Chapter 1

Industrial Agglomeration and Technology Upgrading and Innovation: The Experience of Indonesia

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Industrial Agglomeration and Technology Upgrading and Innovation: The Experience of Indonesia

Dionisius A. Narjoko

Abstract

This study addresses the impact of industrial upgrading on firm performance. It puts forward a general hypothesis which states that linkages of firms with other firms or economic agents, either globally or domestically, should facilitate the upgrading process. The empirical results based on the survey of 150 respondents provide some support to this. In particular, and among others, foreign or joint venture firms seem to have been more successful than domestic firms in conducting industrial upgrading. The study also found some supportive argument based on a few in-depth interviews on the importance of the linkages. Specifically, having an export market orientation and a motivation to improve competitiveness encourages firms to upgrade their production capability, particularly in terms of the technology of their machinery.

Based on the key findings, this study puts forward some policy recommendations. One, the government needs to increase the level of foreign direct investment (FDI) as well as domestic direct investment, and to create a more liberal FDI policy such as non-discriminatory national treatment and liberal negative investment list. This recommendation is consistent with the argument that one possible explanation of the lagging technological development in Indonesia is the deteriorating investment climate after the 1997/98 economic crisis. Two, there is a need to speed up (unilateral) services trade liberalization for Mode 4. This is because the services of consultants seem to still play a crucial role in transferring knowledge and technology. And three, this paper also puts forward the recommendation to make comprehensive reforms in the logistics sector in order to reduce transport cost and improve service quality. Included here is the development of a national strategy on reforming the logistics sector and financing infrastructure projects.

1. INTRODUCTION

Industrial upgrading and innovation activities are important to facilitate industrialization in developing countries. They act as a driver for industrial growth through some channels and ways that improve a country's industrial competitiveness.

Experience from many developing countries indicates that linkages across firms, both internationally and domestically, help firms to upgrade their production capability and to innovate. Indeed, Ernst (2004) has argued and showed that international linkage plays a key determinant for the upgrading, and one of the important channels for this is in the form of a global/international production network (GPN). The East Asian experience suggests that a relatively open international trade and FDI regime facilitates the work and spread of the network. The domestic linkage, meanwhile, usually extends the results of the international linkage through the channelling of domestic trade and production activities, including the forming of many local industrial clusters within countries.

This study addresses this subject, taking the reference of the Indonesian experience. It benefits from the survey conducted in Indonesia for the overall research project. In particular, the study focuses on and asks about the importance of linkages with other firms or economic agents, either internationally or domestically, in determining firm performance in terms of competitiveness. In addition to examining the linkages, this study also draws some important observations from the survey, as a second objective, by describing the key characteristics of the survey's respondents. Assessing the characteristics is useful and contributes to the general literature on technology development in Indonesia.

Meanwhile, the case of Indonesia fits this subject well because of its rapid industrialisation in the past thirty years or so. Local industrial clusters have been developed over the course of this rapid industrial growth, and this study draws from information of some firms in the industrial cluster of the *Jabodetabek* (*Jakarta*, *Bogor*, *Depok*, *Tangerang*, and *Bekasi*) area which is located in the greater Jakarta area in Indonesia.

The rest of this paper is organized as follows. Section 2 briefly reviews the relevant literature, including a few key points about the technological development in Indonesia. Section 3 describes the distribution of firms in the Jabodetabek area while Section 4 describes some basic characteristics of the survey's respondents. Section 5 forms the core of this paper, reporting and discussing several key elements of the survey results. Finally, Section 6 puts forward a number of policy recommendations based on the findings of the study.

2. BRIEF LITERATURE REVIEW

2.1. The Determinants of Industrial Upgrading and Innovation

The study on industrial upgrading is considered to be necessary for developing countries in order for the industrialization process in these countries to allow firms to move up in the overall value chain of industries. To achieve this, developing countries could make use of their abundant FDI (IMF 2004). Thus, the international linkage of the domestic industry, which takes place through trade and production channels, could be a key determinant of industrial upgrading for developing countries (Ernst 2004). In the past decade or so, this has in fact been supported by the rise and surge in regionalism. This international relation may take the form of the global production network (GPN) model of industrial clusters.

Recently, there has been a wide interest in the study of GPN, defined as the nexus of interconnected functions and operations through which goods and services are produced, distributed, and consumed (Henderson et al. 2002). This network uses industrial clusters in each country as the location of the production process. While some studies on this subject are well documented (e.g., Yeung 2008, Dicken et al. 2001, Coe et al. 2004), there is little research on industrial upgrading as one of the consequences of the GPN model of industrial clusters.

This section aims at reviewing the literature concerning the current trend of the GPN production pattern, the model of industrial clusters, and upgrading. To acquire

higher technological and managerial capabilities, it is argued that suppliers from less developed countries should operate in a cluster with complete supporting facilities for trade and industry, including adequate logistics services. As such, a cluster should be developed in order to engage with foreign producers and gain from said engagement. Moreover, this heightened cross-country economic activity should make use of the regionalization recently implemented through the ASEAN Economic Community (AEC), particularly in reducing cross-country distance and expediting the flow of goods and information.

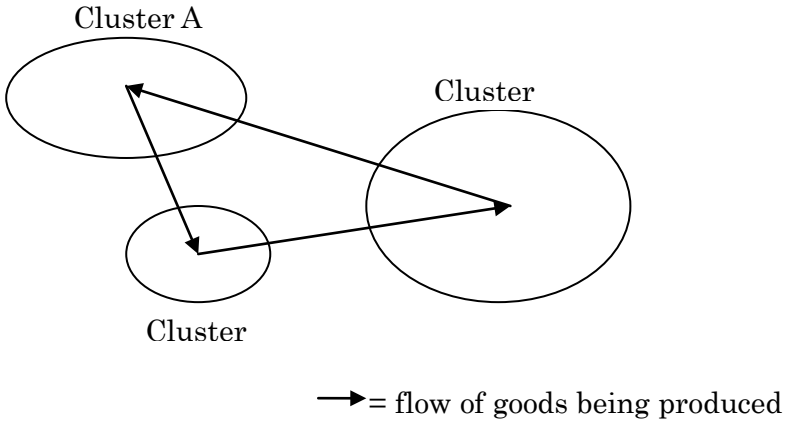
The next section discusses the international production network, more specifically, its elements, advantages, and critical points to be considered to enhance the advantages from the network. It then explains the role of industrial clusters and the criteria of a competitive cluster. The last part of the literature review provides evidence of upgrading as the effect of the production system.

2.2. GPN Model of Industrial Clusters

According to Ernst (2004) and Yeung (2008), a GPN is a geographically dispersed production where each stage of production is located in the most efficient place while industrial clustering is the localization of the operation of the GPN. Figure 1 shows the relationship between the two, whereby each cluster produces different outcomes and may locate in different countries but all clusters are connected in one production network.

Participants in this model involve a transnational company (TNC) as the lead firm and its subsidiaries, strategic partners, suppliers, customers, and non-corporate institutions. Yeung (2008) divides the functions of these participants into two categories: (1) the function of the TNC of conducting research and development (R&D) and arranging for strategic management, marketing, and distribution, and (2) the function of its partners of producing the goods.

Figure 1. Gross Production Network Model of Industrial Cluster



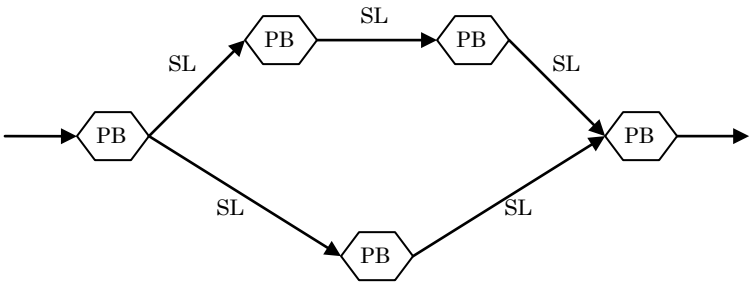
In this model, developing countries usually serve as suppliers for the TNCs. The literature (e.g. Ernst 2000, 2004; Ernst and Kim 2002) also organizes suppliers into two types: higher-tier suppliers, who are capable to manage the global supply chain, possess technology, and likely to have mini production network; and lower-tier suppliers, who have an advantage in low-cost production but do not have investments in technology and are vulnerable to external shocks. This organization of suppliers is important in assessing the upgrading level of domestic industry and its involvement in the international chain of linkages.

One of the advantages of a manufacturing model of this kind is the big possibility of industrial upgrading. Studies indicate that countries participating in this model have industrialized the fastest (Feenstra 1998, Jones and Kierzkowski 2000, Navaretti et al. 2002, as cited in Ernst 2004). The reason may be that this model reduces constraints of international technology spillover as well as increases the need for knowledge diffusion. As TNCs focus in R&D, their technological skills will be reflected in their high-standard demand to their subsidiaries around the world. This encourages the suppliers to upgrade their capability. The requirements for specific production process and competition among suppliers also result in a moving up of firms to the higher level in the value chain.

In order to identify the significant parts of the development of the GPN, one can use the approach of fragmentation theory by Deardoff (2001) which defines the

production network as the split of production into production blocks (PB) where the blocks are connected by service links (SL) as shown in Figure 2. According to this approach, the two main elements that ensure a gain from this model are the lower costs in the service links and in the production blocks (Kimura 2008). Service links such as transportation and telecommunication should not be costly in this production system because the frequency of connection between blocks in this system is high. Thus, service links play an important role in the existence of this fragmented production. With regard to the lower cost in production blocks, it is achieved when manufacturing activity is located in a well-established industrial cluster system.

Figure 2. Fragmented Production



2.3. Industrial Cluster

This study argues that domestic industrial cluster should be developed in order for a country to gain from a GPN. The reason for conducting production activity in a well-established cluster is to deliver competitive and high-quality products. In a cluster, there is a lot of costsaving resulting from proximity and the relatively inexpensive cost of logistic such as easy access to information of products, market condition, and technology.

An internationally linked industrial cluster should be equipped with uncomplicated access to capital, human resource, market, hard and soft infrastructures, and logistics (warehousing, packaging, shipping, and airfreight), and should be supported by a stable macroeconomic condition. These factors should be supported by government policies.

Kuchiki (2005) therefore asserts that the role of government is to deliberately build a cluster on the basis of policies while the TNCs' role is to be the builder of value chain management.

2.4. Industrial Upgrading from the GPN Model of Industrial Clusters

The coverage of upgrading may include the introduction of new products, higher capabilities in design and development, and an improved and more integrated business process system. To be upgraded, firms may carry out the following innovation efforts such as technology search, technology purchases, and expenditure on licensing and consulting services. Ernst (2004) recommends the use of international linkages, namely: collaboration with foreign universities and research institutes in asking for customized training for the firm or industry, collaboration with international consulting firms, and participation in an international peer group network. Another common source of industrial advances is brain circulation where local citizens who have had experiences in industrialized countries return home and make use of what they have learned from industrialized countries. Ernst categorizes two aspects of upgrading: firm-level and industry-level. Firm-level upgrading is when the firm makes the effort to shift from generating low-end to high-end products while industrial-level upgrading is when innovations are conducted by universities and research institutions, without which firm-level upgrading will be difficult.

Both aspects, whenever conducted by firms, are likely to be the result of the engagement of the firms with foreign subcontractors. As mentioned, the TNCs force and/or give opportunity to suppliers to innovate, and industrial clustering enables the innovation to be realized. The position of the manufacturing firms in a cluster makes it possible for the firms to move up in their technological ladder. Thus, the involvement of local companies in a GPN as well as their location in an agglomerated economy may generate a larger value added from their production process.

Past researches show that this phenomenon does happen in East Asia, particularly in the electronics, machinery, and telecommunication industries (Kimura and Ando 2005, Athukorala and Yamashita 2006). A popular example is the electronic production

chain involving Malaysia, Singapore, Thailand, and, to a little extent, the Philippines and Indonesia. Ernst (2004) finds evidence of more sophisticated softwares used in Malaysian firms as a consequence of linkages of local firms with global brand leaders. Ernst also considers four factors affecting the information technology changes in Malaysian electronic firms. One is the operation of US-based manufacturers in the country which had promoted improvements in the technological level of the domestic industry. The arrival of these flagships appears to be a contributing factor in the introduction of new products in the market - although Ernst considers this factor to have created only a limited upgrading in Malaysia. Two is that the acquisition of Asian suppliers by US manufacturers leads to an infusion of new capital and technology by the suppliers. Three is that the FDI coming from Japan and Taiwan for the production of raw materials for computer manufacturing provides upgrading opportunities in product design and supply chain management services for Malaysian companies as the investors' affiliates. And four is that in the midst of severe competition, domestic higher-tier suppliers become more aware of their needs to enable them to move their position up in the hierarchy of vertical integration.

Another example is given by Ernst and Kim (2002) about a global electronics brand leader named Cisco. Thirty-two manufacturing plants worldwide are connected to one another through Cisco. As suppliers, the plants need to obtain certain certifications in order to meet Cisco's requirements. This kind of standard requirements compels small- and medium- companies to enhance the quality of their products and/or business process.

In addition, the textile and clothing industry in Southeast Asia has gained from the GPN in the form of an improvement in technological and industrial capabilities. In the 2000s, the involvement of Hong Kong, Taiwan, and Korea in the GPN of apparel industry decreased whereas that of China and Southeast Asian countries increased. This has led to a change in the role of Asian suppliers in the manufacturing arrangement. Gereffi et al. (2002, as cited in UNIDO 2004) indicate that for over a few decades, the Asian manufacturers have only assembled fabrics according to detailed instruction from buyers. However, in recent years, they have started to move up the value chain by also offering designs of apparels, making samples, sustaining product quality, and meeting

price and other requirements. This movement also works as a learning process for the local producers to deliver competitive consumer goods to the global market.

2.5. Few Key Points on the Technological Development in Indonesia

A very recent paper by a well-respected Indonesian economist, Thee Kian Wie, provides very useful key points on the technology development in Indonesia. The following paragraphs draw from this study (Thee 2006):

First, technology development in Indonesia seems to have lagged behind other developing countries which generally share the same industrialization process as Indonesia. This technological lag is illustrated in Table 1 which shows a low percentage of technology content in Indonesia's manufacturing exports relative to other countries in East Asia. The Table also shows that Indonesia's position is much lower than that of Thailand which has a similar industrial development as Indonesia.

Table 1. Indonesia's High Technology Exports in Regional Perspective, 2003

Country	High technology manufactured exports (US$ billion)	High technology exports as a percentage of total manufactured exports (%)
Indonesia	**4,580**	**14**
Malaysia	47,042	58
Singapore	71,421	59
Thailand	18,203	30
China	107,543	27
South Korea	57,161	32

Note. High technology exports are products with a high R&D intensity, as in aerospace, computers, pharmaceuticals, and scientific instruments.

Source: World Bank: *World Development Indicators, 2005*, table 5.12, pp. 314-8.

Second, the technology adoption that has occurred in the Indonesian industrialization seems to have taken place only marginally. As noted by Thee (2006, p.11), a comparative study on the link between manufactured exports and technological capabilities in Korea, Taiwan, Indonesia, Thailand, and Vietnam (Ernst et al. 1998) shows that even in export-oriented manufacturing firms in Indonesia, there were still limited basic

production or operational capabilities required for the smooth functioning of the plants. Many of these firms adopted only minor changes in their capabilities, specifically with regard to the introduction of minor changes in process technologies to adapt to local conditions, and only a handful developed more sophisticated capabilities.

Third, as argued by Thee (2006, p.19-20), one important factor that might explain the lack of technological development of Indonesia vis-à-vis the other developing countries is the weak investment climate that occurred there after the 1997/98 economic crisis. Unlike the other developing countries such as Malaysia and Thailand, Indonesia experienced deterioration in its investment climate during the post-crisis period. Because of this lack of FDI – often regarded as an important source of technology transfer – Thee argued that many firms in Indonesia were not able to restructure their production capabilities to adjust to changes in the industrial structure after the crisis.

3. DISTRIBUTION OF MANUFACTURING FIRMS IN THE JABODETABEK AREA

Indonesian manufacturers seem to heavily concentrate in the Jabodetabek area which absorbs around 23 percent of the country's total number of manufacturing plants. Data on the geographical distribution of manufacturing firms in Jabodetabek suggest the existence of an agglomeration process in the metropolitan area (see Figure 3). Most industries are gathered outside Jakarta while the city of Jakarta itself functions, to some extent, as a place for the headquarters. In Table 2, majority of the manufacturers operate in Tangerang, Bekasi, Bogor, and North Jakarta. The proportion of industries in the city of Jakarta – in terms of the number of plants – is larger than in terms of the number of total employees. This indicates that the size of plants in Jakarta is somewhat smaller than in the outskirts of Jakarta.

Across Greater Jakarta, there seems to be a division of areas among the five major industries. Most of the firms in the textile and product textile (TPT), wood and wood products (WWP), and food, beverage, and tobacco (FBT) industries operate in Tangerang, Western Jakarta while majority of the firms in the machinery, electronics,

and equipments (MEE), and automobile industries are located in Bekasi, Eastern Jakarta. On the whole, though, Tangerang absorbs more labor than Bekasi. This implies that the TPT, WWP, and FBT industries tend to be more labor-intensive than the MEE and automobile industries.

In addition, the TPT, WWP, and FBT industries seem to be more equally distributed across the metropolitan area than the other two important industries. This might be because the first three industries are easier to be established in terms of location and may not need a vast area and many facilities as the MEE and automobile industries.

Figure 3. Geographical Distribution of Industries by Employment in the Jabodetabek, 2006

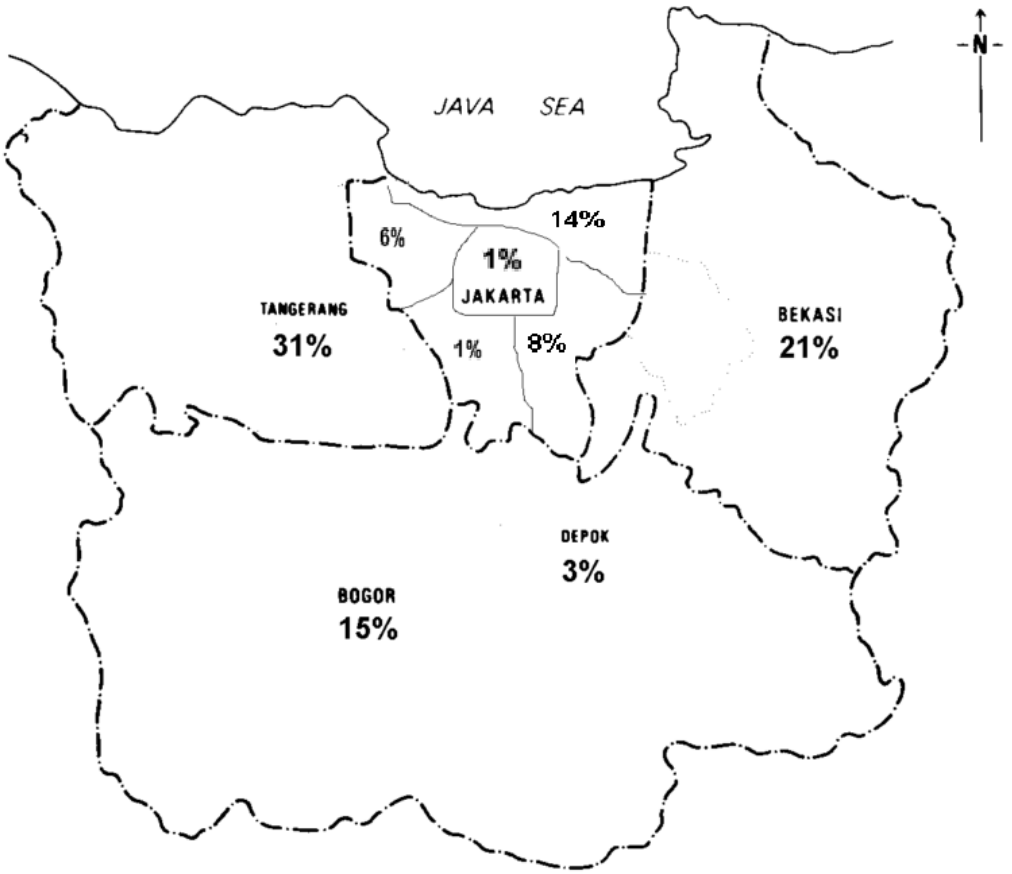


Table 2. Geographical Distribution of Industries in The Jabodetabek, 2006

Sub-region in Jabodetabek	# of plants		# of employees(% of total in Jabodetabek)							
	#	% of total in Jabodetabek	Total in #	Total in %	Food, beverages and tobacco	Textiles and products textile	Wood and wood products	Machinery, electronics and equipments	Automotives	Others
TANGERANG	1675	**25.0%**	420802	**31.2%**	**25.2%**	**36.7%**	**34.7%**	24.6%	14.0%	31.3%
WEST JAKARTA	1039	15.5%	76955	5.7%	7.8%	5.8%	4.4%	3.8%	0.9%	7.2%
CENTRAL JAKARTA	149	2.2%	8711	0.6%	0.4%	0.4%	0.2%	0.2%	0.1%	1.4%
SOUTH JAKARTA	229	3.4%	16994	1.3%	1.3%	1.3%	0.5%	0.2%	0.0%	2.0%
EAST JAKARTA	486	7.2%	108716	8.1%	12.9%	2.6%	6.8%	8.8%	14.9%	12.1%
NORTH JAKARTA	1048	15.6%	194196	14.4%	15.3%	20.0%	12.0%	3.2%	30.6%	8.4%
BEKASI	1094	16.3%	286188	21.2%	18.1%	11.4%	19.0%	**50.7%**	**32.4%**	21.6%
BOGOR	863	12.9%	201124	14.9%	16.8%	18.7%	19.6%	6.7%	6.7%	13.6%
DEPOK	130	1.9%	34208	2.5%	2.1%	3.2%	2.8%	1.9%	0.2%	2.5%
JABODETABEK	6713	100.0%	1347894	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
INDONESIA	29468		4755703							

4. THE SURVEY QUESTIONNAIRE AND CHARACTERISTICS OF THE RESPONDENTS

4.1. The Survey Questionnaire

As mentioned, this study benefits from the survey that is designed for the whole research project on the subject documented in this volume. The questionnaire tries to capture the extent of industrial upgrading and innovation in an agglomerated industrial area. This involves many aspects such as the characteristics of the firms, the nature and characteristics of the research and development conducted by firms, and some geographical aspects (e.g., distance across firms in industrial clusters as well as distance between firms and consumers, the availability of logistics services in the clusters, etc.). In addition, the survey also asks firms on some policy-related questions regarding government assistance for research within firms.

4.2. The Characteristics of the Respondents

This section discusses the firm-level survey of 150 companies operating across Jakarta and the surrounding cities (Jakarta, Bogor, Depok, Tangerang, and Bekasi/Jabodetabek). As Figure 4 shows, around 80 percent of the respondents are locallyowned while the other 20 percent are foreign-owned and joint venture firms whose major investors are Japanese, American, and South Korean (Figure 5). This characteristic jibes with the population level in the Indonesian manufacturing industry where majority of the establishments are local and a substantial number of investors in the industry are Japanese.

Figure 4. Ownership Structure of The Respondents

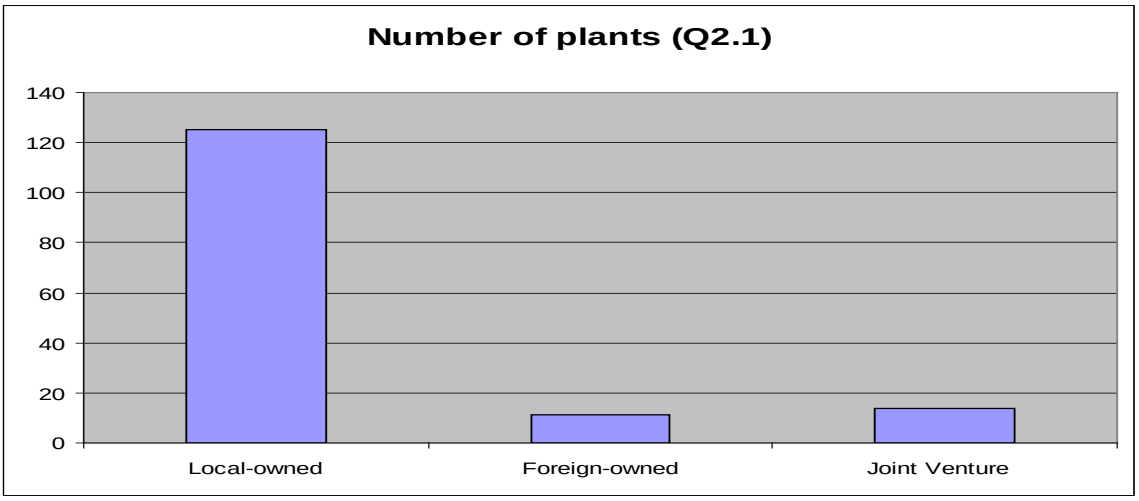
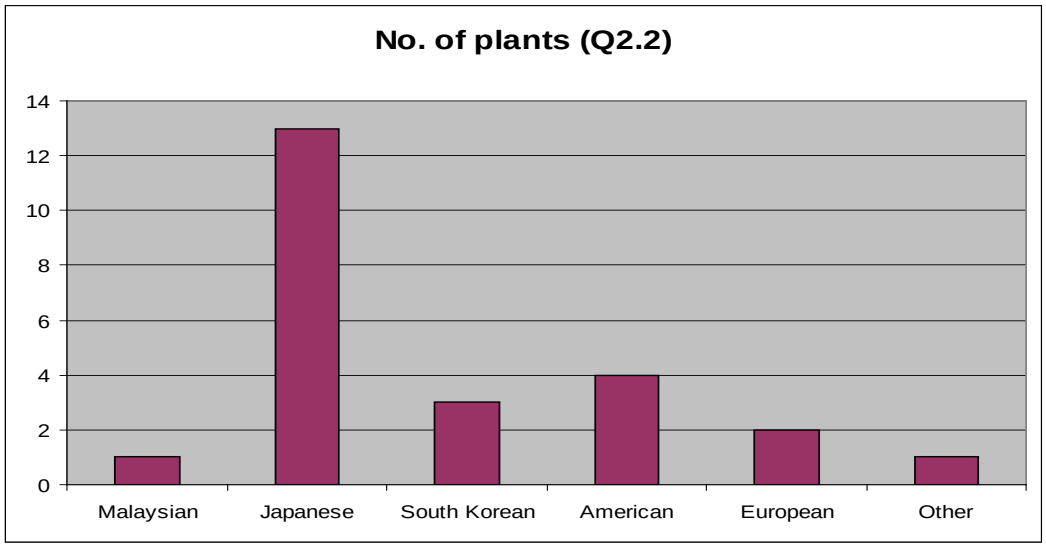


Figure 5. Largest Foreign Investor of Foreign-Owned and Joint Venture Firms



Regarding size of the respondents, the distribution of firms is more equal in terms of total assets rather than in terms of the number of full-time employees. As to total assets, one-sixth of the respondents have US$ 10 million and above while one-tenth manage assets worth between US$ 100 thousand and US$ 500 thousand (Figure 6). In terms of the number of employees, about two-thirds of the respondents are small and medium enterprises or those with less than 200 employees (Figure 7). This feature is consistent with official data showing that local enterprises tend to have a smaller size than foreign-owned enterprises.

Figure 6. Size of the Respondents, by Total Assets

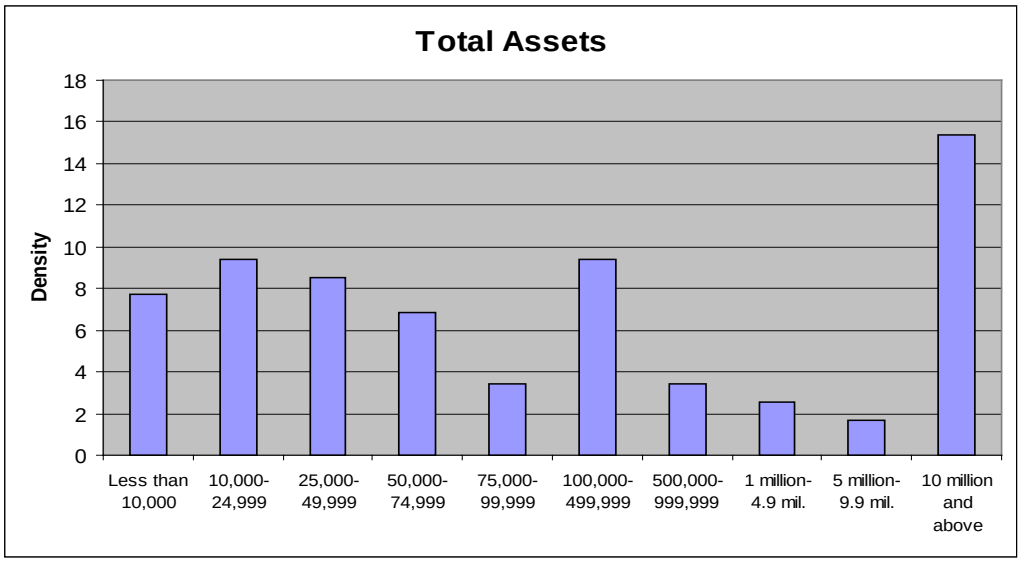
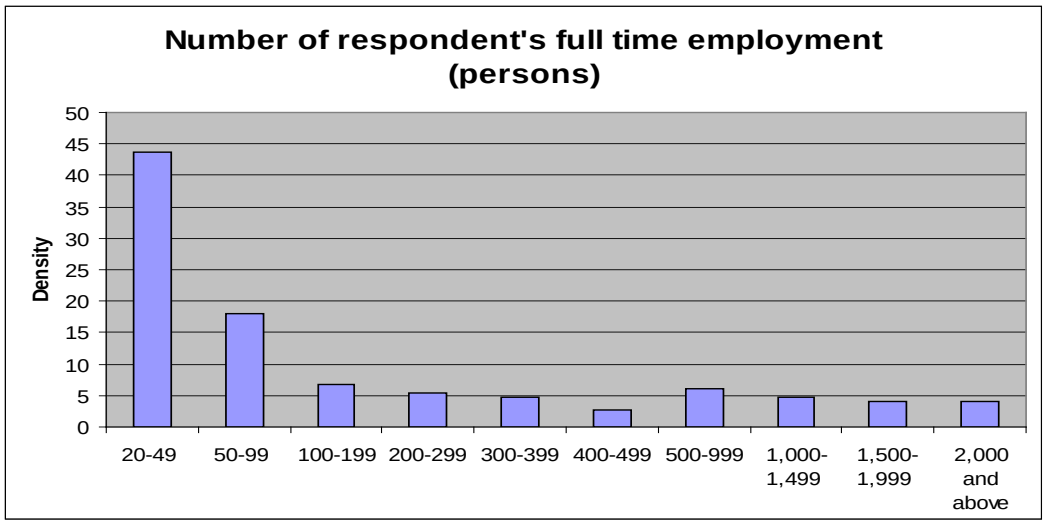


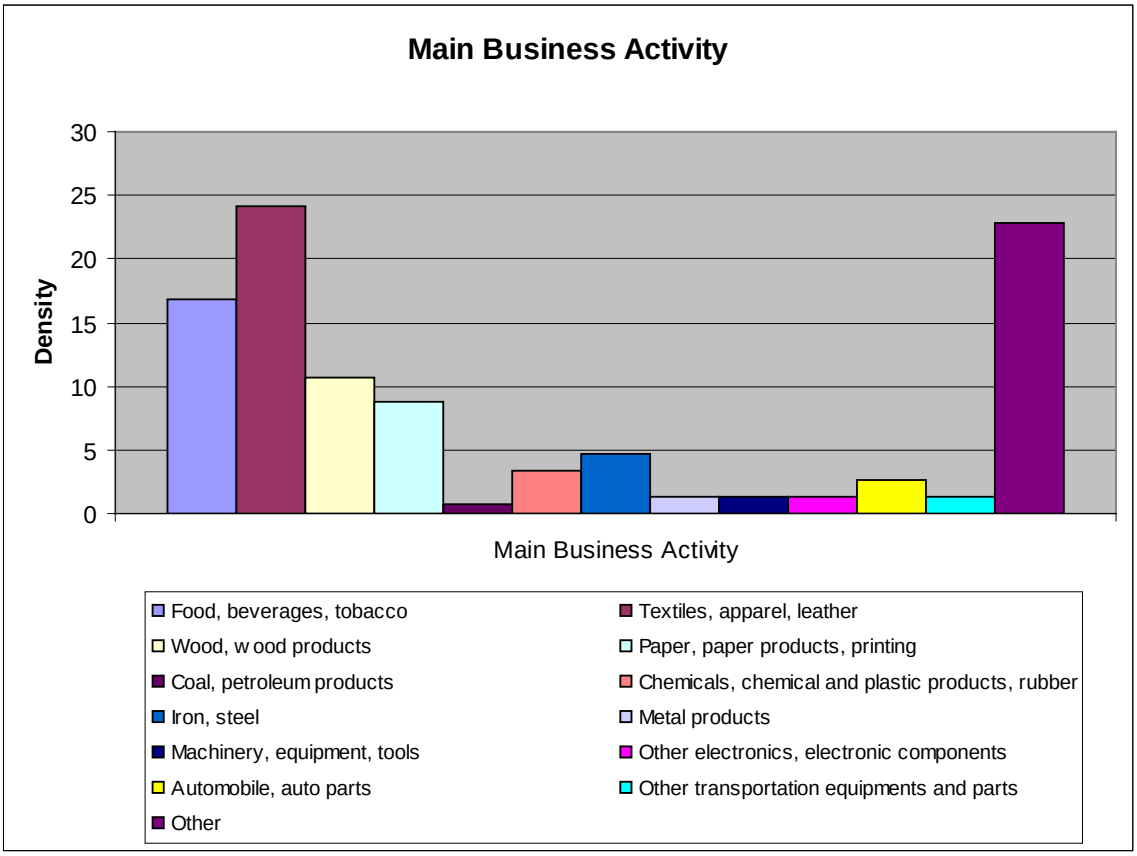
Figure 7. Size of the Respondents, by Number of Full-Time Employee



The respondents' main business activities vary, but most are categorized in the following four subsectors: textiles, apparel and leather; food, beverage and tobacco; wood and wood products; and paper and paper products (Figure 8). This is in line with the structure of the Indonesian economy which heavily relies on labor-intensive industries. Out of 17 categories presented to the respondents, a significant number

among them chose ‘other industries’ as their main business activity. This is probably a result of their not knowing the classification of their products.

Figure 8. Main Business Activities of the Respondents



The presence of an agglomeration economy in the Jabodetabek area may be indicated by observing the supply and output of the respondent firms. Since most respondents are local firms, one may expect that their most important market is also local and not international. From around 140 manufacturers answering “domestic” as their market, approximately 85 percent of them target only Jabodetabek as their most important market (Figure 9). This is similar to the location of the companies’ suppliers. About 100 companies mention that their suppliers are also from this region (Figure10).

Figure 9. Location of Important Target Market

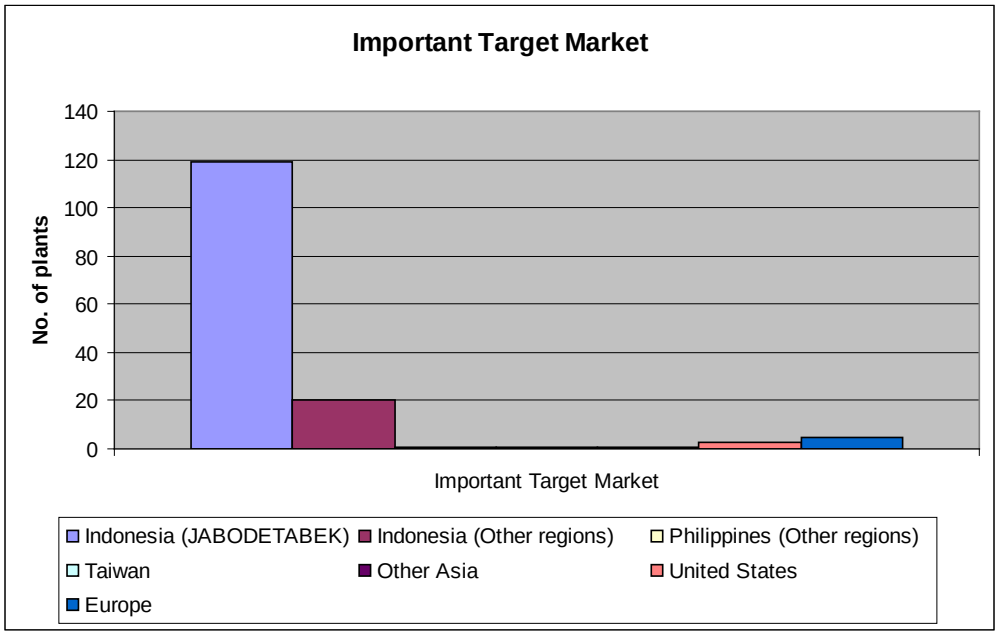
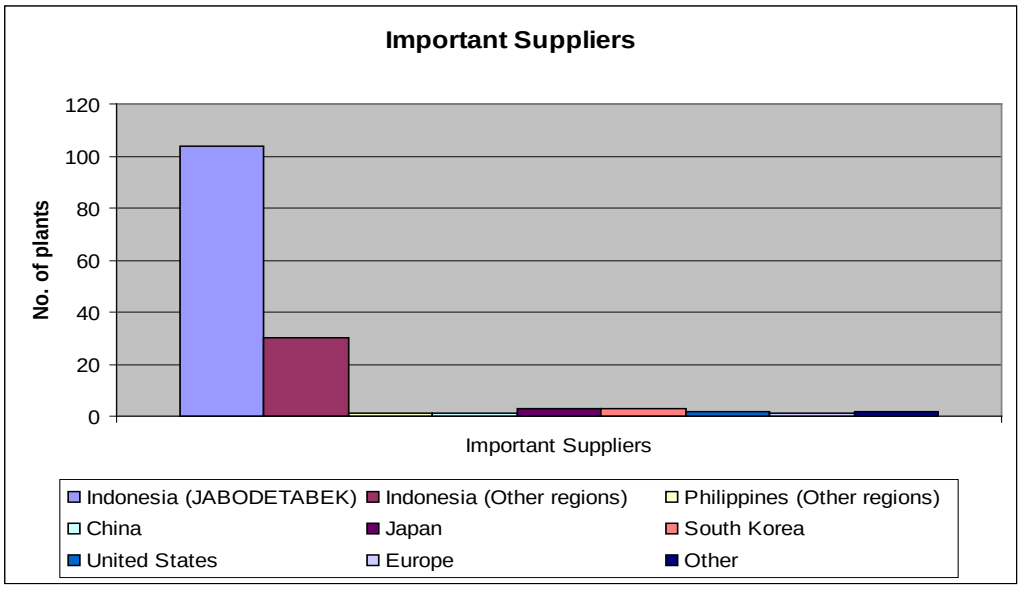


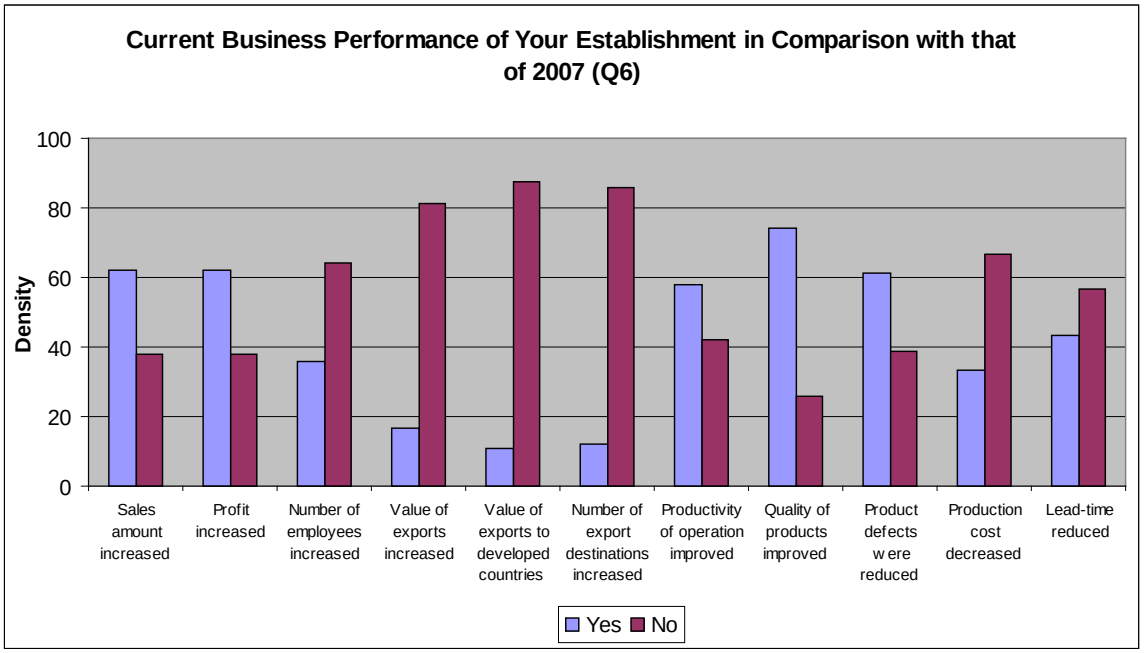
Figure 10 Location of Important Suppliers



Around 60 percent of the respondents report an increase in sales and profit of their firms, together with an improvement in their product quality in recent years (Figure 11). However, only a small portion of firms report a higher export value. This may be because majority of the respondents are small and medium enterprises, which tend to be

non-exporters. Another possible reason is that the global crisis negatively affected the companies' export demand, particularly in the last quarter of 2008.

Figure 11. Business Performance in the Recent Year



Meanwhile, the functions of the establishments have not changed over time (Figure12 and 13) and majority of them are both producers and marketers. In the survey, the number of firms that changed their function/role is so small that no certain conclusion can be drawn.

Figure 12. Function of Respondents, at Present

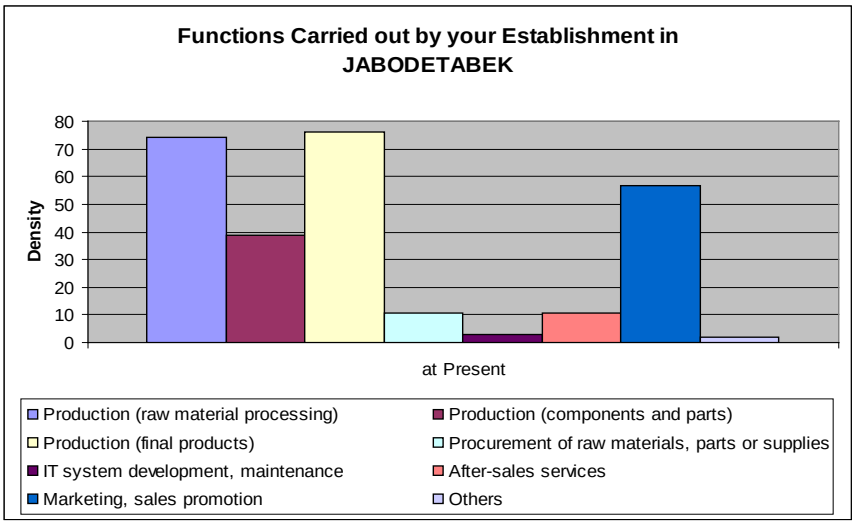
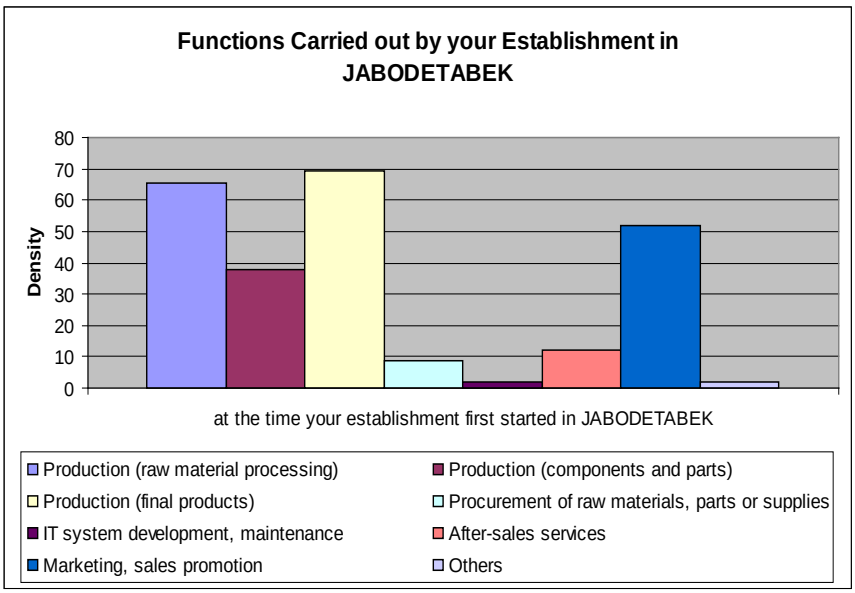


Figure 13. Function of Respondents, at the Start of the Firm's Operation



On being asked about R&D activities, around 26 establishments responded that they carry out such activities (Figure 14). One-fourth of these 26 companies (or about 5% of all respondents) have a special R&D department in their companies (Figure 15), with a few of these 26 companies having started R&D from the 1970s–1994. After 1994 until the present, though, a downward trend among companies starting to do R&D can be seen (Figure 16). There might not be any reason for this, owing to the fact that

the total number of firms surveyed is only about 25, too small in terms of a sample size. Still, a possible reason is that during the 1980s and 1990s, the industry enjoyed a boost from government policies on industry and trade liberalization, thereupon not giving reasons nor encouragement for firms to initiate R&D activities. But then, the number of respondents conducting R&D increased considerably in the latter half of the 1990s due to the effect of the 1997 Asian financial crisis when domestic purchasing power was low and the Rupiah depreciated, causing many firms to switch their market orientation from domestic to export-oriented. Entering the international market forces some firms to acquire new machines and/or other factors of production. This is inferred to by respondents who answered that they started R&D in the period of 1995-99. Another interesting characteristic is that the number of firms beginning their R&D has decreased since then, which could be due to the impact of the poor business climate in the country in the year 2000s.

Figure 14. Proportion of Firms Conducting R&D Activities

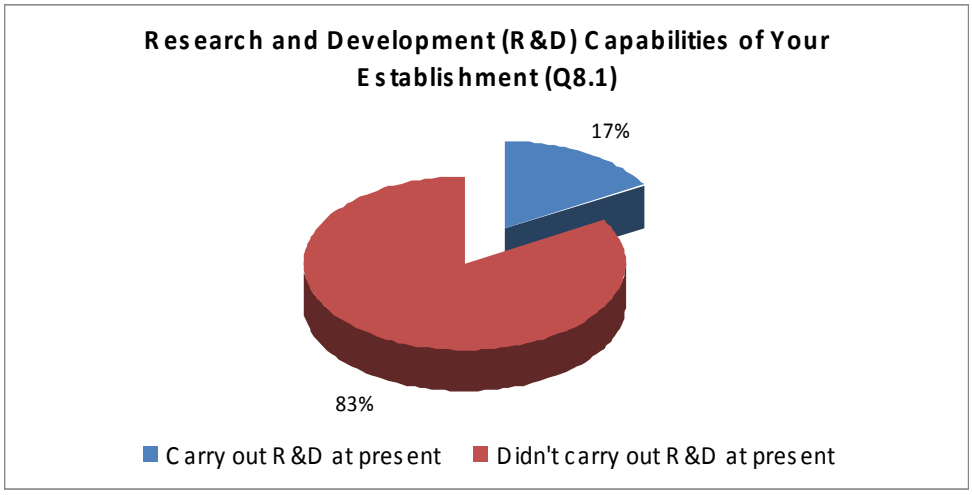


Figure 15. Proportion of Firms Having R&D Department (to total firms conducting R&D)

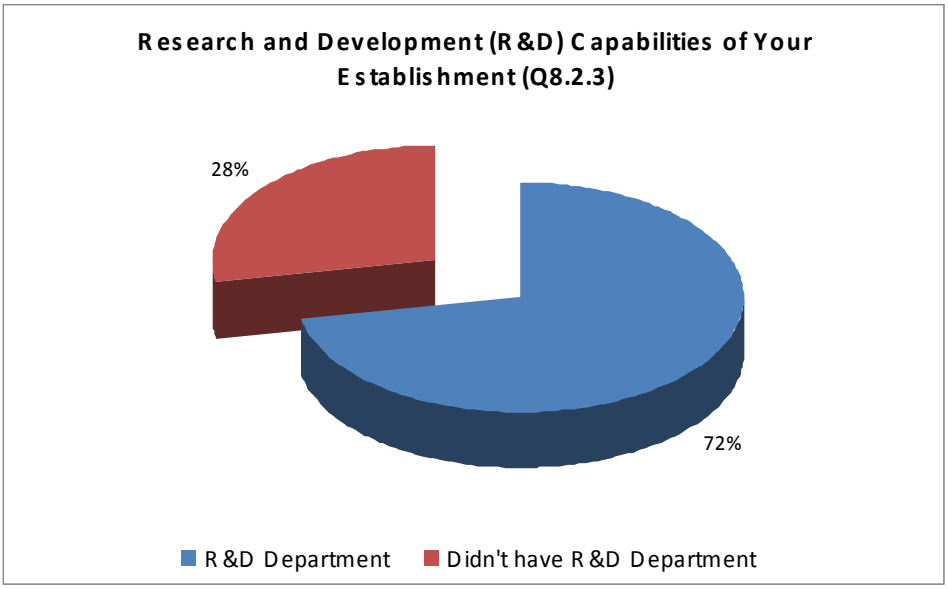
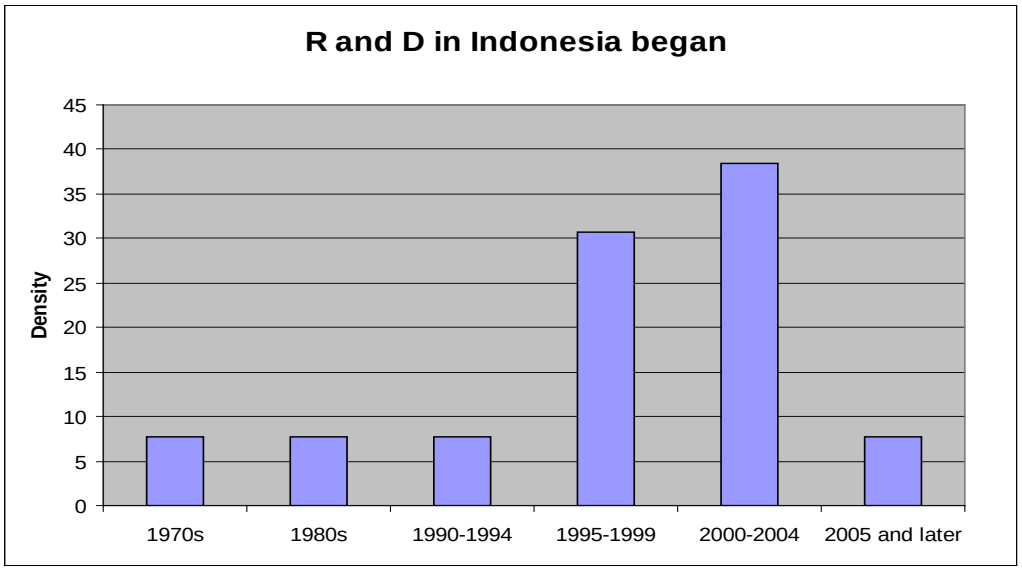


Figure 16. Number of Firms Starting R&D Activities, by Time Period



Nevertheless, their R&D activities seem to have been very minimal since about 40 percent of the 26 firms do not allocate any fund for R&D and employ only less than 5 people for this activity (Figures 17 and 18). However, there are five establishments with R&D expenditures of about 5 percent from its sales and two establishments employing

between 26-50 people for R&D.

Figure 17. Proportion of R&D Expenditure to Total Sales

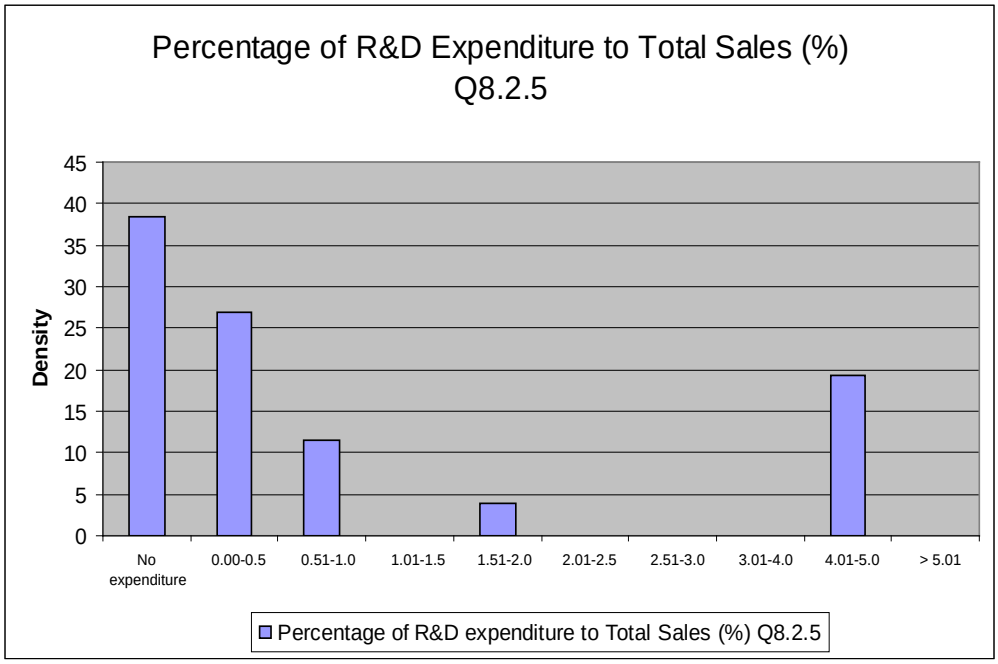
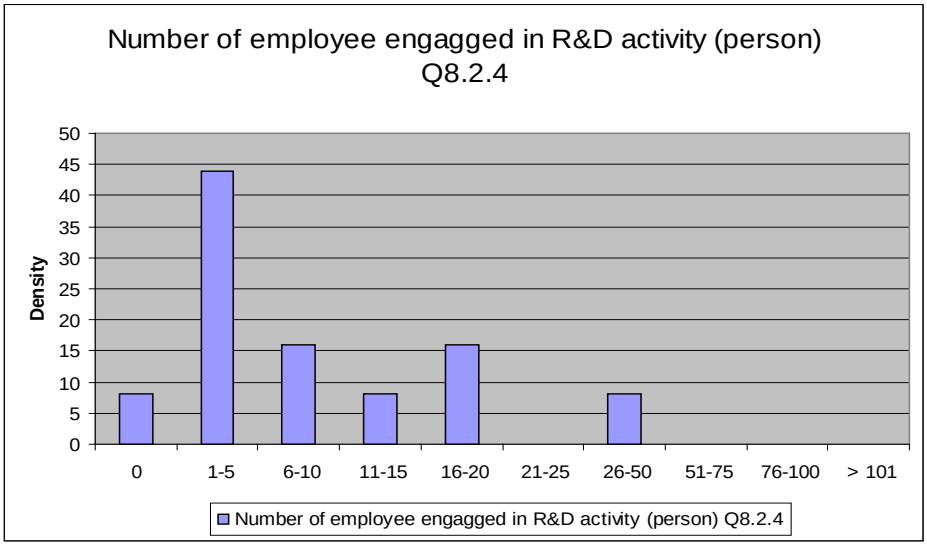


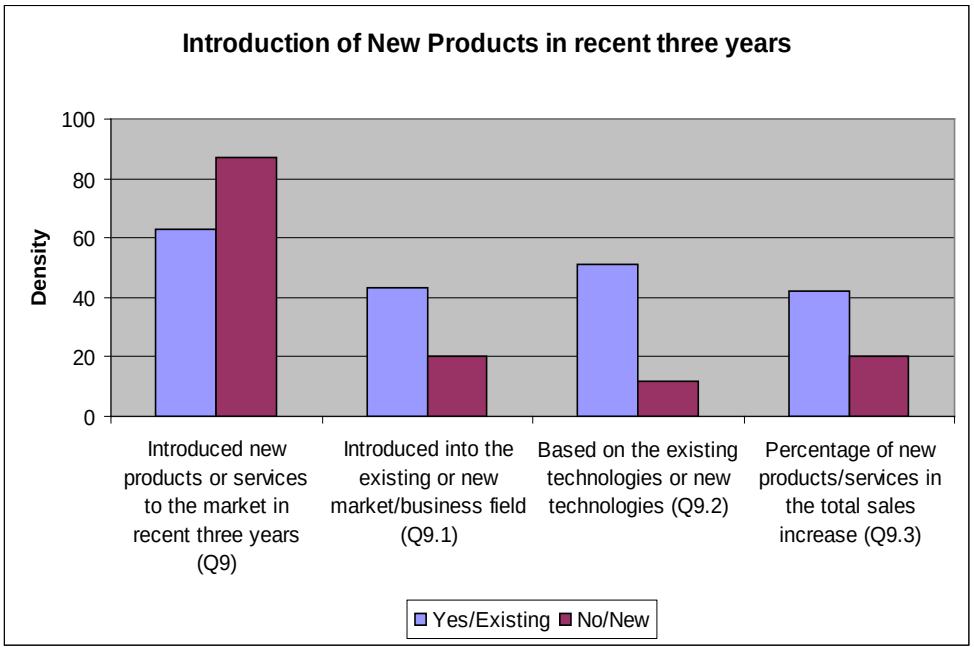
Figure 18. Number of Employees Engaged in R&D Activities



Regarding innovation, 40 percent of the respondents introduced new products/services in the last three years (Figure 19). About 80 percent of them appear to

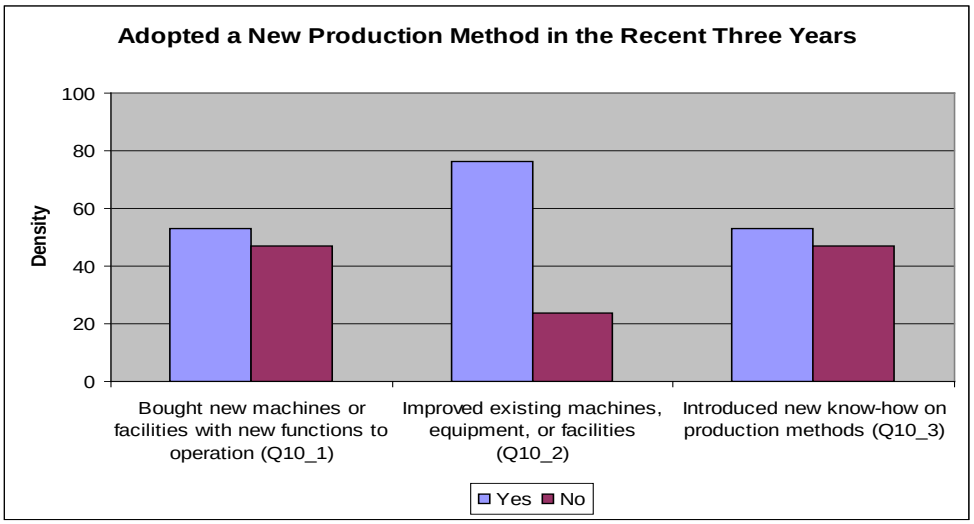
have succeeded for the reason that the proportion of the new products/services are becoming larger in their total sales since the time they were first introduced. However, this innovation does not refer to a great product invention because most of the new products still exploit existing markets and use existing technology.

Figure 19. Introduction of New Products in Recent Three Years



The respondents seem to have been active in the innovation of new or improved machines. In the last three years, approximately half of respondents bought new machines or facilities with new functions to operation and introduced new know-how on production methods (Figure 20). Moreover, almost 80 percent of the respondents improved their existing machines, equipment or facilities.

Figure 20. Changes in Production Method in Recent Three Years



Respondents were also asked about their sources of innovation and upgrading. Sources which are regarded to be important for more than 40 percent of the respondents include: recruitment of mid-class personnel, the firms' sales and production departments, technical information from patents, and foreign-made equipments and software (Figures 21 and 22). This indicates weak linkages between respondents and other firms/institutions, and/or small benefits from existing linkages between them in terms of technological spillover.

Out of 150 companies, there are about 125 companies who do not have R&D activities, and about 60 to 90 companies neither buy new machines nor introduce new products. According to the respondents, the major obstacles for innovation are high tariffs on equipment and materials needed for innovation, limited R&D supporting industry, expensive R&D support services, and insufficient protection of intellectual property rights (Figure 23). These obstacles indicate a need for government attention in improving the access to the materials. The impediments to innovation may also suggest that the agglomerated economy has not fully functioned as a supporting innovative environment for manufacturing firms in the Indonesian economy.

Figure 21. The Sources of Information and Technology for Innovation and Upgrading I

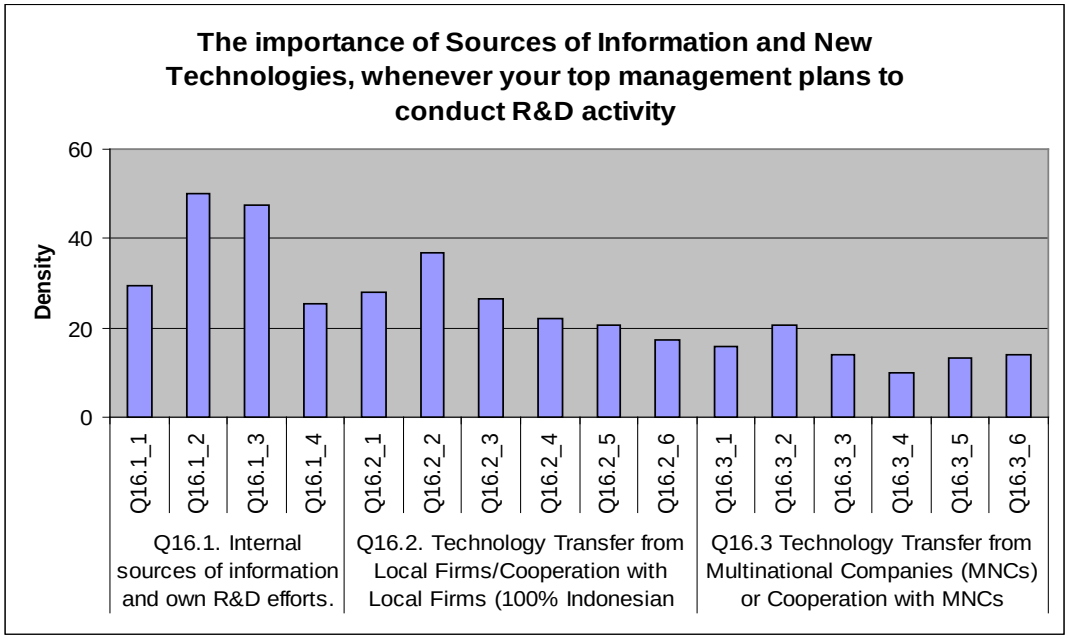


Figure 22. The Sources of Information and Technology for Innovation and Upgrading II

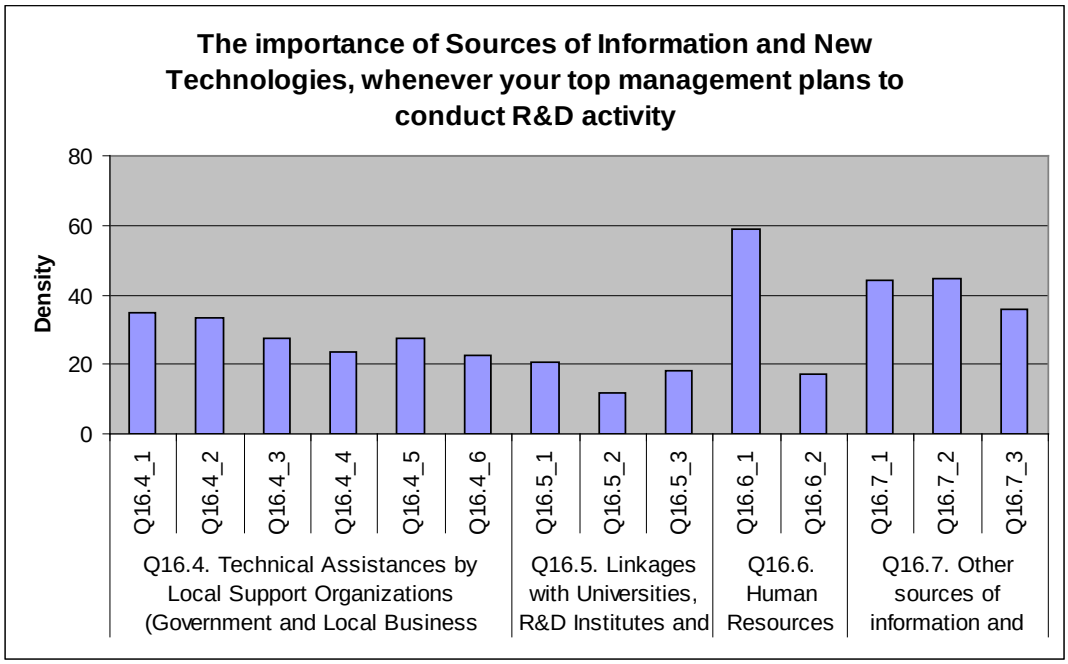
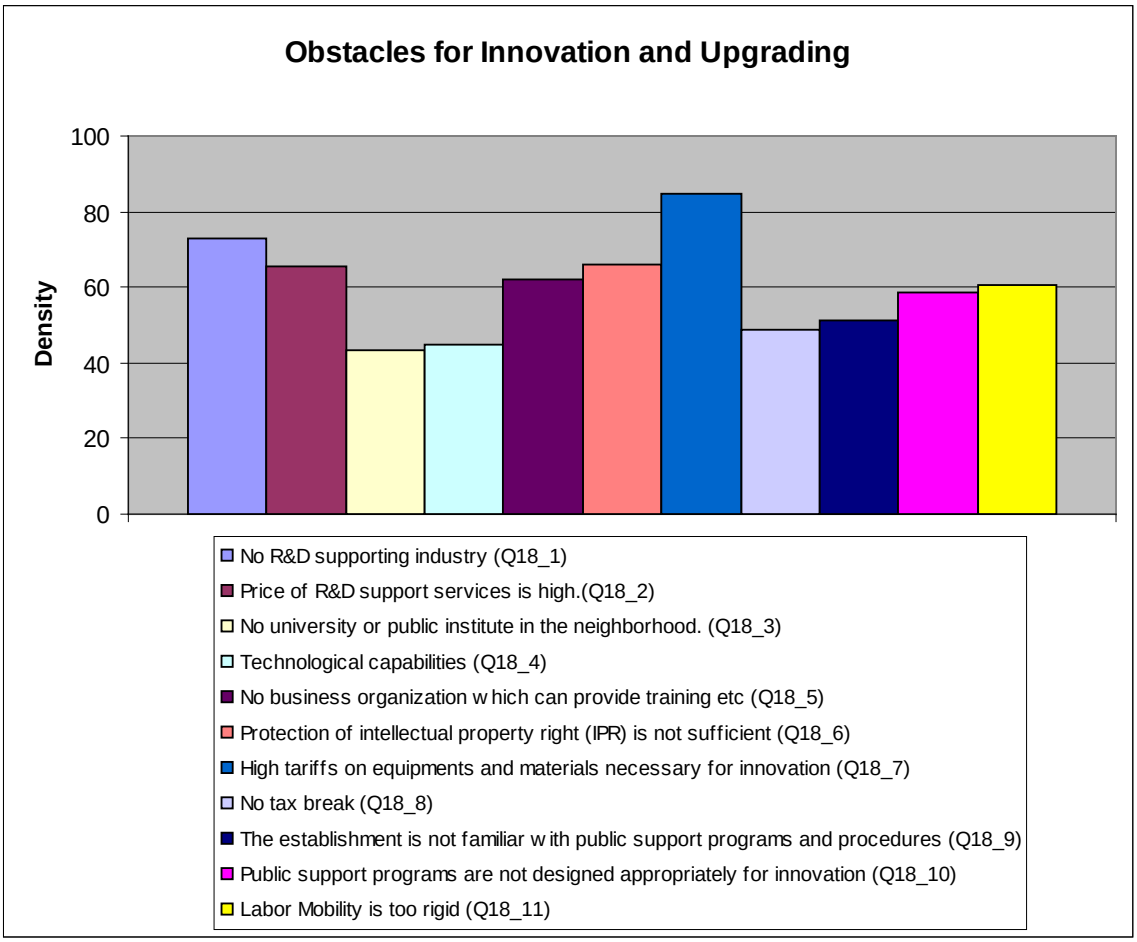


Figure 23. The Obstacles for Innovation and Upgrading



5. INDUSTRIAL UPGRADING, INNOVATION, AND FIRM PERFORMANCE

5.1. The Impact of Upgrading and Innovation on Firm Performance

This study defines some variables to measure the impact of upgrading and innovation on firm performance. These variables were extracted and devised from the survey questionnaire, as follows:

a. Productivity of operation (devised from Q6.7 of the questionnaire);
b. Product quality (devised from Q6.8 of the questionnaire);
c. Product defect (devised from Q6.9 of the questionnaire);
d. Production costs (devised from Q6.10 of the questionnaire);
e. Leadtime (the period of time needed to deliver a product from producer to customers as devised from Q6.11 of the questionnaire).

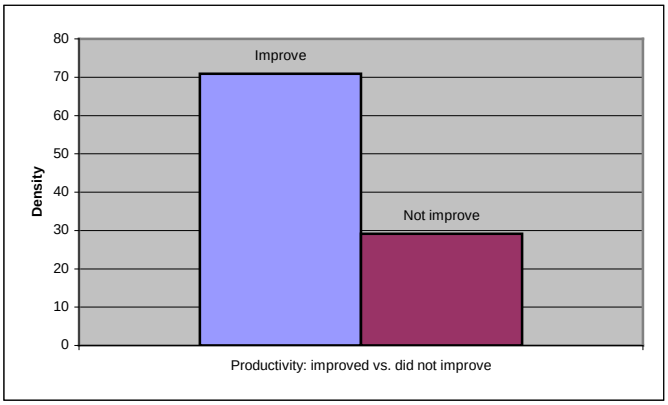
Some frequencies of distribution of the upgrading performance variables are produced to get some insights into the impact of upgrading and innovation. Figures 24a to 24e present these distributions.

Based on the figures, there is an overall mixed result on the impact. Favorable results are shown by the variable of productivity, product quality, and product defect variables (Figures 24a and 24c). As shown in Figure 24a, about 60 percent of the respondents cited an improved productivity while as shown in Figures 24b and 24c, more than 60 percent of the respondents experienced improvement in the quality of their products.

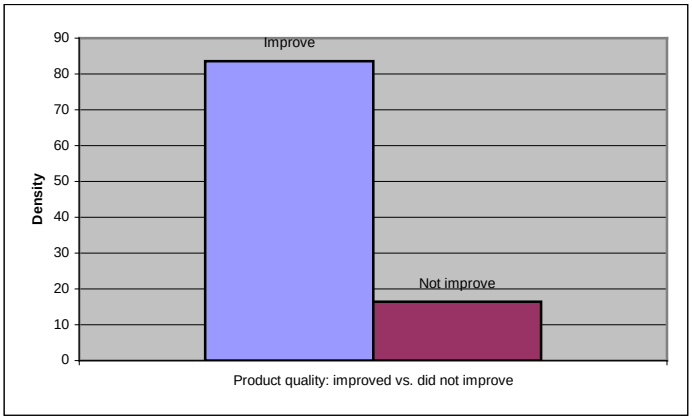
There are still some disappointing results, as indicated in Figures 24d and 24e. In particular, production costs evidently have not been able to be substantially reduced. On the delivery end, the lead time also has not been successfully reduced. Slightly more than 60 percent of the respondents were not able to reduce their cost performance in their production. These results indicate some problems in the logistics and transport area which might need further elaboration. Another potential explanation is that the extent of the ICT in the area of the survey is still relatively low, at least as compared with other countries in the region.

Figure 24. Frequency of Distribution of the Upgrading-and-Innovation Performance Variables

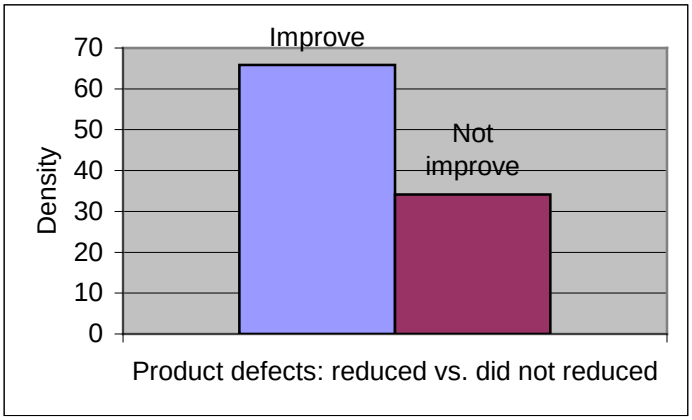
a. Productivity



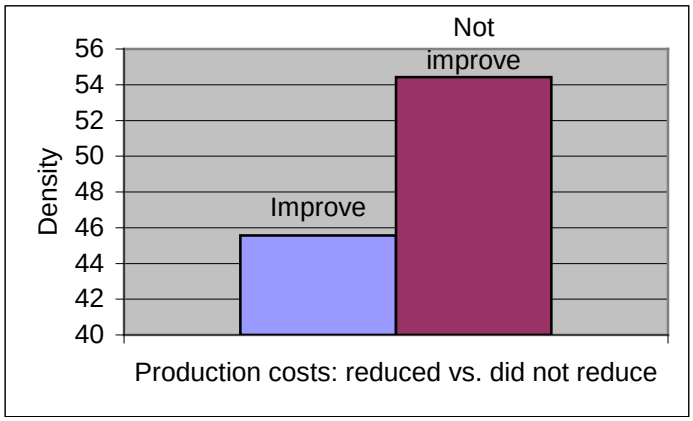
b. Product Quality



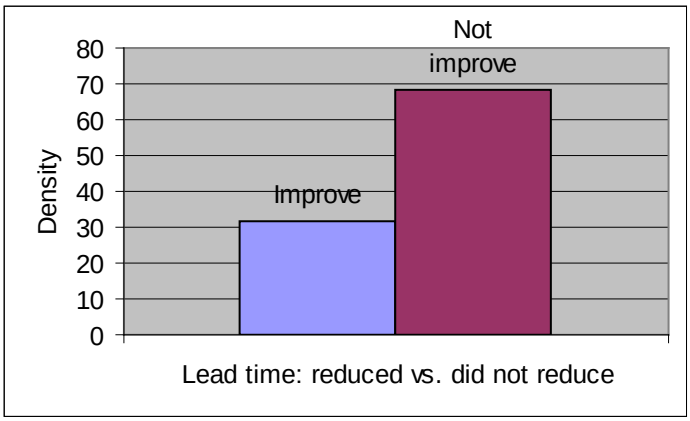
c. Product Defect



d. Production Costs



e. Lead Time



5.2. Factors that might Explain the Variation of the Upgrading and Innovation Impact on Firm Performance

Thus, all in all, there is variation in the extent of industrial upgrading based on the survey's results. Indeed, it is important to understand the factor causing this. This study thus moves forward to explain this variation (i.e., the variation in the extent of the industrial upgrading) by conducting descriptive analysis.

The study postulates that much of the impact of the upgrading and innovation depends on the pathways of industrial upgrading. This makes sense because there are many channels that a firm can take in upgrading its capabilities. Indeed, as Ernst (2004) pointed out, the upgrading process occurs quite often at the firm level, and given that one firm tends to be different compared with another, one should thus expect that the

‘pathways’ should matter because firms can choose many different channels to acquire the necessary upgrading.

The next step of our empirical exercise is therefore to attempt to get some insights on the pathways.

In conducting this exercise, for its methodological approach, ideally, one should have variables that describe the ‘dynamic’ process of the pathways. This is because the pathways tend to be a ‘process’ and could last within a medium- or long-term period of a company’s life. However, since our survey is static in nature, it could not therefore really describe the pathway.

This study then resorts to two strategies in an attempt to resolve the problem. First, we proxy the pathways with all of the performance variables. As a justification, this should represent the end-result of the pathways. The second strategy is to conduct in-depth interviews to get the details of the ‘dynamic’ nature of the pathways. This clearly serves as a complement to the first strategy.

The study asks the following questions in examining the pathways: “do linkages with other local and global companies and/or economies affect the extent of the pathways?” If so, “what is the relationship?” and “which one tends to give a better impact -- local or global linkages?”

In order to answer these questions, the study adopted the following general model:

The pathways (measured by the performance variables) = f (local and global linkages, other determinants).

Here, the pathways are assumed to come from such activities that involve exchange information and learning process about new technology (production and non-production), and all these can be facilitated through contacts with other parties (both local and foreign). Therefore, the variables for local and global linkages can be devised by choosing some variables that represent these contacts. This method follows the common strategy often implemented in ‘technology- or export- spillover’ studies.

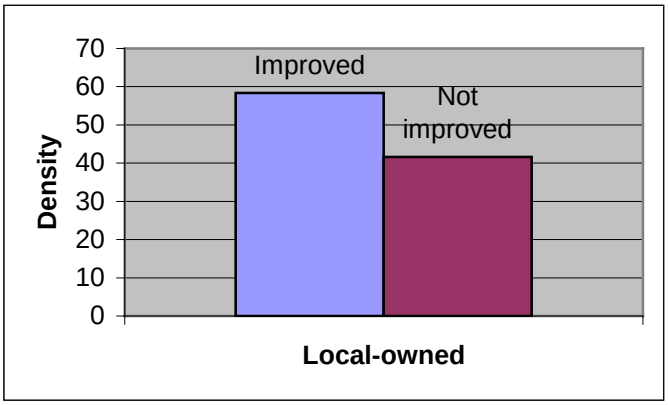
The key variables to represent the linkages are as follows:

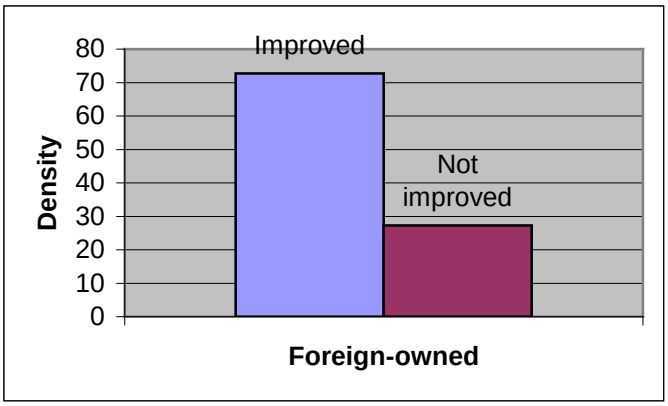
a. Ownership (i.e., domestic, foreign, and joint venture);
b. Target markets (local or overseas); and
c. Source of inputs (local or overseas).

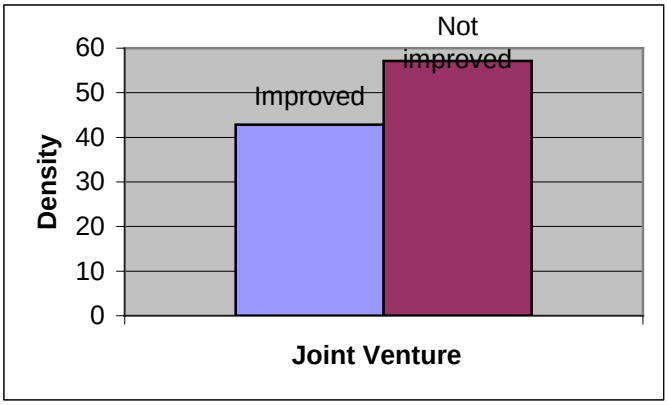
Some of the key points from the bi-variate descriptive analysis are presented below. Consider first the ownership variable as presented in Figure 25. The 100 percent foreign ownership seems to provide better pathways of the upgrading, rather than full (i.e., 100%) domestic ownership and joint venture (JV) firms. This is very clear when we observe the improvements with regard to productivity and production costs. This finding, however, does not mean that domestic and JV firms do not facilitate the pathways; the other upgrading performance variables also show favorable results for the fully domestic ownership and JV types of firms. This is consistent with the general findings from studies on multinationals and foreign direct investment.

Figure 25. The impact of ownership variable on the upgrading performance variables.

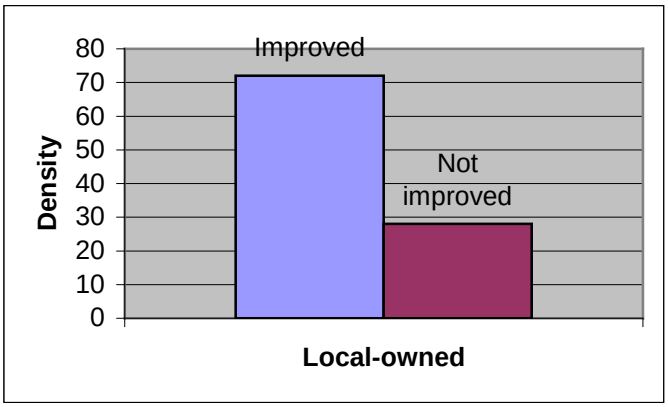
a. Productivity

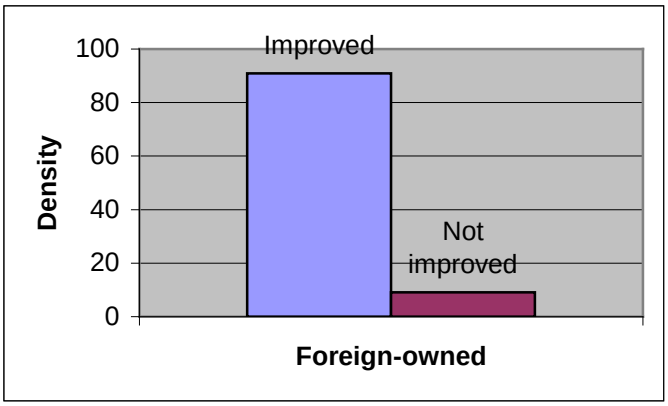


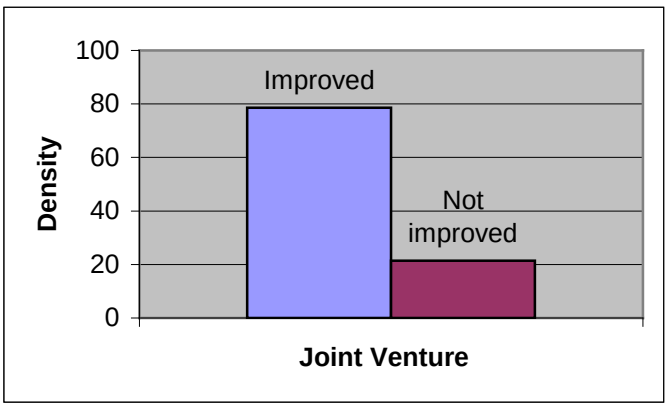




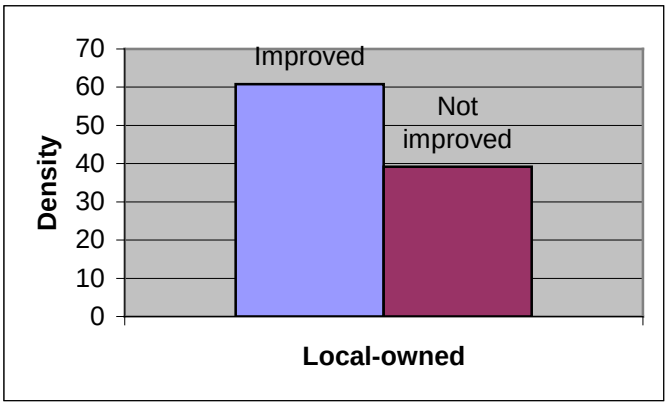
b. Product Quality

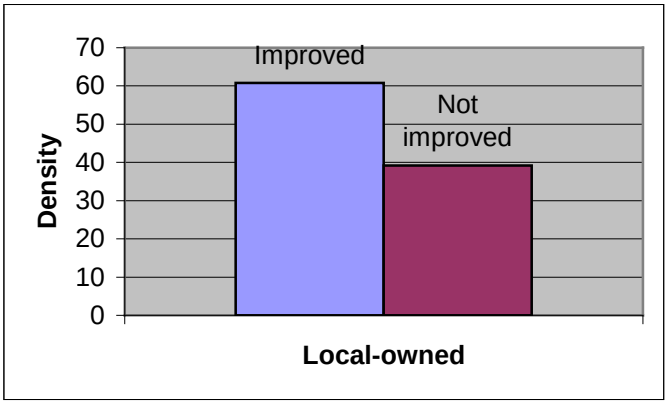


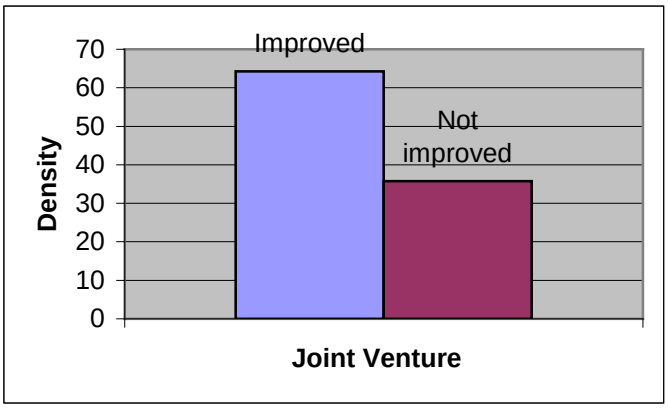




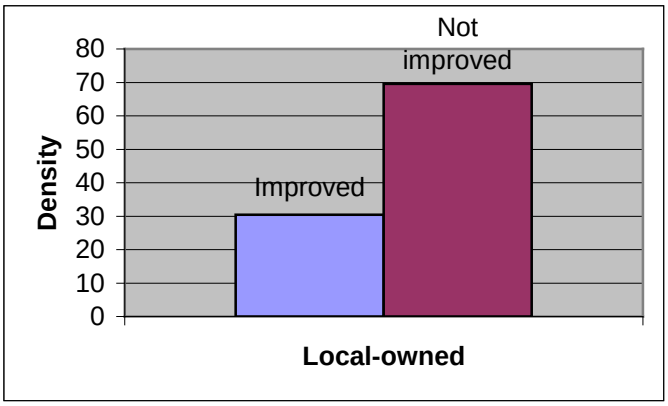
c. Product Defect

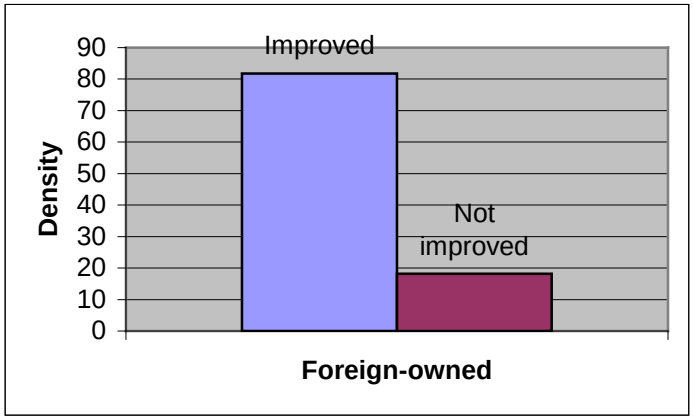


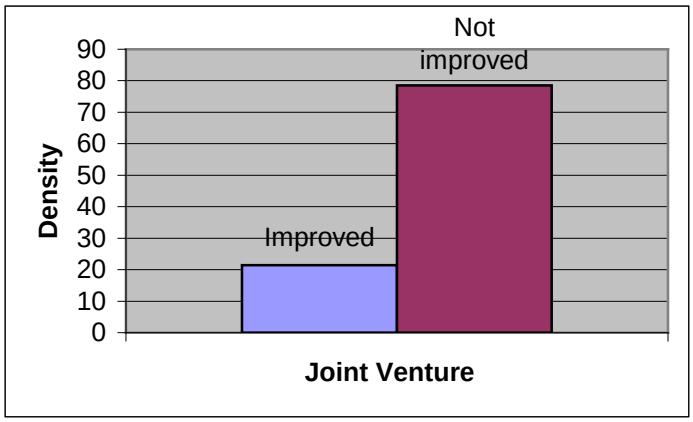




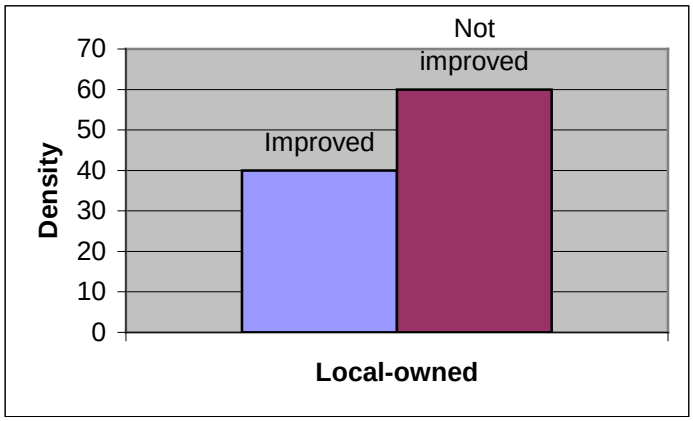
d. Production Costs

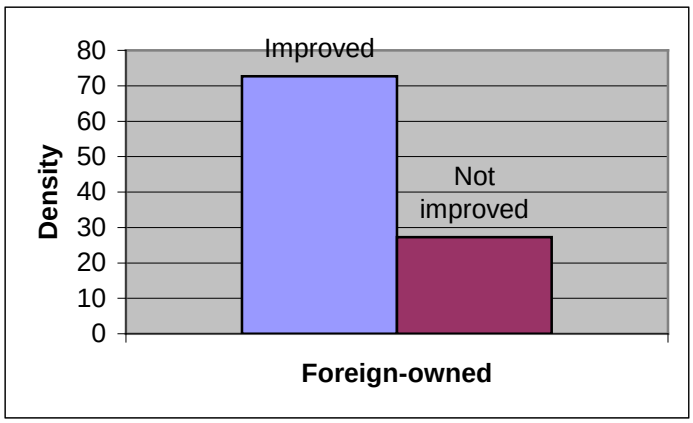






e. Lead Time


Not
improved
Improved
70
60
50
40
30
20
10
0
Density
Local-owned


Improved
Not
improved
80
70
60
50
40
30
20
10
0
Density
Foreign-owned

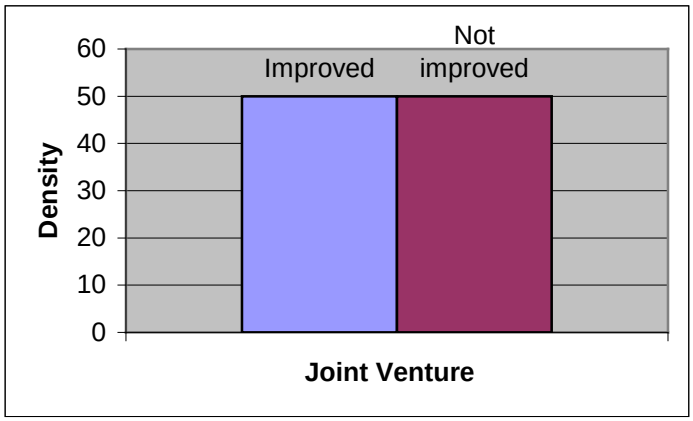
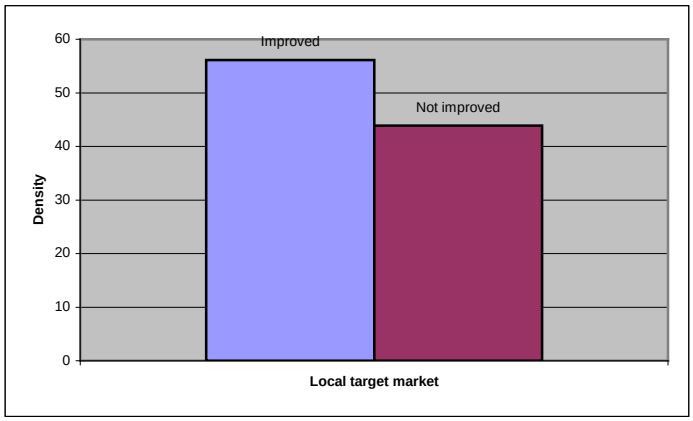
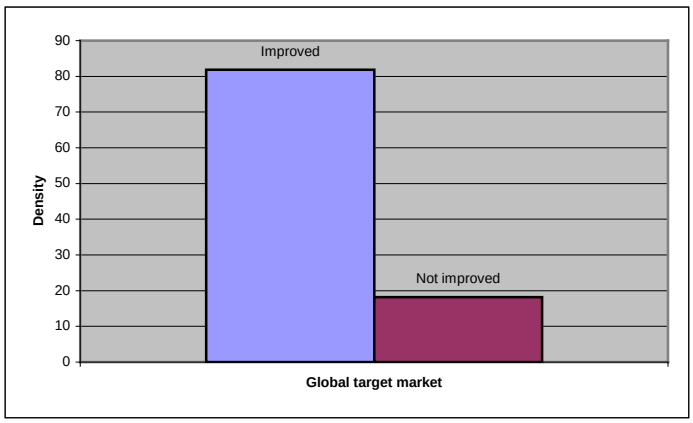

Not
improved
Improved
60
50
40
30
20
10
0
Density
Joint Venture

Figure 26, meanwhile, presents the frequency distribution of the target market variable by the response of the upgrading performance variables. Few key observations are clear. One, the impact of local and global linkages on the pathways is, in general, similar but with no clear pattern. The impact seems to be positive for productivity and product quality but not very clear for production costs and leadtime. However, in terms of production cost, global linkages have a slightly better effect than local linkages.

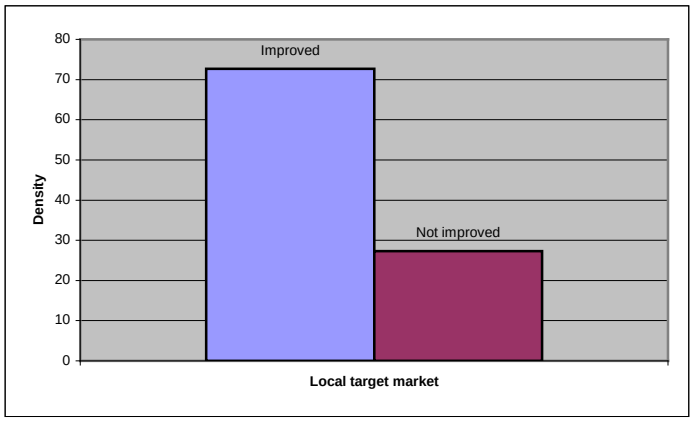
Figure 26. The Impact of Target-Market Variable on the Upgrading Performance Variables.

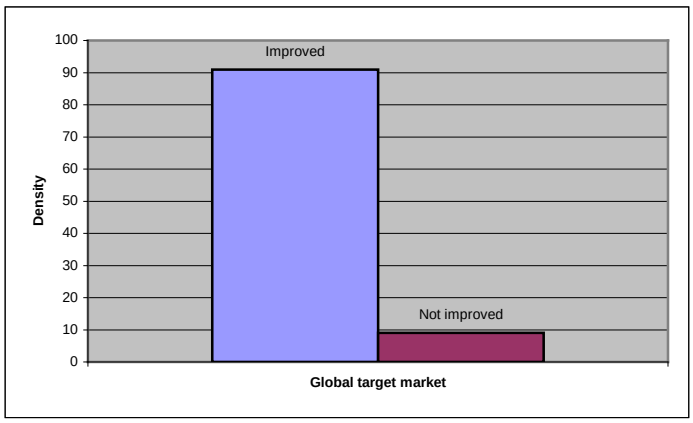
a. Productivity



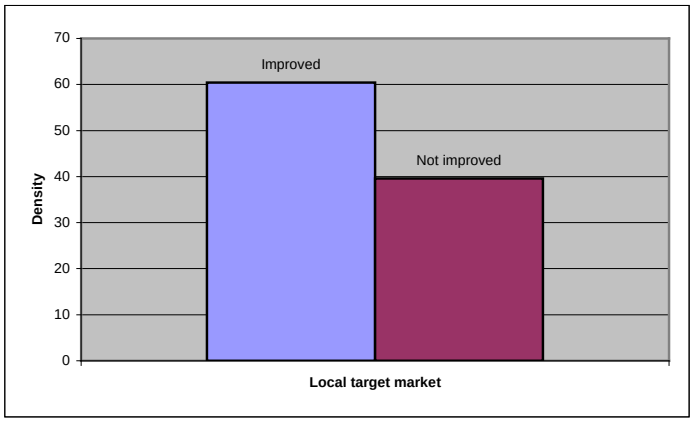


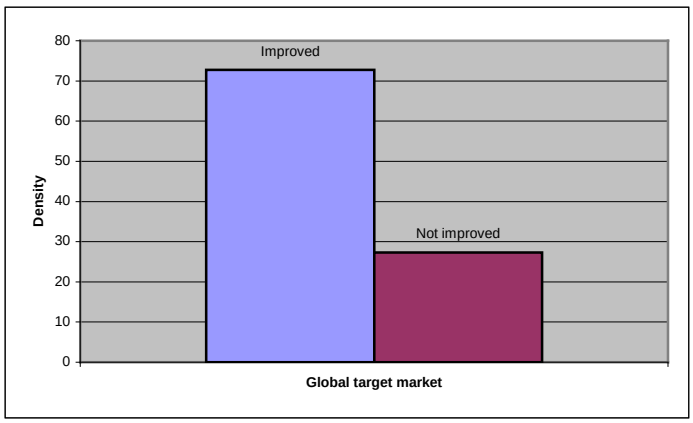
b. Product Quality



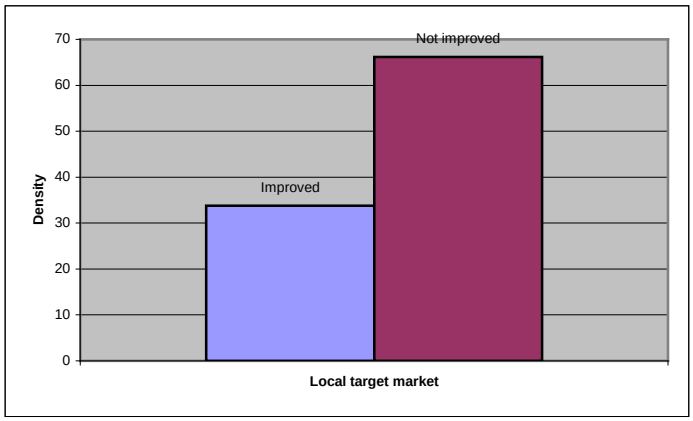


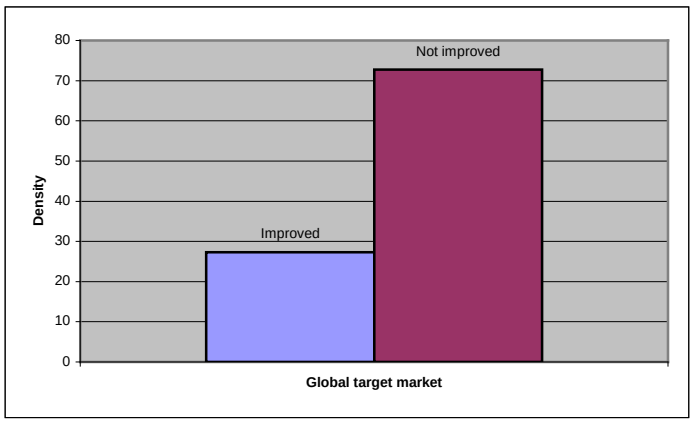
c. Product Defect



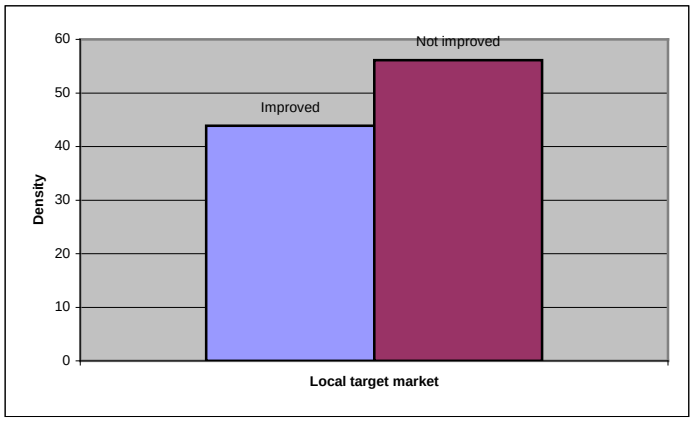


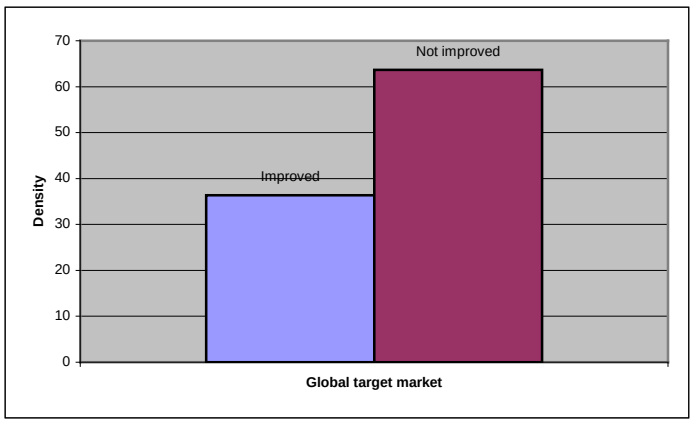
d. Production Costs





e. Lead Time

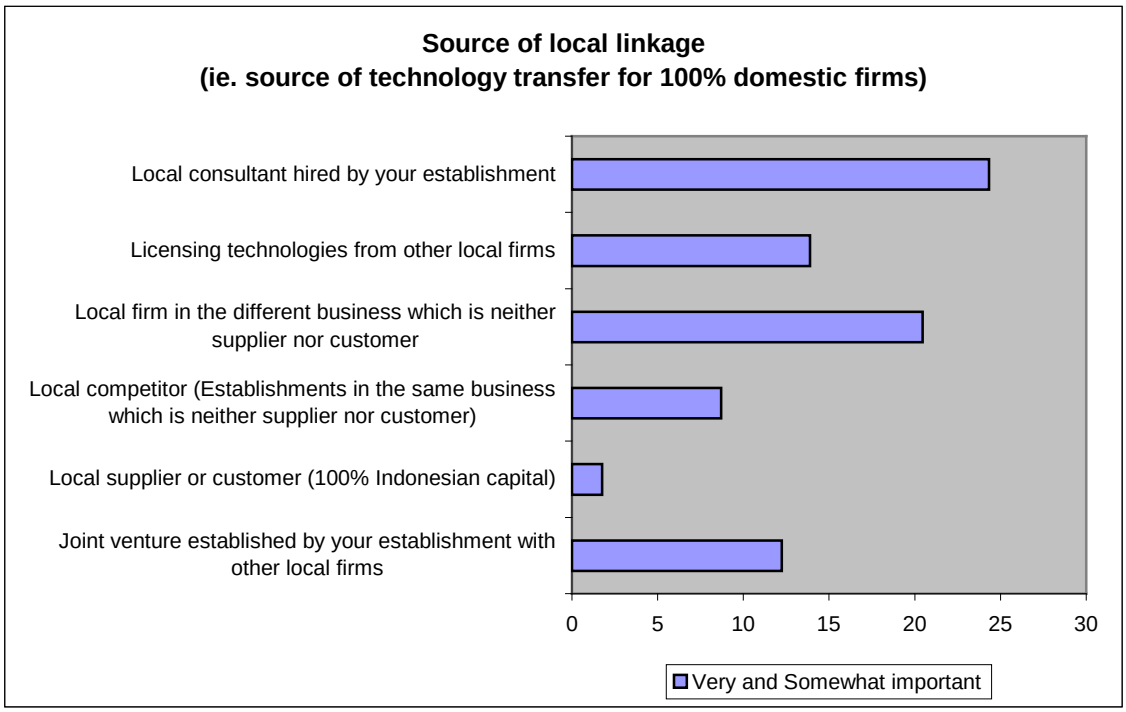




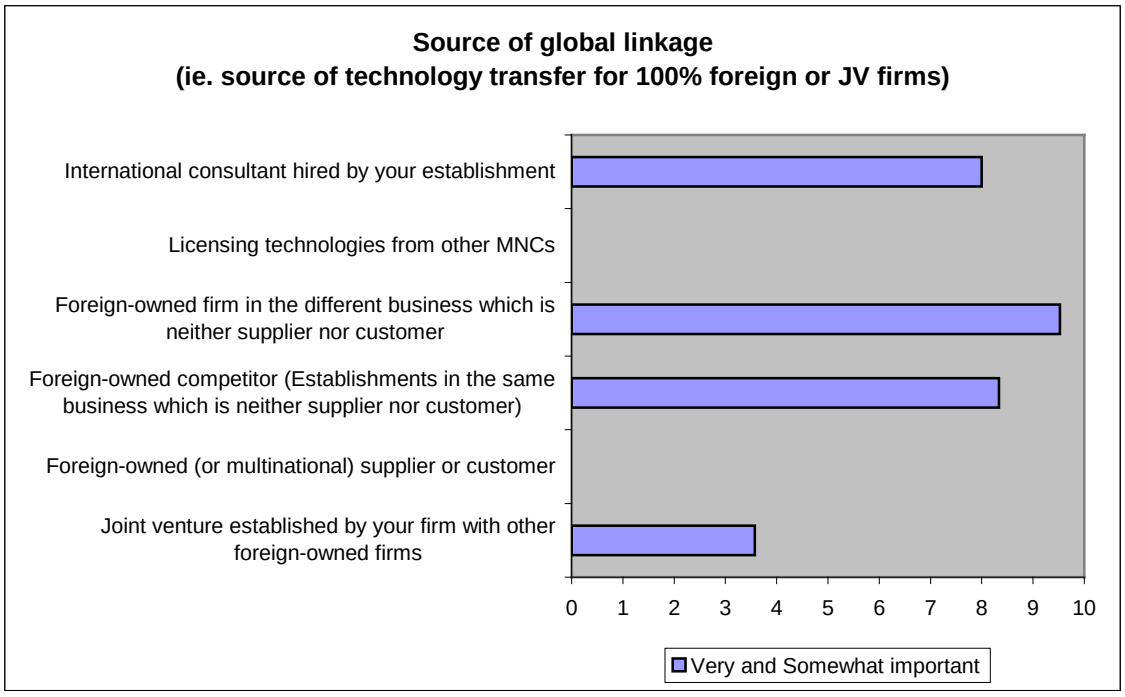
The above Figures provide some insights on the importance of local and global linkages on the extent of industrial upgrading and innovation. Equally important is the question of where these local and global linkages come from, making it worthwhile to look into. Figure 27 thus shows frequency distributions of the sources of the linkage as drawn from the answers to one of the questions in the questionnaire. Based on Figure27, consultants seem to play an important role in facilitating the impact of both local and global linkages on upgrading. In terms of the local linkage or local firms in particular, Figure 27 also infers that buying technology facilitates their upgrading and innovation although this does not seem to hold true for global linkage or for foreign and JV firms. And for both local and foreign firms, in the meantime, one can glean from Figure 27 that being in competition with other firms, either in the same business or not, also seems to be an important factor for the upgrading.

Figure 27. Source of Pathways of Industrial Upgrading

a. Local Linkage



b. Global Linkage



5.3. Few Insights from Interviews with Firms

As mentioned earlier, to complement the quantitative results of the study and to fill in certain gaps in insight and analysis as brought about by the dynamic nature of the upgrading process, the author also conducted in-depth interviews with the firms surveyed. Three firms -- two of which are garments companies (Firms A and B) and an auto-parts company (Firm C) were interviewed. The following points were gathered from these interviews with regard to the question of the importance of the global and local linkages in facilitating the pathways towards upgrading.

The first key point is that having an export orientation helps firms to upgrade. This is particularly the case with Firm A where it immediately had to restructure its plants once it acquired a substantial export order. The restructuring involves replacing its old machinery with new ones to be able to meet the quality standard required by the international buyers. Firm A had to replace practically all of its machinery because the 'system' nature of its production process, where replacement can not be done on a 'piece-meal' basis, dictated so.

Firm B faced the same situation where it had to install some new machinery. The only difference is that Firm B replaced its old machinery and installed a few very sophisticated machinery in terms of technology in order to boost the performance of its workers. And indeed, this is what happened after the installment. Labor productivity significantly improved, further enhancing the firm's competitiveness in the international market which includes major garment producing-competitor countries like China and India. The owner, also the director of this firm, claimed that the new machinery installed helped the company to win several export orders over other competitors from India.

While Firms A and B highlight the importance of global linkage in facilitating technology upgrading, Firm C demonstrates the importance of local linkage. Firm C, which is an auto-parts producer, explained that it tries to continuously reduce its dependence on foreign suppliers for its production. In particular, Firm C had shifted the sourcing of its production inputs from foreign to local suppliers. This somehow reflects

the impact of technology spillover that had taken place among many local firms. Firm C also mentioned that the procurement of inputs from local suppliers is very competitive, and explained that any local supplier can immediately be dropped from its list of suppliers if the quality of the supplied inputs declines. After all, there are many other ready local suppliers to provide the inputs to the firm.

Another important point derived from the interview with Firm C is the fact that the lack of skilled labor seems to substantially constrain the upgrading process. Hence, this highlights the importance of training programs and some reforms in the education system of Indonesia if the country wants to substantially upgrade its industry technological capabilities.

6. SOME POLICY RECOMMENDATIONS

Developing economies should take advantage of the opportunity to undertake upgrading as provided by its industries' participation in the international production network. As a common factor behind the successful catching-up process in East Asian countries, active government involvement is needed to further the process in these countries. Three recommendations are hereby given to policy makers, namely, (a) support of production activity in cluster areas, (b) promotion of the quality of service links, and (c) creation of a national system of innovation. Supporting production activity could be done in many ways, including the maintenance of political and macroeconomic stability, development of human capital skills, and insurance of the operation of banks and non-bank credit institutions as financial intermediaries. With regard to promoting the quality of service links, the government should focus more attention to infrastructure, logistics, and trade facilitation. As to the third recommendation of creating a national system of innovation, this is taken from Nelson's work (2007) which says that investing in education and research effort, and enforcing property rights protection will be the foundations for building this system. It is hoped that these policy actions will assist industries in advancing their capabilities through their participation in the GPN model of industrial clusters.

In addition to these normative policy recommendations, the study also offers recommendations based on the findings of the survey and discussed in this paper.

For one, the government needs to increase the participation of FDI (and also domestic direct investment) and to create a more liberal FDI policy (e.g., non-discriminatory national treatment and liberal negative investment list). This recommendation is consistent with the argument put forward by Thee (2006) that one possible explanation of the lagging technological development in Indonesia is the deteriorating investment climate after the 1997/98 economic crisis. As argued in the literature as well as demonstrated by this study, global linkages through the presence of foreign ownership in Indonesian firms can improve the upgrading process. All these, however, need to be consistent with the World Trade Organization (WTO) rules and should give large marginal benefits to the ASEAN Economic Community (AEC), considering the blueprint's objective of having an integrated ASEAN region.

There is a need to speed up (unilateral) services trade liberalization for Mode 4 since the services of consultants seem to still play a crucial role in transferring knowledge and technology. However, this requires the establishment of a regulatory framework that recognizes the skills of professional workers (e.g., engineers, lawyers, etc.). Equally important is to improve both the quantity and quality of training programs in Indonesia. As noted by the interview results, there seems to be a significant lack of skilled workers in some industries in Indonesia.

Moreover, in connection with the policy recommendation in terms of services, there is also a need to undertake comprehensive reforms in the logistics sector. This is to reduce transport costs and improve services quality. Included here is the development of a national strategy on reforming the logistics sector as well as the financing of infrastructure projects.

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