms than non-linked firms. Linked firms enjoy both local and global linkages and are more likely to secure new multinational suppliers within and outside of a concentrated area.

Linked and non-linked firms differ in their importing activities as well. Linked firms have more advantages in terms of securing new international suppliers than non-linked firms when they decide to import new parts and materials. If the importation of new parts and materials from a particular country is too costly, a firm's linkages can help it to partially overcome this challenge by making it easier for the firm to seek a new supplier in other countries.

D. Creation of new markets

Finally, creation of new markets also reflects a firm's upgrading behavior. Our first question here is whether or not existing linkages could help a firm create a new market for existing and new goods. Our second and similar question is whether or not existing linkages could help create a new international market. Panel D of Table 5 presents the difference between linked and non-linked firms in creating new markets.

Linked firms tend to secure new domestic customers more than non-linked firms. In particular, linked firms are able to secure new local customers within the area where they and the new customers are both located. Linked firms also tend to find new multinational customers in areas near where they (the linked firms) operate. There is large difference between the ability of linked and non-linked firms to export to markets in East Asia (but outside the ASEAN), the EU, and U.S. and their ability to export to ASEAN countries alone. This suggests that their linkages actually help linked firms meet the challenge and difficulties of exporting to distant markets.

[Table 5 here]

5. Determinants of innovation failure and success

A. The variety of innovations

In this section, we present the effects of linkages on innovations. The univariate comparison reports in the last section do not control for factors that explain the success or failure of innovations. In this section, too, we present the results of the multivariate test that controls for the country differences and other firm characteristics, such as capital structure, age, number of employees, function, and R&D activities. We report the determinants of the variety of innovations. Table 6 presents the baseline results of the impacts of linkages on innovations. The dependent variable is the variety of innovations, i.e., the sum of product innovations, process innovations including organizational changes, and securing new customers and suppliers. The variety of innovations is approximated by normal distribution. Ordinary regression model was used to explain the variety of innovations.

The independent variables include the following explanatory variable: number of linkages is calculated by the sum of firm's production linkages and intellectual linkages. Rigorously speaking, we count the number of *types* of linkages. If the firm has a linkage to a local or foreign customer or supplier, we count that as *one* type of local or foreign production linkage. In addition, if the firm has a linkage to local or foreign university, we also count that as another type of local or foreign intellectual linkage. This means that such a firm has two types of linkages. "Multinational Enterprises" is a dummy variable equal to one for a firm that is wholly funded by foreign capital. Multinationals can access global technology frontiers and belong to international markets. This is not only a proxy of financial advantages for innovations but also a proxy of technology advantages compared with local firms.

Age and employment size are also attributes of innovations. Aged firms have a history of established production linkages and accumulated innovations. There is also a difference in the types of innovations and innovation investments that large and small/medium firms make. Cross-country differences can be attributed to the fundamental differences in the causes and consequences of innovations in response to market conditions.

The results are reported in Table 6. The coefficient for the variety of linkages is .189 with standard error of .027; it is statistically significant at the 1 percent level. Firms with more types of linkages implement significantly more innovations than firms with fewer types of linkages, even after one controls for capital structure, age, size, and country differences. We separately estimate the innovation impacts of the variety of linkages by R&D activities because there is a strong correlation between R&D activities and the variety of linkages. The coefficient for the variety of linkages is .161 with standard error of .041 for firms with R&D activities and .161 with standard error of .031 for firms without R&D activities. Both of them are statistically significant at the 1 percent level. The effects of being an MNE and the size of the firm are significant. The variety of innovations achieved cannot be attributed to differences in the age of the sample firms. Cross-country differences in the variety of innovations are apparent: firms in Indonesia and the Philippines innovate less than those in Thailand. This sample also reflects the difference between less developed countries in East Asia like Indonesia and the Philippines and more developed countries like Thailand. There is no significant difference between Vietnam and Thailand.

Table 7 presents the impacts of different types of linkages on innovations: (1) the number of production linkages with customers, suppliers, and other linkages made through the labor market and the equipment supply chain; (2) the number of intellectual linkages with universities, research institutes, business organizations, and public support agencies; (3) the number of the sample firms' internal resources. The Production linkages, intellectual linkages, and internal resources are also positive and have a significant impact on the variety of innovations at the 1 percent level. More than production and intellectual linkages, however, the innovations could be attributed to internal resources.

It is natural that the innovation impacts of linkages are different among the types of function. Table 8 reports the effects of linkages on the variety of innovations by the firms' functions. First, the coefficient for the variety of linkages is .293 with a standard error of .063 for firms with procurement functions. Second, the coefficient for the variety of linkages is .249 with a standard error of .038 for firms with a marketing department. Third, the coefficient for the variety of linkages is .239 with a standard error of .037 for firms that produce raw materials. Finally, the coefficients for the variety of linkages are also positive and significant for firms that do final assembly and parts production, although the volume is less than that for the functions of producing raw materials, parts procurement, and marketing.

[Table 6 to 8 here]

B. New varieties

To what extent are firms able to introduce new products with and without linkages? To what extent are firms able to create new markets when they introduce new products? To what extent do firms utilize new technologies when they introduce new products? We test these questions here. Table 9 reports the effects of linkages on the number of types of introducing new product varieties. In our sample, each firm has following three options: (1) introduce new goods or not, (2) introduce new goods to new markets or not, and (3) introduce new goods based on new technologies or not. If a firm achieves all types of introducing new varieties, it acquires three points. We used the Ordered Logit model to explain the determinants of the number of types of introducing new varieties. As reported in Table 9, the number of types of introducing new varieties is positive and significantly related to the variety of linkages. Two decomposed linkages (production and intellectual linkages) and internal resources are also positively related to the number of types of introducing new varieties. The coefficient for the number of MNEs is negative and significant.

Table 10 presents the coefficients for linkages by R&D activities. The coefficient for all types of linkages is not significantly different from zero when firms have R&D activities. On the other hand, the coefficient for all types of linkages is .038 with standard errors of .020 when firms do not have R&D activities, indicating that a firm with many production linkages would be able to achieve more of the number of types of introducing new varieties than a firm that does not have many linkages.

Table 11 presents the coefficients for production linkages by R&D activities. The coefficient for production linkages is positive but this does not have significant impact when firms have R&D activities. This is true in the case of intellectual linkages and internal resources. Table 12 and 13 reports the coefficients for intellectual linkages and internal resources as .115 with standard error of .055 and .212 with standard error of .103, respectively, when firms do not have R&D activities. As shown in Table 14, there are also functional differences in the number of types of introducing new varieties. The coefficients for the variety of linkages are positive and significant when firms do marketing, production of raw materials, procurement, and final assembly.

[Table 9 to 14 here]

C. Adoption of new technologies and organizational structure

Process innovations also play a key role in upgrading business activities. Innovations in business processes can be carried out in two ways. The first involves the adoption of new technologies to improve efficiency or quality. The second involves changing the organizational structure to respond to the external environment.

First, we report the result of adoption of new technologies. There are three types of process innovations related to the adoption of new technologies inside the firm: (1) purchase of new machines or facilities with new functions; (2) improvement of existing machines, equipment, or facilities; (3) introduction of new know-how on production methods. We call these "process innovations towards the firm" or innovations made for the firm's internal processes. Table 15 presents the impacts of process innovation on the variety of linkages. Only "internal resources" has a positive and significant effect. The coefficient for the number of internal resources is .110 with a standard error of .060 at the 10 percent level. As reported in Table 16, the coefficient for the number of internal resources is .064 with a standard error of .024 when firms do marketing activities.

Second, we report the result of changing the organizational structure to enable a firm to respond to its external environment. There are three types of process innovations related to this: (1) Certification by International Organization for Standardization (ISO); (2) Introduction of ICT to reorganize the business process; (3) Introduction of other internal activities to respond to changes in the market. We call these "process innovations toward the outside market." Table 17 reports the effect of the variety of linkages on process innovations toward the outside market. The coefficient for the variety of linkages is .054 with a standard error of .013 for all types of linkages. The number of production linkages, intellectual linkages, and internal resources is also positive and has a significant impact on process innovations. Table 18 presents the effects of the variety of linkages on process innovations toward the outside market by functions. All the coefficients are positive and significant. The coefficients of the variety of linkages for firms involved in producing raw materials, doing marketing, parts, and procurement are relatively larger than for firms doing final assembly.

[Table 15 to 18 here]

D. New sources of input

It is important to secure new sources of input—both locally and overseas—in order to improve quality and stimulate process innovations. The dependent variable is higher for firms that are successful in doing this than for firms that fail to secure multiple types of local and foreign trade partners.

Table 19 reports the impacts of the variety of linkages on securing new sources of input. The coefficient for the variety of linkages is .061 with a standard error of .011. This indicates that firms with more linkages tend to secure more new suppliers than firms with few linkages.

The most striking evidence in cross-country comparison is Vietnamese firms that have been able to secure more suppliers than Thai firms. This is partially reflected by the difference in the industry composition between the two countries. Table 20 compares the results of the impact of the variety of linkages on the number of secured new suppliers by functions. All of coefficients are positive and significant. The coefficients of the variety of linkages for firms that produce raw materials and do marketing functions are relatively larger than for firms that produce parts and do final assembly.

[Table 19 to 20 here]

E. Creation of new markets

The creation of new local and international markets is very important in helping upgrade business processes and, to a certain extent, spurring process innovations. The dependent variable is higher for firms that are able to secure new local and international customers than for firms fail to do so. Table 21 reports the impacts of the variety of linkages on securing new customers. The coefficient for the variety of linkages is .076 with a standard error of .012, indicating that firms with many linkages are more successful in securing new markets than firms with few linkages. Table 22 compares the results of the impact of the variety of linkages on the number of secured new suppliers by functions. All of coefficients are positive and significant. The coefficients of the variety of linkages for firms with procurement and marketing functions are relatively larger than for firms that make raw materials and parts and do final assembly.

[Table 21 to 22 here]

6. The effect of spatial architecture of production networks

A. Production networks in space

This section focuses on five issues related to production linkages between the main customer and supplier in a spatial economy: (1) capital tie-up; (2) products type; (3) JIT system; (4) exchange of engineers; (5) the relationship between production networks and innovation networks.

We have two competing theories of spatial architecture of production network to explain co-location between two firms. First, if fixed search costs of production partners (or setup and coordination costs of alliances) decrease with capital structure between firms, it is efficient for firms with capital tie-up to form production linkages with their affiliates. Second, if communication costs per meeting and information exchanges increase with geographic distance between firms, these two firms will form production linkages that will tend to co-locate in one area. Capital tie-up with affiliates is a good proxy for the existence of production linkages. If both of the first and second conjectures are appropriate in East Asia, firms with capital tie-up tend to locate nearer each other than firms without capital tie-up.

That is, the geographic extent of input-output linkage is locally limited for firms with capital tie-up than firms without capital tie-up due to the needs of the JIT system or frequent information exchanges for quality upgrading. This is a transport costs-based theory of co-location. This explanation is also derived from standard spatial economy. Less productive (less differentiated goods production) firms forge local or nearby alliances while more productive firms do it globally. For given variable communication costs of alliances, the geographic extent of input-output linkages should be ruled out by productivity. If communication costs increase, the probability of network formation with remote firms could decrease.

Second, there is the enforceability-based theory of agglomeration. This theory emphasizes the monitoring effect of production networks from buyer to seller. If buyers do not have a long-term or tight relationship with the producers, such buyers would have to frequently monitor and check product quality repeatedly. The cost of communication is an increasing function of geographic distance between buyers and sellers. If this conjecture is right, for example, firms with capital tie-up need not be co-located because these buyer and sellers would already know each other. The geographic extent of input-output linkage is locally limited for firms without capital tie-up compared to firms with capital tie-up due to monitoring needs. This section answers the following questions of production networks in space: (1) Are there any differences in the input-output linkages across firms and countries in East Asia; (2) How strong are the linkages between customers and suppliers; (3) Are production linkages also important partners for innovations?

Table 23 presents data on geographic proximity of a firm to its main customer and supplier in relation to capital tie-up. Almost all of the sample firms do not have capital tie-up to their main customer and supplier. On average, firms with a capital tie-up to the main customer and supplier are located more remotely from one another (514 km from customer, 374 km from supplier) than firms that have no any capital tie-up to their main customer or supplier (394 km from main customer, 353 km from supplier). This result validates the theory of co-location that some kind of monitoring occurs to enable firms to create a production network.

This result also holds for the types of goods that buyers and sellers produce. Table 24 compares the geographic proximity of sample firms to their main customer and supplier by the status of customized-goods production. If the transport cost-based theory of co-location is accurate, firms could buy standard goods from nearby suppliers and sell their own products to nearby customers. On the other hand, if customized goods are insensitive to transport costs, a firm can buy from a remote producer and sell to a remote customer. Data show that on average, firms who buy standard goods from a supplier and sell their own product to a customer who makes standard goods are located near their main customer and supplier (353 km from main customer, 206 km from supplier). Firms who buy customized goods from a supplier and sell their own products to a customer who makes customized goods are located farther away from their main customer and supplier (467 km from customer, 432 km from supplier).

It is natural for firms to create a JIT system with locally concentrated partners. Table 25 compares the geographic proximity of a firm to a main customer and supplier by the introduction of the JIT system. Firms who have a JIT system with their main customer and supplier are located nearer to their main trading partners than firms who have no

JIT system with their main partners (333 km from customer with JIT, 232 km from supplier with JIT versus 448 km from customer without JIT, 442 km from supplier without JIT). The formation of the JIT system justifies co-location based on transport costs.

Exchanging engineers between firms is also a main proxy of exchanging production-related knowledge on production linkages. Table 26 compares the geographic proximity of firms that accept engineers from their main trading partners to these same partners to the geographic proximity of firms that choose not to do so with their main partners. The results show that firms that decide to accept engineers from their main customers and suppliers tend to be located farther away from these same trading partners (669 km from customer and 567 km from supplier for firms that accept engineers versus 318 km from customer and 237 km from supplier for firms that do not accept engineers).

Table 27 compares the geographic proximity of firms that dispatch engineers to their main customers and suppliers from those same trading partners to the geographic proximity of firms that do not dispatch engineers to their main partners. Firms save on communication costs to remote areas by accepting engineers from their main customers and suppliers if these trading partners are located far from them. This is also true for firms that decide to dispatch engineers to their main partners. By doing this, firms can save on communication costs, especially if the partners are located in remote areas (500 km from customer and 348 km from supplier for firms that dispatch engineers versus 391 km from customer and 342 km from supplier for firms that do not dispatch engineers).

Finally, there is the overlap between production linkages and innovations network. As reported in Table 28, many firms (341 out of 600) responded that their main consumers are an important consideration in any decision to upgrade business activities and implement innovations while many firms also said that their main supplier is not that important a factor in any decision to upgrade and innovate their business processes and products. Geographic proximity to main customer and supplier, on average, is locally limited for firms who consider their main supplier as an important factor in upgrading and innovations (367 km from supplier if firms do not consider versus 141 km from supplier if firms consider).

[Table 23 to 28 here]

B. The effect of accepting/dispatching engineers and JIT system: face-to-face communications on innovations

We report the following internal effects of linkages in order to understand the information flow on production linkages. First, exchanging engineers could stimulate information flow based on face-to-face communication. Second, the formation of the JIT system could provide the opportunity for frequent communication between suppliers and customers. Since the last section reports on the effect of variety of linkages on product and process innovations, we relate the internal information flow of linkages to product and process innovations.

Table 29 reports the effects of accepting engineers from customers and suppliers on the introduction of new products. The dependent variable is equal to one if each firm introduces new products and is equal to zero otherwise. The independent variable, accepting engineers from customers or suppliers, is equal to one if each firm accepts engineers from the main customer or supplier. Marginal effects are presented. Other control variables are MNEs, age, firm size, and country dummy variables. We separately estimate the impacts of flows of engineers on product innovations by goods characteristics, that is, customized- and standard-goods production. As reported in Table 29, the coefficient for accepting engineers from suppliers is .329 with a standard error of .105, and it is statistically significant at the 1 percent level. Thus, firms that accept engineers from main suppliers are likely to experience significantly higher probability of product innovation than firms that do not accept engineers from main suppliers. This effect holds true if the main customers and suppliers produce standard goods. Overall, product innovation is positively related to accepting engineers from main suppliers and dispatching engineers to main customers.

Table 30 presents the innovation impacts of dispatching engineers to main customers and suppliers. The dependent variable is product innovation. This is equal to one if each firm introduces new varieties and is equal to zero if otherwise. The independent variable, dispatching engineers to customers or suppliers, is equal to one if each firm dispatches engineers to the main customers or suppliers. As reported in Table 30, the coefficient for dispatching engineers to main customers is .153 with a standard error of .080 if the main customer produces customized goods. The coefficient for dispatching engineers to main suppliers is .248 with a standard error of .100 if the main supplier produces standard goods. These results suggest that the acceptance of engineers from the main supplier and the dispatching of engineers to the main partners are positively important for product innovations.

Let us move to process innovations. Table 31 presents the impact of accepting engineers from the supplier on improving existing machines. The coefficient for accepting engineers from the supplier is -.140 with a standard error of .081 if the main customer produces customized goods. The coefficient for accepting engineers from the supplier is .173 with standard error of .080 if the main customer produces standard goods. The coefficient for accepting engineers from the supplier is -.242 with standard error of .094 if the main supplier produces customized goods. The coefficient for accepting engineers from the supplier is .191 with standard error of .053 if the main supplier produces standard goods. These results indicate that if the main partners produce customized goods, it is not easy to improve existing machines for firms that accept engineers from suppliers. On the other hand, if the main partners produce standard goods, accepting engineers from main suppliers stimulates the improvement of existing machines.

Table 32 reports the result of dispatching engineers to the main partners on improving existing machines. The coefficient for dispatching engineers to the customer is .139 with a standard error of .074 if the main customer produces customized goods. The coefficient for dispatching engineers to the customer is .174 with a standard error of .089 if the main supplier produces customized goods. The coefficient for dispatching engineers to the supplier is .157 with a standard error of .060 if the main supplier produces standard goods. Thus, firms that dispatch engineers to customers and suppliers could experience significantly higher probability of process innovations toward internal firm-improving existing machines. In summary, process innovation toward internal production efficiency is negatively related to accepting engineers from suppliers if production linkages are connected to produce customized goods. On the other hand, process innovation is positively related to accepting engineers from suppliers if production linkages are connected to produce standard goods. Process innovation is also positively related to dispatching engineers to customers if production linkages are connected to produce customized goods.

Table 33 presents the effect of accepting engineers from suppliers for firms that are working on getting ISO certification. The first column indicates that the coefficient for accepting engineers from the main supplier is .250 with a standard error of .060. Thus, firms that accept engineers from the main supplier have a significantly higher probability of getting ISO certified. This is true if the main customer and supplier produce customized and standard goods, respectively. Table 34 reports the effect of dispatching engineers to the main customer. The coefficient for dispatching engineers to customers is .193 with a standard error of .067, indicating that firms that dispatch engineers to customers have a significantly positive impact of getting ISO certified, which is considered as a process innovation towards the external market.

Making investments to deal with disequilibria is another kind of process innovation. The dependent variable is equal to one if a firm invests in internal activities that will help it adjust to changes in the market. As reported in Table 35, the coefficient for accepting engineers from the supplier is .332 with a standard error of .053. Thus, firms that accept engineers from suppliers are more likely to make investments that will enable them to adjust to changes in the market. Table 36 shows that the coefficient for dispatching engineers to the customer is .218 with a standard error of .059 while the coefficient for dispatching engineers to the supplier is .150 with a standard error of .073. The impacts on process innovation of the practice of dispatching engineers is higher for firms that dispatch engineers to customers than for firms that dispatch engineers to suppliers in the face of market disequilibria or market turbulence. In summary, process innovation aimed at enabling a firm to respond to changes in the external market environment is positively related to the practice of accepting engineers from suppliers and dispatching engineers to main customers.

Finally, the formation of a JIT system is also a proxy of information exchanges on production linkages. Table 37 reports the impacts of forming a JIT system with the main customer and supplier on earning ISO certification, which is a type of process innovation towards the external market. The independent variables of forming a JIT system with the customer or supplier are equal to 1 if a firm forms a JIT system for production and distribution with its main customer or supplier, respectively, and are equal to zero otherwise. Table 37 shows that the coefficient a JIT system with the customer is .245 with a standard error of .100 if the customer produces a standard product. The coefficient for a JIT system with the supplier is .225 with a standard error of .098 if the supplier produces a customized product. These results indicate that firms that form a JIT system with a customer have a significantly higher probability of getting ISO certified than firms that do not have a JIT system with their main customer.

Table 38 presents the impact of forming a JIT system with a customer on a firm's ability to adjust to changes in the market. The empirical question here is whether a JIT system provides information flows in the face of market changes or market turbulence. The coefficient for a JIT system with the customer is .206 with a standard error of .102 if the customer produces a standard product, indicating that the firm that forms a JIT system with a customer has a higher probability of investing in internal activities that will help it adjust to changes in the market. Overall, a process innovation that helps a firm adjust to changes in the market environment, for example, ISO certification or market turbulence, is positively related to JIT system with a customer.

[Table 29 to 38 here]

7. Reasons firms with many linkages and firms with direct information flows from partners are more successful

Empirical evidence based on both univariate comparisons and multivariate tests suggest two findings about the impacts of linkages on innovations. First, firms with many linkages achieve many types of product and process innovations. In particular, compared to firms that do not have many linkages, firms with many linkages achieved many types of organizational changes in response to changes in the market environment and market-based process innovations, such as earning ISO certification, investment in ICT to communicate to trade partners, investment in internal activities to adjust to market turbulence, and securing new suppliers and customers. Second, information flows, especially face-to-face communication and frequent exchanges in information, play an important role in achieving product and process innovations. In particular, compared to firms that do not accept engineers from main partners or dispatch engineers to main partners, firms that interact with main partners are more likely to introduce new product varieties, organizational changes in response to changes in the market environment, and market-based process innovations.

A. The value of knowledge diversity

One reason for the success of firms with many linkages is that each type of linkage provides unique information about upgrading business processes and changes in the market. Linkages variable is constructed by two different types of linkages: production and intellectual linkages. The former means linkages with several production partners that are located within or between areas of concentration. The latter means linkages with universities and research and public business organizations within or between areas of concentration. The empirical results also imply that two extremely different types of linkages complement product and process innovations. These linkages do not cancel out each other's contributions. The empirical results clearly suggest that the combination of two different sources of knowledge is valuable for innovations.

B. Accuracy arising from interactions

Although the number of types of linkages increases the number of types of product and process innovations, internal resources have the most important impact for innovations. Product and process innovations are, by nature, a process of trial and error. One of the reasons why many types of linkages are beneficial to innovations is that the number of types of linkages and internal resources are interpreted using instruments that help produce more accurate information compared to trial and error. If firms have many types of production linkages, the number and diversity of linkages would insure accuracy when firms invest in innovations. This is supported by the empirical evidence that the variety of linkages increases the number of types of product innovations when firms do not do R&D activities while the variety of linkages does not increase the number of types of product innovations when firms experiment with R&D. If firms do not already have an instrument for internal trial and error, they can learn about other firms' trials and errors only through external linkages. Firms with sufficient internal resources or with R&D activities could acquire this information by themselves.

C. Information flows from customer and supplier linkages

Firms with direct information flow from partners tend to be more successful because of the value brought by face-to-face communication and frequent interaction. Accepting engineers from the main supplier insures the transfer of knowledge relating to raw materials, parts, and components. If the suppliers are based in a more competitive market, the main supplier has to pay the costs of knowledge transfer, i.e., dispatching engineers to the main customer. Dispatching engineers to the main customer also insures the transfer of knowledge about production processes and market changes. Since it is critically important for firms to acquire the most accurate information about market changes, the supplier dispatches the engineers from an upstream to a downstream level. The empirical results suggest that there are backward linkages of information flows from customer to supplier. Because most suppliers are keen to acquire ISO certification to help them expand their market, they need to communicate face to face with their main customer to pay the costs of dispatching engineers. The JIT system also provides an opportunity for frequent interactions between customers and suppliers. Frequent interactions insure the accuracy of information about market changes.

8. Conclusion

In East Asia, a complex production network has been constructed utilizing wage disparity and lower transportation costs across countries in the region. Lower transportation costs between regions foster the fragmentation of production processes over borders. In particular, the intermediate process is more complex, skill intensive, and higher paid while the final process is easier to build, unskilled-labor intensive, and lower paid. On the other hand, since both inter-firm supplier-customer relationships and intra-firm upstream and downstream processes face higher transportation costs, firms with capital tie-up to their main trading partners tend to co-locate near one another.

From the viewpoint of spatial economy, it is unclear whether geographic proximity between firms tends to spur knowledge transfer between upstream and downstream processes within a concentrated area. On one hand, co-location stimulates frequent communication between firms. On the other hand, the mobility of engineers (dispatching of workers to partners and accepting of workers from partners) between firms was shown to be more frequent for firms located in remote areas than nearer their main trading partners. Empirical work was needed to provide a solution. To detect the origin and destination of knowledge flow between upstream and downstream processes, we collected information on engineer mobility and implementation of the JIT system to estimate the strength of ties.

The empirical results suggest that firms with many linkages, with face-to-face communication at the engineer level, and with frequent interaction with production partners are able to innovate successfully, particularly in the areas of organizational reform toward external markets and market-based process innovations like creation of new markets and securing new sources of input. We offer the following three hypotheses as a possible explanation for these results: (1) Many types of linkages or combinations of different types of linkages provide the value of knowledge diversity; (2) Many types of linkages provide the opportunity to get accurate information about other firms' trials and errors for firms without their own R&D department or sufficient internal resources; (3) Face-to-face communication and frequent interaction with production partners provide a chance to acquire deep and correct information about changes in the market and market turbulence.

Finally, we derive two policy suggestions based on these empirical results. First, policy resources should target firms that have a few production and intellectual linkages, particularly small- and medium-sized firms in East Asia. Linked firms receive benefits from partners while providing important information about market changes to their other partners, especially their supplier. It is also important to devote policy resources to the implementation of a JIT system. If there are some obstacles to implementing a JIT system that will help firms upgrade, public assistance can be tapped to create such a network. Economies of network based on production linkages could create such externality.

Second, policy resources should be allocated to the reduction of obstacles to engineer mobility in East Asia. Since engineer mobility happens at the local and international levels, (1) insuring free mobility of engineers or simplifying immigration procedures and (2) creating common certification of engineers' skills in East Asia could stimulate the upgrading of firms and industries through face-to-face communication at the different stages of product and process innovation.

References

Brambilla, I., 2006, Multinationals, Technology, and the Introduction of Varieties of Goods, *NBER Working Paper* No. 12217.

Bresnahan, T F., Brynjolfsson, E., and Hitt, L M., 2002, Information Technology, Workplace Organization, and the Demand for Skilled Labor: Firm Level Evidence, *The Quarterly Journal of Economics*, 117(1):339-376.

Bloom, N., Draca, M., and van Reenen, J., 2008, Trade Induced Technical Change? The Impact of Chinese Imports on IT and Innovation, Manuscript, Stanford University and London School of Economics.

Comebs, P.P., Mayer, T., and Thisse, J-F., 2008, *Economic Geography: The Integration of Regions and Nations*, Princeton University Press, New Jersey.

Combes, P.P., Duranton, G., Gobillon, L., Puga, D., and Roux, S., 2009, The Productivity Advantages of Large Markets: Distinguishing Agglomeration from Firm Selection, Manuscript, GREQAM, INED, University of Toronto, IMDEA and CREST.

Conley, T., and Udry, C., 2008, Learning about a New Technology: Pineapple in Ghana, forthcoming, *American Economic Review*.

Ellison, G., and Glaeser, E L., 1999, The Geographic Concentration of Industry: Does Natural Advantage Explain Agglomeration?, *American Economic Review Papers and Proceedings,* 89 (2), 311-316.

Ellison, G., Glaeser, E L., and Kerr, W R., 2009, What Causes Industry Agglomeration? Evidence from Coagglomeration Patterns, Manuscript.

Glaeser, E L., Kallal, H D., Scheinkman, J A., and Shleifer A., Growth in Cities, *Journal of Political Economy*, 1992, 100(6): 1126-52.

Gorodnichenko,Y., Svejnar, J., and Terrell, K., 2008, Globalization and Innovation in Emerging Markets, *NBER Working Paper* No. 14481.

Greenstone, M., Hornbeck, R., and Moretti, E., 2008, Identifying Agglomeration Spillovers: Evidence from Million Dollar Plants, *NBER Working Paper* No. 13833.

Karpoff, J., 2001, Public versus Private Initiative in Arctic Exploration: The Effects of Incentives and Organizational Structure, *Journal of Political Economy*, 109(1): 38-78.

Lucas, R E. Jr., 1988, On the Mechanics of Economic Development, *Journal of Monetary Economics*, Vol. 22, No. 1: 3-42.

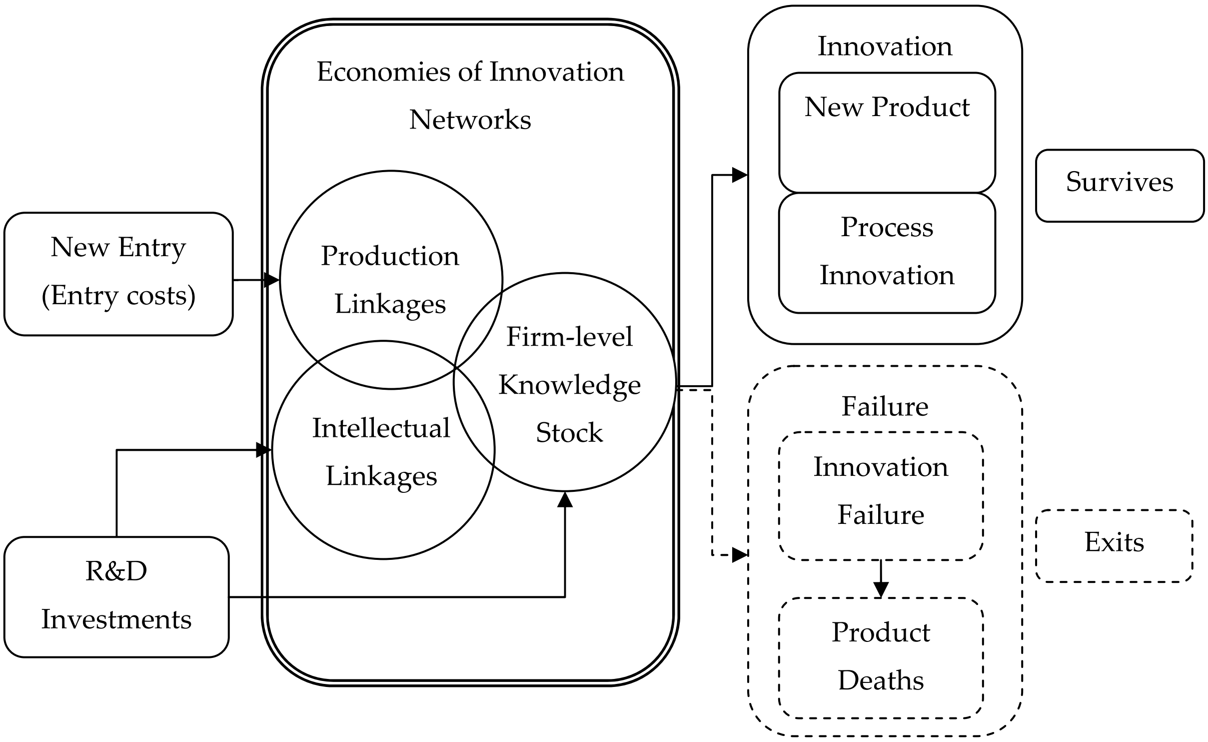
Ramstetter E. D., and Sjoholm F., 2006, *Multinationals Corporations in Indonesia and Thailand: Wages, Productivity, and Exports*, Palgrave Macmillan, Basingstorke.

Rosenthal, S. and Strange, W., 2004, Evidence on the Nature and Sources of Agglomeration Economies, in: Henderson, J.V. and J.-F. Thisse (eds.) *Handbook of Regional and Urban Economics*, Vol. 4, North-Holland: Elsevier, 2713-2739.

Syverson, C, 2004, "Market Structure and Productivity: A Concrete Example" *Journal of Political Economy*, 112(6): 1181–1222.

Teshima, K., 2008, Import Competition and Innovation at the Plant Level: Evidence from Mexico, Manuscript, Columbia University.

Figure 1: A Framework of Product and Process Innovation



Note: Given local innovation system and firm's exogenous productivity, each firm chooses to the number of information linkages and frequency of commuting to partner to maximize present value of firm.

Table 1: Number of Observations by Industry and Country

	Pooled sample			Indonesia			Philippines			Thailand			Vietnam		
	Freq.	Percent	Cum.	Freq.	Percent	Cum.	Freq.	Percent	Cum.	Freq.	Percent	Cum.	Freq.	Percent	Cum.
1 Food	80	13.31	13.31	25	16.78	16.78	35	17.24	17.24	15	13.39	13.39	5	3.65	3.65
2 Apparel	105	17.47	30.78	36	24.16	40.94	43	21.18	38.42	17	15.18	28.57	9	6.57	10.22
3 Wood	31	5.16	35.94	16	10.74	51.68	7	3.45	41.87	4	3.57	32.14	4	2.92	13.14
4 Paper	27	4.49	40.43	13	8.72	60.4	5	2.46	44.33	4	3.57	35.71	5	3.65	16.79
5 Coal	3	0.5	40.93	1	0.67	61.07		N.A.		2	1.79	37.5		N.A.	
6 Chemical	59	9.82	50.75	5	3.36	64.43	21	10.34	54.68	15	13.39	50.89	18	13.14	29.93
7 Nonmetal	9	1.5	52.25		N.A.		8	3.94	58.62		N.A.		1	0.73	30.66
8 Iron	24	3.99	56.24	7	4.7	69.13	5	2.46	61.08	1	0.89	51.79	11	8.03	38.69
9 Nonferrous	1	0.17	56.41		N.A.		1	0.49	61.58		N.A.			N.A.	
10 Metal	37	6.16	62.56	2	1.34	70.47	16	7.88	69.46	11	9.82	61.61	8	5.84	44.53
11 Machinery	30	4.99	67.55	2	1.34	71.81	8	3.94	73.4	5	4.46	66.07	15	10.95	55.47
12 Computers	6	1	68.55		N.A.		1	0.49	73.89	4	3.57	69.64	1	0.73	56.2
13 Electronics	54	8.99	77.54	2	1.34	73.15	30	14.78	88.67	2	1.79	71.43	20	14.6	70.8
14 Precision	6	1	78.54		N.A.		1	0.49	89.16	1	0.89	72.32	4	2.92	73.72
15 Auto	32	5.32	83.86	4	2.68	75.84	12	5.91	95.07	8	7.14	79.46	8	5.84	79.56
16 Transport	8	1.33	85.19	2	1.34	77.18	1	0.49	95.57	3	2.68	82.14	2	1.46	81.02
17 Other	89	14.81	100	34	22.82	100	9	4.43	100	20	17.86	100	26	18.98	100
Total	601	100		149	100		203	100		112	100		137	100	

Table 2: Summary Statistics of Firm Characteristics

	Obs	Mean	Std. Dev.	Min	Max
Firm Characteristics					
Age	589	14.202	12.392	0	80
Full-time Employees	602	293.879	456.483	10	2000
Local Firms	605	0.617	0.487	0	1
Joint Venture Firms	605	0.132	0.339	0	1
Multinational Enterprise	605	0.251	0.434	0	1
Production (raw material processing)	605	0.463	0.499	0	1
Production (components and parts)	605	0.281	0.450	0	1
Production (final products)	605	0.712	0.453	0	1
Procurement of raw materials, parts, or supplies	605	0.250	0.433	0	1
Marketing, sales promotion	605	0.433	0.496	0	1
R&D activities (1 if Yes, 0 otherwise)	605	0.221	0.416	0	1
Industry					
Food	605	0.132	0.339	0	1
Apparel	605	0.174	0.379	0	1
Wood	605	0.051	0.221	0	1
Paper	605	0.045	0.207	0	1
Coal	605	0.005	0.070	0	1
Chemical	605	0.098	0.297	0	1
Nonmetal	605	0.015	0.121	0	1
Iron	605	0.040	0.195	0	1
Nonferrous	605	0.002	0.041	0	1
Metal	605	0.061	0.240	0	1
Machinery	605	0.050	0.217	0	1
Computers	605	0.010	0.099	0	1
Electronics	605	0.089	0.285	0	1
Precision	605	0.010	0.099	0	1
Auto	605	0.053	0.224	0	1
Transport	605	0.013	0.114	0	1
Other	605	0.147	0.355	0	1

Table 2: Summary Statistics of Firm's Perception for Own Performances

		Obs	Mean	Std. Dev.	Min	Max
1	Sales amount increases	605	0.560	0.497	0	1
2	Profit increased	605	0.499	0.500	0	1
3	Number of employees increased	605	0.372	0.484	0	1
4	Value of exports increased	605	0.243	0.429	0	1
5	Value of exports to developed countries increased	605	0.188	0.391	0	1
6	Number of export destination increased	605	0.175	0.380	0	1
7	Productivity of operation improved	605	0.631	0.483	0	1
8	Quality of products improved	605	0.775	0.418	0	1
9	Product defects were reduced	605	0.699	0.459	0	1
10	Production cost decreased	605	0.455	0.498	0	1
11	Lead-time was reduced	605	0.579	0.494	0	1

Table 2: Summary Statistics of Innovations

		Obs	Mean	Std. Dev.	Min	Max
	Number of Innovations					
1	Number of Types of Innovations	605	8.970	4.913	0	21
2	Number of Types of Product Innovations	605	0.671	0.870	0	3
3	Number of Types of Process Innovations in Production Method	605	1.752	1.220	0	3
4	Number of Types of Securing New Supplier	605	2.549	2.061	0	7
5	Number of Types of Securing New Customer	605	2.742	2.128	0	7
6	Number of Types of Organizational Changes	605	1.469	1.198	0	3
	Product Innovations					
1	Introduction of New Good	605	0.458	0.499	0	1
2	Introduction of New Good to New Market	605	0.096	0.295	0	1
3	Introduction of New Good with New Technology	605	0.117	0.322	0	1
	Process Innovations					
1	Bought New Machines	605	0.529	0.500	0	1
2	Improved Existing Machines	605	0.673	0.470	0	1
3	Introduced New Know-how on Production Methoc	605	0.550	0.498	0	1
4	Adopted an international standard (ISO or	605	0.531	0.499	0	1
5	Introduced ICT and reorganized business	605	0.342	0.475	0	1
6	Introduced other internal activities to respond to changes in the market?	605	0.597	0.491	0	1

Table 2: Summary Statistics of Innovations

		Obs	Mean	Std. Dev.	Min	Max
	Securing New Supplier					
1	Secured a new local supplier (100% local capital) in survey city	605	0.636	0.481	0	1
2	Secured a new local supplier (100% local capital) in the country outside survey city	605	0.567	0.496	0	1
3	Secured a new Multinational Company (MNC) (100% foreign capital) or joint venture (JV) supplier in survey city	605	0.174	0.379	0	1
4	Secured a new MNC or JV supplier in the country outside survey city	605	0.162	0.369	0	1
5	Secured a new supplier in other ASEAN countries	605	0.327	0.470	0	1
6	Secured a new supplier in other countries in East Asia (China, Japan, Korea, Taiwan)	605	0.380	0.486	0	1
7	Secured a new supplier in other foreign countries	605	0.302	0.460	0	1
	Securing New Customer					
1	Secured a new local customer (100% local capital) in survey city	605	0.653	0.476	0	1
2	Secured a new local customer (100% local capital) in the country	605	0.580	0.494	0	1
3	Secured a new MNC or JV customer in survey city	605	0.307	0.462	0	1
4	Secured a new MNC or JV customer in the country	605	0.218	0.413	0	1
5	Secured a new customer in other ASEAN	605	0.271	0.445	0	1
6	Secured a new customer in other countries in East Asia (China, Japan, Korea, Taiwan)	605	0.347	0.476	0	1
7	Secured a new customer in other foreign countries	605	0.365	0.482	0	1

Table 2: Summary Statistics of Linkages

		Obs	Mean	Std. Dev.	Min	Max
	Number of Linkages and Internal Resources					
1	Number of Linkages	605	8.064	8.783	0	26
2	Number of Production Linkages	605	5.893	5.884	0	17
3	Number of Intellectual Linkages	605	2.172	3.457	0	9
4	Number of Internal Sources	605	1.917	1.602	0	4
	Production Linkages					
1	Joint venture established by your firm with other local firms	605	0.326	0.469	0	1
2	Local supplier or customer (100% local capital)	605	0.412	0.493	0	1
3	Local competitor (Firms in the same business which is neither supplier nor customer)	605	0.236	0.425	0	1
4	Local firm in the different business which is neither supplier nor customer	605	0.226	0.419	0	1
5	Licensing technologies from other local firms	605	0.448	0.498	0	1
6	Local consultant hired by your firm	605	0.233	0.423	0	1
7	Joint venture established by your firm with other foreign-owned firms	605	0.383	0.487	0	1
8	Foreign-owned (or multinational) supplier or customer	605	0.450	0.498	0	1
9	Foreign-owned competitor (Firms in the same business which is neither supplier nor customer)	605	0.321	0.467	0	1
10	Foreign-owned firm in the different business which is neither supplier nor customer	605	0.294	0.456	0	1
11	Licensing technologies from other MNCs	605	0.236	0.425	0	1
12	International consultant hired by your firm	605	0.193	0.395	0	1
13	Recruitment of mid-class personnel	605	0.559	0.497	0	1
14	Recruitment of personnel retired from MNCs and large firms	605	0.243	0.429	0	1
15	Technical information obtainable from patents	605	0.362	0.481	0	1
16	Introduction of "foreign-made" equipment and software	605	0.509	0.500	0	1
17	Reverse engineering	605	0.461	0.499	0	1
	Intellectual Linkages					
1	Technical assistance financed/provided by government/public agency	605	0.278	0.448	0	1
2	Technical assistance financed/provided by local business organization	605	0.302	0.460	0	1
3	Research consortium organized with the support of government	605	0.235	0.424	0	1
4	Research consortium organized with the support of local business organization	605	0.225	0.418	0	1
5	Business consortium organized with the support of government	605	0.236	0.425	0	1
6	Business consortium organized with the support of local business organization	605	0.233	0.423	0	1
7	Technical cooperation with (or assistance from) local university or R&D institute	605	0.233	0.423	0	1
8	Technical cooperation with (or assistance from) foreign university or R&D institute	605	0.217	0.412	0	1
9	Academic society and academic journal	605	0.213	0.410	0	1
	Internal Resources					
1	Own R&D department	605	0.339	0.474	0	1
2	Own Sales department or sales agent	605	0.448	0.498	0	1
3	Own production or manufacturing department	605	0.618	0.486	0	1
4	Technological agreement with the headquarters or affiliated firm	605	0.512	0.500	0	1

Table 2: Summary Statistics of the Relationship with Main Customer and Supplier

		Obs	Mean	Std. Dev.	Min	Max
	Relationship with Customer					
1	Main Customer makes Customized Good	605	0.638	0.481	0	1
2	Geographic Proximity to Customer (km)	584	400.069	438.087	5	1000
3	JIT with Customer	605	0.451	0.498	0	1
4	Capital Tie-up with Customer	605	0.107	0.310	0	1
5	Duration of the Relationship with Customer (year)	590	6.412	3.489	0.5	10
6	Accept Engineers from Customer	605	0.339	0.474	0	1
7	Dispatch Engineers to Customer	605	0.215	0.411	0	1
8	Customer is Important Partner for Innovation	605	0.668	0.471	0	1
	Relationship with Supplier					
1	Main Supplier makes Customized Good	605	0.554	0.498	0	1
2	Geographic Proximity to Supplier (km)	545	343.418	413.176	5	1000
3	JIT with Supplier	605	0.362	0.481	0	1
4	Capital Tie-up with Supplier	605	0.112	0.316	0	1
5	Duration of the Relationship with Supplier (year)	570	6.233	3.587	0.5	10
6	Accept Engineers from Supplier	605	0.273	0.446	0	1
7	Dispatch Engineers to Supplier	605	0.170	0.376	0	1
8	Supplier is Important Partner for Innovation	605	0.117	0.322	0	1

Table 3: Number of Innovations by Industry and Country

	Pooled sample					Indonesia					Philippines					Thailand					Vietnam				
	Mean	Median	S.D.	Min	Max	Mean	Median	S.D.	Min	Max	Mean	Median	S.D.	Min	Max	Mean	Median	S.D.	Min	Max	Mean	Median	S.D.	Min	Max
1 Food	8.07	8	4.91	0	21	5.48	4	4.16	0	15	8.11	8	5.03	0	21	11.2	11	4.2	5	20	11.4	12	1.52	9	13
2 Apparel	6.29	6	4.68	0	21	5.5	4.5	3.45	0	15	4.4	4	3.95	0	17	11.35	11	4.24	4	21	8.89	8	5.51	0	18
3 Wood	6.87	7	3.58	0	13	6.81	6	3.62	0	13	6.14	5	5.24	0	13	7.25	7	1.26	6	9	8	8	1.83	6	10
4 Paper	9.7	9	4.46	2	21	7.92	8	3.8	2	16	11.2	12	2.59	8	14	13.25	13.5	6.85	5	21	10	12	4.3	5	15
5 Coal	12.67	13	0.58	12	13	13	13	.	13	13			N.A			12.5	12.5	0.71	12	13			N.A		
6 Chemical	10.37	11	4.14	2	21	9	8	4.47	4	15	9.1	8	3.99	2	19	11.87	11	4.85	4	21	11	12.5	3.27	4	14
7 Nonmetal	8.44	8	5.64	1	19			N.A			8.63	8.5	6	1	19			N.A			7	7	.	7	7
8 Iron	8.42	8.5	4.7	0	17	6.29	6	5.5	0	17	7.6	10	5.77	0	13	7	7	.	7	7	10.27	9	3.44	5	17
9 Nonferrous	6	6	.	6	6						6	6	.	6	6			N.A					N.A		
10 Metal	12	12	4.99	0	20	5	5	2.83	3	7	9.94	10	4.95	0	20	16.82	17	2.79	11	20	11.25	11.5	1.58	9	14
11 Machinery	10.8	12.5	4.37	1	17	14	14	1.41	13	15	8.63	7	6.48	1	17	10.4	11	1.95	8	13	11.67	13	3.52	4	16
12 Computers	12.33	14	6.89	3	20			N.A			14	14	.	14	14	10	9.5	7.16	3	18	20	20	.	20	20
13 Electronics	10.63	10	3.57	1	19	7	7	0	7	7	10.2	9.5	4.33	1	19	11	11	2.83	9	13	11.6	12	1.96	7	14
14 Precision	10.67	12	3.39	6	14			N.A			7	7	.	7	7	11	11	.	11	11	11.5	13	3.7	6	14
15 Auto	10.25	10.5	5.71	0	21	9.5	10.5	3.11	5	12	7.5	6	5.79	0	19	16.13	15.5	3.83	11	21	8.88	8	4.26	4	16
16 Transport	10.38	10	3.46	6	17	10.5	10.5	2.12	9	12	11	11	.	11	11	12.67	12	4.04	9	17	6.5	6.5	0.71	6	7
17 Other	8.78	8	5.02	1	21	5.85	5	4.49	1	21	6.67	5	4.33	2	15	11.1	12	4.29	4	20	11.54	12	4.08	1	20
Total	8.96	9	4.91	0	21	6.44	6	4.14	0	21	7.84	8	5.01	0	21	12.07	12	4.58	3	21	10.83	12	3.6	0	20

Table 4: Number of Linkages by Industry and Country

	Pooled sample					Indonesia					Philippines					Thailand					Vietnam				
	Mean	Median	S.D.	Min	Max	Mean	Median	S.D.	Min	Max	Mean	Median	S.D.	Min	Max	Mean	Median	S.D.	Min	Max	Mean	Median	S.D.	Min	Max
1 Food	6.86	4	8.41	0	26	8.32	7	6.9	0	20	2.69	0	5.81	0	26	13.4	12	11.86	0	26	9.2	9	0.84	8	10
2 Apparel	6.67	3	8.56	0	26	5.86	5.5	5.22	0	20	0.58	0	1.56	0	8	22.18	26	6.9	6	26	9.67	10	1.5	8	12
3 Wood	6.74	4	8.87	0	26	5.38	2.5	7.87	0	26	0.86	0	2.27	0	6	21	26	10	6	26	8.25	9	1.5	6	9
4 Paper	8.22	6	8.4	0	26	7.08	5	6.17	0	20	0	0	0	0	0	23.5	26	5	16	26	7.2	7	1.3	6	9
5 Coal	6.67	4	4.62	4	12	4	4	.	4	4			N.A			8	8	5.66	4	12			N.A		
6 Chemical	10.05	8	10.1	0	26	14.6	12	11.13	1	26	4	0	8.15	0	26	19.2	26	11.53	0	26	8.22	8	1.52	6	12
7 Nonmetal	3.44	0	5.34	0	15			N.A			2.75	0	5.26	0	15			N.A			9	9	.	9	9
8 Iron	7.96	8	7.96	0	26	13.29	10	12.37	0	26	1.4	0	3.13	0	7	0	0	.	0	0	8.27	8	1.56	6	11
9 Nonferrous	0	0	.	0	0	N.A					0	0	.	0	0			N.A					N.A		
10 Metal	9.7	7	9.98	0	26	7.5	7.5	0.71	7	8	1.13	0	2.83	0	11	23.91	24	1.22	22	26	7.88	8	1.46	6	10
11 Machinery	8.17	9	7.1	0	26	17.5	17.5	10.61	10	25	0.88	0	2.47	0	7	12.4	11	11.84	0	26	9.4	10	1.55	7	11
12 Computers	9	5.5	10.77	0	26			N.A			0	0	.	0	0	11	9	12.68	0	26	10	10	.	10	10
13 Electronics	6.65	7	7.08	0	26	13.5	13.5	3.54	11	16	4.03	0	7.87	0	26	16	16	14.14	6	26	8.95	9	1.96	6	14
14 Precision	10.33	8.5	8.64	0	26			N.A			0	0	.	0	0	26	26	.	26	26	9	8.5	2.16	7	12
15 Auto	7.75	6	9.66	0	26	9.25	5.5	11.47	0	26	0	0	0	0	0	17.88	26	11.39	0	26	8.5	8.5	2.14	6	12
16 Transport	12.13	7.5	10.29	0	26	15	15	15.56	4	26	0	0	.	0	0	17.33	20	10.26	6	26	7.5	7.5	0.71	7	8
17 Other	10.01	8	9.07	0	26	6.65	5.5	6.82	0	26	0	0	0	0	0	22.3	26	8.16	0	26	8.42	8.5	1.65	5	12
Total	8.04	6	8.77	0	26	7.63	6	7.49	0	26	1.89	0	5.11	0	26	19	26	9.97	0	26	8.62	9	1.68	5	14

Table 5: Innovation Outcomes by Linkages and Mean Differences

		All	Linkages: Under Median	Linkages: Over Median	t-Statistics
	Number of Types of Innovations	8.970	7.142	10.878	-10.101
		A. Product Innovations			
	Number of Product Innovations	0.671	0.628	0.716	-1.249
1	Introduction of New Good	0.458	0.440	0.476	-0.893
2	Introduction of New Good to New Market	0.096	0.084	0.108	-1.000
3	Introduction of New Good with New Technology	0.117	0.104	0.132	-1.077

Table 5: Innovation Outcomes by Linkages and Mean Differences (Continued)

		All	Linkages: Under Median	Linkages: Over Median	t-Statistics
		B. Process Innovations			
	Number of Types of Process Innovations in Production Method	1.752	1.832	1.669	1.643
1	Bought New Machines	0.529	0.557	0.500	1.395
2	Improved Existing Machines	0.673	0.706	0.639	1.757
3	Introduced New Know-how on Production Methods	0.550	0.570	0.530	0.967
4	Number of Types of Organizational Changes	1.469	1.159	1.794	-6.758
5	Adopted an international standard (ISO or others)?	0.531	0.430	0.635	-5.145
6	Introduced ICT and reorganized business processes by it?	0.342	0.246	0.443	-5.200
7	Introduced other internal activities to respond to changes in the market?	0.597	0.482	0.716	-6.030

Table 5: Innovation Outcomes by Linkages and Mean Differences (Continued)

		All	Linkages: Under Median	Linkages: Over Median	t-Statistics
		C. Securing New Suppliers			
	Number of Types of Securing New Supplier	2.549	1.893	3.233	-8.446
1	Secured a new local supplier (100% local capital) in survey city	0.636	0.515	0.764	-6.577
2	Secured a new local supplier (100% local capital) in the country outside	0.567	0.472	0.666	-4.876
3	Secured a new Multinational Company (MNC) (100% foreign capital) or joint venture (JV) supplier in survey city	0.174	0.110	0.240	-4.271
4	Secured a new MNC or JV supplier in the country outside survey city	0.162	0.117	0.209	-3.122
5	Secured a new supplier in other ASEAN countries	0.327	0.207	0.453	-6.657
6	Secured a new supplier in other countries in East Asia (China, Japan,	0.380	0.259	0.507	-6.482
7	Secured a new supplier in other foreign countries	0.302	0.214	0.395	-4.953

Table 5: Innovation Outcomes by Linkages and Mean Differences (Continued)

		All	Linkages: Under Median	Linkages: Over Median	t-Statistics
		D. Securing New Customers			
	Number of Types of Securing New Customer	2.742	1.819	3.706	-12.157
1	Secured a new local customer (100% local capital) in survey city	0.653	0.518	0.794	-7.440
2	Secured a new local customer (100% local capital) in the country	0.580	0.443	0.723	-7.251
3	Secured a new MNC or JV customer in survey city	0.307	0.126	0.497	-10.758
4	Secured a new MNC or JV customer in the country	0.218	0.126	0.314	-5.737
5	Secured a new customer in other ASEAN countries	0.271	0.175	0.372	-5.575
6	Secured a new customer in other countries in East Asia (China, Japan, Korea, Taiwan)	0.347	0.191	0.510	-8.736
7	Secured a new customer in other foreign countries	0.365	0.239	0.497	-6.802

Table 6: Number of Linkages and Number of Innovations by R&D

OLS	(1)	(2)	(3)
Dependent variables: Number of Innovations	All	With R&D	Without R&D
Number of Linkages	**0.189****	**0.161****	**0.161****
	[0.027]	**[0.041]**	**[0.031]**
Multinational Enterprises	1.635**	-0.129	2.431**
	[0.464]	[1.267]	[0.518]
Age	0.030+	0.039	0.005
	[0.017]	[0.027]	[0.021]
Full-time Employees	0.003**	0.003**	0.002**
	[0.000]	[0.001]	[0.000]
Indonesia	-3.925**	-3.502**	-3.688**
	[0.570]	[1.077]	[0.718]
Philippines	-1.725**	-0.837	-2.346**
	[0.663]	[0.979]	[0.821]
Vietnam	0.08	0.355	-0.292
	[0.628]	[1.204]	[0.793]
Constant	7.363**	9.111**	7.527**
	[0.647]	[0.961]	[0.811]
Observations	587	128	459
R-squared	0.35992	0.30877	0.35505

Notes:

Robust standard errors in brackets.

+ significant at 10%; * significant at 5%; ** significant at 1%

Reference country is Thailand.

Table 7: Number of Linkages and Number of Innovations

OLS	(1)	(2)	(3)	(4)
Dependent variables: Number of Innovations	All	All	All	All
Number of Linkages	**0.189****			
	[0.027]			
Number of Production Linkages		**0.283****		
		[0.039]		
Number of Intellectual Linkages			**0.428****	
			[0.074]	
Number of Internal Resources				**0.989****
				[0.134]
Multinational Enterprises	1.635**	1.619**	1.697**	1.908**
	[0.464]	[0.462]	[0.471]	[0.451]
Age	0.030+	0.029+	0.032+	0.026
	[0.017]	[0.017]	[0.017]	[0.017]
Full-time Employees	0.003**	0.003**	0.003**	0.002**
	[0.000]	[0.000]	[0.000]	[0.000]
Indonesia	-3.925**	-4.104**	-4.181**	-4.113**
	[0.570]	[0.538]	[0.608]	[0.583]
Philippines	-1.725**	-1.933**	-2.214**	-2.431**
	[0.663]	[0.630]	[0.688]	[0.630]
Vietnam	0.08	-0.862	1.007	-0.951
	[0.628]	[0.595]	[0.742]	[0.608]
Constant	7.363**	7.601**	7.870**	7.605**
	[0.647]	[0.605]	[0.686]	[0.642]
Observations	587	587	587	587
R-squared	0.35992	0.36141	0.3431	0.36584

Notes:
Robust standard errors in brackets.
+ significant at 10%; * significant at 5%; ** significant at 1%
Reference country is Thailand.

Table 8: Number of Linkages and Number of Innovations by Functions

OLS	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variables: Number of Innovations Last 3 years	All	Raw materials	Parts	Final Assembling	Procurement	Marketing
Number of Linkages	**0.189****	**0.239****	**0.162****	**0.191****	**0.293****	**0.249****
	[0.027]	**[0.037]**	**[0.045]**	**[0.037]**	**[0.063]**	**[0.038]**
Multinational Enterprises	1.635**	2.406**	1.810*	1.428**	-0.332	2.691**
	[0.464]	[0.645]	[0.834]	[0.535]	[0.976]	[0.549]
Age	0.030+	0.046+	0.016	0.048*	-0.026	0.037*
	[0.017]	[0.024]	[0.034]	[0.019]	[0.049]	[0.018]
Full-time Employees	0.003**	0.002**	0.002**	0.002**	0.005**	0.003**
	[0.000]	[0.001]	[0.001]	[0.000]	[0.001]	[0.001]
Indonesia	-3.925**	-3.874**	-5.053**	-3.797**	-4.518**	-2.814*
	[0.570]	[1.112]	[1.110]	[0.772]	[1.667]	[1.261]
Philippines	-1.725**	-1.531	-2.117	-1.488	0.606	1.411
	[0.663]	[1.187]	[1.343]	[0.912]	[1.770]	[1.361]
Vietnam	0.080	-0.222	-1.164	0.793	-0.535	0.092
	[0.628]	[1.175]	[1.235]	[0.827]	[1.846]	[1.298]
Constant	7.363**	6.737**	8.907**	7.059**	6.382**	6.041**
	[0.647]	[1.157]	[1.270]	[0.898]	[1.760]	[1.401]
Observations	587	272	167	419	146	253
R-squared	0.360	0.407	0.402	0.346	0.318	0.500

Notes:
Robust standard errors in brackets.
+ significant at 10%; * significant at 5%; ** significant at 1%
Reference country is Thailand.

Table 9: Number of Linkages and Number of Product Innovations

Ordered Logit	(1)	(2)	(3)	(4)
Dependent variables: Number of Innovations in Introducing New Product (0, 1, 2, 3)	All	All	All	All
Number of Linkages	**0.031****			
	[0.012]			
Number of Production Linkages		**0.042***		
		[0.017]		
Number of Intellectual Linkages			**0.088***	
			[0.035]	
Number of Internal Resources				**0.298****
				[0.065]
Multinational Enterprises	-0.589*	-0.587*	-0.585*	-0.512*
	[0.238]	[0.238]	[0.239]	[0.238]
Age	0.007	0.007	0.008	0.007
	[0.007]	[0.007]	[0.008]	[0.007]
Full-time Employees	0.001**	0.001**	0.001**	0.001**
	[0.000]	[0.000]	[0.000]	[0.000]
Indonesia	-0.388	-0.453	-0.35	-0.172
	[0.294]	[0.282]	[0.304]	[0.281]
Philippines	0.303	0.218	0.335	0.523+
	[0.314]	[0.300]	[0.323]	[0.281]
Vietnam	-0.636*	-0.807**	-0.368	-0.686*
	[0.321]	[0.298]	[0.376]	[0.294]
Observations	587	587	587	587

Notes:

Robust standard errors in brackets.

+ significant at 10%; * significant at 5%; ** significant at 1%

Reference country is Thailand.

Table 10: Number of Linkages and Number of Product Innovations by R&D

Orderd Logit	(1)	(2)	(3)
Dependent variables: Number of Innovations in Introducing New Product (0, 1, 2, 3)	All	With R&D	Without R&D
Number of Linkages	**0.031****	0.007	**0.038+**
	[0.012]	[0.019]	**[0.020]**
Multinational Enterprises	-0.589*	0.115	-0.45
	[0.238]	[0.523]	[0.311]
Age	0.007	-0.005	0.006
	[0.007]	[0.011]	[0.010]
Full-time Employees	0.001**	0	0.001**
	[0.000]	[0.000]	[0.000]
Indonesia	-0.388	-0.786	0.038
	[0.294]	[0.622]	[0.447]
Philippines	0.303	-0.12	0.541
	[0.314]	[0.461]	[0.529]
Vietnam	-0.636*	0.521	-0.63
	[0.321]	[0.455]	[0.485]
Observations	587	128	459

Notes:

Robust standard errors in brackets.

+ significant at 10%; * significant at 5%; ** significant at 1%

Reference country is Thailand.

Table 11: Number of Production Linkages and Number of Product Innovations by R&D

Orderd Logit	(1)	(2)	(3)
Dependent variables: Number of Innovations in Introducing New Product (0, 1, 2, 3)	All	With R&D	Without R&D
Number of Production Linkages	**0.042***	0.009	0.047
	[0.017]	[0.029]	[0.028]
Multinational Enterprises	-0.587*	0.117	-0.446
	[0.238]	[0.522]	[0.310]
Age	0.007	-0.005	0.006
	[0.007]	[0.011]	[0.010]
Full-time Employees	0.001**	0	0.001**
	[0.000]	[0.000]	[0.000]
Indonesia	-0.453	-0.799	-0.091
	[0.282]	[0.617]	[0.411]
Philippines	0.218	-0.134	0.362
	[0.300]	[0.455]	[0.484]
Vietnam	-0.807**	0.485	-0.873*
	[0.298]	[0.439]	[0.427]
Observations	587	128	459

Notes:

Robust standard errors in brackets.

+ significant at 10%; * significant at 5%; ** significant at 1%

Reference country is Thailand.

Table 12: Number of Intellectual Linkages and Number of Product Innovations by R&D

Orderd Logit	(1)	(2)	(3)
Dependent variables: Number of Innovations in Introducing New Product (0, 1, 2, 3)	All	With R&D	Without R&D
Number of Intellectual Linkages	**0.088***	0.02	**0.115***
	[0.035]	[0.057]	**[0.055]**
Multinational Enterprises	-0.585*	0.117	-0.455
	[0.239]	[0.520]	[0.313]
Age	0.008	-0.005	0.006
	[0.008]	[0.012]	[0.010]
Full-time Employees	0.001**	0	0.001**
	[0.000]	[0.000]	[0.000]
Indonesia	-0.35	-0.766	0.116
	[0.304]	[0.636]	[0.453]
Philippines	0.335	-0.11	0.637
	[0.323]	[0.475]	[0.529]
Vietnam	-0.368	0.584	-0.239
	[0.376]	[0.530]	[0.587]
Observations	587	128	459

Notes:

Robust standard errors in brackets.

+ significant at 10%; * significant at 5%; ** significant at 1%

Reference country is Thailand.

Table 13: Number of Internal Sources and Number of Product Innovations by R&D

Orderd Logit	(1)	(2)	(3)
Dependent variables: Number of Innovations in Introducing New Product (0, 1, 2, 3)	All	With R&D	Without R&D
Number of Internal Sources	**0.298****	0.233	**0.212***
	[0.065]	[0.153]	**[0.103]**
Multinational Enterprises	-0.512*	-0.042	-0.422
	[0.238]	[0.516]	[0.310]
Age	0.007	-0.002	0.007
	[0.007]	[0.013]	[0.010]
Full-time Employees	0.001**	0	0.001**
	[0.000]	[0.000]	[0.000]
Indonesia	-0.172	-0.735	0.014
	[0.281]	[0.597]	[0.399]
Philippines	0.523+	0.064	0.466
	[0.281]	[0.418]	[0.453]
Vietnam	-0.686*	0.386	-0.790+
	[0.294]	[0.454]	[0.426]
Observations	587	128	459

Notes:
Robust standard errors in brackets.
+ significant at 10%; * significant at 5%; ** significant at 1%
Reference country is Thailand.

Table 14: Number of Linkages and Number of Product Innovations by Functions

Ordered Logit	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variables: Number of Innovations in Introducing New Product (0, 1, 2, 3)	All	Raw materials	Parts	Final Assembling	Procurement	Marketing
Number of Linkages	**0.031****	**0.058***	0.015	**0.037****	**0.041+**	**0.069****
	[0.012]	**[0.024]**	[0.024]	**[0.014]**	**[0.023]**	**[0.024]**
Multinational Enterprises	-0.589*	-0.614	-0.841+	-0.797**	-0.314	-1.648**
	[0.238]	[0.412]	[0.434]	[0.292]	[0.467]	[0.428]
Age	0.007	0.013	0.004	0.013	-0.014	0.024*
	[0.007]	[0.011]	[0.021]	[0.009]	[0.018]	[0.012]
Full-time Employees	0.001**	0.001+	0.001**	0.001**	0.001*	0.001*
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Indonesia	-0.388	0.697	-1.052+	-0.622+	-0.606	-0.019
	[0.294]	[0.578]	[0.601]	[0.342]	[0.765]	[0.808]
Philippines	0.303	1.614*	0.530	0.107	-0.887	1.109
	[0.314]	[0.723]	[0.666]	[0.354]	[0.624]	[0.900]
Vietnam	-0.636*	-0.162	-0.438	-0.568	-1.362+	-0.071
	[0.321]	[0.687]	[0.645]	[0.358]	[0.750]	[0.824]
Observations	587	272	167	419	146	253

Notes:
Robust standard errors in brackets.
+ significant at 10%; * significant at 5%; ** significant at 1%
Reference country is Thailand.

Table 15: Number of Linkages and Number of Process Innovations

Ordered Logit	(1)	(2)	(3)	(4)
Dependent variables: Adopted a New Production Method (0, 1, 2, 3)	All	All	All	All
Number of Linkages	0			
	[0.011]			
Number of Production Linkages		0.017		
		[0.017]		
Number of Intellectual Linkages			0.027	
			[0.029]	
Number of Internal Resources				**0.110+**
				[0.060]
Multinational Enterprises	-0.766**	-0.767**	-0.764**	-0.738**
	[0.228]	[0.228]	[0.229]	[0.231]
Age	0.013+	0.013+	0.013+	0.012+
	[0.007]	[0.007]	[0.007]	[0.007]
Full-time Employees	0.002**	0.002**	0.002**	0.002**
	[0.000]	[0.000]	[0.000]	[0.000]
Indonesia	-0.632*	-0.643*	-0.648*	-0.536*
	[0.262]	[0.261]	[0.257]	[0.269]
Philippines	-0.042	-0.056	-0.071	0.041
	[0.295]	[0.296]	[0.283]	[0.278]
Vietnam	-1.330**	-1.388**	-1.269**	-1.338**
	[0.318]	[0.306]	[0.346]	[0.309]
Observations	587	587	587	587

Notes:

Robust standard errors in brackets.

+ significant at 10%; * significant at 5%; ** significant at 1%

Reference country is Thailand.

Table 16 : Number of Linkages and Number of Process Innovations by Functions

Ordered Logit	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variables: Adopted a New Production Method (0, 1, 2, 3)	All	Raw materials	Parts	Final Assembling	Procurement	Marketing
Number of Linkages	0.012	0.030	0.027	0.006	0.042	**0.064****
	[0.011]	[0.019]	[0.024]	[0.015]	[0.026]	**[0.024]**
Multinational Enterprises	-0.766**	-1.190**	-0.200	-0.838**	0.102	-1.981**
	[0.228]	[0.349]	[0.443]	[0.261]	[0.415]	[0.369]
Age	0.013+	0.019*	0.020	0.014+	-0.013	0.024*
	[0.007]	[0.009]	[0.017]	[0.007]	[0.018]	[0.010]
Full-time Employees	0.002**	0.001**	0.001**	0.001**	0.002**	0.001**
	[0.000]	[0.000]	[0.000]	[0.000]	[0.001]	[0.000]
Indonesia	-0.632*	-0.763	-1.047+	-0.579+	-0.656	-0.631
	[0.262]	[0.577]	[0.582]	[0.339]	[0.607]	[0.988]
Philippines	-0.042	-0.085	-0.151	0.000	0.673	0.560
	[0.295]	[0.639]	[0.667]	[0.378]	[0.732]	[1.061]
Vietnam	-1.330**	-1.266*	-1.479*	-1.187**	-1.657*	-0.963
	[0.318]	[0.599]	[0.668]	[0.385]	[0.783]	[1.012]
Observations	587	272	167	419	146	253

Notes:

Robust standard errors in brackets.

+ significant at 10%; * significant at 5%; ** significant at 1%

Reference country is Thailand.

Table 17: Number of Linkages and Number of Process Innovations

Ordered Logit	(1)	(2)	(3)	(4)
Dependent variables: Number of Business Process Improvement (Min:0, Max:3)	All	All	All	All
Number of Linkages	**0.054****			
	[0.013]			
Number of Production Linkages		**0.084****		
		[0.020]		
Number of Intellectual Linkages			**0.113****	
			[0.036]	
Number of Internal Resources				**0.333****
				[0.062]
Multinational Enterprises	1.272**	1.266**	1.286**	1.390**
	[0.219]	[0.220]	[0.219]	[0.225]
Age	0.002	0.002	0.003	0.001
	[0.007]	[0.007]	[0.007]	[0.007]
Full-time Employees	0.001**	0.001**	0.001**	0.001**
	[0.000]	[0.000]	[0.000]	[0.000]
Indonesia	-2.041**	-2.087**	-2.118**	-2.003**
	[0.308]	[0.299]	[0.315]	[0.301]
Philippines	-0.907**	-0.939**	-1.092**	-1.001**
	[0.328]	[0.317]	[0.330]	[0.286]
Vietnam	-0.991**	-1.255**	-0.766*	-1.232**
	[0.319]	[0.308]	[0.361]	[0.299]
Observations	587	587	587	587

Notes:
Robust standard errors in brackets.
+ significant at 10%; * significant at 5%; ** significant at 1%
Reference country is Thailand.

Table 18 : Number of Linkages and Number of Product Innovations by Functions

Ordered Logit	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variables: Number of Business Process Improvement (Min:0, Max:3)	All	Raw materials	Parts	Final Assembling	Procurement	Marketing
Number of Linkages	**0.054****	**0.099****	**0.079***	**0.052****	**0.072+**	**0.088****
	[0.013]	**[0.023]**	**[0.031]**	**[0.017]**	**[0.037]**	**[0.021]**
Multinational Enterprises	1.272**	1.735**	1.303**	1.200**	1.022*	1.974**
	[0.219]	[0.324]	[0.377]	[0.266]	[0.415]	[0.358]
Age	0.002	-0.004	-0.005	0.012	0.010	0.001
	[0.007]	[0.010]	[0.018]	[0.008]	[0.015]	[0.010]
Full-time Employees	0.001**	0.001**	0.001**	0.001**	0.002**	0.001**
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Indonesia	-2.041**	-0.906	-2.395**	-1.944**	-2.011*	-3.021*
	[0.308]	[0.631]	[0.649]	[0.404]	[0.920]	[1.193]
Philippines	-0.907**	0.187	-0.460	-0.894*	-0.151	-1.197
	[0.328]	[0.730]	[0.655]	[0.418]	[0.927]	[1.224]
Vietnam	-0.991**	-0.491	-1.757**	-0.644	-0.536	-2.202+
	[0.319]	[0.655]	[0.627]	[0.415]	[0.827]	[1.215]
Observations	587	272	167	419	146	253

Notes:
Robust standard errors in brackets.
+ significant at 10%; * significant at 5%; ** significant at 1%
Reference country is Thailand.

Table 19: Number of Linkages and Number of Process Innovations

Ordered Logit	(1)	(2)	(3)	(4)
Dependent variables: Number of Securing New Suppliers of Raw Materials and Parts (Min:0, Max:7)	All	All	All	All
Number of Linkages	**0.061****			
	[0.011]			
Number of Production Linkages		**0.091****		
		[0.016]		
Number of Intellectual Linkages			**0.139****	
			[0.029]	
Number of Internal Resources				**0.347****
				[0.060]
Multinational Enterprises	1.041**	1.032**	1.061**	1.152**
	[0.219]	[0.218]	[0.220]	[0.219]
Age	0.008	0.007	0.009	0.005
	[0.008]	[0.008]	[0.008]	[0.008]
Full-time Employees	0.001**	0.001**	0.001**	0.000*
	[0.000]	[0.000]	[0.000]	[0.000]
Indonesia	-0.905**	-0.961**	-0.964**	-0.880**
	[0.246]	[0.242]	[0.246]	[0.259]
Philippines	-0.191	-0.253	-0.319	-0.29
	[0.263]	[0.259]	[0.266]	[0.280]
Vietnam	0.985**	0.687*	1.296**	0.733**
	[0.273]	[0.269]	[0.300]	[0.280]
Observations	587	587	587	587

Notes:
Robust standard errors in brackets.
+ significant at 10%; * significant at 5%; ** significant at 1%
Reference country is Thailand.

Table 20: Number of Linkages and Number of Securing New Suppliers by Functions

Ordered Logit	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variables: Number of Securing New Suppliers of Raw Materials and Parts (Min:0, Max:7)	All	Raw materials	Parts	Final Assembling	Procurement	Marketing
Number of Linkages	**0.061****	**0.077****	**0.041***	**0.063****	**0.110****	**0.075****
	[0.011]	**[0.018]**	**[0.019]**	**[0.016]**	**[0.024]**	**[0.024]**
Multinational Enterprises	1.041**	1.336**	1.272**	1.069**	0.037	2.017**
	[0.219]	[0.298]	[0.418]	[0.273]	[0.382]	[0.356]
Age	0.008	0.018+	0.008	0.014	-0.017	0.008
	[0.008]	[0.010]	[0.019]	[0.010]	[0.018]	[0.015]
Full-time Employees	0.001**	0.000	0.000	0.000	0.002**	0.001
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.001]
Indonesia	-0.905**	-1.007+	-0.771	-0.748*	-1.582*	-0.536
	[0.246]	[0.599]	[0.539]	[0.339]	[0.649]	[0.848]
Philippines	-0.191	-0.190	-0.050	-0.063	0.034	0.997
	[0.263]	[0.617]	[0.586]	[0.368]	[0.673]	[0.864]
Vietnam	0.985**	0.784	0.843	1.339**	0.215	1.483+
	[0.273]	[0.631]	[0.592]	[0.383]	[0.719]	[0.850]
Observations	587	272	167	419	146	253

Notes:
Robust standard errors in brackets.
+ significant at 10%; * significant at 5%; ** significant at 1%
Reference country is Thailand.

Table 21: Number of Linkages and Number of Securing New Customer

Ordered Logit	(1)	(2)	(3)	(4)
Dependent variables: Number of Securing New Customers (Min:0, Max:7)	All	All	All	All
Number of Linkages	**0.076****			
	[0.012]			
Number of Production Linkages		**0.116****		
		[0.018]		
Number of Intellectual Linkages			**0.163****	
			[0.032]	
Number of Internal Resources				**0.307****
				[0.062]
Multinational Enterprises	0.486*	0.467*	0.518*	0.562**
	[0.221]	[0.220]	[0.222]	[0.213]
Age	0.011	0.011	0.012+	0.01
	[0.007]	[0.007]	[0.007]	[0.007]
Full-time Employees	0.000**	0.000*	0.001**	0.000+
	[0.000]	[0.000]	[0.000]	[0.000]
Indonesia	-1.502**	-1.574**	-1.597**	-1.665**
	[0.257]	[0.247]	[0.268]	[0.277]
Philippines	-1.328**	-1.406**	-1.516**	-1.745**
	[0.283]	[0.274]	[0.296]	[0.296]
Vietnam	0.445+	0.068	0.783**	0.007
	[0.261]	[0.258]	[0.301]	[0.271]
Observations	587	587	587	587

Notes:

Robust standard errors in brackets.

+ significant at 10%; * significant at 5%; ** significant at 1%

Reference country is Thailand.

Table 22: Number of Linkages and Number of Securing New Customer by Functions

Ordered Logit	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variables: Number of Securing New Customers (Min:0, Max:7)	All	Raw materials	Parts	Final Assembling	Procurement	Marketing
Number of Linkages	**0.076****	**0.077****	**0.049***	**0.077****	**0.106****	**0.117****
	[0.012]	**[0.021]**	**[0.024]**	**[0.016]**	**[0.030]**	**[0.027]**
Multinational Enterprises	0.486*	0.747*	0.293	0.561*	-0.709+	1.737**
	[0.221]	[0.337]	[0.397]	[0.262]	[0.405]	[0.306]
Age	0.011	0.015	0.004	0.017*	-0.008	0.016+
	[0.007]	[0.009]	[0.017]	[0.008]	[0.020]	[0.009]
Full-time Employees	0.000**	0.000	0.000	0.000	0.001*	0.001**
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Indonesia	-1.502**	-2.369**	-2.558**	-1.480**	-1.039	-1.257
	[0.257]	[0.699]	[0.529]	[0.337]	[0.765]	[1.012]
Philippines	-1.328**	-2.236**	-2.190**	-1.203**	0.345	0.410
	[0.283]	[0.725]	[0.657]	[0.372]	[0.831]	[1.026]
Vietnam	0.445+	-0.419	-0.157	0.605+	0.747	0.459
	[0.261]	[0.675]	[0.540]	[0.357]	[0.828]	[0.987]
Observations	587	272	167	419	146	253

Notes:

Robust standard errors in brackets.

+ significant at 10%; * significant at 5%; ** significant at 1%

Reference country is Thailand.

Table 23: Geographic Proximity to Customer/Supplier by Capital Tie-up with Customer/Supplier

With Customer	With Supplier	Variable (km)	Obs	Mean	S.D.	Min	Max
No	No	Geographic Proximity to Consumer	498	394.2	435.2	5	1000
		Geographic Proximity to Supplier	462	353.0	415.1	5	1000
Yes	No	Geographic Proximity to Consumer	23	301.2	392.3	5	1000
		Geographic Proximity to Supplier	19	236.9	351.8	5	1000
No	Yes	Geographic Proximity to Consumer	23	428.0	471.8	5	1000
		Geographic Proximity to Supplier	23	182.5	316.7	5	1000
Yes	Yes	Geographic Proximity to Consumer	40	514.2	471.9	5	1000
		Geographic Proximity to Supplier	41	374.8	449.7	5	1000

Table 24: Geographic Proximity to Customer/Supplier by Customized Goods Transaction with Customer/Supplier

With Customer	With Supplier	Variable (km)	Obs	Mean	S.D.	Min	Max
No	No	Geographic Proximity to Consumer	182	353.9	428.8	5	1000
		Geographic Proximity to Supplier	154	206.0	330.7	5	1000
Yes	No	Geographic Proximity to Consumer	80	276.5	363.8	5	1000
		Geographic Proximity to Supplier	67	217.8	339.3	5	1000
No	Yes	Geographic Proximity to Consumer	26	332.7	385.0	5	1000
		Geographic Proximity to Supplier	28	462.1	437.4	5	1000
Yes	Yes	Geographic Proximity to Consumer	296	467.8	456.1	5	1000
		Geographic Proximity to Supplier	296	432.1	438.3	5	1000

Table 25: Geographic Proximity to Customer/Supplier by JIT with Customer/Supplier

With Customer	With Supplier	Variable (km)	Obs	Mean	S.D.	Min	Max
No	No	Geographic Proximity to Consumer	307	448.9	445.9	5	1000
		Geographic Proximity to Supplier	289	442.8	435.4	5	1000
Yes	No	Geographic Proximity to Consumer	71	391.3	442.4	5	1000
		Geographic Proximity to Supplier	45	172.5	341.9	5	1000
No	Yes	Geographic Proximity to Consumer	15	294.6	440.9	5	1000
		Geographic Proximity to Supplier	18	369.2	439.9	5	1000
Yes	Yes	Geographic Proximity to Consumer	191	333.1	415.9	5	1000
		Geographic Proximity to Supplier	193	232.0	348.1	5	1000

Table 26: Geographic Proximity to Customer/Supplier by Accept Engineers from Customer/Supplier

From Customer	From Supplier	Variable (km)	Obs	Mean	S.D.	Min	Max
No	No	Geographic Proximity to Consumer	359	318.5	403.2	5	1000
No	No	Geographic Proximity to Supplier	331	237.6	340.1	5	1000
Yes	No	Geographic Proximity to Consumer	64	319.3	404.1	5	1000
Yes	No	Geographic Proximity to Supplier	57	368.6	404.7	5	1000
No	Yes	Geographic Proximity to Consumer	23	282.8	389.2	5	1000
No	Yes	Geographic Proximity to Supplier	23	501.4	454.1	5	1000
Yes	Yes	Geographic Proximity to Consumer	138	669.4	443.5	5	1000
Yes	Yes	Geographic Proximity to Supplier	134	567.0	474.8	5	1000

Table 27: Geographic Proximity to Customer/Supplier by Dispatch Engineers to Customer/Supplier

To Customer	To Supplier	Variable (km)	Obs	Mean	S.D.	Min	Max
No	No	Geographic Proximity to Consumer	439	391.4	434.3	5	1000
No	No	Geographic Proximity to Supplier	407	342.2	409.5	5	1000
Yes	No	Geographic Proximity to Consumer	48	295.5	397.3	5	1000
Yes	No	Geographic Proximity to Supplier	41	361.1	418.8	5	1000
No	Yes	Geographic Proximity to Consumer	20	454.0	463.7	18	1000
No	Yes	Geographic Proximity to Supplier	23	315.8	406.0	5	1000
Yes	Yes	Geographic Proximity to Consumer	77	500.6	464.3	5	1000
Yes	Yes	Geographic Proximity to Supplier	74	348.7	439.9	5	1000

Table 28: Geographic Proximity to Customer/Supplier by Importance of Customer/Supplier as Innovation Partner

Customer	Supplier	Variable (km)	Obs	Mean	S.D.	Min	Max
No	No	Geographic Proximity to Consumer	173	369.9	420.5	5	1000
No	No	Geographic Proximity to Supplier	162	389.8	426.1	5	1000
Yes	No	Geographic Proximity to Consumer	341	444.5	450.0	5	1000
Yes	No	Geographic Proximity to Supplier	312	367.8	427.5	5	1000
No	Yes	Geographic Proximity to Consumer	15	244.7	358.0	18	1000
No	Yes	Geographic Proximity to Supplier	16	90.4	107.7	5	350
Yes	Yes	Geographic Proximity to Consumer	55	261.9	399.1	5	1000
Yes	Yes	Geographic Proximity to Supplier	55	141.8	229.3	5	1000

Table 29: Engineer Acceptance from Customers/Suppliers and Introduction of New Good

Probit (Marginal Effects)	(1)	(2)	(3)	(4)	(5)
Dependent variables: Introduction of New Good (Yes/No)	All	Customer makes Customized Product	Customer makes Standard Product	Supplier makes Customized Product	Supplier makes Standard Product
Accept Engineers from Customer	-0.039	-0.024	-0.017	0.024	-0.076
	[0.067]	[0.085]	[0.115]	[0.097]	[0.098]
Accept Engineers from Supplier	0.104	0.059	**0.329****	-0.038	**0.343****
	[0.069]	[0.083]	**[0.105]**	[0.090]	**[0.081]**
Multinational Enterprises	-0.179**	-0.234**	-0.041	-0.162*	-0.077
	[0.059]	[0.069]	[0.110]	[0.077]	[0.103]
Age	0.001	0.003	-0.004	0.002	-0.001
	[0.002]	[0.002]	[0.003]	[0.003]	[0.003]
Full-time Employees	0.000**	0.000**	0.000	0.000**	0.000**
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Indonesia	-0.213**	-0.174*	-0.348**	-0.230**	-0.217*
	[0.059]	[0.075]	[0.099]	[0.075]	[0.095]
Philippines	-0.068	-0.103	-0.053	-0.133	-0.093
	[0.062]	[0.085]	[0.091]	[0.089]	[0.083]
Vietnam	-0.249**	-0.253**	0.334*	-0.320**	0.217+
	[0.070]	[0.087]	[0.149]	[0.089]	[0.132]
Observations	587	376	211	325	262

Notes:
Robust standard errors in brackets.
+ significant at 10%; * significant at 5%; ** significant at 1%
Reference country is Thailand.

Table 30: Engineer Dispatch to Customers/Suppliers and Introduction of New Good

Probit (Marginal Effects)	(1)	(2)	(3)	(4)	(5)
Dependent variables: Introduction of New Good (Yes/No)	All	Customer makes Customized Product	Customer makes Standard Product	Supplier makes Customized Product	Supplier makes Standard Product
Dispatch Engineers to Customer	**0.122+**	**0.153+**	0.054	0.116	0.078
	[0.067]	**[0.080]**	[0.133]	[0.093]	[0.106]
Dispatch Engineers to Supplier	0.124	0.124	0.104	0.046	**0.248***
	[0.077]	[0.098]	[0.132]	[0.108]	**[0.100]**
Multinational Enterprises	-0.158**	-0.224**	0.020	-0.170*	-0.044
	[0.056]	[0.065]	[0.103]	[0.070]	[0.101]
Age	0.001	0.003	-0.003	0.002	-0.001
	[0.002]	[0.002]	[0.003]	[0.003]	[0.003]
Full-time Employees	0.000**	0.000**	0.000*	0.000*	0.000*
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Indonesia	-0.223**	-0.191*	-0.321**	-0.234**	-0.204*
	[0.059]	[0.076]	[0.101]	[0.075]	[0.095]
Philippines	-0.107+	-0.158+	-0.047	-0.153+	-0.097
	[0.063]	[0.083]	[0.091]	[0.088]	[0.082]
Vietnam	-0.265**	-0.278**	0.303+	-0.321**	0.178
	[0.064]	[0.080]	[0.162]	[0.082]	[0.141]
Observations	587	376	211	325	262

Notes:
Robust standard errors in brackets.
+ significant at 10%; * significant at 5%; ** significant at 1%
Reference country is Thailand.

Table 31: Engineer Acceptance from Customers/Suppliers and Improved Existing Machines

Probit (Marginal Effects)	(1)	(2)	(3)	(4)	(5)
Dependent variables: Improved Existing Machines (Yes/No)	All	Customer makes Customized Product	Customer makes Standard Product	Supplier makes Customized Product	Supplier makes Standard Product
Accept Engineers from Customer	0.050	0.082	-0.023	0.116	0.004
	[0.062]	[0.083]	[0.100]	[0.101]	[0.074]
Accept Engineers from Supplier	-0.059	**-0.140+**	**0.173***	**-0.242***	**0.191****
	[0.065]	**[0.081]**	**[0.080]**	**[0.094]**	**[0.053]**
Multinational Enterprises	-0.219**	-0.277**	-0.089	-0.198*	-0.146
	[0.061]	[0.074]	[0.113]	[0.085]	[0.106]
Age	0.003	0.004	0.000	0.006+	-0.001
	[0.002]	[0.003]	[0.003]	[0.003]	[0.002]
Full-time Employees	0.000**	0.000**	0.000*	0.000**	0.000**
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Indonesia	-0.053	-0.114	-0.073	0.046	-0.190+
	[0.067]	[0.094]	[0.104]	[0.093]	[0.097]
Philippines	-0.056	-0.115	-0.030	-0.031	-0.126+
	[0.064]	[0.104]	[0.080]	[0.109]	[0.068]
Vietnam	-0.293**	-0.351**	0.048	-0.263*	-0.063
	[0.082]	[0.103]	[0.159]	[0.113]	[0.136]
Observations	587	376	211	325	262

Notes:
Robust standard errors in brackets.
+ significant at 10%; * significant at 5%; ** significant at 1%
Reference country is Thailand.

Table 32: Engineer Disptach to Customers/Suppliers and Improved Existing Machines

Probit (Marginal Effects)	(1)	(2)	(3)	(4)	(5)
Dependent variables: Improved Existing Machines (Yes/No)	All	Customer makes Customized Product	Customer makes Standard Product	Supplier makes Customized Product	Supplier makes Standard Product
Dispatch Engineers to Customer	**0.118+**	**0.139+**	0.020	**0.173+**	0.027
	[0.060]	**[0.074]**	[0.121]	**[0.089]**	[0.076]
Dispatch Engineers to Supplier	**0.115+**	0.106	0.136	0.048	**0.157****
	[0.065]	[0.087]	[0.099]	[0.112]	**[0.060]**
Multinational Enterprises	-0.237**	-0.316**	-0.061	-0.278**	-0.114
	[0.058]	[0.068]	[0.110]	[0.074]	[0.103]
Age	0.002	0.003	0.001	0.005	-0.001
	[0.002]	[0.003]	[0.003]	[0.003]	[0.002]
Full-time Employees	0.000**	0.000**	0.000*	0.000**	0.000**
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Indonesia	-0.062	-0.118	-0.060	0.054	-0.183+
	[0.067]	[0.095]	[0.101]	[0.092]	[0.095]
Philippines	-0.089	-0.152	-0.041	-0.036	-0.125+
	[0.064]	[0.104]	[0.081]	[0.107]	[0.069]
Vietnam	-0.298**	-0.348**	0.004	-0.227*	-0.086
	[0.077]	[0.096]	[0.180]	[0.101]	[0.152]
Observations	587	376	211	325	262

Notes:
Robust standard errors in brackets.
+ significant at 10%; * significant at 5%; ** significant at 1%
Reference country is Thailand.

Table 33: Engineer Acceptance from Customers/Suppliers and Adopted ISO

Probit (Marginal Effects)	(1)	(2)	(3)	(4)	(5)
Dependent variables: Adopted ISO (Yes/No)	All	Customer makes Customized Product	Customer makes Standard Product	Supplier makes Customized Product	Supplier makes Standard Product
Accept Engineers from Customer	0.069	0.057	0.131	0.023	0.138
	[0.065]	[0.084]	[0.112]	[0.092]	[0.095]
Accept Engineers from Supplier	**0.250****	**0.249****	**0.261***	**0.279****	**0.196+**
	[0.060]	**[0.073]**	**[0.111]**	**[0.077]**	**[0.101]**
Multinational Enterprises	0.240**	0.247**	0.242*	0.242**	0.269**
	[0.058]	[0.071]	[0.111]	[0.079]	[0.094]
Age	-0.001	-0.002	-0.002	-0.002	-0.002
	[0.002]	[0.003]	[0.003]	[0.003]	[0.003]
Full-time Employees	0.000**	0.000**	0.001**	0.000**	0.000**
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Indonesia	-0.361**	-0.413**	-0.344**	-0.355**	-0.364**
	[0.061]	[0.078]	[0.103]	[0.090]	[0.079]
Philippines	-0.331**	-0.476**	-0.199*	-0.408**	-0.297**
	[0.062]	[0.079]	[0.094]	[0.098]	[0.081]
Vietnam	-0.270**	-0.361**	0.002	-0.279*	-0.208
	[0.078]	[0.097]	[0.230]	[0.109]	[0.133]
Observations	587	376	211	325	262

Notes:
Robust standard errors in brackets.
+ significant at 10%; * significant at 5%; ** significant at 1%
Reference country is Thailand.

Table 34: Engineer Dispatch to Customers/Suppliers and Adopted ISO

Probit (Marginal Effects)	(1)	(2)	(3)	(4)	(5)
Dependent variables: Adopted ISO (Yes/No)	All	Customer makes Customized Product	Customer makes Standard Product	Supplier makes Customized Product	Supplier makes Standard Product
Dispatch Engineers to Customer	**0.193****	**0.190***	**0.226+**	**0.198***	**0.197+**
	[0.067]	**[0.079]**	**[0.124]**	**[0.082]**	**[0.109]**
Dispatch Engineers to Supplier	0.087	0.025	0.178	0.005	**0.207+**
	[0.082]	[0.101]	[0.136]	[0.110]	**[0.116]**
Multinational Enterprises	0.323**	0.342**	0.289**	0.353**	0.291**
	[0.053]	[0.062]	[0.107]	[0.067]	[0.093]
Age	-0.002	-0.003	-0.002	-0.002	-0.001
	[0.002]	[0.002]	[0.004]	[0.003]	[0.003]
Full-time Employees	0.000**	0.000**	0.001**	0.000**	0.000**
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Indonesia	-0.362**	-0.422**	-0.324**	-0.367**	-0.356**
	[0.060]	[0.077]	[0.103]	[0.088]	[0.080]
Philippines	-0.350**	-0.490**	-0.224*	-0.446**	-0.310**
	[0.061]	[0.077]	[0.095]	[0.095]	[0.080]
Vietnam	-0.213**	-0.315**	-0.055	-0.246*	-0.254+
	[0.076]	[0.095]	[0.254]	[0.106]	[0.137]
Observations	587	376	211	325	262

Notes:
Robust standard errors in brackets.
+ significant at 10%; * significant at 5%; ** significant at 1%
Reference country is Thailand.

Table 35: Engineer Acceptance from Customers/Suppliers and Adjust Changes in the Market

Probit (Marginal Effects)	(1)	(2)	(3)	(4)	(5)
Dependent variables: Introduced Internal Acitivities to Adjust Changes in the Market (Yes/No)	All	Customer makes Customized Product	Customer makes Standard Product	Supplier makes Customized Product	Supplier makes Standard Product
Accept Engineers from Customer	0.061	0.102	-0.051	0.138	-0.025
	[0.066]	[0.080]	[0.112]	[0.091]	[0.094]
Accept Engineers from Supplier	**0.332****	**0.336****	**0.368****	**0.308****	**0.367****
	[0.053]	**[0.065]**	**[0.084]**	**[0.077]**	**[0.065]**
Multinational Enterprises	0.140*	0.103	0.201+	0.153+	0.147
	[0.062]	[0.078]	[0.114]	[0.082]	[0.102]
Age	-0.001	-0.002	0.003	0.000	-0.002
	[0.002]	[0.003]	[0.003]	[0.003]	[0.003]
Full-time Employees	0.000**	0.000**	0.000*	0.000**	0.000
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Indonesia	-0.612**	-0.584**	-0.695**	-0.553**	-0.667**
	[0.051]	[0.073]	[0.061]	[0.083]	[0.056]
Philippines	-0.370**	-0.386**	-0.379**	-0.397**	-0.374**
	[0.066]	[0.098]	[0.090]	[0.109]	[0.080]
Vietnam	-0.407**	-0.457**	0.042	-0.400**	-0.346*
	[0.081]	[0.100]	[0.249]	[0.111]	[0.135]
Observations	587	376	211	325	262

Notes:
Robust standard errors in brackets.
+ significant at 10%; * significant at 5%; ** significant at 1%
Reference country is Thailand.

Table 36: Engineer Dispatch to Customers/Suppliers and Adjust Changes in the Market

Probit (Marginal Effects)	(1)	(2)	(3)	(4)	(5)
Dependent variables: Introduced Internal Acitivities to Adjust Changes in the Market (Yes/No)	All	Customer makes Customized Product	Customer makes Standard Product	Supplier makes Customized Product	Supplier makes Standard Product
Dispatch Engineers to Customer	**0.218****	**0.228****	0.113	**0.215****	**0.236****
	[0.059]	**[0.067]**	[0.125]	**[0.079]**	**[0.089]**
Dispatch Engineers to Supplier	**0.150***	0.096	**0.282****	0.117	**0.198+**
	[0.073]	[0.093]	**[0.104]**	[0.103]	**[0.103]**
Multinational Enterprises	0.255**	0.256**	0.252*	0.305**	0.175+
	[0.053]	[0.063]	[0.105]	[0.065]	[0.099]
Age	-0.001	-0.003	0.004	-0.001	-0.002
	[0.002]	[0.003]	[0.003]	[0.003]	[0.003]
Full-time Employees	0.000**	0.000**	0.000*	0.000**	0.000
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Indonesia	-0.613**	-0.595**	-0.681**	-0.560**	-0.658**
	[0.050]	[0.071]	[0.062]	[0.081]	[0.056]
Philippines	-0.399**	-0.406**	-0.408**	-0.449**	-0.385**
	[0.066]	[0.098]	[0.089]	[0.106]	[0.080]
Vietnam	-0.343**	-0.382**	-0.107	-0.312**	-0.423**
	[0.083]	[0.103]	[0.283]	[0.113]	[0.129]
Observations	587	376	211	325	262

Notes:
Robust standard errors in brackets.
+ significant at 10%; * significant at 5%; ** significant at 1%
Reference country is Thailand.

Table 37: JIT with Customers/Suppliers and Adopted ISO

Probit (Marginal Effects)	(1)	(2)	(3)	(4)	(5)
Dependent variables: Adopted ISO (Yes/No)	All	Customer makes Customized Product	Customer makes Standard Product	Supplier makes Customized Product	Supplier makes Standard Product
JIT with Customer	**0.122+**	0.106	**0.245***	**0.225***	0.071
	[0.068]	[0.095]	**[0.100]**	**[0.098]**	[0.092]
JIT with Supplier	-0.041	0.027	**-0.204+**	-0.015	-0.054
	[0.071]	[0.092]	**[0.113]**	[0.100]	[0.099]
Multinational Enterprises	0.310**	0.331**	0.252*	0.350**	0.278**
	[0.053]	[0.063]	[0.104]	[0.068]	[0.089]
Age	-0.002	-0.002	-0.002	-0.002	-0.001
	[0.002]	[0.002]	[0.003]	[0.003]	[0.003]
Full-time Employees	0.000**	0.000**	0.001**	0.000**	0.000**
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Indonesia	-0.375**	-0.464**	-0.301*	-0.466**	-0.344**
	[0.063]	[0.077]	[0.118]	[0.092]	[0.084]
Philippines	-0.322**	-0.483**	-0.153	-0.493**	-0.241**
	[0.063]	[0.079]	[0.100]	[0.092]	[0.082]
Vietnam	-0.149+	-0.265**	0.174	-0.196+	-0.116
	[0.079]	[0.097]	[0.202]	[0.108]	[0.152]
Observations	587	376	211	325	262

Notes:
Robust standard errors in brackets.
+ significant at 10%; * significant at 5%; ** significant at 1%
Reference country is Thailand.

Table 38: JIT with Customers/Suppliers and Adjust Changes in the Market

Probit (Marginal Effects)	(1)	(2)	(3)	(4)	(5)
Dependent variables: Introduced Internal Acitivities to Adjust Changes in the Market (Yes/No)	All	Customer makes Customized Product	Customer makes Standard Product	Supplier makes Customized Product	Supplier makes Standard Product
JIT with Customer	**0.117+**	0.085	**0.206***	0.147	0.114
	[0.066]	[0.090]	**[0.102]**	[0.099]	[0.090]
JIT with Supplier	-0.042	0.030	-0.178	0.014	-0.089
	[0.067]	[0.087]	[0.111]	[0.098]	[0.095]
Multinational Enterprises	0.240**	0.235**	0.238*	0.295**	0.180*
	[0.052]	[0.064]	[0.100]	[0.065]	[0.091]
Age	-0.001	-0.003	0.003	0.000	-0.002
	[0.002]	[0.003]	[0.003]	[0.003]	[0.003]
Full-time Employees	0.000**	0.000**	0.000**	0.000**	0.000*
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Indonesia	-0.606**	-0.608**	-0.661**	-0.603**	-0.637**
	[0.053]	[0.072]	[0.070]	[0.085]	[0.060]
Philippines	-0.361**	-0.378**	-0.347**	-0.457**	-0.325**
	[0.067]	[0.099]	[0.095]	[0.106]	[0.083]
Vietnam	-0.269**	-0.314**	0.147	-0.257*	-0.276+
	[0.085]	[0.103]	[0.202]	[0.113]	[0.155]
Observations	587	376	211	325	262

Notes:
Robust standard errors in brackets.
+ significant at 10%; * significant at 5%; ** significant at 1%
Reference country is Thailand.