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GLOBALIZATION AND PERFORMANCE OF SMALL AND LARGE FIRMS

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EXECUTIVE SUMMARY

ERIA Microdata research FY 2013 examines whether and how globalization has differential effects on small and (or versus) large firms and aims at identifying policy issues to be addressed in order to achieve a more strong and resilient economic growth in East Asian countries. Globalization in this research is broadly defined to include trade and foreign direct investment (FDI) liberalization, trade (exports and imports), international capital flows, outsourcing and traded intermediate goods. The research conducted ten country studies for eight countries in the Asia-Pacific region, namely China, Indonesia, Japan, Korea, Malaysia, Philippines, Thailand, and Vietnam.

Growth performance of many East Asian countries has been far above the international standard. There is a growing consensus that one of the key factors behind it the increasingly integration between these economies with the global market. However, there is also a growing concern that the growth performance has been very uneven across firms; not only in developed countries such as Japan and Korea but also in developing countries such as Indonesia and Vietnam. There seems to be a popular belief that firm performances are divergent, particularly along the dimension of firm size. It is often claimed that the diverging performance is caused by globalization. Compared to large firms, small firms (or SMEs – small and medium enterprises) are at a disadvantageous position to adjust to globalization, among other, but most importantly, in terms of adjustments to an increased import competition, expanded export opportunities, enlarged foreign investment opportunities, and increased global production sharing. The perceived view on the divergence and its possible linkage with globalization, irrespective of the existence of its factual basis, has become an important economic or socio-economic policy issue in many countries. This research attempts to shed some light on these issues.

Key questions raised and addressed in this research include the following, for example, has the performance gap between small and large firms been increasing? are there observable forces that work toward this direction? Does globalization cause firm performance to diverge? if so, what are the specific mechanisms? If not, why? What is the empirical evidence? Where exactly are the market failures in this process? What are the policy measures that are deemed necessary to achieve strong and resilient growth and development?

Existing empirical evidence on the possibly differential effects of globalization on small and large firms are surprisingly rare. Of course, there are numerous empirical studies that examine the possible different firm responses to globalization under the theoretical background of the so-called heterogeneous firm trade theories; however, most of these studies tend to focus not on the size but on other firm characteristics, such as firm productivity or firm’s exporting and importing characteristics.

Standard heterogeneous firm trade theories predict that firm’s responses to globalization differs according to initial productivity. As in the Melitz model, for example, firm productivity is positively correlated with firm size and also determines firm’s initial exporting status. The popular belief that small firms are relatively at a disadvantageous position in respect to globalization is therefore not without some theoretical ground. However, the actual responses of small and (or versus) large firms to globalization could be much more complex those captured by theoretical models. Hence, there might be other important factors which are not understood well enough or left out in the models but still important for to determine firm’s responses to globalization.

While not all answer can certainly be answered by this research alone, we believe that the studies in the research are able to provide some new empirical evidence and insights into the relationship between globalization and performance of small and (or versus) large firms. In what follows we expect that all this points out at least some important policy issues which are likely to be necessary to fully appropriate the potential benefits from globalization, and to make growth more stronger and resilient.

Studies in this research show the diverse patterns of relative response of small and large firms. They reveal evidence that small firms are indeed disadvantaged in some aspects of globalization and in the context of some of the countries. In the case of Indonesian manufacturing, for example, the increase in import penetration seems to have reduced the average size of domestic firms. There is however contrary evidence in the case studies of the other countries. Nevertheless, the interesting part of after noting all these evidence is an understanding that there seems to exist some hard-to-ignore tendency that small firms, although they are relatively disadvantaged over large firms in participating in global activities, exhibit larger gains from globalization or grow faster in their productivity than their larger counterparts. This is indicated, for example, by the case studies of manufacturing firms in China and Malaysia where the gap in productivity between larger and smaller firms are fount to have been lowered over the time.

The studies in this project show that the most obvious way to increase the performance of smaller firms is by engaging them in export and maximizing the productivity spillovers by multinationals (MNEs). The latter could take many forms, one of which is direct involvement of smaller firms as suppliers of the MNEs. As uniquely presence in Southeast and East Asia in general, MNEs typically operate either as or in networks of productions with other firms/MNEs in other countries but within the region (i.e., commonly known as the East Asia production networks). As the case study of Thai and Philippines manufacturing show, engagement in supplying to MNEs operating in the production networks proved to be able to increase the growth, survival and productivity of SMEs in these countries.

Meanwhile, engaging in exports evidently is able to increase the productivity performance of SMEs. In fact, exporting seems to be one of the important ways to increase the productivity of smaller firms. As shown in the case study of manufacturing firms in Malaysia for example, engaging in exporting by smaller firms can be explained more by the theory of self-selection rather than by learning by exporting theory. Self-selecting in to exporting arguable requires a firm to do more effort to increase its productivity rather than that implied by learning by exporting theory.

Notwithstanding the evidence on the positive impact of globalization on the performance of smaller firms, it remains a fact that these firms has a scale disadvantage that inherently put them in a different (lower) productivity level than their larger counterparts. Therefore, it is important for government to facilitate smaller firms to be able to read the benefit offered by globalization. In terms of exporting, this can be done by providing assistance or facilitation that reduces the sunk cost of exporting. As shown by one of Japanese country studies, providing information about foreign market through the relation of firms to banks that lend them loans proved to be beneficial in this case. Assistance could also be given more by ensuring conducive the general business environment. This includes the strategy to make investment regime open and be friendly to foreign investors, considering potential positive productivity spillovers coming from MNE activities.

Overall, results of the studies in this project provide useful information for policy makers in respect to managing the impact of globalization on performance of firms and, more importantly, to address the issue of potential diverging effect on the size distribution of firms. The studies convey a message that globalization could indeed improve the performance of smaller firms provided there is a careful policy management, and the policy being managed needs to have a clear objective of maximizing the potential or opportunities from globalization by providing the right and balanced facilitation measures.

CHAPTER 1
Introduction and Overview

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1. Background and Objective

This report is the outcome of the ERIA research project *Globalization and Performance of Small and Large Firms* in fiscal year 2013, which was launched as part of a series of micro-data studies of globalization by ERIA since 2008. Under this project, ten country studies were conducted for eight countries in the Asia-Pacific region: China, Indonesia, Japan, Korea, Malaysia, Philippines, Thailand, and Vietnam.

The objective of this report is to empirically examine whether and how *globalization* has differential effects on small and (or versus) large firms, and to identify policy issues that need to be addressed to achieve a more strong and resilient economic growth in East Asian countries.

During the past decades, the growth performance of many East Asian countries has been far above the international standard. There is a growing consensus that one of the key factor behind the relatively strong growth performance of these economies lies in the fact that they were increasingly integrated with the global market, *de factor* and *de jure*. However, in many East Asian economies, there is also a growing concern that the growth performance has been very uneven across firms. Not only in developed countries such as Japan and Korea but also in developing countries such as Indonesia and Vietnam, for example; there seems to be a popular belief that firm performances are divergent, particularly along the dimension of firm size.

Furthermore, it is often claimed that these possibly divergent performances of small versus large firms are caused by globalization. In other words, it is often claimed that, compared with large firms, small firms or SMEs are at a disadvantageous position to adjust in various dimensions to the process of globalization – in terms of adjustments to an increased import competition, expanded export opportunities, enlarged foreign investment opportunities, and increased global production sharing. Indeed, the perceived divergent performance between small and large firms and its possible linkage with globalization, irrespective of the existence of its factual basis, has become an important economic or socio-economic policy issue in many countries. This project attempts to shed light on these issues.

Specifically, the key questions raised and addressed in this report is as follows. Has the performance gap between small and large firms been increasing? Or, are there observable forces that work toward this direction? Does globalization cause firm performance to diverge? If so, what are the specific mechanisms? If not, why? What is the empirical evidence? Where exactly are the market failures in this process? What are the policy measures that are deemed necessary to achieve strong and resilient growth and development?

More specific questions can be raised under the broad theme of this report. Here are some of the examples. Is there evidence that the performance (size, productivity, profitability, survival probability, etc.) gap between small and large firms is increasing? Or, more generally, how does the performance of initially small firms compare with those of initially large firms, conditionally or unconditionally? Do trade and FDI liberalization policies have uneven effects on small versus large firms? How do the adjustments of small firms differ from those of large firms when market is opened? Are small firms at a disadvantageous position to appropriate the potential benefits from global engagement: i.e., interaction with global markets via trade, FDI, outsourcing, participation in global production networks? What are the specific mechanisms? What are the important firm- or plant-characteristics that help to understand the performance of small firms vis-à-vis large firms? What are the roles of innovation, human resources, finance, product diversification in this process?

Although one cannot answer all of these questions in one project, the ten country studies of this report address at least some of these questions. We believe that this report provides some new empirical evidence and insights into the relationship between globalization and performance of small and (or versus) large firms and, furthermore, points out at least some important policy issues which are likely to be necessary to fully appropriate the potential benefits from globalization and make the growth processes more strong and resilient.

Despite the utmost importance of these issues, existing empirical evidence on the possibly differential effects of globalization on small and large firms are surprisingly rare. Of course, there are numerous empirical studies which examine possibly heterogeneous responses of firms to globalization under the theoretical background of the so-called heterogeneous firm trade theories. However, most of these empirical studies tend to focus not on firm size but on other firm characteristics, such as firm productivity or firm's exporting and importing characteristics as determining a firm's response to globalization. This report also aims to fill this gap in the literature.

Standard heterogeneous firm trade theories predict that firm's responses to globalization differ according to initial productivity. For example, the standard Melitz' model predicts that, in response to the symmetric reduction of trade costs, initially more productive firms grow and prosper while initially less productive firms shrink and exit. In this model, firm productivity is positively correlated with firm size and also determines firm's initial exporting status. So, in order to empirically test the implications of Melitz' style heterogeneous firm trade theories, researchers have focused on firm productivity or firm's exporting status to capture possibly differential responses of firms to globalization. In view of the practical importance of the firm size dimension, however, we consider it as a worthwhile effort to focus on firm size in assessing the possibly heterogeneous responses of firms to globalization.

Furthermore, because of the positive correlation between firm productivity and firm size, the popular belief that small firms are relatively at a disadvantageous position in the process of globalization is not without some theoretical ground. However, the actual responses of small and (or versus) large firms to globalization could be much more complex than can be captured by some simplified theoretical models. That is, there might be other important factors which are not understood well enough or left out in simplified theoretical models but still important for determining firm's responses to globalization. For example, it could be large firms rather than small firms that are more vulnerable to an increased import competition if small and large firms are producing different products within a narrowly defined industry and if imported products are primarily of the sort which is typically produced by large firms. This could be a realistic scenario given that most trade are conducted by large firms. Another example might be that small firms, although they are disadvantaged in utilizing enhanced export opportunities, might exhibit greater improvement in performances than large firms if they succeed in participating in exporting. Some available evidence on greater learning-by-exporting by smaller firms, although it is not modeled in standard theories, lends support to this scenario. In short, there might exist factors that determine firm's responses to globalization which might differ along the firm size dimension. These factors are important in reality but are not adequately captured in existing theories, This report therefore firstly examines whether small and large firm's responses to globalization differ and then further investigate why.

As the shown by the case studies across the countries covered by this project, , diverse patterns of relative response of small firms vis-à-vis large firms are found. There is evidence that small firms are indeed disadvantaged in some aspects of globalization and in the context of some of the countries, but there is also evidence to the contrary in other aspects of globalization or in the context of the other countries. Nevertheless, what is particularly interesting to find is that there seems to exist some hard-to-ignore tendency that small firms, although they are relatively disadvantaged over large firms in participating in global activities, exhibits larger gains of some form after participation.

We provides a synopsis of what follows below and summarize the main policy implications arising from all studies in this project.

2. Summary of Country Studies

Inui, Ito, and Miyakawa's paper, "*Japanese Small and Medium-Sized Enterprises' Export Decisions: The Role of Overseas Market Information*", examines whether the information on overseas market provided by banks helps to explain firm’s export market participation, and whether the effect is more pronounced for SMEs than large firms. To do so, they use a unique dataset containing information not only on firms’ export activities but also on their lender banks’ exposure to other exporting firms and lender banks’ own overseas activities. They explain that, relative to large firms, SMEs are at a disadvantageous position to acquire information on foreign markets, which are necessary to enter and remain in the foreign market. Under this context, the key focus of their paper is to examine whether lender banks play the role of providing information on foreign markets to their client firms. In the case of Japan, they explain, lender banks generally provide not only financial support but also business consulting services to their client firms utilizing extensive knowledge collected through their lending transaction relationships and from various information sources. If so, it is plausible that SMEs, which are at an informational disadvantage relative to large firms, would find it more helpful than large firms to receive such information through lender banks. Against this background, the authors examine whether the information spillovers through the lender banks positively affect the likelihood that a firm will start exporting as well as the number of export destinations. In addition, they examine whether this effect is more pronounced for SMEs.

Their empirical results highlight an important role of lender banks as a conduit of information spillovers in firm’s exporting behavior, particularly for small- and medium-sized firms. Specifically, the estimation results indicate that information spillovers through the banks positively affect SMEs’ decision to start exporting and the range of destinations to which they export. Such information spillovers also reduce the likelihood that exporters exit from export markets. The export-to-sales ratio of exporters, however, is not affected by such information spillovers. These results imply that information on foreign markets provided by lender banks substantially reduces the fixed entry costs associated with starting exporting and entering new export markets, as well as firms’ costs associated with continuing to export.

Based on the results, Inui, Ito, and Miyakawa argue that government should proactively involve banks in its export promotion policies, which will be particularly important for increasing the number of SMEs participating in export market.

Specifically, they suggest that properly helping and incentivizing small banks, in particular, to build international service networks and provide necessary information to their clients could be one effective way of implementing export promotion policies.

Hayakawa and Matsuura's paper, *"Dynamic Two-way Relationship between Exporting and Importing: Evidence from Japan"*, investigates the dynamic nature of trading (exporting and importing) using Japanese firm-level data. Specifically, they first examine whether state dependence and cross effects exist in Japanese firms or not. Here, the state dependence exists if past exporting (importing) helps current exporting (importing), while the cross effect exists if past importing helps current exporting or vice versa. The authors explain that the state dependence can exist if, for example, there is a sunk entry cost in exporting of if there is learning-by-exporting. The cross effect can exist if, for example, there exists a common element in the sunk costs of exporting and importing. Then, they examine whether or not state dependence and cross effects differ by firm size. Finally, they investigate whether state dependence and cross effects are destination-specific or not.

Main empirical results, among others, are as follows. First, there are evidence of the existence of significant state dependence and cross effects in exporting and importing. Second, the state dependence and the cross effects are found to be market-specific. This implies that it is more difficult to expand trading partners than to continue trading with the existing partners. Finally, such market-specific state dependence and cross effects are more pronounced for SMEs. The authors even find some evidence that trading with one region discourages SMEs from starting trading with other regions.

Hayakawa and Matsuura point out that the existence of more pronounced market specificity in the state dependence and cross effect implies that it is more difficult for SMEs to expand their trading partners. They go on to argue that it is important not only to support the first-timers in exporting or importing but also to encourage currently exporting or importing SMEs with just a few trading partners to expand their trading partners.

Zhang's paper, *"Productivity Evolution of Chinese Large and Small Firms in the Era of Globalization"*, examines the productivity evolution of large and small Chinese firms between 1999 and 2007, and quantifies the contribution of exporting and FDI to changes in TFP gap between small and large firms. First of all, he finds that small firms are less productive than large firms, even after controlling for a set of firm characteristics. However, he also finds that productivity gap has decreased from about 40% in 1999 to 25% in 2007, a remarkable productivity convergence in 8 years.

Next, Zhang quantifies the impact of exporting and FDI on the productivity gap and productivity convergence, utilizing Blinder-Oaxaca decomposition methodology in labor economics. In these analyses, the average log TFP difference between small and large firms is attributed to an endowment effect and a return effect. The endowment effect reflects the differences in share of exporter firms or foreign-invested firms between small and large firms, while the return effect reflects the estimated differences in exporter TFP premium or FDI TFP premium between the two groups. The estimation and decomposition results show that exporting and FDI together explain about 13.8 and 8.1 percent of the TFP gap between small and large firms in 1999 and 2007, respectively. Furthermore, it is found that the impact of exporting is driven mainly by the endowment effect while the impact of FDI by the return effect. Zhang also decomposes the difference in TFP growth between small and large firms using dynamic Blinder-Oaxaca method. He finds that exporting and FDI can explain about 23.9% of the productivity convergence between the two groups. For both exporting and FDI, the endowment change effects as well as the return change effects are found to be important channels for the productivity convergence.

Based on the results, Zhang argues that, in order to encourage the productivity growth of small firms, the government should focus more on helping small firms to become exporters and strengthening their ability to benefit from exporting. He also argues that the government should also guide more FDI into smaller firm sector as multinationals are a critical source of technology and knowledge.

Nam and Oh's paper, *"Changes in Competition of Small vs. Large Firms from International Trade"*, examines whether increased trade has differential effects on small and large firm's mark-up, utilizing plant level panel dataset in Korean manufacturing sector. Using estimated firm-level mark-up, they first provide several interesting facts. First, mark-up is higher for firms with higher market share (firm size) and for exporters. Another finding of interest is that the dispersion of mark-up distribution across firms has been reduced over time in Korean manufacturing. The issue which is most relevant for this project is whether the squeeze in the mark-up distribution over time is related to globalization. They do not find, however, any empirical linkage between the reduction of dispersion of mark-up distribution and globalization; industry-level import penetration does not have any significant effect on firm-level mark-up. In terms of policy, the authors cautions against policies to interfere with the increased competition from globalization.

Takii's paper, *"Import Penetration, Export Orientation and Plant Size in Indonesian Manufacturing"*, examines the effects of globalization on firm size and whether these effects differ between initially small and large firms, utlizing a plant-level panel dataset for Indonesian manufacturing sector. As measures of globalization, he considers import tariff, trading partner countries' tariff, import penetration and export-output ratio. Some of the interesting results are as follows. In the case of import tariff reduction, he finds some evidence that import tariff reductions decreases firm size but this effect was not statistically significant. There was no strong evidence, either, that import tariff reductions affects small firms more adversely. By contrast, in the case of import penetration, he finds strong evidence that an increase in import penetration reduces firm size. However, there was no strong evidence that this adverse effect is larger for smaller firms. He concludes that evidence do not support the fear that only relatively large firms can benefit from globalization and smaller firms are at a disadvantage. Based on these results, Takii argues, among others, that plant size is not necessarily an appropriate criterion when deciding on the extent of public support for manufacturing plants under globalization.

Aldaba's paper, *"Understanding the Relationship Between Globalization and Survival of Philippine SMEs"*, examines whether the effect of globalization on the probability of firm exit differs between SMEs and large enterprises utilizing a firm-level dataset on Philippine manufacturing sector from 1996 to 2006. As measures of globalization, she considers tariff rate, effective protection rate, foreign ownership, and export intensity. Probit model of firm exit is estimated based on the full-sample of firms as well as on subsamples of SMEs and large enterprises.

The full-sample estimation results show that tariff reduction increases the probability of firm exit while foreign ownership and higher export intensity decreases it. However, she does not find clear evidence that SMEs are more adversely affected by tariff reduction, compared with large enterprises. If at all, the results indicate that large enterprises are more adversely affected by tariff reduction, although this difference is not likely to be quantitatively large. Sub-sample estimation results reveal more interesting findings. While tariff rate and export intensity are important determinant of firm's probability of exit for both SMEs and large enterprises, foreign ownership is found to matter only in SME sample. Based on the results, Aldaba emphasizes the potentially important role of multinational enterprises in the Philippine economy and argues that the government should try to attract more FDI and strengthen the relationship between FDI and SMEs in particular.

Lee's paper, *"The Exporting and Productivity Nexus: Does Firm Size Matter?"*, examines whether the relationship between exporting and productivity differs across firm size in the Malaysian manufacturing sector. A two period (2002, 2006) firm-level panel data from the Study on Knowledge Content in Economic Sectors in Malaysia is used in the study. He first asks whether the exporter productivity premium is different between large and small firms. He finds that the productivity gap between exporters and non-exporters become smaller and less significant as firm size increases. Then he asks whether the larger exporter productivity premium for smaller firms reflect self-selection or learning-by-exporting. He tests self-selection by comparing the productivity of export starters with those of non-exporters. He finds that the statistical significance of the productivity differentials between export starters and non-exporters become weaker as firm size increases suggesting, that self-selection in exporting is more important for small firms than for large firms. He tests learning-by-exporting for larger and smaller firm groups separately. He finds that, while there is no learning-by-exporting for larger firm group, there is weak evidence of learning-by-exporting for smaller (medium-sized) firm group.

Based on the above results, Lee argues that export-oriented industrialization should continue to be an important industrial policy to strengthen productivity-driven growth. In particular, he argues that policies to enhance productivity levels of small firms are likely to be very important in order to encourage them to export.

Kuncoro's paper, *"Small and Large Firm Performance Gaps in Indonesia in the Era of Globalization: Evidences from Micro-Data on Manufacturing Establishments"*, also examines whether examine of the impact of globalization on the performance gap between small and large firms in Indonesian manufacturing. He finds that opening up of Indonesian economy through market liberalization increases the gap between large and small firms in terms of productivity and wages although, over time, small firms catches up large firms at least partially. However, he finds that small firms benefits from more open trade regime, which enable them to acquire imported inputs. In addition, he discusses several factors, such as FDI, R&D, and location factors, which are likely to be important for the benefits of globalization to be realized.

Thangavelu's paper, *"Globalization and Performance of Small and Large Firm: Case of Vietnamese Firms"*, examines the horizontal and backward FDI spillover effects in Vietnamese manufacturing sector, allowing for possibly differential effects between large firms and SMEs. He finds that, while there is no evidence of horizontal FDI spillovers, there is weak evidence of FDI spillovers through its backward linkages. Estimation results for sub-groups of small and large domestic firms show that the backward spillover effect is negative for small domestic firms while it is positive for large domestic firms, although these effects are not statistically significant.

Jongwanich and Kohpaiboon's paper, *"Firm Productivity, Globalization and Global Production Sharing: Lessons from Thai Manufacturing"*, examines productivity determinants which might differ between large and small firms in Thai manufacturing, using the 2006 industrial census. The main focus is to gain better understanding the effect of economic globalization. Two aspects of economic globalization are discussed here, trade policy and global production networks. One of their key findings is that while firm-specific variables such as years of operation, R&D activities, a number of skill workers employed have positive effect on productivity, modes in which firms are integrated into the global economy like market orientation, intermediate imports and foreign partnership positively contribute to their productivity. In particular, it is found that firms operating in more restrictive trade policy register lower productivity than those in more liberal environment. Insulting firms from foreign competition through cross-border protection like tariff tends to induce producers to become 'unresponsive' to improved technological capability as well as requests for improvement in the quality and price of what they offer. From this project's viewpoint, what is particularly interesting is that the negative effect seems to be much higher for large firms, perhaps due to presence of water-in-tariff occurring among small and medium firms.

With regard to the global production network, the authors find that whether small firms are disadvantaged over large firms depends on the type of production network. In the producer-driven network, small firms are disadvantaged in the sense that they need additional productivity in order to survive. By contrast, there is no such evidence in the case of buyer-driven networks. That is, firms participating in buyer-driven networks tend to have lower productivity regardless of their size.

3. Policy Implications

This project aims to better understand whether and how globalization has affected the performances of small and large firms as well as identifying policy issues needed to be addressed in order to achieve a more strong and resilient economic growth and development of East Asian economies.

As summarized, the country papers indeed provide some evidence on this, that globalization may affect size or performance of firms. The impact of globalization moreover could be different depending on the size of the firms. Evidence gathered from the country studies however is not able to clearly point out the direction of the impact, i.e. whether or not globalization widen or narrow the performance gap between small and large firms. The gap is found to have narrowed over the time in the case study of some countries while it is not clear in the experience of the other countries. Nevertheless, the fact that globalization has made performance of firms in some countries to diverge is sufficient to flag policy makers on the potential adverse impact coming out from globalization. In this respect, over the time the country may be locked in a situation where there is very unequal distribution of firm by size. In this situation, the different in firm performance by size is also usually very large which in turn will create some issues in output and welfare generation.

It is important to note however that some studies in this project found the gap in the performance between large and small firms has narrowed over the time and this could be attributed to some extent by globalization. As in the case study of manufacturing firms in China, for example, export participation and FDI are able to explain some portion of the reasoning for the convergence in the productivity performance between large and small firms in the country. This is a positive impact and, for policy makers, this sends a signal that there is a merit to engage in, as well as deepen the engagement with, globalization. One plausible outcome coming out from this scenario is a situation where large and small firms coexist but with very small productivity difference. In other words, smaller and larger firms are more or less the same in terms of their competitiveness in doing business. This will be a favorable situation because there will no be issues in output and welfare generation coming out from large and small firms.

The studies in this project show and further suggest that the most obvious way to increase the performance of smaller firms which inherit a scale disadvantage is by engaging in export and maximizing the productivity spillovers by multinationals (MNEs). The latter could take many forms, one of which is direct involvement of smaller firms as suppliers of the MNEs. As uniquely presence in Southeast and East Asia in general, MNEs typically operate either as or in networks of productions with other firms/MNEs in other countries but within the region (i.e., commonly known as the East Asia production networks). As the case study of Thai and Philippines manufacturing show, engagement in supplying to MNEs operating in the production networks proved to be able to increase the growth, survival and productivity of SMEs in these countries. Meanwhile, engaging in exports evidently is able to increase the productivity performance of SMEs, as indicated in some of the country papers. In fact, exporting seems to be one of the important ways to increase the productivity of smaller firms. As shown in the case study of manufacturing firms in Malaysia for example, engaging in exporting by smaller firms can be explained more by the theory of self-selection rather than by learning by exporting theory. Self-selecting in to exporting arguable requires a firm to do more effort to increase its productivity rather than that implied by learning by exporting theory.

Performance of smaller firms may also improve as a result of increased pressure of competition commonly exists when a country is connected to or becomes more open to global economy. As shown by the case study of Korean manufacturing, the variability of mark-up across firms was reduced over the time consistent with deeper integration of Korean economy to global economy. In this setting, smaller firms are forced to improve their performance in order to survive which translates to better performance for overall group of the firms. Competition pressure works more from demand side. Meanwhile, from the supply side, greater imports in a country as results of more opened trade regime could improve the performance of smaller firms by providing firms, including the smaller ones, with more choices of production inputs; this is indicated by one of the papers on Indonesian manufacturing.

Notwithstanding the evidence on the positive impact of globalization on the performance of smaller firms, it remains a fact that these firms has a scale disadvantage that inherently put them in a different (lower) productivity level than their larger counterparts. Therefore, it is important for government to facilitate smaller firms to be able to read the benefit offered by globalization. In terms of exporting, this can be done by providing assistance or facilitation that reduces the sunk cost of exporting. As shown by one of Japanese country studies, providing information about foreign market through the relation of firms to banks that lend them loans proved to be beneficial in this case. Assistance could also be given more by ensuring conducive the general business environment. This includes the strategy to make investment regime open and be friendly to foreign investors, considering potential positive productivity spillovers coming from MNE activities.

Overall, results of the studies in this project provide useful information for policy makers in respect to managing the impact of globalization on performance of firms and, more importantly, to address the issue of potential diverging effect on the size distribution of firms. The studies seems to convey a message that globalization could indeed improve the performance of smaller firms provided there is a careful policy management, and the policy being managed needs to have a clear objective of maximizing the potential or opportunities from globalization by providing the right and balanced facilitation measures.

CHAPTER 2

Japanese Small and Medium-Sized Enterprises' Export Decisions: The Role of Overseas Market Information*

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This paper examines how the Japanese firms' export decision is affected by the availability of information on export markets, focusing on how such a mechanism differs between large firms and small and medium-sized enterprises (SMEs). Unlike existing studies which solely focus on information sharing among firms, we are interested in the role of firms' lender banks as an additional source of information. Specifically, using a unique dataset containing information not only on firms' export activities but also on their lender banks' exposure to other exporting firms and lender banks' own overseas activities, we find that information spillovers through lender banks positively affects SMEs' decision to start exporting and the range of destinations to which they export. Such information spillovers also reduce the likelihood that exporter firms exit from export markets. The export-to-sales ratio of exporter firms, however, is not affected by such information spillovers. These results imply that information on foreign markets provided by lender banks substantially reduces the fixed entry costs associated with starting exporting and entering new export markets as well as firms' costs associated with continuing to export. Our results highlight that channels of information spillovers other than those examined in the literature so far may be of considerable importance, especially for SMEs.

Keywords: Export Decision; Lender Bank; Information Spillover; Extensive and Intensive Margins

JEL Classification: F10, F14, G21, L25

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1. Introduction

The successful globalization of Japanese firms, especially small and medium-sized enterprises (SMEs), is becoming one of the most import policy topics in Japan. Facing sluggish domestic sales against the background of an aging and shrinking population, Japanese firms have been shifting their sales and profits to export markets. The share of exports in Japan's GDP has increased from 10.9% in 2000 to 14.7% in 2012. While well-established large firms have been diversifying their destinations of sales and locations abroad, it is generically difficult for SMEs to overcome the various obstacles associated with entering overseas markets. Given that a large share of firm activities (e.g., in terms of the number of firms, the number of employees, and value added) are accounted for by SMEs in the manufacturing sector, however, it is important from a policy perspective to induce SMEs to expand their business activities towards overseas markets. Motivated by this discussion, this paper examines the determinants of firms' export behavior with putting a special emphasis on SMEs.

The international trade literature suggests that to start exporting firms incur fixed sunk costs. These costs reflect, for example, the fact that firms initially are uncertain about their export profitability, and, thus they have to collect a considerable amount of relevant information on export markets. Other potential costs include, for example, modifying products to suit local tastes and setting up distribution networks. Developing a theoretical model, Melitz (2003) therefore suggests that only firms which are sufficiently productive to cover such fixed costs can be exporters. Extant empirical studies (e.g., Bernard et al. 2003; Mayer and Ottaviano 2008; and Todo 2011) examining this hypothesis, however, indicate that there must be other important factors which affect firms' decision to export. They suggest that even when their productivity is not very high, firms can be exporters as long as other critical conditions are satisfied. In other words, understanding other important drivers of exports effectively provides a chance for even SMEs, which tend to be less productive than larger firms, to expand their overseas business activities.

The extant literature has already focused on a number of conditions or factors that may affect firms' export decision. One important research strand in this context concentrates on information spillovers. The underlying idea is that information exchange with other exporting firms reduces the individual fixed costs associated with exporting, and that such information exchange therefore increases the probability that a firm will export (see, e.g., Krautheim (2012) for a theoretical investigation).[1] Having access to information on foreign markets, the hypothesis goes, substantially reduces uncertainty and encourages firms to engage in export activities. Empirical work by Koenig et al. (2010) confirms this hypothesis, showing that the presence of other exporters has a positive effect on the export decision of other firms. However, although Koenig et al. (2010) find evidence of positive information spillovers, the evidence produced by other empirical studies on such information spillovers is at best weak (e.g., Aitken et al. 1997, Barrios et al. 2003, Bernard and Jensen 2004). According to a survey conducted by the Small and Medium Enterprise Agency of Japan, however, it is clear that many enterprises that would like to export face problems in terms of, e.g., "securing outstanding partner enterprises" and "ascertaining the needs of local enterprises and residents overseas". Especially compared to large enterprises, a high percentage of SMEs have not been able to undertake export operations as a result of the difficulty to "secure outstanding partner enterprises." This is a serious challenge for SMEs, which have limited managerial resources compared to large enterprises (Japan Small Business Research Institute 2008). In fact, the productivity of SMEs on average is much lower than that of large firms, suggesting that many SMEs are not sufficiently profitable to afford the

[1] Other strands in the literature examine the relationship between firms' export status and their innovative capacity, the price and/or quality of their product(s), various country characteristics, and institutional factors such as free trade agreements, economic diplomacy, and so on.

fixed costs of exporting. Therefore, in order for SMEs to start exporting, they have to raise their productive or try to lower the costs of exporting. However, SMEs usually have much fewer transaction partners than large firms due to their small size of activities and it is expected that SMEs are more likely to face serious difficulties to find a partner enterprise abroad through information exchanges with their current transaction partners, implying that it is costly for SMEs to collect information on foreign markets and possible partner enterprises abroad. Thus, one of the most important research question is what channels contribute to the effective information exchange between exporting firms and non-exporting firms, which is more relevant for SMEs than large firms and has not been clearly examined in the extant studies. Depicting detailed sketches of information spillovers is important especially in the context of SMEs since it is much less clear how such information spillover arises for SMEs than for larger firms. For example, SMEs likely have much fewer opportunities to interact with export firms in their daily business activities than large firms.

Given these discussions on information spillovers, this paper focuses on information provided by lender banks as an additional channel of information spillovers. The hypothesis we examine in this paper is that lender banks also contribute to such information exchange in the form of conduit. In the case of Japan, lender banks generally provide not only financial support but also business consulting services utilizing extensive knowledge collected through their lending transaction relationships and from various information sources. Since the monitoring of borrower firms is important for banks, banks in general should accumulate information on borrower firms and related parties. Thus, if we assume that a particular bank is very knowledgeable about overseas business opportunities either through its own banking activities (e.g., foreign branches) or transactions with client firms with experience in exporting, potential exporter firms would find it helpful to consult with such a bank.

The information provided by lender banks could be more important for SMEs than that for large firms from the following two reasons. First, although SMEs tend to have less resources about overseas market than larger firms (e.g., smaller number of trading partners, lower exposure to overseas information through imports, or more constraints on internal resources allocated to the collection of overseas market information), they are usually keeping close ties to lender banks and, thus in a good position to obtain feedback from banks on their business strategies. Hence, lender banks could play an important role as a conduit of export market information for SMEs. Second, lender banks themselves have a strong motivation to provide such information to client SMEs since the expansion of client firms' business activities naturally leads to larger business opportunities for lender banks. In other words, as far as lender banks have accumulated overseas market information, it is natural for them to share such information with their clients.

This paper contributes to the existing literature in at least two ways. First, we examine the export decision by using a dataset that makes it possible to link firm-level information with information on the lender banks of each firm. Our dataset includes a large number of firms, enabling us a rigorous analysis separately for large firms and SMEs. To the best of our knowledge, this is the first paper to explore the impact of information spillovers through lender banks on firms' export behavior, which are represented by starting exports (*an extensive margin*), expanding export destinations (*another extensive margin*), stopping exports (*another extensive margin*), and changing the export-to-sales ratio (*the intensive margin*), as well as the impacts of main banks' financial health and the agglomeration of nearby exporters.[2] Second, the paper especially investigates whether the importance of information provided by

[2] Financial institutions presumably play an important role in determining client firms' export activities has recently been highlighted in studies by Amiti and Weinstein (2011), Paravisini et al. (2011), Feenstra, Li and Yu (2013), and Miyakawa et al. (2013), which indicate that banks' financial health plays an important role in determining firms' export behavior.

banks is substantially sizable for SMEs. It is naturally expected that SMEs find it more difficult to collect the information associated with export markets by themselves than larger firms do due to its managerial resource constraints mentioned above. Our results below show that information on overseas markets provided by lender banks substantially reduces the fixed costs associated with exporting for SMEs and thereby helps them to enter export markets and continue exporting.

The organization of this paper is as follows. Section 2 describes the dataset used in this paper and provides some descriptive statistics for our sample firms. Section 3 briefly explains the roles that main banks play in Japan and presents the empirical strategy we employ in this paper. Section 4 presents our estimation results and Section 5 concludes.

2. Differences in Export Behavior between Large Firms and SMEs

2.1. Data Description

Let us start by looking at the difference in export status and various firm characteristics between large firms and SMEs. In order to examine firms' export behavior and various characteristics, this study uses the firm-level panel data obtained from the *Basic Survey on Business Structure and Activities (BSBSA)*, which is collected annually by Ministry of Economy, Trade and Industry (METI) for the period 1997-2008. The survey is compulsory and covers all firms with at least 50 employees and 30 million yen of paid-in capital in the Japanese manufacturing, mining, and wholesale and retail sectors and several other service sectors. The survey contains detailed information on firm-level business activities such as the 3-digit industry in which the firm operates, its number of employees, sales, purchases, exports, and imports (including a breakdown of the destination of sales and exports and the origin of purchases and imports).[3] It also contains the number of domestic and overseas subsidiaries, and various other financial data such as costs, profits, investment, debt, and assets. Although the survey covers firms in the non-manufacturing sector, this paper focuses on firms in the manufacturing sector only because the survey does not cover international transactions in services and only asks firms about the amount of trade in goods.[4]

The key aim of our analysis, as mentioned above, is to investigate the importance of information on destination markets and advice provided by lender banks to their client firms. To do so, we combine the firm-level data with information on firms' lender banks and examine the relationships between firm characteristics, lender banks' ability to provide advice, and firms' export status. We merge the dataset with information on the lender banks for each firm using the loan relation information stored in Teikoku Databank Ltd's corporate information database. The database, called *COSMOS2*, contains the lender banks' names for each firm in the order of the importance to the firms (maximum ten lender banks for each firm). We assume that the bank listed as a first lender to a firm-year observation as the main bank for the firm in each year. In order to characterize the lender banks, we obtain various types of information on banks, such as the total assets of the bank, its equity ratio, and its loan deposit ratio from Nikkei NEEDS Financial Quest database. We also calculate the number of client firms for each bank using our firm-bank-linked dataset. Our unbalanced panel data contain approximately 7,000 manufacturing firms each year.

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[3] The survey asks for the amount as well as the destination or origin of exports and imports broken down into seven regions (Asia, Middle East, Europe, North America, Latin America, Africa, and Oceania). Unfortunately, more detailed information on the destination of exports and origin of imports is not available.

[4] Although the survey also asks non-manufacturing firms for information on exports and imports, they are required to provide the amount of trade in goods only. The survey started to ask about international transactions in services in the 2010 survey.

2.2. Overview of the Firm-Bank-Linked Database

Using the firm-bank-linked database, we examine the differences in firms' export behavior and various characteristics between large firms and SMEs. First, Table 1 summarizes the share of exporters in our dataset. SMEs are defined as firms with paid-in capital of up to 300 million Japanese yen or up to 300 employees, following the Japanese legal definition of SMEs. We define all other firms in our database as large firms. We further divide SMEs into small firms and medium firms in order to examine the differences within SMEs more closely. Small firms are defined as firms whose paid-in capital is equal to or smaller than 150 million Japanese yen and the number of employees is equal to or smaller than 150. All of other SMEs are defined as medium-sized firms.

As shown in Table 1, the share of exporters differs considerably between large firms and SMEs. While approximately 60 percent of large firms are exporters, only 25 percent of SMEs are. The share of exporters is among small firms is even smaller, with more than 80 percent of small firms being non-exporters. Given that the nearly 90 percent of the firms in our dataset are SMEs, there are a significant number of non-exporting manufacturing firms as shown in Table 1. Table 1 also implies that becoming an exporter is particularly difficult for SMEs and that a lot of SMEs may suffer from the lack of resources and information on foreign markets required to start exporting.

Table 1: Number of Firms in the Dataset by Size and Export Status

	No. of firms	Share in all firms (%)	Share in the size category (%)
All firms	77,305	***100.0***	
Exporters	22,526	29.1	
Non-exporters	54,779	70.9	
Large firms	9,778	12.6	***100.0***
Exporters	5,876		60.1
Non-exporters	3,902		39.9
SMEs	67,527	87.4	***100.0***
Exporters	16,650		24.7
Non-exporters	50,877		75.3
Medium firms	45,298	58.6	***100.0***
Exporters	12,959		28.6
Non-exporters	32,339		71.4
Small firms	22,229	28.8	***100.0***
Exporters	3,691		16.6
Non-exporters	18,538		83.4

Table 1 suggests that SMEs are less likely to start exporting than large firms. Next, let us statistically test whether the probability of starting exporting is lower for SMEs than for large firms. We define an export starter as a firm which did not export from year *t-3* to year *t-1* but exported in year *t*. We construct various dummy variables representing a firm's export status and examine differences in export behavior across firms of different sizes. First, we prepare a dummy variable, *NEW_EXP*, which takes one for firms which did not export from year *t-3* to year *t-1* but exported in year *t*. This variable takes zero for firms which did not export from years *t-3* to *t*. Therefore, the variable *NEW_EXP* is not defined for firms which did export between years *t-3* and *t (Always exporter)*. For firms which exported in year *t-1*, we prepare a dummy variable, *NEW_REGION,* which takes one for firms which increased the number of export destinations in year *t*. For exporting firms which did not increase the number of export destinations in year *t*, the variable *NEW_REGION* takes zero. For firms which exported in year *t-1*, we also prepare a dummy variable, *STOP_EXP*, which takes one for firms which stopped exporting in year *t*, and zero otherwise. Moreover, we construct a variable, *EXP_SALES*, which represents the ratio of export value to sales for firms which export in year *t*.

Table 2 shows the mean values for these variables. For all firms, the mean value of *NEW_EXP* is 0.034, suggesting that 3.4 percent of non-exporting firms in years *t-3* to *t-1* started exporting in year *t*. Looking at the difference between large firms and SMEs, 6.4 percent of non-exporting large firms started exporting in year *t* while 3.2 percent of non-exporting SMEs started exporting in year *t*. The difference of this propensity to start exporting is statistically significant at 1% level. Similarly, the propensity to start exporting differs significantly between medium firms and small firms. As for expansion of export destinations (*NEW_REGION*), larger firms are more likely to increase export destinations and the differences are statistically significant across different sizes of firms. On the other hand, smaller exporting firms are more likely to stop exporting than larger firms (*STOP_EXP*). These figures indicate that it is more difficult for smaller firms to cover the fixed costs to start exporting than for larger firms, and that smaller firms are less likely to continue exporting. However, while the export intensity (*EXP_SALES*) is larger for large firms than for SMEs, it is not statistically different between medium firms and small firms.

Table 2: Differences in export behavior by firm size

	All firms		Large firms vs. SMEs					Medium firms vs. Small firms				
			Large firms		SMEs			Medium firms		Small firms		
Variable	Obs.	Mean	Obs.	Mean	Obs.	Mean	*t*-test	Obs.	Mean	Obs.	Mean	*t*-test
NEW_EXP	50,385	0.034	3,711	0.062	46,674	0.032	***	29,844	0.037	16,830	0.023	***
NEW_REGION	20,884	0.156	5,606	0.181	15,278	0.147	***	11,944	0.152	3,334	0.126	***
STOP_EXP	20,884	0.067	5,606	0.051	15,278	0.072	***	11,944	0.066	3,334	0.093	***
EXP_SALES	20,143	0.135	5,138	0.160	15,005	0.127	***	11,704	0.126	3,301	0.130	

Note: *** indicates that the mean values of two groups of firms are different at the 1% significance level.

It appears that exporting is more difficult for SMEs than for large firms. Existing theories may explain the fact as small firms are not sufficiently productive to cover fixed costs to start exporting. Therefore, it is expected that small firms are much less productive than larger firms. In order for less productive small firms to start exporting, they may have to utilize various information sources to collect information on export markets, such as nearby exporting firms, foreign investors, transaction partners, and lender banks. Table 3 compares various firm characteristics and the availability of information between exporters and non-exporters for large firms and for SMEs. For firm characteristics, we examine mean values for TFP and firms' cash flow (liquid asset share) (*F_CASH*) for each size-category of firms. As proxies for the availability of information on export markets, we calculate the number of nearby firms (*F_NEARBYFIRM* and *F_NEARBYINDEXP*),[5] the foreign ownership ratio (*FOREIGN*), the import ratio (*IMPORTRATIO*), and the share of overseas assets in total assets (*FFORIVN*) for each firm. We also calculate several variables which proxy the amount of information on export markets provided by lender banks for each firm: the share of exporting client firms in the total number of client firms for the top-lender bank of a firm (*BANKINFO*), the average share of exporting client firms in the total number of client firms for all the lender banks of a firm (*BANKINFO_AVR*), the number of overseas branches of the top-lender bank of a firm (*BANKBR*), the average number of overseas branches of all the lender banks of a firm (*BANKBR_AVR*), and the size (total assets in logarithm) of the top-lender bank (*B_SIZE*). We also prepare a dummy variable, *EXIM*, which takes one for firms who borrow from the Japan Bank for International Corporation, formerly called the Japan Export-Import Bank. This is a government-run financial institution specialized in international banking such as trade finance.

5 The first nearby-firm variable, *F_NEARBYFIRM*, represents the number of firms located in the same city for each firm. The second nearby-firm variable, *F_NEARBYINDEXP*, represents the number of exporting firms belonging to the same industry and located in the same city for each firm.

As shown in Table 3, exporters tend to have higher TFP and larger cash flow than non-exporters for all size categories, and the mean values for exporters and for non-exporters are significantly different for all the cases. These figures indicate that exporters are more productive and less financially constrained than non-exporters, thereby are able to cover the fixed costs of exporting. Moreover, exporters have a larger value for all the variables representing availability of information on export markets or information sources for each firm than non-exporters for all the size categories. Only for small firms, the mean value of *EXIM* is larger for non-exporters, although the difference in the mean values is not statistically significant. All these figures indicate that exporters tend to have more information available than non-exporters, implying that utilizing such available information lowers the fixed costs of exporting.

Moreover, we should note that the average TFP for exporting SMEs is much lower than the average TFP for non-exporting large firms (0.032 vs. 0.056). On the other hand, as for the mean values for the information related variables, the difference between exporting SMEs and non-exporting large firms looks small. Exporting SMEs tend to have a larger mean value for proxies of information obtained directly by a firm (*FOREIGN*, *IMPORTRATIO*, *FFORINV*) than non-exporting large firms. As for proxies of information provided by a firm's lender banks, although the mean values for exporting SMEs are smaller than those for non-exporting large firms, the difference is quite small.

Thus, it appears that SMEs are inferior to large firms in terms of both firms' own performance and the availability of various information sources. Even exporting SMEs are less productive than non-exporting large firms. Given the fact that they are not sufficiently productive to cover the cost of exporting, SMEs would need to utilize various information sources to lower the costs of exporting. Based on these figures, we conjecture that the availability of various information sources is more critical for

SMEs to start exporting than for large firms.

Table 3: Comparison of Mean Values for Exporters and Non-exporters

Variable	All firms		Large firms		SMEs		Medium firms		Small firms	
	Exporters	Non-exporters	Exporters	Non-exporters	Exporters	Non-exporters	Exporters	Non-exporters	Exporters	Non-exporters
TFP	0.050	-0.008	0.101	0.056	0.032	-0.013	0.043	0.000	-0.008	-0.036
F_CASH (t-1)	0.580	0.542	0.537	0.507	0.595	0.544	0.593	0.541	0.602	0.550
F_NEARBYFIRM	428.008	262.111	600.068	484.389	367.286	245.064	377.732	256.626	330.610	224.894
F_NEARBYINDEXP	4.667	1.592	5.519	2.656	4.366	1.510	4.434	1.559	4.127	1.424
FOREIGN	14.565	2.160	22.328	8.533	11.825	1.671	13.465	2.192	6.068	0.763
IMPORTRATIO	0.046	0.008	0.049	0.014	0.044	0.008	0.045	0.008	0.043	0.007
FFORINV	0.033	0.004	0.051	0.009	0.026	0.003	0.028	0.004	0.020	0.002
BANKINFO	0.240	0.207	0.261	0.237	0.233	0.204	0.234	0.208	0.228	0.198
BANKINFO_AVR	0.237	0.204	0.255	0.232	0.231	0.202	0.232	0.206	0.225	0.195
BANKBR	17.932	13.863	20.354	17.580	17.077	13.578	17.451	14.219	15.764	12.461
BANKBR_AVR	15.116	12.018	16.890	14.938	14.490	11.794	14.779	12.351	13.473	10.821
B_SIZE	16.718	16.308	17.011	16.733	16.614	16.276	16.651	16.352	16.485	16.142
EXIM	0.005	0.001	0.010	0.004	0.003	0.001	0.003	0.001	0.000	0.001

Note: The difference between exporters and non-exporters is statistically significant at the 1% significance level for all the cases except *EXIM* for small firms.

3. Empirical Strategy

3.1. The Main Bank System in Japan

The so-called "main bank system" has been a key feature of Japan's economic system that can be traced back as far as the early post-war period.[6] In this system, a firm's "main bank" usually is the bank from which it has borrowed the most and with which it typically has a long-term relationship. In addition, it is widely argued that main banks not only provide loans to client firms but also play a consulting role by providing relevant business information. In addition, main banks may get involved in the management of a firm in times of distress. Although the extent and form of main banks' involvement in firms' management in times of financial difficulties have been changing over time, main banks are still perceived to play an important role as providers of both funds and information to their client firms.

Trying to provide a theoretical underpinning for such long-term relationships

6 For an overview of the origins of the main bank system, see, e.g., Hoshi and Kashyap (2001).

between main banks and borrower firms, Patrick (1994) argues that such relationships enable banks to gain access to "soft information" on borrower firms, which helps to raise the efficiency of loan screening and borrower monitoring. The argument that repeated bank loan transactions lead to the accumulation of soft information on client firms has also been voiced in more recent studies such as Degryse et al. (2009).

Such soft information on borrower firms and banks' own ability to collect information on industry-, region-, and nation-wide businesses has been helping Japanese main banks to provide effective and useful financial and consulting services to their client firms, and thereby has been contributing both to main banks' profits and the growth of their client firms' business. Particularly in recent years, aware of the fact that the growth prospects for Japan's domestic market are not necessarily promising and domestic manufacturing production has in fact been shrinking, banks have been promoting various services to support client firms' international activities. With more and more large Japanese firms relocating production overseas, smaller domestic firms have been forced to reduce output, resulting in a fall in demand for funds, which in turn has reduced business opportunities for banks in Japan. Moreover, if banks' existing client firm went out of business, banks would not only lose current business but also future business in which to utilize the firm-specific soft information they have accumulated. Thus, faced with a potentially shrinking market at home, many banks in recent years have put greater emphasis on providing support services to client firms seeking to exploit growth opportunities overseas.

Concrete examples of such kind of support services that banks provide to their borrowers to help them with regard to international activities are provided by a Japanese Bankers Association (JBA) report (Japanese Bankers Association 2011). According to the report, other than traditional banking services such as the usual loan business, deposit services, payment services, lease and leaseback deals, or the issue of stand-by letters of credit (L/C), main banks often provide client firms with information on potential business partners in foreign countries as well as advice on recruiting employees, advertising, tax systems, and administrative issues such as accounting systems, laws, and regulations. These examples indicate that banks provide not only financial transactions but also information services. In the report, the JBA cites a survey it conducted according to which 38 out of 43 Japanese banks with activities in Asia say they provide services other than loan, deposit, and payment services. Specifically, 32 out of the 38 banks with activities in Asia say they provide information related to investment (i.e., tax and accounting systems, etc.), while 31 banks provide opportunities for business matching (e.g., organizing business matching events for Japanese firms and potential local partners). In addition, many banks provide information on firms located in destination regions (14 banks), loan guarantees (12 banks), and support with export and import procedures (8 banks).

Another important issue in the recent banking studies is the existence of non-main banks. Suppose that a firm with multiple loan relations faces an adverse shock only to its main bank while another firm faces adverse shocks to all its lender banks including main bank. It is natural to expect that the latter firm could find it more difficult to circumvent the adverse impact originating from loan suppliers. Khwaja and Mian (2008), for example, examine such an environment and find that an average level of shocks affecting lender banks is an appropriate measure of financial friction. Such a latest discussion motivates us to employ not only the variables related only to main bank but other lender banks.

3.2. Empirical Model

This section explains the empirical strategy we employ to investigate the determinants of export dynamics. We are particularly interested in the impact of information provided by main banks on firms' export dynamics represented by (i) the initiation of exports (i.e., extensive margin), (ii) the expansion of export destinations (i.e., extensive margin), (iii) the termination of exports (i.e., extensive margin), and (iv) the intensity of exports (i.e., intensive margin). For the three extensive margins of exports (i) to (iii), we focus on the probabilities that a firm starts exporting, extends export destinations, and stops exporting, while we use the export-to-sales ratio to represent the intensive margin of exports (iv).

Following previous empirical studies on the determinants of the extensive margin (e.g., Koenig et al. 2010, Minetti and Zhu 2011), we assume that firm *i* starts exporting, extends export destination, and stops exporting if its profits are larger when exporting than when not exporting, extending destinations than when not extending, and stopping exports than when continuing, respectively. Let π_{it1}^{*},π_{it2}^{*}, and π_{it3}^{*} represent the differences between the profits of firm *i* when it starts exporting, extends export destination, and stops exporting at time *t,* respectively, and its profits when it does not at time *t*. The differences are determined by firm characteristics, the firm's financial conditions, main bank characteristics (health of banks providing trade finance), and the amount of information on the export market available to the firm. The availability of information on the export market is assumed to substantially lower the uncertainty of profits from exporting, extending exports destinations, and continuing exports and hence, to lower either the variable or the fixed cost associated with these exporting dynamics. While information spillovers from nearby exporter firms are also taken into account, we are particularly interested in information provided through the main bank and the non-main banks of the firm. Therefore, we parameterize π_{itk}^{*} as:

$$\pi_{\mathrm{itk}}^{*} = \alpha_{1\mathrm{k}} + \mathrm{Z}_{\mathrm{it-1}}\beta_{1\mathrm{k}} + \mathrm{I}_{\mathrm{it-1}}\gamma_{1\mathrm{k}} + \varepsilon_{\mathrm{it}} \quad where\ k = 1,2,3 \tag{1}$$

where Z_{it-1} is a vector of controls for firm characteristics and a firm's financial condition which may affect firm i's differential profits π_{itk}^{*}; I_{it-1} is a vector of variables representing information available to the firm; and ε_{it} captures unobserved firm characteristics and other unknown factors that may also affect differential profits.

We assume that firm i starts exporting, extends export destinations, and stops exporting if the differential profits $\pi_{itk}^{*}>0$. Under the assumption that ε_{it} is a normally distributed random error with zero mean and unit variance, the probabilities that firm i starts exporting, extends export destinations, and continues exporting can be written as:

$$\mathrm{Prob}_{\mathrm{itk}} = \mathrm{Prob}(\alpha_{1k} + \mathrm{Z}_{\mathrm{it}-1}\beta_{1k} + \mathrm{I}_{\mathrm{it}-1}\gamma_{1k} + \varepsilon_{\mathrm{it}} > 0)\ \ where\ k = 1,2,3 \qquad (2)$$

In the first instance, we estimate Equation (2) with a random effect panel probit approach. In order to take any potential endogeneity into account, we lag all right-hand side variables by one year. The dependent variable $Prob_{itk}$ denotes the change in export status at the firm-level and takes a value of 1 if a firm exports for the first time at time t (k=1), increases the number of export destination at time t (k=2), and stops exporting at time t (k=3). We define a firm as an export starter if the firm did not export over either the last three years from t-3 to t-1 and exports at time t. $Prob_{it1}$ takes a value of zero if a firm did not export for the last three years prior to year t and does not export in year t. Firms which always export are not included in the estimation of $Prob_{it1}$. For the estimation of $Prob_{it2}$ and $Prob_{it3}$, we only use firms which exported at t-1.

For the intensive margin, we estimate the following model (3) through a panel estimation assuming firm-level fixed effect. The dependent variable EXP_SALES_{it} denotes the ratio of exports to the total sales measured at the firm-level. For this estimation, we only use firms which exported at t.

$$\mathrm{EXP/SALES}_{it} = \alpha_{14} + Z_{it-1}\beta_{14} + I_{it-1}\gamma_{15} + \eta_i + \varepsilon_{it} \quad (3)$$

Regarding control variables for firm characteristics and the firm's financial conditions (Z_{it}), we include the TFP level of the firm, which is measured by the method detailed in Appendix 1. Based on the results of both theoretical and empirical studies, we expect TFP to be positively correlated with firms' decision to start exporting. Further, to take the impact of liquidity constraints on firms' export behavior into account, we include a variable representing firms' financial characteristics, such as the ratio of liquidity assets to total asset (*F_CASH*). The reason for including this variable is that, as highlighted by, e.g., Manova et al. (2011), Feenstra et al. (2013), and Minetti and Zhu (2011), financial constraints are likely to prevent firms from exporting because firms need sufficient liquidity in order to meet the entry costs associated with starting exporting. Therefore, we expect that firms with more liquidity are more likely to start exporting.

We also control for the financial health of main banks. Feenstra et al. (2013), for example, find that the health of banks providing trade finance is an important determinant of firm level exports. As proxy variables for main banks' financial health, we employ variables such as bank size (the log of the total assets of the bank, *B_SIZE*), the equity ratio (*B_CAP*), and the loan deposit ratio (*B_LTD*).

Regarding information available to the firm (I_{it}), we include variables representing the amount of information on export markets accumulated by lender banks (i.e., both main and non-main banks) as well as information spillovers from nearby firms. The explanatory variable of main interest is the amount of information on export markets potentially available to the firm through its main bank and other lender banks, which are proxies for the amount of information firm *i*'s main bank and other lender banks have accumulated. Specifically, we measure this variable as (i) the ratio of the number of exporting client firms to the total number of the main bank's client firms, i.e., the intensity of each main bank's dealings with exporting firms, *BANKINFO*, (ii) the average of the same variable as (i) for all the lender banks, *BANKINFO_AVR*, (iii) the number of foreign branches of the main bank, *BANKBR*, and (iv) the average of the same variable as (iii) for all the lender banks, *BANKBR_AVR*.

We conjecture that banks dealing with exporter firms with a higher intensity and/or operating a larger number of foreign branches accumulate more information related to overseas markets. The former conjecture could be the case when, for example, banks allocate limited lending/internal managerial capacity to each lending activity. Under this environment, the intensity of bank's dealing with exporting firms represents to what extent the bank focuses on the lending activities accompanying overseas market information (i.e., allocate more internal resources to exporting firms).

Note that using the average level of lender banks' information variable is likely to mitigate the potential bias coming from a systematic matching between a firm and a main bank. Suppose, for example, it is possible that firms being about to start exporting tend to choose a bank with larger amount of export market information. If this is the case, the reverse causality running from firms' export decision to main banks' information variables causes bias to our estimation of the coefficients associated with main banks' information variables. Given that it is relatively difficult for firms to entirely shuffle the list of lender banks just to initiate export, the average level of lender banks' information variable can mitigate the endogeneity bias originating from this reverse causality. We estimate the empirical model using average information variables instead of the main bank's information variable as a robustness check for our results.

Given our interests in the information spillovers through lender banks for SMEs, we run the regressions based on the equations (2) and (3) for subsamples consisting of all observations, large firms, and SMEs. To examine the importance of the information spillovers for SMEs more precisely, we also use two subsamples of SMEs to run the equations (2) and (3): Medium firms and small firms.[7]

In addition to banks' information variables, as highlighted in previous studies, there may be some spillovers from nearby exporters. In order to examine whether this is the case, we included the two nearby-firm variables, *F_NEARBYFIRM* and *F_NEARBYINDEXP*, which are defined in Section 2.2. Industry dummies (for fifteen manufacturing industries) and year dummies are also included in order to control for industry-specific and time-specific fixed effects. The summary statistics for all the variables used in our empirical analysis and the distribution of *BANKINFO* over banks in our dataset in year 2000 are provided in Appendix 2 and Appendix 3, respectively.

4. Estimation Results

Tables 4 to 7 summarize the results of our estimation for the extensive and intensive margins of exports based on equations (2) and (3). In each table, the columns labeled (a), (b), and (c) show the estimation results for the sample of all firms, large firms, and SMEs, respectively. We also show the results for the medium firms and the small firms in the columns (c1) and (c2), respectively. For each size category, the column (i) and (ii) show the results using the main bank's information variables and those using the average of information variables of all the lender banks for each firm, respectively.

As for firms' entry to export market (*NEW_EXP*), first, Table 4 shows that the information spillovers from lender banks' transactions with other exporting firms (*BANKINFO* or *BANKINFO_AVR*) have a strong positive impact on firms' entry to export markets. While the information spillovers from lender banks have a strong

[7] The definition of the size categories is same as that in Section 2.2.

positive impact in the case of SMEs, they do not have a statistically significant impact in the case of large firms. It implies that the information provided by banks is an important driver of starting exports for SMEs. This result is found regardless of whether we measure the accumulation of overseas market information only for the main bank or for all the lender banks (columns (i) and (ii)). This confirms the robustness of the estimation result. SMEs presumably lack internal resources and external information sources to collect information on overseas markets for themselves than larger firms as we discussed in the previous section. Therefore, lender banks would be particularly important information sources for SMEs. Second, the number of lender banks' overseas branches (*BANKBR* or *BANKBR_AVR*) also has a positive impact on firms' entry to export markets. One interesting difference between large firms and SMEs is that the average number of lender banks' overseas branches (*BANKBR_AVR*) matters for large firms while only that of main banks (*BANKBR*) matters for SMEs. Given that banks' overseas branches play an important role for their client firms' overseas payment, this difference may imply that SMEs solely rely on their main bank to make settlement for overseas transactions while large firms tend to use overseas branches of several lender banks, not concentrating on their main bank. SMEs probably tend to start exporting with a small transaction volume and their overseas payment can be handled by their main bank. However, large firms, which are likely to have many transaction partners overseas, may need to utilize a greater number of overseas branches in as many countries as possible. The estimated significantly positive coefficient of *BANKBR_AVR* for large firms may reflect such difference. Third, as theoretically predicted, TFP has a positive impact on the decision to start exporting (see the column (a)). However, this result is not found for each subsample. It implies that the impact of TFP is largely overlapped with the impact of firms' size since there is no significant impact of TFP within each subsample. Fourth, also as theoretically predicted, firms' liquidity (*F_CASH*) has a positive impact on firms' entry to export markets. Interestingly, this matters only for SMEs but not for large firms. As exporting is a more risky activity than selling products domestically, firms would have to hold sufficient cash flows in order to take this risky behavior. Particularly, SMEs may require sufficient liquidity to start exporting (i.e., enter foreign markets with a lot of uncertainties) because fund-raising or borrowing is usually more difficult for SMEs than for large firms. Fifth, among other independent variables, higher firms' overseas investment ratio (*FFORINV*) or import ratio (*IMPORTRATIO*), which are proxies for the degree of firms' exposure to overseas markets, increases the chance for firms to enter export markets. Sixth, the information spillovers through nearby firms or nearby exporters (*F_NEARBYFIRM* or *F_NEARBYINDEXP*) do not have any significant impacts on firms' entry to export markets, which is not consistent to the result by Koenig et al. (2010) but largely consistent with the results found in several studies such as Aitken et al. (1997), Barrios et al. (2003), and Bernard and Jensen (2004). Seventh, banks' balance sheet variables (i.e., *B_SIZE*, *B_CAP*, and *B_LTD*) also do not have any significant impact on firms' entry into export markets.

Table 4. Estimation Results for NEW_EXP

Random-Effect Panel Logit	(a) All Size Firms																			
					(b) Large Firms				(c) SMEs											
Dependent Variable:													(c1) Medium firms				(c2) Small firms			
NEW_EXP(t)	(i) Main bank		(ii) Average		(i) Main bank		(ii) Average		(i) Main bank		(ii) Average		(i) Main bank		(ii) Average		(i) Main bank		(ii) Average	
	dy/dx	SD	dy/dx	SD	dy/dx	SD	dy/dx	SD	dy/dx	SD	dy/dx	SD	dy/dx	SD	dy/dx	SD	dy/dx	SD	dy/dx	SD
BANKINFO (t-1)	2.070	0.614 ***			-1.761	1.673			2.624	0.671 ***			2.384	0.779 ***			2.971	1.404 **		
BANKINFO_AVR (t-1)			3.480	0.765 ***			-2.664	2.189			4.419	0.838 ***			3.946	0.982 ***			5.252	1.720 ***
BANKBR (t-1)	0.006	0.003 **			0.005	0.007			0.007	0.003 **			0.007	0.003 **			0.006	0.006		
BANKBR_AVR (t-1)			0.002	0.004			0.022	0.010 **			-0.002	0.004			-0.001	0.005			-0.007	0.009
FFORINV (t-1)	6.213	1.060 ***	6.136	1.057 ***	7.651	2.767 ***	7.729	2.804 ***	5.684	1.178 ***	5.609	1.177 ***	2.919	1.427 **	2.897	1.429 **	10.731	2.087 ***	10.545	2.079 ***
EXIM (t-1)	0.189	0.802	0.106	0.797	0.263	1.326	0.219	1.350	-0.098	1.085	-0.247	1.085	-0.074	1.099	-0.182	1.099	-17.566	1.8E+04	-18.947	2.9E+04
B_SIZE (t-1)	-0.052	0.038	0.005	0.031	0.012	0.108	-0.061	0.096	-0.082	0.041 **	0.008	0.034	-0.079	0.048 *	0.012	0.040	-0.115	0.083	-0.017	0.068
B_CAP (t-1)	-4.072	3.090	-2.792	3.021	-12.629	9.742	-13.638	9.530	-3.118	3.294	-1.496	3.223	-2.655	3.879	-0.993	3.792	-3.335	6.515	-1.599	6.371
B_LTD (t-1)	-0.172	0.217	-0.151	0.210	-0.058	0.409	-0.170	0.400	-0.233	0.265	-0.199	0.256	-0.322	0.290	-0.290	0.277	-0.137	0.741	-0.073	0.733
F_NEARBYFIRM (t-1)	1.0E-04	9.2E-05	7.3E-05	9.2E-05	2.6E-04	2.1E-04	2.8E-04	2.1E-04	-4.5E-05	1.1E-04	-7.7E-05	1.1E-04	-3.2E-05	1.3E-04	-5.5E-05	1.3E-04	-1.9E-04	2.6E-04	-2.4E-04	2.6E-04
F_NEARBYINDEXP (t-1)	0.009	0.007	0.010	0.007	0.009	0.011	0.008	0.011	0.010	0.009	0.010	0.009	0.008	0.010	0.008	0.010	0.028	0.024	0.029	0.024
IMPORTRATIO (t-1)	3.628	0.583 ***	3.604	0.583 ***	3.256	1.501 **	3.366	1.513 **	3.873	0.643 ***	3.875	0.644 ***	3.742	0.765 ***	3.745	0.764 ***	5.502	1.339 ***	5.455	1.331 ***
FOREIGN (t-1)	0.001	0.001 *	0.001	0.001 *	0.000	0.002	0.000	0.002	0.001	0.001	0.001	0.001 *	0.001	0.001	0.001	0.001	0.001	0.003	0.001	0.002
TFP (t-1)	0.584	0.280 **	0.543	0.280 *	0.154	0.909	0.138	0.923	0.358	0.302	0.316	0.303	-0.068	0.351	-0.103	0.351	0.562	0.657	0.504	0.657
F_CASH (t-1)	0.504	0.247 **	0.512	0.247 **	1.175	0.773	1.166	0.783	0.637	0.267 **	0.647	0.268 **	0.540	0.308 *	0.544	0.308 *	1.385	0.577 **	1.407	0.577 **
Firm Random-Effect	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Industry-Effect	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Year-Effect	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Number of Obs.	37,798				2,770				35,028				22,507				12,521			
Number of Groups	9,370				815				8,803				6,013				3,762			
Obs per group: min	1				1				1				1				1			
avg	4				3.4				4				3.7				3.3			
max	10				10				10				10				10			
Wald chi2	301.34		304.7		47.11		48.3		257.44		260.82		184.58		185.19		89.78		92.66	
Prob > chi2	0.0000		0.0000		0.1018		0.0826		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000	
Log likelihood	-4196.0		-4194.0		-491.4		-489.2		-3662.3		-3660.2		-2680.8		-2680.8		-933.9		-932.2	
Likelihood-ratio test of rho=0																				
chibar2	34.41		34.63		5.18		5.63		28.76		29.44		21.66		21.90		7.70		7.48	
Prob >= chibar2	0.0000		0.0000		0.0110		0.0090		0.0000		0.0000		0.0000		0.0000		0.0030		0.0000	

Note: ***, **, and * indicate significance at the 1, 5, and 10% level, respectively.

Let us consider the quantitative implications of these results. Specifically, let us focus on the results for the SMEs subsample (i.e., the column (c)). The marginal effect of *BANKINFO* and *BANKINFO_AVR* computed based on the estimation results are 2.624 and 4.419, respectively. Suppose that these variables accounting for the availability of information spillover through lender banks increase by one standard deviation for the subsample of non-exporter SMEs (i.e., 0.073 and 0.056 in Panel (c) in Appendix 2) in year *t-1*. Given the estimated marginal effects, the model predicts that the probability for non-exporter SMEs to start exporting will be 2.642 × 0.073 = 19.3% and 4.419 × 0.056 = 24.7% higher than in the case that banks' information variable does not increase. Considering that the sample mean and the standard deviation of the probability for SMEs to start exporting are 3.2% and 17.6%, respectively, this implies that the information spillovers through lender banks has an economically sizable impact on firms' entry to export markets.

The estimation results for the expansion of export destination (*NEW_REGION*) are summarized in Table 5. Information spillovers from lender banks have a positive and significant impact, particularly for SMEs, which is consistent to the results for *NEW_EXP* shown in Table 4. This means that the information provided by lender banks plays an important role not only for the initiation of exports but also for expansion of export destinations. Second, firms' liquidity (*F_CASH*) has a positive impact on the expansion of export destinations, which is also consistent to the results for *NEW_EXP*. However, while *F_CASH* does not have a statistically significant impact for large firms in the case of *NEW_EXP*, it does have a positive and significant impact for large firms in the case of *NEW_REGION*. This may suggest that even for large firms, expanding export destination requires a certain level of liquidity. Third, information spillovers from nearby firms have a positive impact on the probability of expanding destinations in the case of all size firms, but it is only weakly significant (see the column (a)).

Table 5. Estimation Results for NEW_REGION

Random-Effect Panel Logit	(a) All Size Firms				(b) Large Firms				(c) SMEs				(c1) Medium firms				(c2) Small firms			
Dependent Variable: NEW_REGION(t)	(i) Main bank		(ii) Average		(i) Main bank		(ii) Average		(i) Main bank		(ii) Average		(i) Main bank		(ii) Average		(i) Main bank		(ii) Average	
	dy/dx	SD	dy/dx	SD	dy/dx	SD	dy/dx	SD	dy/dx	SD	dy/dx	SD	dy/dx	SD	dy/dx	SD	dy/dx	SD	dy/dx	SD
BANKINFO (t-1)	1.393	0.390 ***			0.733	0.633			1.536	0.502 ***			1.494	0.551 ***			2.074	1.226 *		
BANKINFO_AVR (t-1)			1.580	0.469 ***			0.489	0.801			1.820	0.589 ***			1.858	0.652 ***			1.747	1.419
BANKBR (t-1)	0.002	0.001			-0.001	0.002			0.004	0.002 **			0.005	0.002 **			0.003	0.005		
BANKBR_AVR (t-1)			0.003	0.002			0.007	0.004 *			0.001	0.003			0.001	0.003			0.001	0.006
FFORINV (t-1)	-0.646	0.436	-0.664	0.436	-0.518	0.704	-0.554	0.705	-0.850	0.568	-0.859	0.568	-0.572	0.601	-0.567	0.602	-2.769	1.583 *	-2.815	1.582 *
EXIM (t-1)	0.349	0.305	0.272	0.306	0.473	0.355	0.460	0.358	-0.270	0.599	-0.375	0.599	-0.340	0.596	-0.450	0.597	N.A.	N.A.	N.A.	N.A.
B_SIZE (t-1)	0.008	0.024	0.024	0.020	0.055	0.045	0.000	0.039	-0.032	0.028	0.020	0.024	-0.033	0.032	0.026	0.027	-0.035	0.066	0.006	0.055
B_CAP (t-1)	-1.415	1.991	-1.095	1.944	1.422	3.878	-0.325	3.761	-2.173	2.344	-1.187	2.296	-2.215	2.626	-1.003	2.566	-3.017	5.324	-2.658	5.267
B_LTD (t-1)	0.104	0.100	0.135	0.097	-0.120	0.142	-0.067	0.135	0.258	0.144 *	0.265	0.140 *	0.258	0.149 *	0.260	0.145 *	0.191	0.552	0.229	0.548
F_NEARBYFIRM (t-1)	9.7E-05	5.5E-05 *	1.0E-04	5.5E-05 *	1.3E-04	8.9E-05	1.3E-04	8.9E-05	1.7E-05	7.0E-05	2.0E-05	7.0E-05	-1.0E-05	7.5E-05	-6.4E-06	7.5E-05	1.1E-04	2.0E-04	1.3E-04	2.0E-04
F_NEARBYINDEXP (t-1)	0.000	0.004	0.000	0.004	-0.003	0.009	-0.002	0.009	0.002	0.005	0.002	0.005	0.004	0.005	0.004	0.005	-0.011	0.018	-0.011	0.018
IMPORTRATIO (t-1)	0.016	0.279	-0.001	0.279	-0.112	0.526	-0.133	0.525	0.009	0.339	-0.005	0.340	-0.351	0.387	-0.368	0.388	1.485	0.763 *	1.490	0.765 *
FOREIGN (t-1)	0.000	0.000 *	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.001
TFP (t-1)	0.212	0.170	0.200	0.170	-0.430	0.318	-0.441	0.317	0.232	0.209	0.221	0.209	0.255	0.232	0.240	0.232	-0.230	0.502	-0.221	0.502
F_CASH (t-1)	0.435	0.187 **	0.423	0.187 **	1.145	0.351 ***	1.153	0.350 ***	0.425	0.229 *	0.416	0.229 *	0.356	0.257	0.350	0.257	0.825	0.517	0.800	0.518
Firm Random-Effect	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Industry-Effect	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Year-Effect	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Number of Obs.	19,942				5,406				14,536				11,367				3,169			
Number of Groups	4,780				1,245				3,816				3,064				1,077			
Obs per group: min	1				1				1				1				1			
avg	4.2				4.3				3.8				3.7				2.9			
max	10				10				10				10				10			
Wald chi2	163.29		160.48		83.94		86.53		124.25		116.71		115.27		108.65		41.89		39.95	
Prob > chi2	0.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.1966		0.2596	
Log likelihood	-8405.8		-8407.3		-2484.6		-2483.4		-5877.5		-5881.4		-4709.0		-4712.4		-1146.8		-1147.9	
Likelihood-ratio test of rho=0																				
chibar2	271.33		273.28		29.16		28.69		246.21		249.96		171.58		174.79		62.58		62.54	
Prob >= chibar2	0.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000	

Note: ***, **, and * indicate significance at the 1, 5, and 10% level, respectively.

Next, Table 6 summarizes the results for the exit from export markets. First, for SMEs, the *BANKINFO_AVR* has a negative impact on the probability for firms to stop export. In other words, it is more likely for a firm to continue exporting when the firm's lender banks accumulate larger amounts of information on export markets. It implies that keeping relations with these informative lender banks reduces the fixed cost incurred by firms in each period to, for example, update market information.[8] Second, different from the case of *NEW_EXP* and *NEW_REGION*, main banks' loan-to-deposit ratio (*B_LTD*) has a negative impact on the likelihood for firms to exit from export markets. This means that firms keeping a relation with a main bank showing higher intensity of loan provision relative to deposit exhibit higher survivability in export markets. This could reflect, for example, the importance of stable financial supply from its main bank for the survivability of a borrower firm to cover trade finance. Third, a higher *FFORINV*, or *IMPORTRATIO* significantly reduces the probability for firms to exit from export markets, suggesting that a firm's own international transactions such as foreign investments and imports help the firm to continue exporting.

[8] Like Baldwin and Krugman (1989), we assume that firms still have to pay some fixed costs to stay in the market, even after they entered export markets. For example, firms still have to invest in marketing, reputation, distribution, and so on, to remain there. Baldwin and Krugman (1989) call these costs "maintenance cost."

Table 6. Estimation Results for STOP_EXP

Random-Effect Panel Logit	(a) All Size Firms				(b) Large Firms				(c) SMEs				(c1) Large SMEs				(c2) Small SMEs			
Dependent Variable: STOP_EXP(t)	(i) Main bank		(ii) Average		(i) Main bank		(ii) Average		(i) Main bank		(ii) Average		(i) Main bank		(ii) Average		(i) Main bank		(ii) Average	
	dy/dx	SD	dy/dx	SD	dy/dx	SD	dy/dx	SD	dy/dx	SD	dy/dx	SD	dy/dx	SD	dy/dx	SD	dy/dx	SD	dy/dx	SD
BANKINFO (t-1)	-0.334	0.642			-1.571	1.204			0.016	0.794			0.056	0.931			-0.339	1.603		
BANKINFO_AVR (t-1)			-1.491	0.795 *			-0.182	1.519			-2.227	0.974 **			-2.588	1.163 **			-1.186	1.840
BANKBR (t-1)	-0.002	0.002			-0.002	0.005			-0.002	0.003			0.000	0.003			-0.005	0.006		
BANKBR_AVR (t-1)			-0.006	0.004			-0.008	0.008			-0.004	0.004			0.002	0.005			-0.019	0.009 **
FFORINV (t-1)	-4.426	0.863 ***	-4.357	0.862 ***	-3.042	1.570 *	-3.039	1.575 *	-4.765	1.066 ***	-4.705	1.062 ***	-4.716	1.249 ***	-4.674	1.246 ***	-4.419	1.988 **	-4.450	2.003 **
EXIM (t-1)	-0.697	0.806	-0.609	0.806	-0.785	1.154	-0.787	1.155	-0.566	1.174	-0.459	1.174	-0.422	1.190	-0.311	1.193	N.A.	N.A.	N.A.	N.A.
B_SIZE (t-1)	0.009	0.039	0.011	0.033	-0.020	0.089	-0.004	0.078	0.024	0.044	0.024	0.037	-0.001	0.053	-0.004	0.044	0.061	0.086	0.088	0.070
B_CAP (t-1)	5.853	3.120 *	5.559	3.052 *	12.594	7.316 *	13.155	7.183 *	4.575	3.552	4.132	3.479	1.748	4.246	1.510	4.145	10.718	6.731	10.308	6.682
B_LTD (t-1)	-0.489	0.225 **	-0.469	0.221 **	-0.136	0.327	-0.198	0.322	-0.689	0.323 **	-0.623	0.316 **	-1.230	0.442 ***	-1.154	0.434 ***	0.483	0.597	0.543	0.593
F_NEARBYFIRM (t-1)	-8.8E-05	1.1E-04	-6.6E-05	1.1E-04	4.5E-05	2.1E-04	6.0E-06	2.1E-04	-3.1E-05	1.4E-04	8.4E-06	1.3E-04	6.7E-05	1.5E-04	1.1E-04	1.5E-04	-3.9E-04	3.0E-04	-3.7E-04	3.0E-04
F_NEARBYINDEXP (t-1)	-0.011	0.010	-0.010	0.010	0.015	0.020	0.015	0.020	-0.023	0.013 *	-0.022	0.013 *	-0.028	0.015 *	-0.028	0.015 *	0.002	0.026	0.002	0.026
IMPORTRATIO (t-1)	-1.054	0.515 **	-1.055	0.515 **	-1.599	1.269	-1.583	1.276	-1.056	0.583 *	-1.070	0.582 *	-0.600	0.672	-0.628	0.672	-2.576	1.211 **	-2.465	1.216 **
FOREIGN (t-1)	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	0.000	0.001	-0.011	0.011	-0.011	0.011
TFP (t-1)	-0.819	0.285 ***	-0.787	0.285 ***	-0.413	0.662	-0.436	0.663	-0.628	0.335 *	-0.592	0.334 *	-0.837	0.398 **	-0.804	0.398 **	0.868	0.645	0.870	0.649
F_CASH (t-1)	0.045	0.316	0.061	0.316	-0.031	0.746	-0.040	0.747	-0.124	0.367	-0.094	0.367	-0.046	0.441	-0.029	0.441	-0.660	0.671	-0.577	0.675
Firm Random-Effect	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Industry-Effect	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Year-Effect	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Number of Obs.	19,942				5,406				14,536				11,367				3,169			
Number of Groups	4,780				1,245				3,816				3,064				1,077			
Obs per group: min	1				1				1				1				1			
avg	4.2				4.3				3.8				3.7				2.9			
max	10				10				10				10				10			
Wald chi2	191.07		195.62		57.94		56.58		152.10		157.77		123.6		127.82		60.38		63.25	
Prob > chi2	0.0000		0.0000		0.0117		0.0158		0.0000		0.0000		0.0000		0.0000		0.0049		0.0024	
Log likelihood	-4551.2		-4548.6		-997.0		-997.7		-3519.6		-3516.5		-2570.7		-2568.1		-915.4		-912.9	
Likelihood-ratio test of rho=0																				
chibar2	275.18		275.03		66.92		67.76		217.45		215.00		170.58		169.54		34.93		35.66	
Prob >= chibar2	0.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000	

Note: ***, **, and * indicate significance at the 1, 5, and 10% level, respectively.

Finally, Table 7 shows the estimation results for the intensive margin (i.e., export-to-sales ratio: *EXP_SALES*). First, the most important finding is that the information spillovers from lender banks do not have any significant impact on firms' intensive margin of exports, while information from lender banks positively affects firms' extensive margin of exports (starting and stopping exporting and expansion of export destinations). This result implies that the information provided by banks mainly reduces the fixed costs associated with exporting. Second, among the independent variables, firms' overseas investment (*FFORINV*) shows a negative impact on the intensive margin. It may imply the substitutability between own exporting activities and overseas production. Third, the foreign ownership ratio (*FOREIGN*) has a positive and significant impact on the intensive margin of exports in most cases, suggesting that foreign participation is likely to increase the export intensity. This could capture the importance of the cooperation with its foreign parent firms or investors in export markets. However, *FOREIGN* has a significantly negative impact in the case of small firms (column (c2)). Although this is beyond the scope of this paper, the conspicuous difference between small firms and larger firms would be an interesting issue that should be examined more closely in the future. The purpose or characteristics of foreign investors may be different between the case of small firms and the case of larger firms, resulting in the different degrees of export intensity between them. Fourth, transactions with the Japan Bank for International Corporation (JBIC), *EXIM*, have a positive and significant impact on the intensive margin in the case of all size firms (column (a)), though it does not have any significant coefficient in the cases of extensive margins (Tables 4-7). This result suggests that JBIC helps to increase exports from Japanese firms by financing their export activities, and that provision of financing from JBIC lowers the variable costs incurred by exporting firms. This is consistent with the fact that firms usually consult with JBIC as to trade financing after they decide to start exporting, not before the decision of starting exporting. However, the variable *EXIM* becomes insignificant in all the estimation results using subsamples (columns (b) and (c)). Although it implies that this mechanism largely overlaps with the effect of firm size, the insignificant results may be partly due to the fact that only a small number of exporters (especially SMEs) borrow from JBIC. According to Table 3 above, only 0.5 percent of exporters report that JBIC is one of the top-ten lender banks. Nevertheless, our result in Table 7 confirms that JBIC plays a certain role in promoting and increasing exports from Japanese firms.

Table 7: Estimation Results for EXP_SALES

Fixed-Effect Panel Estimation	(a) All Size Firms				(b) Large Firms				(c) SMEs											
Dependent Variable:													(c1) Large SMEs				(c2) Small SMEs			
EXP_SALES(t)	(i) Main bank		(ii) Average		(i) Main bank		(ii) Average		(i) Main bank		(ii) Average		(i) Main bank		(ii) Average		(i) Main bank		(ii) Average	
	dy/dx	SD	dy/dx	SD	dy/dx	SD	dy/dx	SD	dy/dx	SD	dy/dx	SD	dy/dx	SD	dy/dx	SD	dy/dx	SD	dy/dx	SD
BANKINFO (t-1)	0.001	0.017			0.026	0.031			-0.004	0.021			0.013	0.023			-0.045	0.049		
BANKINFO_AVR (t-1)			-0.018	0.020			0.023	0.039			-0.029	0.024			-0.011	0.027			-0.105	0.053 **
BANKBR (t-1)	0.000	0.000			0.000	0.000			0.000	0.000			0.000	0.000			0.000	0.000		
BANKBR_AVR (t-1)			0.000	0.000			0.000	0.000			0.000	0.000			0.000	0.000			0.000	0.000
FFORINV (t-1)	-0.084	0.014 ***	-0.084	0.014 ***	0.046	0.049	0.044	0.049	-0.098	0.014 ***	-0.097	0.014 ***	-0.101	0.014 ***	-0.100	0.014 ***	0.022	0.076	0.026	0.076
EXIM (t-1)	0.022	0.013 *	0.023	0.013 *	0.013	0.017	0.012	0.018	0.013	0.020	0.015	0.020	0.013	0.020	0.014	0.020	N.A.	N.A.	N.A.	N.A.
B_SIZE (t-1)	-0.001	0.001	-0.001	0.001	-0.001	0.002	-0.003	0.002 *	-0.001	0.001	-0.001	0.001	-0.001	0.001	-0.001	0.001	0.002	0.002	0.001	0.002
B_CAP (t-1)	-0.039	0.076	-0.059	0.073	-0.125	0.168	-0.190	0.162	-0.003	0.083	-0.004	0.081	-0.007	0.094	-0.010	0.092	0.177	0.179	0.164	0.177
B_LTD (t-1)	0.008	0.004 *	0.008	0.004 *	0.007	0.007	0.009	0.007	0.010	0.006 *	0.010	0.006 *	0.011	0.006 *	0.012	0.006 *	0.002	0.023	0.002	0.023
F_NEARBYFIRM (t-1)	-3.5E-06	7.3E-06	-3.3E-06	7.3E-06	-3.0E-06	1.3E-05	-2.8E-06	1.3E-05	-2.1E-06	9.9E-06	-2.3E-06	9.9E-06	-8.4E-06	1.1E-05	-8.5E-06	1.1E-05	1.6E-05	3.4E-05	1.3E-05	3.4E-05
F_NEARBYINDEXP (t-1)	0.000	0.000	0.000	0.000	-0.001	0.001	-0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.001	0.002	-0.001	0.002
IMPORTRATIO (t-1)	-0.022	0.019	-0.022	0.019	-0.137	0.038 ***	-0.136	0.038 ***	0.003	0.022	0.002	0.022	-0.066	0.025 ***	-0.067	0.025 ***	0.293	0.053 ***	0.292	0.053 ***
FOREIGN (t-1)	3.4E-05	1.2E-05 ***	3.5E-05	1.2E-05 ***	9.0E-05	2.6E-05 ***	8.8E-05	2.6E-05 ***	1.4E-05	1.3E-05	1.5E-05	1.3E-05	2.5E-05	1.4E-05 *	2.6E-05	1.4E-05 *	-7.0E-05	3.8E-05 *	-6.6E-05	3.8E-05 *
TFP (t-1)	0.023	0.010 **	0.023	0.010 **	0.018	0.022	0.017	0.022	0.018	0.011	0.018	0.011	0.003	0.013	0.003	0.013	0.036	0.027	0.036	0.027
F_CASH (t-1)	0.006	0.014	0.007	0.014	-0.001	0.031	0.000	0.031	0.008	0.016	0.009	0.016	-0.007	0.018	-0.007	0.018	0.041	0.039	0.045	0.039
Firm Fixed-Effect	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Year-Effect	Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Number of Obs.	19,862				5,326				14,536				11,367				3,169			
Number of Groups	4,778				1,222				3,816				3,064				1,077			
Obs per group: min	1				1				1				1				1			
avg	4.2				4.4				3.8				3.7				2.9			
max	10				10				10				10				10			
F-value	163.78		163.76		63.14		63.24		95.26		95.4		78.01		78.02		18.72		18.91	
Prob > F	0.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000	
R-sq: Within	0.2070		0.2070		0.2708		0.2711		0.1761		0.1763		0.1844		0.1845		0.1722		0.1737	
Between	0.0109		0.0106		0.0231		0.0228		0.0156		0.0154		0.0111		0.0111		0.0323		0.0313	
Overall	0.0482		0.0478		0.0758		0.0754		0.0411		0.0409		0.0354		0.0351		0.0448		0.0463	
corr(u_i, Xb)	-0.0280		-0.0290		-0.0202		-0.0209		-0.0189		-0.0197		-0.0451		-0.0461		-0.0505		-0.0456	
F test that all u_i=0:																				
F-value	12.56		12.56		12.04		12.06		12.42		12.43		12.01		12.02		11.55		11.57	
Prob > F	0.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000	

Note: ***, **, and * indicate significance at the 1, 5, and 10% level, respectively.

To summarize, these results imply that information on foreign markets provided by various channels, especially by lender banks, substantially reduces the fixed costs of exporting. Our results highlight that channels of information spillovers other than those examined in the literature so far may be of considerable importance. Moreover, the information channel from lender banks is particularly important for SMEs who, compared with large firms, usually have less number of transaction partners in their purchases and sales, and lack internal resources to collect information on export markets.

5. Concluding Remarks

This paper examined the role of information spillovers through lender banks in the context of firms' export decisions. To do so, we used a unique dataset containing information not only on Japanese firms' export activities and the availability of nearby exporting firms, but their lender banks' experience in transacting with other exporting firms and the lender banks' own overseas activities. The estimation results indicate that information spillovers through the banks positively affect SMEs' decision to start exporting and extend their export destinations. The information spillovers also reduce the likelihood for exporters to exit from export markets. The export-to-sales ratio of exporters, however, is not affected by the information spillovers. These results imply that information on foreign markets provided by lender banks substantially reduces the fixed entry costs of export markets as well as the costs associated with maintaining firms' export status.

The research presented in this study could be expanded in a number of directions. One such direction would be to extend our analysis to examine others important dimensions of firms' international activities such as foreign direct investment. A further potentially interesting extension would be to use the model in this study to analyze how the impact of changes in currency exchange rates interacts with information spillovers through lender banks. If information spillovers work more promptly under the depreciation of Japanese yen, which supposedly encourage Japanese firms to expand their exports, the effect of banks' information provision will be more sizable under the depreciation of Japanese yen than in the case of appreciation. We believe all of these extensions would provide further insights to gain a better understanding of firms' export dynamics and the role of lender banks.

This paper also provides an important policy implication. As mentioned in the introduction, our knowledge regarding what factors are important for firms to become an exporter remains very limited, even though export promotion has been an important policy issue in many countries. With regard to Japan, many firms, particularly SMEs, do not export even though their performance is good or they actively invest in research and development. Promoting exports by these firms is an urgent policy issues for Japan, which has been facing population decline and sluggish domestic demand for a prolonged period. This paper showed the importance of banks' role as an information provider for potential exporters, implying that the government should proactively involve banks in its export promotion policies. The availability of information from lender banks is particularly important for SMEs to start exporting, which suggests that lender banks play a crucial role as information sources for the export decision of SMEs who are likely to be lack of internal resources and have limited number of transaction partners.

On the other hand, banks may also be interested in providing more support services for firms trying to expand their business abroad. In fact, particularly small banks see their client firms face declining domestic demand and therefore worry that their own business may shrink. Helping such banks to build international service networks and building on the banks' support services may allow the government to implement its export promotion policies more effectively. Moreover, since banks have accumulated a lot of information on their client firms' business, they may have useful knowledge on what type of firms should receive support from the government and on what type of support is most effective. The government should recognize that SMEs strongly need useful information on export markets in order to lower the fixed costs of exporting and consider how to provide useful information effectively to SMEs. Of course, government and non-profit organizations already provide various support services for firms' international business and for trading companies. Information provided by such organizations or trading companies is complementary to information collected by banks through lending relationships, and it is important for the government to effectively utilize these various information sources for export promotion policies.

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Appendix 1: The multilateral TFP index

As detailed in Fukao et al. (2011), the TFP level of firm *i* in industry *j* in year *t*, $TFP_{i,j,t}$ is defined in comparison with the TFP level of a hypothetical representative firm in the benchmark year t_0 in industry *j*. In the EALC 2010 Database, the benchmark year t_0 is set to the year 2000 and the firm-level TFP level is calculated as follows, using the multilateral TFP index method developed by Good et al. (1997):.

$$\mathrm{LN}(\mathrm{TFP}_{i,j,t}) = \left\{\mathrm{LN}(Q_{i,j,t}) - \overline{\mathrm{LN}(Q_{j,t})}\right\} - \sum_{k=1}^{n}\left(S_{i,k,j,t} + \overline{S_{k,j,t}}\right)\left\{\mathrm{LN}(X_{i,k,j,t}) - \overline{\mathrm{LN}(X_{k,j,t})}\right\}$$

for $t = t_0$

$$\mathrm{LN}(\mathrm{TFP}_{i,j,t}) = \left\{\mathrm{LN}(Q_{i,j,t}) - \overline{\mathrm{LN}(Q_{j,t})}\right\} - \frac{1}{2}\sum_{k=1}^{n}\left(S_{i,k,j,t} + \overline{S_{k,j,t}}\right)\left\{\mathrm{LN}(X_{i,k,j,t}) - \overline{\mathrm{LN}(X_{k,j,t})}\right\}$$
$$+ \sum_{s=t_0+1}^{t}\left\{\overline{\mathrm{LN}(Q_{j,s})} - \overline{\mathrm{LN}(Q_{j,s-1})}\right\} - \sum_{s=t_0+1}^{t}\sum_{k=1}^{n}\frac{1}{2}\left(\overline{S_{k,j,s}} + \overline{S_{k,j,s-1}}\right)\left\{\overline{\mathrm{LN}(X_{k,j,s})} - \overline{\mathrm{LN}(X_{k,j,s-1})}\right\}$$

for $t > t_0$

$$\mathrm{LN}(\mathrm{TFP}_{i,j,t}) = \left\{\mathrm{LN}(Q_{i,j,t}) - \overline{\mathrm{LN}(Q_{j,t})}\right\} - \frac{1}{2}\sum_{k=1}^{n}\left(S_{i,k,j,t} + \overline{S_{k,j,t}}\right)\left\{\mathrm{LN}(X_{i,k,j,t}) - \overline{\mathrm{LN}(X_{k,j,t})}\right\}$$
$$- \sum_{s=t+1}^{t_0}\left\{\overline{\mathrm{LN}(Q_{j,s})} - \overline{\mathrm{LN}(Q_{j,s-1})}\right\} + \sum_{s=t+1}^{t_0}\sum_{k=1}^{n}\frac{1}{2}\left(\overline{S_{k,j,s}} + \overline{S_{k,j,s-1}}\right)\left\{\overline{\mathrm{LN}(X_{k,j,s})} - \overline{\mathrm{LN}(X_{k,j,s-1})}\right\}$$

for $t < t_0$

where $Q_{i,j,t}$ stands for the real output (real sales) of firm *i* (in industry *j*) in year *t*, $X_{i,k,j,t}$ represents the real input of production factor *k* of firm *i* (in industry *j*) in year *t*, and $S_{i,j,k,t}$ is the cost share of production factor *k* at firm *i* (in industry *j*) in year *t*. $\overline{LN(Q_{j,t})}$ denotes the arithmetic average of the log value of the output, in year *t*, of all firms in industry *j* to which firm *i* belongs, while $\overline{LN(X_{k,j,t})}$ stands for the arithmetic average of the log value of the input of production factor *k*, in year *t*, of all firms in industry j to which firm i belongs. Finally, $\overline{S_{k,J,t}}$ is the arithmetic average of the cost share of the input of production factor k, in year t, of all firms in industry j to which firm i belongs.

Appendix 2: Summary Statistics

Panel (a): All Firms

	All Firm Size								
	All firms			Exporter			Non-Exporter		
Variable	Obs.	Average	Std. Dev.	Obs.	Average	Std. Dev.	Obs.	Average	Std. Dev.
TFP	77,305	0.009	0.156	22,526	0.050	0.162	54,779	-0.008	0.150
F_CASH (t-1)	77,305	0.553	0.173	22,526	0.580	0.154	54,779	0.542	0.179
F_NEARBYFIRM	77,305	310.452	534.795	22,526	428.008	608.762	54,779	262.111	493.162
F_NEARBYINDEXP	77,305	2.488	5.611	22,526	4.667	7.196	54,779	1.592	4.515
FOREIGN	77,305	5.774	56.487	22,526	14.565	88.610	54,779	2.160	35.062
IMPORTRATIO	70,680	0.019	0.068	21,529	0.046	0.095	49,151	0.008	0.046
FFORINV	77,305	0.012	0.050	22,526	0.033	0.076	54,779	0.004	0.029
BANKINFO	77,305	0.217	0.074	22,526	0.240	0.071	54,779	0.207	0.074
BANKINFO_AVR	77,305	0.214	0.059	22,526	0.237	0.057	54,779	0.204	0.057
BANKBR	77,305	15.049	21.236	22,526	17.932	22.416	54,779	13.863	20.615
BANKBR_AVR	77,305	12.920	12.280	22,526	15.116	12.589	54,779	12.018	12.035
B_SIZE	77,305	16.428	1.539	22,526	16.718	1.496	54,779	16.308	1.541
B_CAPRATIO	77,305	0.044	0.014	22,526	0.043	0.014	54,779	0.044	0.014
B_LTD	77,305	0.578	0.202	22,526	0.599	0.233	54,779	0.570	0.188
EXIM	77,305	0.002	0.047	22,526	0.005	0.067	54,779	0.001	0.036

Panel (b): Large Firms

	Large Firms								
		All firms			Exporter			Non-Exporter	
Variable	Obs.	Average	Std. Dev.	Obs.	Average	Std. Dev.	Obs.	Average	Std. Dev.
TFP	9,778	0.083	0.149	5,876	0.101	0.150	3,902	0.056	0.144
F_CASH (t-1)	9,778	0.525	0.154	5,876	0.537	0.143	3,902	0.507	0.167
F_NEARBYFIRM	9,778	553.905	650.779	5,876	600.068	663.208	3,902	484.389	625.287
F_NEARBYINDEXP	9,778	4.377	6.902	5,876	5.519	6.879	3,902	2.656	6.574
FOREIGN	9,778	16.823	80.969	5,876	22.328	90.707	3,902	8.533	62.653
IMPORTRATIO	9,136	0.036	0.088	5,663	0.049	0.096	3,473	0.014	0.068
FFORINV	9,778	0.034	0.062	5,876	0.051	0.072	3,902	0.009	0.030
BANKINFO	9,778	0.252	0.079	5,876	0.261	0.078	3,902	0.237	0.079
BANKINFO_AVR	9,778	0.246	0.062	5,876	0.255	0.061	3,902	0.232	0.060
BANKBR	9,778	19.247	22.452	5,876	20.354	22.744	3,902	17.580	21.902
BANKBR_AVR	9,778	16.111	12.458	5,876	16.890	12.527	3,902	14.938	12.262
B_SIZE	9,778	16.900	1.448	5,876	17.011	1.410	3,902	16.733	1.489
B_CAPRATIO	9,778	0.042	0.013	5,876	0.041	0.013	3,902	0.043	0.013
B_LTD	9,778	0.640	0.321	5,876	0.645	0.318	3,902	0.632	0.324
EXIM	9,778	0.007	0.085	5,876	0.010	0.099	3,902	0.004	0.060

Panel (c): SMEs

	SMEs								
		All firms			Exporter			Non-Exporter	
Variable	Obs.	Average	Std. Dev.	Obs.	Average	Std. Dev.	Obs.	Average	Std. Dev.
TFP	67,527	-0.002	0.154	16,650	0.032	0.162	50,877	-0.013	0.150
F_CASH (t-1)	67,527	0.557	0.175	16,650	0.595	0.155	50,877	0.544	0.179
F_NEARBYFIRM	67,527	275.200	506.236	16,650	367.286	576.229	50,877	245.064	477.287
F_NEARBYINDEXI	67,527	2.214	5.343	16,650	4.366	7.281	50,877	1.510	4.306
FOREIGN	67,527	4.175	51.801	16,650	11.825	87.697	50,877	1.671	31.926
IMPORTRATIO	61,544	0.017	0.064	15,866	0.044	0.095	45,678	0.008	0.044
FFORINV	67,527	0.009	0.047	16,650	0.026	0.077	50,877	0.003	0.029
BANKINFO	67,527	0.211	0.072	16,650	0.233	0.066	50,877	0.204	0.073
BANKINFO_AVR	67,527	0.209	0.056	16,650	0.231	0.053	50,877	0.202	0.056
BANKBR	67,527	14.441	20.985	16,650	17.077	22.236	50,877	13.578	20.485
BANKBR_AVR	67,527	12.458	12.185	16,650	14.490	12.552	50,877	11.794	11.988
B_SIZE	67,527	16.359	1.540	16,650	16.614	1.511	50,877	16.276	1.540
B_CAPRATIO	67,527	0.044	0.014	16,650	0.043	0.014	50,877	0.044	0.014
B_LTD	67,527	0.570	0.177	16,650	0.583	0.191	50,877	0.565	0.172
EXIM	67,527	0.001	0.039	16,650	0.003	0.052	50,877	0.001	0.033

Panel (d): Medium Firms

Variable	All firms Obs.	All firms Average	All firms Std. Dev.	Medium firms Exporter Obs.	Medium firms Exporter Average	Medium firms Exporter Std. Dev.	Non-Exporter Obs.	Non-Exporter Average	Non-Exporter Std. Dev.
TFP	45,298	0.012	0.154	12,959	0.043	0.160	32,339	0.000	0.150
F_CASH (t-1)	45,298	0.556	0.174	12,959	0.593	0.151	32,339	0.541	0.180
F_NEARBYFIRM	45,298	291.272	518.487	12,959	377.732	581.793	32,339	256.626	486.549
F_NEARBYINDEXI	45,298	2.382	5.699	12,959	4.434	7.554	32,339	1.559	4.502
FOREIGN	45,298	5.417	58.654	12,959	13.465	92.927	32,339	2.192	36.364
IMPORTRATIO	41,357	0.019	0.067	12,354	0.045	0.094	29,003	0.008	0.047
FFORINV	45,298	0.011	0.053	12,959	0.028	0.082	32,339	0.004	0.034
BANKINFO	45,298	0.216	0.073	12,959	0.234	0.067	32,339	0.208	0.073
BANKINFO_AVR	45,298	0.213	0.056	12,959	0.232	0.054	32,339	0.206	0.056
BANKBR	45,298	15.144	21.307	12,959	17.451	22.400	32,339	14.219	20.781
BANKBR_AVR	45,298	13.046	12.211	12,959	14.779	12.497	32,339	12.351	12.024
B_SIZE	45,298	16.438	1.530	12,959	16.651	1.503	32,339	16.352	1.532
B_CAPRATIO	45,298	0.044	0.014	12,959	0.043	0.014	32,339	0.044	0.014
B_LTD	45,298	0.577	0.197	12,959	0.587	0.204	32,339	0.573	0.194
EXIM	45,298	0.002	0.043	12,959	0.003	0.058	32,339	0.001	0.036

Panel (e): Small Firms

Variable	All firms Obs.	All firms Average	All firms Std. Dev.	Small firms Exporter Obs.	Small firms Exporter Average	Small firms Exporter Std. Dev.	Non-Exporter Obs.	Non-Exporter Average	Non-Exporter Std. Dev.
TFP	22,229	-0.031	0.150	3,691	-0.008	0.162	18,538	-0.036	0.147
F_CASH (t-1)	22,229	0.559	0.176	3,691	0.602	0.167	18,538	0.550	0.177
F_NEARBYFIRM	22,229	242.448	478.649	3,691	330.610	554.773	18,538	224.894	460.002
F_NEARBYINDEXI	22,229	1.873	4.514	3,691	4.127	6.223	18,538	1.424	3.939
FOREIGN	22,229	1.644	33.633	3,691	6.068	65.821	18,538	0.763	22.120
IMPORTRATIO	20,187	0.013	0.057	3,512	0.043	0.100	16,675	0.007	0.039
FFORINV	22,229	0.005	0.030	3,691	0.020	0.057	18,538	0.002	0.020
BANKINFO	22,229	0.203	0.071	3,691	0.228	0.063	18,538	0.198	0.071
BANKINFO_AVR	22,229	0.200	0.056	3,691	0.225	0.051	18,538	0.195	0.055
BANKBR	22,229	13.009	20.238	3,691	15.764	21.603	18,538	12.461	19.910
BANKBR_AVR	22,229	11.262	12.044	3,691	13.473	12.689	18,538	10.821	11.862
B_SIZE	22,229	16.199	1.548	3,691	16.485	1.532	18,538	16.142	1.545
B_CAPRATIO	22,229	0.045	0.014	3,691	0.044	0.014	18,538	0.045	0.014
B_LTD	22,229	0.554	0.125	3,691	0.571	0.137	18,538	0.551	0.123
EXIM	22,229	0.001	0.027	3,691	0.000	0.016	18,538	0.001	0.028

Appendix 3: BANKINFO Variable

The table shows the distribution of *BANKINFO* for top 76 banks as of the end of 2000 FY in our dataset. Each column accounts for one bank. The bank is sorted as descending order in terms of *BANKINFO*. *NUM_CLIENT* is the number of total client firms for each bank.

Ranking	*NUM_CLIENT*	*BANKINFO*	Ranking	*NUM_CLIENT*	*BANKINFO*
1	126	0.44	39	780	0.21
2	76	0.41	40	3,033	0.20
3	56	0.38	41	54	0.20
4	62	0.34	42	69	0.20
5	3,347	0.31	43	499	0.20
6	1,670	0.30	44	508	0.20
7	7,035	0.30	45	3,312	0.19
8	1,232	0.30	46	493	0.19
9	58	0.29	47	208	0.18
10	453	0.29	48	4,544	0.18
11	2,110	0.28	49	83	0.18
12	378	0.28	50	504	0.18
13	107	0.27	51	100	0.18
14	616	0.27	52	553	0.18
15	828	0.27	53	73	0.18
16	9,582	0.26	54	377	0.18
17	1,109	0.26	55	97	0.18
18	7,492	0.26	56	263	0.17
19	1,196	0.26	57	975	0.17
20	55	0.25	58	476	0.17
21	402	0.25	59	279	0.17
22	1,044	0.25	60	143	0.17
23	4,705	0.24	61	54	0.17
24	206	0.24	62	186	0.17
25	167	0.24	63	642	0.17
26	71	0.24	64	716	0.16
27	3,234	0.24	65	147	0.16
28	1,384	0.24	66	295	0.16
29	416	0.24	67	136	0.16
30	143	0.23	68	94	0.16
31	561	0.22	69	208	0.16
32	185	0.22	70	1,400	0.16
33	224	0.21	71	57	0.16
34	571	0.21	72	541	0.16
35	260	0.21	73	552	0.15
36	128	0.21	74	145	0.15
37	171	0.21	75	179	0.15
38	627	0.21	76	317	0.15

CHAPTER 3

Dynamic Two-way Relationship between Exporting and Importing: Evidence from Japan[1]

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In this paper, we investigate the dynamic nature of trading using Japanese firm-level data. Specifically, we examine the state dependence and cross effects in exporting and importing. Our findings are as follows. First, we found significant state dependence and cross effects in exporting and importing. Second, those diminish over time. Third, the state dependence and the cross effects are found to be market-specific. Furthermore, such market specificity is more significant in small- and medium-sized enterprises. Last, the past export/import intensity matters in the current trade status.

Keywords: Japan, firm-level, two-way relationship
JEL Classification: F10; F13; F15

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1. Introduction

Recently, within-industry firm heterogeneity in terms of internationalization has attracted many researchers' attention. For example, larger-sized firms are in a more advantageous position to gain the benefit from international activities such as exporting and importing. Since the entry into foreign markets requires firms to bear sunk costs, only productive firms, usually relatively large-sized enterprises (LEs) are able to sell their products to foreign markets or to source intermediate goods from foreign manufacturers. Especially, recent empirical studies (e.g., Vogel and Wagner, 2010) highlight that while most productive firms get engaged in both exporting and importing, less productive firms, most of which are small- and medium-sized enterprises (SMEs), become one-way traders or domestic firms. Namely, it is well revealed in the literature that according to the differences in productivity or sizes, there are various kinds of differences in firms' international activities.

Another important aspect in firms' international activities is the existence of their dynamic nature. For example, once firms bear sunk costs for starting exporting, they do not need to incur those costs in the following years and thus will be able to easily continue their exporting activities. This is called "state dependence" in exporting and has been empirically confirmed in several previous studies such as Das, *et al*. (2007) and Roberts and Tybout (1997). The same story can be applied in the context of importing. That is, firms with the past experience of importing will be more likely to be importers in the future. Such state dependence in importing is also found in Aristei, *et al*. (2013) and Muuls and Pisu (2009). However, the time persistency of such state dependence might be controversial. Namely, while the export experience one year ago has a positive effect on exporting in the current year, the experience of last exporting in several years ago may not. Indeed, Roberts and Tybout (1997) found that the state dependence persists until two years after exporting and that the export experience in three years ago does not have significant effects on exporting in the current year.

Furthermore, such a dynamic nature is expected to exist between exporting and importing. As mentioned in Aristei, *et al*. (2013), common sunk costs arise when firms implement an organizational structure in charge of international operations or when firms acquire information on foreign markets, which may include both potential buyers (export) and suppliers of intermediate inputs (import). Therefore, the sunk costs for importing (exporting) will be lower for exporters (importers). Also, even if there are no common sunk costs between exporting and importing, productivity improvement through starting importing (exporting) may enable firms to bear the original amount of sunk costs of exporting (importing). As a result, firms with the past experience of exporting (importing) are expected to tend to start importing (exporting) activities as well. This is called "cross effects" between exporting and importing, which are empirically found in Aristei, *et al*. (2013), Kasahara and Lapham (2013), and Muuls and Pisu (2009).

In this paper, we investigate the dynamic nature of trading using Japanese firm-level data. Specifically, we first examine whether state dependence and cross effects exist in Japanese firms or not. Second, it is explored whether or not the experience one year ago has different effects from that more than one years ago. This analysis is similar to that in Roberts and Tybout (1997), but they do not examine such time persistency for cross effects. Third, we also examine whether or not state dependence and cross effects differ by firm characteristics such as firm size. Buono and Fadinger (2012) examine the role of firm productivity (in addition to country characteristics) in the state dependence in exporting but do not for that in importing and cross effects. Last, we investigate whether state dependence and cross effects are destination-specific or not. For example, it is examined whether or not the past experience in exporting to Asia has the stronger effects in exporting to Asia in the current year than the experience in exporting to other regions.

In addition to the above-mentioned self-selection into internationalization, the literature has investigated the impacts of internationalization on firm productivity.[2] For example, Wagner (2002) and De Loecker (2007) investigated exporters in Germany and Slovenia, respectively, and found the positive impacts of exporting on their productivity, i.e., learning-by-exporting. On the other hand, the results for the impacts of importing are mixed. For example, Amiti and Konings (2007) found for firms in Indonesia that the increase of imported inputs through tariff reduction enhances firm productivity. However, Vogel and Wagner (2010) did not find the learning-by-importing in Germany. One source for this different result is that while imported inputs have much better quality than domestic inputs in the case of developing countries, the difference in quality between imported and domestic inputs is not so significant in the case of developed countries. Thus, starting importing does not lead to the significant productivity enhancement in the case of developed countries.

If learning-by-importing is not available in the case of developed countries, it becomes more important to analyze the dynamic transition process of firm internationalization for Japanese case, a case of a developed country. Even if direct positive impacts on firm productivity are not available from importing, the existence

[2] As for the survey papers on this field, see, for example, Hayakawa et al. (2012) and Wagner (2012).

of such two-way relationship means that importing activities encourage firms to start exporting and yield positive impacts on productivity through learning-by-exporting. In other words, importing activities have not direct but indirect impacts on firm productivity. Thus, our analysis for Japanese case will contribute to enhancing our understanding on how firms particularly in developed countries obtain benefits from internationalization. Also, this dynamic transition process of importing and exporting activities will uncover why the gap in productivity between SMEs and LEs expands over time.[3] Namely, while the LEs starting only exporting enjoy immediately productivity enhancement through learning-by-exporting, those starting just importing also may enjoy productivity enhancement through starting exporting subsequently. On the other hand, SMEs cannot enjoy such productivity enhancement because they do not afford starting either exporting or importing.

The rest of this paper is organized as follows. The next section specifies our theoretical framework on state dependence and cross effects. Section 3 provides our empirical framework and data sources. After taking a brief look at trade status in Japanese firms in Section 4, we report our estimation results in Section 5. Section 6 concludes on this paper.

2. Theoretical Framework

In this section, we discuss the mechanism of the dynamic transition process of importing and exporting activities. In particular, we shed light on the state dependence and the cross effects. While the state dependence is the positive relationship between the current and past status of exporting/importing, the cross

[3] See Figure A1 in Appendix.

effects are that the past experience in importing (exporting) raises the probability of exporting (importing) at the current year. To make our discussion clearer, we suppose that total fixed costs for trading consist of sunk costs and the fixed costs relating to, for example, market uncertainty. The former costs are borne by firms only when they start trading while firms need to pay the latter fixed costs every time.[4]

The relationship between sunk costs for trading and firm productivity is crucial not only in the mechanism of firms' trading but also for the existence of state dependence and cross effects in trading. The literature has examined the mechanism of firms' trading. Melitz (2003) is the theoretical pioneering study on the selection mechanism in firms' exporting. The selection mechanism in firms' importing is examined in Kasahara and Lapham (2013). In either case, sunk costs for exporting and importing play a crucial role in the selection mechanism of exporting and importing, respectively. Those studies theoretically demonstrate that firms with relatively high productivity get engaged in exporting (importing) because the more productive firms have the larger operating profits from exporting (importing) and thus can still obtain non-negative gross profit even if they incur sunk costs for exporting (importing). Thus, since firms with the past experience of exporting (importing) do not need to incur sunk costs anymore, such firms will be able to continue exporting (importing) in the future.

Nevertheless, in reality, many exporters (importers) enter into and exit from exporting (importing) multiple times. For example, as formalized in Blum et al. (2013) and Eaton et al. (2011), fixed costs for trading and/or demand in foreign

4 The former and latter costs are respectively called "entry fee" and "maintenance cost" in Baldwin and Krugman (1989), "entry cost" and "reentry cost" in Roberts and Tybout (1997), and "start-up costs" and "fixed costs" in Das et al. (2007).

market might include stochastic components. Then, the large negative shocks for the fixed costs and the demand may not enable even firms with the trade experience to continue trading. Under this case, "learning" plays an important role in encouraging firms to continue trading. As mentioned in the introductory section, exporting and importing contributes to enhancing firms' productivity through learning advanced knowledge in the foreign market or enjoying economies of scale. These are called learning-by-exporting and learning-by-importing though the learning-by-importing may not be available in the case of firms in developed countries. Also, as theoretically demonstrated in Albornoz, *et al*. (2012), Arkolakis and Papageorgiou (2009), and Buono and Fadinger (2012), firms that start trading learn about foreign market and thus may face the lower demand uncertainty from the next year. As a result, with the rise of productivity through trading or the decrease of market uncertainty, firms can obtain the larger benefits from trading and will be likely to continue trading.

Also, the productivity rise through learning-by-exporting (learning-by-importing) becomes one of the important sources for cross effects. The productivity rise through exporting (importing) increases the benefits from importing (exporting) and thus encourages firms to start importing (exporting). In addition, the existence of the common fraction in sunk costs between exporting and importing becomes another important source. The organizational division and system for international business in addition to the general knowledge on international business can be shared between exporting and importing. As a result, cross effects between exporting and importing will work.

There are some more issues on state dependence and cross effects. The first is their relationship with time. On the one hand, state dependence and cross effects may diminish over time because the sunk costs for trading may recover to the original amount over time. On the other hand, as theoretically formalized in Arkolakis and Papageorgiou (2009), and Buono and Fadinger (2012), market uncertainty may decrease over time. In addtion, as empirically found in De Loecker (2007), the rise of productivity through trading increases over time. As a result, the relationship of state dependence and cross effects with time is an empirical question.

Second, the magnitude of state dependence may differ by firm characteristics. For example, the rise of productivity through trading differs by pre-trading productivity or sizes. Lileeva and Trefler (2010) and Serti and Tomasi (2008) found the larger productivity rise in low productive firms and medium- and large-sized firms, respectively. In addition, low productive or small-sized firms may be likely to stop trading. This stop might be because of knowing the real magnitude of demand uncertainty by trying trading (Albornoz, *et al*., 2012) or of the small capacity of production (i.e. small capital investments) (Blum, *et al*., 2013). Again, due to the heterogeneous effects of trading on productivity across firms, the cross effects may be different according to firm characteristics.

Third, the state dependence and the cross effects might be market-specific. The sunk costs and fixed costs in addition to market uncertainty might have some components specific to trading partner countries. In other words, even if having the experience of bearing sunk costs in exporting to a region, firms may need to again bear sunk costs in exporting to other regions. Furthermore, as shown in De Loecker (2007), the effects of trading on productivity differ by partner country. He found that the effects of exporting to high income countries on firm productivity are larger than those of exporting to low income countries. Buono and Fadinger (2012) also show the differences in the magnitude of state dependence according to partner countries. As a result, the state dependence and the cross effects will be market-specific to some extent.

3. Empirical Framework

In the literature, to analyze empirically the state dependence and cross effects for exporting and importing, many previous papers such as Aristei, *et al*. (2013) estimate a model for the probability of exporting or importing as a function of previous status on both exporting and importing activities, in addition to several firm characteristics. Then they estimate the bivariate probit model and investigate whether trading status in previous period affects the current trading status. However, in this specification, it is difficult to distinguish the cross effects toward two-way traders from those of just switching between exporting and importing.

Instead, we use the category variable Y_{it} which takes 0 for no trading firms, 1 for export-only firms, 2 for import-only firms, and 3 for two-way-trading firms as a dependent variable and then estimate multinomial logit model by employing the following specification;

$$\mathrm{Prob}(Y_{it}=j)=\frac{\exp(\alpha_{ij}+\mathbf{D}_{i,t-1}\boldsymbol{\beta}_{ij}+\mathbf{X}_{i,t-1}\boldsymbol{\gamma}_{ij})}{\sum_k \exp(\alpha_{ik}+\mathbf{D}_{i,t-1}\boldsymbol{\beta}_{ik}+\mathbf{X}_{i,t-1}\boldsymbol{\gamma}_{ik})},$$

where $\mathbf{D}_{i,t\text{-}1}$ is a vector of dummy variables on firm i's status of internationalization, namely exporter, or importer in year t-1. α_{ij} represents choice specific random effects, which are unobserved firm heteronegeneity in total fixed costs for firm i. $\mathbf{X}_{i,t\text{-}1}$ represents several firm characteristics, listed later. In our estimation strategy, firms are assumed to decide whether they engage in only export, only import, or both in each period. This framework is consistent with the decision for internationalization discussed in Kasahara and Lapham (2013).

Following Todo (2011), to incorporate the correlation between random effects, we allow random variation in a vector of coefficients for the lagged status variables, $\boldsymbol{\beta}_{ij}$, and estimate so-called random effect mixed logit model. One of the advantages in using this specification lies in the relaxation of the interdependence from irrelevant alternative (IIA) assumption. The standard multinomial logit model assumes that the estimated coefficients are not changed even if we exclude one choice from the choice set due to the IIA assumption. However, it is known that this assumption is not always satisfied. Introducing random effects enables us to relax this assumption and obtain more reliable estimation results.

Our firm-level control variables include the average wage rates (Wage), the share of manufacturing workers in total workers (Share of Manu. Workers), the ratio of R&D to total sales (R&D-Sales Ratio), debt-asset ratio (Debt-Asset Ratio), and total factor productivity (TFP). We also introduce two Scale dummy variables. Scale (301-999) takes the value one if a firm has more than 300 and less than 1,000 employees and zero otherwise. Scale (>999) does the value one if a firm has over 1,000 employees. Thus, SMEs, which have less than 300 employees, have the value zero for these two Scale variables. This definition of SMEs is suggested by Small and Medium Enterprise Basic Law in Japan. In this paper, we obtain TFP by estimating production function with the Wooldridge (2009) modification of the Levinshon and Petrin (WLP). This method takes into account the potential collineality issue in the first stage of Levinshon and Petrin (2003) estimator suggested by Ackerberg, *et al*. (2006). We also include industry dummy and year dummy variables. All independent variables are lagged for one year.

Data for Japan are drawn from the confidential micro database of the Kigyou Katsudou Kihon Chousa Houkokusho (Basic Survey of Japanese Business Structure and Activities: BSJBSA) prepared annually by the Research and Statistics Department, the Ministry of Trade, Economy and Industry (METI) (1994-2009). This survey was first conducted in 1991 and then annually from 1994. The main purpose of the survey is to capture statistically the overall picture of Japanese corporate firms in light of their activity diversification, globalization and strategies on research and development and information technology.

The strength of this survey is the sample coverage and reliability of information. It is compulsory for firms with more than 50 employees and with capital of more than 30 million yen in manufacturing and nonmanufacturing firms (some non-manufacturing industries such as construction, medical services and transportation services are not included). Another advantage lies in the rich information on global engagement, such as exporting, importing, outsourcing, and foreign direct investment. One limitation is that some information on financial and institutional features is not available. In 2002, the BSJBSA covered about one-third of Japan's total labour force excluding the public, financial and other services industries that are not covered in the survey (Kiyota, Nakajima, and Nishimura, 2009).

Our sample selection policy is as follows; first, we focus on manufacturing industry in this paper, although this survey covers non-manufacturing industries as well as manufacturing firms. This is because the coverage of non-manufacturing industry differs by years and is thus not consistent across years. Second, we restrict our sample period to that from 1994 to 2009 and exclude sample firms that appear in this survey only at once or twice since our estimation method, a dynamic random-effects multinomial logit model requires sample firms to appear in at least three consecutive years. Finally, basic statistics in our sample are reported in Table 1.

Table 1. Basic Statistics

	N	Mean	S.D.	p10	p90
Status	165,555	0.830	1.197	0.000	3.000
Export ($t-1$)	165,555	0.294	0.456	0.000	1.000
Export ($t-2$)	144,031	0.296	0.456	0.000	1.000
Export ($t-3$)	127,330	0.297	0.457	0.000	1.000
Export ($t-4$)	112,934	0.297	0.457	0.000	1.000
Export ($t-5$)	99,609	0.298	0.457	0.000	1.000
Export ($t-1$) * SME	165,555	0.199	0.400	0.000	1.000
Export ($t-2$) * SME	144,031	0.198	0.399	0.000	1.000
Export ($t-3$) * SME	127,330	0.197	0.398	0.000	1.000
Export ($t-4$) * SME	112,934	0.196	0.397	0.000	1.000
Export ($t-5$) * SME	99,609	0.195	0.396	0.000	1.000
Import ($t-1$)	165,555	0.260	0.439	0.000	1.000
Import ($t-2$)	144,031	0.260	0.439	0.000	1.000
Import ($t-3$)	127,330	0.259	0.438	0.000	1.000
Import ($t-4$)	112,934	0.258	0.437	0.000	1.000
Import ($t-5$)	99,609	0.255	0.436	0.000	1.000
Import ($t-1$) * SME	165,555	0.180	0.384	0.000	1.000
Import ($t-2$) * SME	144,031	0.177	0.382	0.000	1.000
Import ($t-3$) * SME	127,330	0.175	0.380	0.000	1.000
Import ($t-4$) * SME	112,934	0.172	0.378	0.000	1.000
Import ($t-5$) * SME	99,609	0.169	0.375	0.000	1.000
SME	165,555	0.846	0.361	0.000	1.000
ln TFP	165,555	2.995	0.760	2.111	3.920
ln Wage	165,555	1.548	0.389	1.080	1.984
R&D-Sales Ratio	165,555	0.010	0.029	0.000	0.032
Debt-Asset Ratio	165,555	0.681	0.281	0.322	0.945
Share of Manu. Workers	165,555	0.654	0.258	0.271	0.932
Scale (301-999)	165,555	0.180	0.384	0.000	1.000
Scale (>999)	165,555	0.064	0.244	0.000	0.000
Export Share ($t-1$)	163,740	0.037	0.109	0.000	0.111
Export Share ($t-1$) * SME	163,740	0.022	0.085	0.000	0.044
Import Share ($t-1$)	163,740	0.037	0.125	0.000	0.089
Import Share ($t-1$) * SME	163,740	0.027	0.110	0.000	0.041

Source: Authors' calculation

4. Data Overview

Before moving estimation results, we take a brief look at firms' trade status. Table 2 reports the share of the number of firms categorized into each status, in total number of firms. The status includes no trade (Domestic), only exporting (Export), only importing (Import), and both exporting and importing (Two-way). The table shows the highest share in “Domestic”, followed by “Two-way”. It is interesting that the share of “Two-way” is higher than that of “Export” or that of “Import”. In other words, a larger number of firms get engaged in both exporting and importing than in either exporting or importing. The table also shows the stable shares of “Export” (around 11%) and “Import” (around 8%) over time. On the other hand, while the share of “Domestic” declines steadily from 67% in 1994 to 59% in 2009, that of “Two-way” rises from 14% to 22%.

Table 2. Shares according to Trade Status

	Domestic	Export	Import	Two-way
1994	67%	11%	8%	14%
1995	65%	12%	8%	15%
1996	64%	11%	8%	16%
1997	67%	10%	8%	15%
1998	68%	10%	7%	15%
1999	67%	11%	7%	16%
2000	65%	11%	6%	18%
2001	64%	11%	7%	19%
2002	63%	11%	7%	20%
2003	61%	11%	8%	20%
2004	60%	11%	8%	21%
2005	60%	11%	8%	22%
2006	60%	11%	8%	22%
2007	59%	11%	9%	22%
2008	60%	11%	7%	22%
2009	59%	12%	7%	22%

Source: Authors’ calculation

Next, Table 3 reports the transition matrices of trade status between 1994 and 2009. Most of the firms in each status keep the same status between two years. One exception is the firms who got engaged in only importing in 1994. The majority of those turned out to stop importing in 2009. Also, we can see that the share of firms changing from “Export” to “Two-way” is higher than that of those changing from

"Import" to "Two-way". Indeed, as is consistent with the above, the status of "Import" seems to be more unstable than that of "Export". Most of the firms in "Import" remain in the same status, i.e. "Import", or stop importing in the coming year. On the other hand, most of the firms in "Export" remain in the same status, i.e. "Export", or start also importing and thus change to "Two-way" in the coming year.

Table 3. Transition Matrix of Trade Status from 1994 to 2009

	2009				Total
1994	Domestic	Export	Import	Two-way	
Domestic	75%	8%	7%	10%	100%
Export	22%	35%	3%	39%	100%
Import	51%	7%	22%	21%	100%
Two-way	11%	13%	6%	70%	100%
Total	57%	13%	7%	24%	100%

Source: Authors' calculation

In the previous section, we discussed the heterogeneity across firms. To see it briefly, we take a look at the differences in trade status between SMEs and LEs. SMEs are defined as firms that have less than 300 employees. The share of each trade status is provided in Table 4. The case of SMEs seems to be similar to that in Table 2. Namely, the largest share can be found in "Domestic", followed by "Two-way". In particular, more than a half of SMEs are categorized into "Domestic". On the other hand, in the case of LEs, the largest share can be found in "Two-way", followed by "Domestic". Thus, SMEs and LEs are likely to be "Domestic" and "Two-way", respectively. In both cases of SMEs and LEs, "Import" has the lowest share.

Table 4. Shares according to Trade Status for SMEs and Large-sized Enterprises

	Domestic		Export		Import		Two-way	
	LE	SME	LE	SME	LE	SME	LE	SME
1994	35%	73%	18%	10%	6%	8%	40%	9%
1995	30%	71%	19%	10%	6%	8%	44%	10%
1996	30%	70%	18%	10%	7%	8%	45%	11%
1997	35%	73%	16%	9%	8%	8%	41%	10%
1998	35%	73%	16%	9%	6%	7%	43%	11%
1999	36%	72%	15%	10%	6%	7%	43%	11%
2000	33%	71%	16%	10%	6%	6%	45%	13%
2001	33%	70%	15%	10%	6%	7%	46%	14%
2002	31%	68%	14%	10%	6%	7%	48%	14%
2003	31%	66%	14%	10%	6%	9%	48%	15%
2004	31%	66%	14%	10%	6%	8%	49%	16%
2005	31%	65%	14%	10%	7%	8%	49%	17%
2006	31%	65%	15%	10%	7%	8%	48%	17%
2007	32%	64%	14%	10%	7%	9%	47%	17%
2008	31%	65%	15%	10%	6%	8%	47%	17%
2009	31%	64%	16%	11%	6%	8%	47%	18%

Source: Authors' calculation

In Table 5, the transition matrix is reported for SMEs and LEs separately. The transition pattern for SMEs in 1994 is similar to that shown in Table 3. Namely, most of the SMEs in each status keep the same status between two years. Then, "Import" firms are more likely to change to "Domestic" firms while "Export" firms are more likely to change to "Two-way". The probabilities for SMEs to be LEs are very low, 6% at highest. Compared with SMEs, LEs in 1994 have relatively high probability to switch their status between two years. For example, while 45% of large domestic firms in 1994 remain domestic firm in 2009, 15% and 16% of them become two-way traders and small domestic firms in 2009, respectively. And the probability for exporters to be two-way traders is amount to 46%.

Table 5. Transition Matrix of Trade Status: SME versus LE

		2009								Total
		SME				LE				
1994		Domestic	Export	Import	Two-way	Domestic	Export	Import	Two-way	
SME	Domestic	75%	7%	6%	8%	2%	1%	0%	1%	100%
	Export	24%	36%	3%	31%	2%	1%	0%	3%	100%
	Import	51%	7%	22%	18%	1%	0%	0%	1%	100%
	Two-way	12%	12%	6%	63%	1%	1%	0%	6%	100%
LE	Domestic	16%	2%	4%	2%	45%	10%	6%	15%	100%
	Export	4%	3%	1%	8%	10%	25%	2%	46%	100%
	Import	8%	1%	8%	7%	38%	4%	9%	24%	100%
	Two-way	2%	1%	1%	9%	7%	12%	4%	63%	100%
Total		51%	9%	6%	15%	6%	3%	1%	9%	100%

Source: Authors' calculation.

Last, we take a brief look at how SMEs and LEs have different performance indicators. Specifically, we examine three indicators including TFP, labor productivity, and the ratio of R&D to sales. There are two important findings in Table 6. First, in all indicators, LEs have the larger values/ratios than SMEs. Second, within each firm size category, Two-way has the largest values/ratios, followed by Export, Import, and Domestic. We also compare these differences by regressing simple equations (ordinary least squares, OLS). The results are reported in Table 7. Taking a look at the specification with industry and year dummy variables, we can see the similar differences with those confirmed in Table 6. One interesting finding in regression analysis is that since the interaction term between export and SMEs has positive and higher coefficients than that for export, exporter premium is larger within SMEs than within LEs. All in all, these results suggest that total sunk costs are larger in order of Two-way, Export, and Import.

Table 6. Performance Premium: Simple Average

	Domestic	Export	Import	Two-way
ln TFP				
SME	2.811	2.929	2.921	3.068
LE	3.557	3.574	3.668	3.791
ln Labor Productivity				
SME	1.758	1.929	1.802	2.003
LE	2.124	2.214	2.179	2.303
R&D-Sales Ratio				
SME	0.441	1.394	0.669	1.654
LE	1.06	2.895	1.735	3.504

Source: Authors' calculation

Table 7. Performance Premium: OLS

	ln TFP		ln Labor Productivity		R&D-Sales Ratio	
	(I)	(II)	(III)	(IV)	(V)	(VI)
Export	0.023*	0.093***	0.102***	0.065***	0.018***	0.016***
	(0.013)	(0.011)	(0.011)	(0.011)	(0.000)	(0.000)
Import	0.098***	0.060***	0.046***	0.040***	0.006***	0.005***
	(0.019)	(0.016)	(0.016)	(0.015)	(0.001)	(0.001)
Two-way	0.235***	0.212***	0.186***	0.129***	0.025***	0.021***
	(0.010)	(0.008)	(0.008)	(0.008)	(0.000)	(0.000)
SME	-0.759***	-0.748***	-0.371***	-0.366***	-0.006***	-0.006***
	(0.008)	(0.007)	(0.007)	(0.006)	(0.000)	(0.000)
Export * SME	0.097***	0.055***	0.071***	0.055***	-0.009***	-0.009***
	(0.015)	(0.012)	(0.013)	(0.012)	(0.001)	(0.001)
Import * SME	0.019	0.016	0.001	0.026*	-0.004***	-0.003***
	(0.020)	(0.017)	(0.017)	(0.016)	(0.001)	(0.001)
Two-way * SME	0.024**	0.019**	0.059***	0.042***	-0.013***	-0.012***
	(0.011)	(0.009)	(0.010)	(0.009)	(0.000)	(0.000)
Constant	3.597***	3.918***	2.159***	2.139***	0.011***	0.015***
	(0.008)	(0.011)	(0.006)	(0.011)	(0.000)	(0.000)
Industry dummy	NO	YES	NO	YES	NO	YES
Year dummy	NO	YES	NO	YES	NO	YES
Observations	164,785	164,785	164,889	164,889	165,555	165,555
R-squared	0.169	0.443	0.084	0.191	0.120	0.185

Notes: *** and ** indicate 1% and 5% significance, respectively. In the parenthesis is the robust standard error.

5. Empirical Results

This section reports our estimation results. We first present our baseline estimation results and then the results for some additional analyses.

5.1. Baseline Results

Our estimation results in the random effect multinomial logit model are reported in Table 8. The results in firm characteristics are as follows. First, the highly productive firms get engaged in exporting and/or importing. These results are well known and are consistent with many previous papers including Aristei, *et al*. (2013) and Muuls and Pisu (2009). Second, firms with the higher wages are more likely to get engaged in exporting but are less likely to be engaged in importing. This symmetric result is very interesting though it is difficult to interpret it well. In Muuls and Pisu (2009), the coefficients for wage rates are estimated to be insignificant in both exporting and importing. Third, taking a look at the results in Scale, we can see that SMEs are less likely to get engaged in exporting, importing, and Two-way. It is interesting that the effects of Scale (>999) on importing is insignificantly estimated. This result will indicate that the very large-sized firms are more likely to get engaged in both exporting and importing than in importing only. Fourth, the non-production worker-intensive firms, R&D intensive firms, or firms with the less debt-asset ratio have the higher probability of expiring and importing.

Table 8. Baseline Results: Random Effect Multinomial Logit Model

	Export	Import	Two-way
(Mean)			
Export ($t-1$)	5.470***	-0.975***	4.420***
	(0.033)	(0.087)	(0.051)
Import ($t-1$)	-0.835***	5.066***	3.679***
	(0.079)	(0.032)	(0.058)
ln TFP	0.089***	0.100***	0.156***
	(0.030)	(0.031)	(0.031)
ln Wage	0.151***	-0.082*	0.075
	(0.050)	(0.049)	(0.052)
R&D-Sales Ratio	5.800***	2.867***	6.052***
	(0.602)	(0.763)	(0.608)
Debt-Asset Ratio	-0.330***	-0.070	-0.301***
	(0.055)	(0.052)	(0.058)
Share of Manu. Workers	-0.236***	-0.492***	-0.677***
	(0.059)	(0.056)	(0.061)
Scale (301-999)	0.281***	0.184***	0.642***
	(0.038)	(0.040)	(0.039)
Scale (>999)	0.469***	0.039	0.844***
	(0.065)	(0.075)	(0.066)
Intercept	-3.356***	-3.374***	-3.980***
	(0.136)	(0.139)	(0.156)
(Standard Deviation)			
Export ($t-1$)	0.025	0.271	0.002
	(0.093)	(0.272)	(0.122)
Import ($t-1$)	0.238	0.085	0.13
	(0.294)	(0.084)	(0.166)
Intercept	-0.018	0.018	-0.296
	(0.094)	(0.092)	(0.188)
Observations		662,220	
Log-likelihood		-61952	

Notes: *** and ** indicate 1% and 5% significance, respectively. In the parenthesis is the robust standard error. All specifications also include industry dummy and year dummy.

The results in the one-year lagged export or import variables are as follows. We can see the existence of state dependence from the results that the one-year lagged export (import) status in export (import) equation is positively associated with the current year status on export (import). The state dependence in exporting will be based on either or both incurring sunk costs for exporting and learning about the advanced technology and/or the uncertainty in foreign market[5]. In the case of

[5] To identify the source of state dependency, we add the interaction term between lagged trading

importing, taking into account the absence of learning-by-importing in developed countries, we may say that it is sourced mainly from incurring sunk costs for importing. On the other hand, while the lagged export (import) status in import (export) equation has significantly negative coefficients, the results in two-way equation show the significantly positive coefficients for both the lagged export and import variables. These results imply that the cross effects toward two-way traders exist rather than those encouraging switching between exporting and importing. The existence of cross effects in not only exporting but also importing will show that the significant fraction of sunk costs is common between exporting and importing.

From the results in standard deviations of coefficients, we can see that all of them are insignificant, suggesting that coefficients do not vary by firm and by mode of internationalization and that the results for multinomial logit model do not differ from the random effect multinomial logit estimation so much. Therefore, we focus on the results of multinomial logit model for further analysis. Indeed, the multinomial logit model greatly saves the computation time, compared with the random effect multinomial logit model.

5.2. Further Analysis

This subsection conducts some more estimation. First, we introduce some more-year-lagged export and import variables. Specifically, we do those up to five years. We also include the interaction terms of those lagged variables with SME dummy. The results are reported in Table 9. The results for the other firm characteristics variables are not reported to save spaces (available upon request). The coefficients for some lagged variables are significantly estimated and indicate that both state dependence and cross effects diminish over time. As a result, we may say that the sunk costs for trading steadily return to those original level over time. On the other hand, most of the coefficients for the interaction terms with SME dummy are insignificantly estimated, indicating little difference in the state dependence and the cross effects according to firm size.

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status dummy variable and TFP growth rate. However, we cannot get any plausible estimation results. Therefore, we would leave this issue for a future agenda.

Table 9. Estimation Results: Further Lagged Variables

	Export	Import	Two-way
Export (t−1)	0.477***	-0.086***	0.200***
	(0.025)	(0.006)	(0.020)
Export (t−2)	0.081***	-0.027***	0.064***
	(0.018)	(0.010)	(0.018)
Export (t−3)	0.006	0.009	0.020
	(0.015)	(0.013)	(0.017)
Export (t−4)	0.039**	-0.009	0.014
	(0.017)	(0.012)	(0.017)
Export (t−5)	0.046***	-0.023**	0.054***
	(0.015)	(0.009)	(0.017)
Export (t−1) * SME	-0.007	0.061***	0.006
	(0.011)	(0.019)	(0.013)
Export (t−2) * SME	0.007	0.009	0.017
	(0.015)	(0.014)	(0.018)
Export (t−3) * SME	0.023	-0.020*	0.009
	(0.019)	(0.011)	(0.019)
Export (t−4) * SME	0.001	0.001	0.004
	(0.017)	(0.014)	(0.019)
Export (t−5) * SME	-0.001	0.024	-0.001
	(0.014)	(0.015)	(0.015)
Import (t−1)	-0.100***	0.411***	0.224***
	(0.006)	(0.032)	(0.025)
Import (t−2)	-0.030***	0.027**	0.048***
	(0.012)	(0.013)	(0.018)
Import (t−3)	-0.008	0.026*	0.013
	(0.014)	(0.014)	(0.016)
Import (t−4)	-0.014	0.020	0.022
	(0.013)	(0.014)	(0.017)
Import (t−5)	-0.021*	0.038***	0.010
	(0.011)	(0.013)	(0.013)
Import (t−1) * SME	0.033**	-0.007	0.000
	(0.017)	(0.008)	(0.013)
Import (t−2) * SME	0.008	0.031**	0.016
	(0.016)	(0.016)	(0.017)
Import (t−3) * SME	-0.010	-0.008	0.006
	(0.015)	(0.011)	(0.018)
Import (t−4) * SME	0.006	-0.002	0.003
	(0.017)	(0.012)	(0.017)
Import (t−5) * SME	0.010	-0.012	0.024
	(0.015)	(0.009)	(0.017)
Observations		91,025	
Log-likelihood		-29295	

Notes: *** and ** indicate 1% and 5% significance, respectively. In the parenthesis is the robust standard error. All specifications also include industry dummy and year dummy. The results in the other firm-level variables are not reported in this table.

Next, we extend our model so as to capture the dimension of export destination and import source countries. Namely, we investigate whether state dependence and cross effects are market-specific or not. To this end, we define dependent variables and the trade experience variables regionally. In particular, we examine trades with Asia and Western countries (i.e. North American and European countries) separately. Furthermore, in order to control for the role of the past experience of trade with the other region, we also introduce the one-year lagged variables of the export and import with the other region (Other Export and Other Import). The results are reported in Table 10. There are three noteworthy points. First, it shows the region-specific state dependence and cross effects in both Asia and Western countries. Second, the region-specific state dependence and cross effects are larger than the effects of the past experience of trade with the other region. Third, the region-specific state dependence and cross effects are larger in SMEs. Also, we have some evidence that trading with one region discourages SMEs to start trading with the other region.

Table 10. Estimation Results: Region-specific Analysis

	Asia			Western Countries		
	Export	Import	Two-way	Export	Import	Two-way
Export (t−1)	0.561***	-0.050***	0.181***	0.563***	-0.019***	0.080***
	(0.011)	(0.002)	(0.008)	(0.014)	(0.001)	(0.006)
Import (t−1)	-0.087***	0.491***	0.195***	-0.029***	0.553***	0.076***
	(0.002)	(0.016)	(0.011)	(0.001)	(0.018)	(0.006)
Export (t−1) * SME	0.032***	0.023***	0.009**	0.020***	0.020***	0.003***
	(0.007)	(0.006)	(0.004)	(0.004)	(0.005)	(0.001)
Import (t−1) * SME	0.043***	0.019***	0.033***	0.017***	0.010***	0.008***
	(0.010)	(0.004)	(0.006)	(0.006)	(0.002)	(0.002)
Other Export (t−1)	0.114***	-0.006	0.072***	0.061***	0.002	0.014***
	(0.009)	(0.003)	(0.007)	(0.005)	(0.002)	(0.002)
Other Import (t−1)	0.018***	0.039***	0.048***	0.004	0.014***	0.007***
	(0.006)	(0.006)	(0.006)	(0.003)	(0.002)	(0.001)
Other Export (t−1) * SME	-0.008	0.006	-0.005	-0.006**	0.003	-0.001
	(0.006)	(0.005)	(0.004)	(0.003)	(0.002)	(0.001)
Other Import (t−1) * SME	0.005	-0.008***	-0.007*	0.002	-0.003*	-0.001
	(0.007)	(0.003)	(0.004)	(0.003)	(0.002)	(0.001)
ln TFP	0.005**	0.002*	0.003**	0.005***	0.003***	0.002***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)
ln Wage	0.011***	-0.008***	-0.004*	0.005**	0.003***	0.002***
	(0.004)	(0.002)	(0.003)	(0.002)	(0.001)	(0.001)
R&D-Sales Ratio	0.217***	0.078***	0.109***	0.167***	0.033**	0.044***
	(0.038)	(0.020)	(0.028)	(0.021)	(0.013)	(0.005)
Debt-Asset Ratio	-0.021***	0.002	-0.009***	-0.010***	-0.002*	-0.005***
	(0.004)	(0.002)	(0.003)	(0.002)	(0.001)	(0.001)
Share of Manu. Workers	-0.025***	-0.012***	-0.027***	-0.007***	-0.014***	-0.005***
	(0.004)	(0.002)	(0.003)	(0.002)	(0.001)	(0.001)
Scale (301-999)	0.024***	0.009***	0.031***	0.019***	0.006***	0.007***
	(0.003)	(0.002)	(0.003)	(0.002)	(0.001)	(0.001)
Scale (>999)	0.038***	0.005	0.040***	0.040***	0.013***	0.018***
	(0.007)	(0.003)	(0.006)	(0.005)	(0.003)	(0.002)
Observations		165,555			165,555	
Log-likelihood		-57685			-41597	

Notes: *** and ** indicate 1% and 5% significance, respectively. In the parenthesis is the robust standard error. All specifications also include industry dummy and year dummy.

Last, we also examine the role of "magnitude" of the past export/import. Specifically, in addition to the dummy variables on the past export and import experience, we include the share of exports in total sales and the share of imports in total inputs. The results are reported in Table 11 and show that not only the past experience of exporting and importing but also those intensities matter in the current trade status. That is, firms that got engaged more intensively in exporting (importing) in the previous year are more likely to export (import) in the current year. However, while the higher export intensity in the past leads to the higher probability of being two-way traders, firms with the high import intensity in the past do not necessarily become two-way traders. Based on these results, we may say that the past export intensity is a more important determinant in the current trade status than the past import intensity. In addition, we can see from the results of the interaction terms of these intensity variables with SME dummy that the role of such intensities in the current trade status is not different according to firm size.

Table 11. Estimation Results: Export/Import Share

	Export	Import	Two-way
Export ($t-1$)	0.552***	-0.073***	0.248***
	(0.010)	(0.003)	(0.009)
Export ($t-1$) * SME	0.009*	0.032***	0.002
	(0.006)	(0.009)	(0.006)
Export Share ($t-1$)	0.136***	-0.170***	0.156***
	(0.027)	(0.044)	(0.028)
Export Share ($t-1$) * SME	-0.029	-0.022	-0.032
	(0.029)	(0.052)	(0.031)
Import ($t-1$)	-0.096***	0.496***	0.258***
	(0.003)	(0.015)	(0.013)
Import ($t-1$) * SME	0.035***	0.001	0.008
	(0.010)	(0.004)	(0.007)
Import Share ($t-1$)	-0.072**	0.045***	0.019
	(0.032)	(0.014)	(0.024)
Import Share ($t-1$) * SME	-0.055	-0.007	0.037
	(0.036)	(0.015)	(0.026)
ln TFP	0.005**	0.003**	0.008***
	(0.002)	(0.001)	(0.002)
ln Wage	0.012***	-0.007***	0.005
	(0.004)	(0.002)	(0.004)
R&D-Sales Ratio	0.332***	0.094***	0.363***
	(0.040)	(0.034)	(0.043)
Debt-Asset Ratio	-0.023***	-0.002	-0.021***
	(0.004)	(0.003)	(0.004)
Share of Manu. Workers	-0.011***	-0.014***	-0.044***
	(0.004)	(0.003)	(0.004)
Scale (301-999)	0.019***	0.006***	0.052***
	(0.003)	(0.002)	(0.004)
Scale (>999)	0.038***	-0.000	0.073***
	(0.007)	(0.004)	(0.009)
Observations		163,740	
Log-likelihood		-59883	

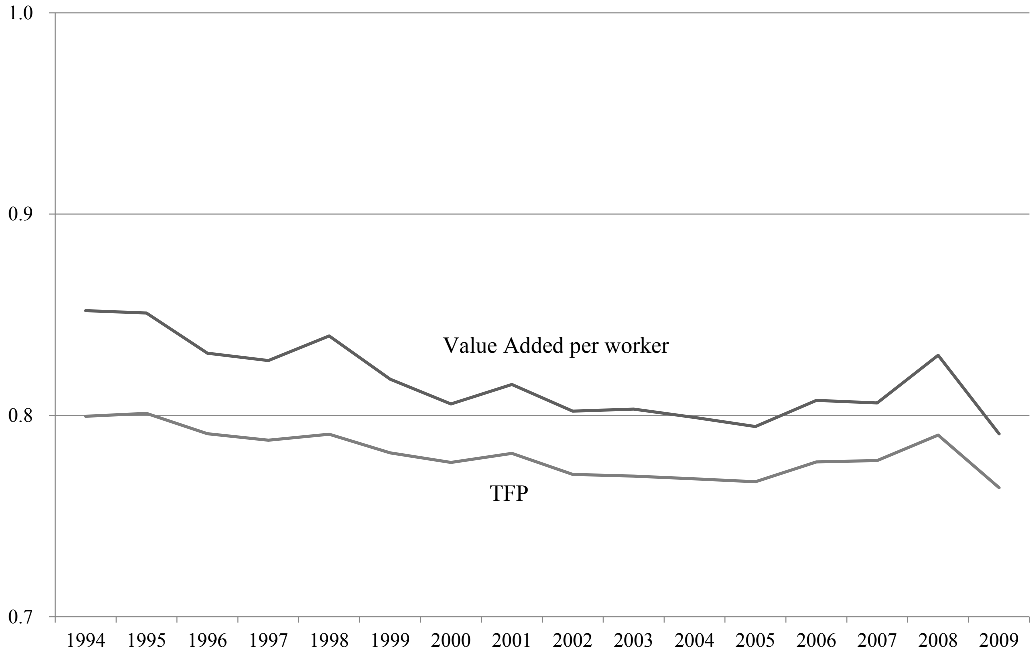
Notes: *** and ** indicate 1% and 5% significance, respectively. In the parenthesis is the robust standard error. All specifications also include industry dummy and year dummy.

6. Summary and Policy Implications

In this paper, we investigate the dynamic nature of trading using Japanese firm-level data. Specifically, we examine the state dependence and cross effects in exporting and importing. Our findings are as follows. First, we found significant state dependence and cross effects in exporting and importing. Thus, even without any positive effects of starting importing on productivity, importers will be able to achieve productivity enhancement through inducing exporting. Second, those diminish over time. If this result indicates that the sunk costs for trading steadily return to those original level over time, it is important how firms maintain their know-how on trading particularly during the non-trading period. Third, the state dependence and the cross effects are found to be market-specific. This implies that it is more difficult to expand trading partners than to continue trading with the existing partners. Furthermore, such market-specific state dependence and cross effects are more significant in SMEs. We also find that trading with one region discourages SMEs to start trading with the other region. Last, the past export/import intensity matters in the current trade status.

The implication specific for SMEs in developed countries is as follows. Due to the more significant market specificity in the state dependence and cross effects, it is more difficult for SMEs to expand their trading partners. In the case of SMEs, trading with one region can even discourage to doing with the other region. These facts immediately imply that if firms can enjoy some amount of positive productivity effects from each trading partner, SMEs can obtain only the fewer amount of positive effects from trading than LEs. In other words, it is important for policy makers to encourage SMEs to expand their trading partners. The policy support is usually available particularly for starting trading for the first time. However, our claim is that it is important to support not only the beginners but also the firms trading with just a few partners.

Appendix. Performance Gap between LEs and SMEs



Source: Authors' calculation
Notes: The figure indicates the ratio of the average performance of SMEs to that of LEs.

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CHAPTER 4

Productivity Evolution of Chinese Large and Small Firms in the Era of Globalization

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Using a large firm-level dataset from Chinese manufacturing industry, this paper studies the productivity gap and productivity convergence between large and small firms in China. We find that small firms are less productive relative to large firms, but the productivity gap became smaller over the sample period 1999-2007. Based on the static and dynamic Blinder-Oaxaca decompositions, we distinguish the endowment effect from the return effect, and quantify the impacts of export and FDI on the productivity gap and productivity convergence.

Key words: China, Small firms, Productivity, Globalization

JEL Classification: F11, L22, O53

1. Introduction

The growth of small firms has been one of the main driving forces of Chinese economy since the reform started in the late 1970s. The emergence of the small private firms is a striking outcome of China's market oriented reform. In addition to their contribution to GDP and employment, small firms have promoted the entrepreneurship, provided broad based growth, and served as incubators for developing Chinese domestic firms into large corporations.

We study the productivity of large and small firms in the background of globalization. After more than 15 years of negotiation, China entered the WTO in 2001. This event is a milestone in the history of China's economic reform and development. Since then, China has enjoyed one of the best decades in global economic history. Its GDP increased from RMB 11.0 trillion in 2001 to 51.9 trillion in 2012. During the same period, China's international trade increased more than seven-fold, making China the largest trading nation in the world. [1]

The WTO entry has also profoundly and irreversibly changed the China's economic reform as a whole. China had to reduce over 7,000 tariffs, quotas and other trade barriers. The average tariff has declined from 15.3% in 2001 to 9.8% in 2010 (Brandt et al., 2013). On the other hand, China improved the governance and rule of law in accordance with the WTO regulations. For example, in the first year of its WTO entry, China abolished 2,300 regulations under the central government. [2]

Did the WTO entry in 2001 affect large firms and small firms differently? To answer this question, we chose two years (1999 and 2007) to compare the pre-WTO era with post-WTO era. In particular, this study focuses on the following three questions:

- How did small firms perform as compared to large firms in 1999 and 2007?
- Had the performance been converging or diverging between 1999 and 2007?
- How did export and FDI contribute to the convergence or divergence of the performance?

Firm size matters for firm productivity and productivity growth. In a classical paper by Jovanovich (1982), firms will grow if they are sufficiently efficient. In industrial

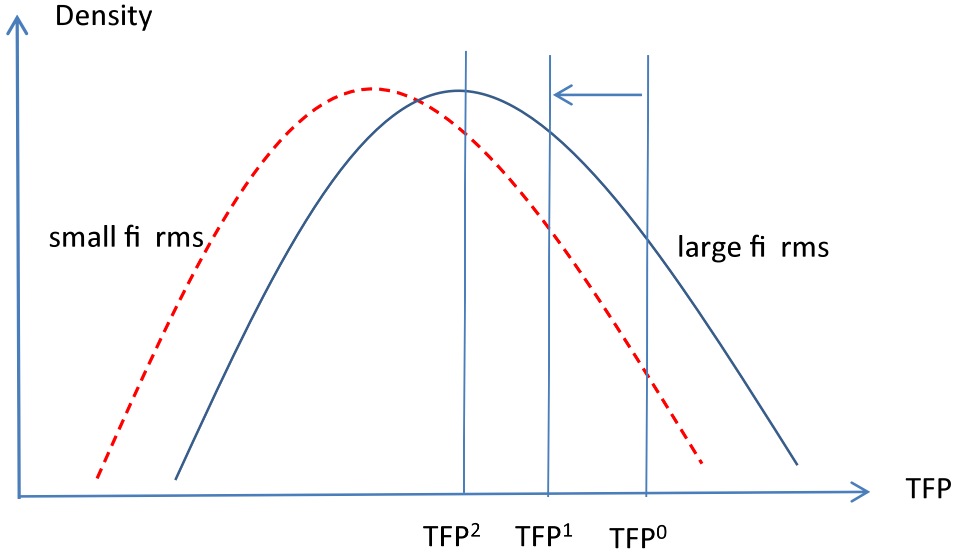
[1] Source: Author's calculation based on *China Statistical Yearbook*, 2013.
[2] Source: China Daily, *WTO Entry Boosts China' Economy*, November 18, 2002.

organization theories, there is a clear positive relation between firm size and productivity. In a review paper, Geroski (1998) distinguishes direct effect of firm size from indirect effect: "firm size affects performance directly (which is what the usual regression coefficients measure), and it also affects performance indirectly because it conditions the size of the effects that other things have on performance (i.e. all of the coefficients in equations vary by size of firm)".

What are the mechanisms of the relationship between firm size and productivity? First, large firms may benefit from scale economies or scope economies. Second, Schumpeter (1942) believes that large firms tend to have an advantage because their financial situation allows them to be the most capable innovators. Based on Spanish firms, Huergo and Jaumandreu (2004) find evidence of positive relationship between firm size and innovation, supporting Schumpeter's hypothesis. Third, large firms may attract people with higher human capital and provide better training. They may be able to afford the kind of specialist advice which can sometimes make a big difference to performance. It could also be true that large firms generate higher return to human capital, as shown by Oosterbeek and Van Praag (1995).

In our paper, beyond these three channels, we try to explore the role of export and FDI in affecting the productivity of firms with different size. It is well documented that exporters are more productive than non-exporters and foreign invested firms are more productive than local firms. According to heterogeneous firm trade model, firms will incur a fixed cost to start exporting (e.g. researching foreign markets, establishing trade networks with foreign buyers, etc.). As a result, only firms with sufficient fund can afford the fixed cost. If this is true, it will certainly give a big advantage to large firms.

Figure 1: The Effect of Trade Liberalization on Large and Small Firms



How does the trade liberalization such as China's WTO entry affect large and small firms? In Figure 1, the two curves depict the density distribution of large and small firms. The horizontal axis is the productivity. Before trade liberalization, the cut-off productivity is TFP^0. In other words, according to Melitz (2003) model, only firms whose productivity is higher than TFP^0 can export. Now trade liberalization reduces the trade cost, allowing lower productivity firms to export. Consequently, productivity cutoff point shifts from TFP^0 to TFP^1. Trade liberalization will benefit large firms more than small firms. This is because a higher percentage of large firms turn from non-exporters into exporters. We can see that by comparing the area of two density curves between TFP^0 and TFP^1.

One key assumption in the above analysis is that the size of the productivity cut-off shift is the same from large and small firms. If the cut-off shifts to TFP^1 for large firms and to TFP^2 for small firms, it is possible that small firms may benefit more from trade liberalization. Different productivity cut-off shift is a possible case in China after the WTO entry. As long as the reduction of trade cost is the same for large and small firms, it will matter more for small firms because the reduction account for a larger proportion of their cost.

We can have a similar argument for FDI liberalization. Chinese government's FDI liberalization policies reduce the cost of foreign investors, allow more foreign firms to invest in China. Small foreign firms benefit more than large firms if the size of cutoff shift is larger for smaller firms.

We use 2003 Law of Small and Medium Enterprise's classification to define small industrial firms.[3] A firm is considered a small firm if it meets one of the following criteria:

- employment under 300;
- sales revenue under RMB 30 million;
- total asset under RMB 40 million.

The 2003 law classify all firms into three categories: large, medium and small firms. For the convenience of comparison, we only define two groups: small firms and large firms. We put medium firms in the category of large firms. This is mainly because Chinese definition of small firms is close to the international standard of SME (small and medium enterprises). For example, the EU considers an SME a firm with up to 250 employees. The employment threshold of Japanese manufacturing SME is 300.

In this study, we use a comprehensive firm-level dataset from China National Bureau of Statistics. We find that small firms are less productive than large firms, even after controlling for a set of firm characteristics. However, we also find that the total factor productivity gap has been significantly reduced. The productivity gap was about 40% in 1999 and only about 25% in 2007. In other words, we observe a quick productivity convergence of about 15 percentage points between large and small firms in our sample period.

Based on the framework of Blinder-Oaxaca decomposition in labor economics literature, we analyze the impact of export and FDI on the productivity gap and productivity convergence. In these analyses, we distinguish the endowment effect from the return effect (or the coefficient effect in labor economics). The endowment effect is the share of firms that are exporters or foreign invested firms (FIEs). The return effect is the size of the coefficients of export and FDI in the productivity regressions. We can interpret the return effect as the export premium and FDI premium, or the return to export and FDI. The source of the export return effect can be self-selection, but it can

[3] Chinese government revised the law and the classification in 2011. Since our sample period is 1999-2007, we decide to use the 2003 classification.

also come from the learning effect (De Loecker, 2007; Lileeva and Trefler, 2010). In fact, the return effect is related to the firm's ability to take advantage of export and FDI opportunities. Our estimation shows that export and FDI explain about 13.8% of the TFP gap in 1999 and 8.1% in 2007. We also find that the endowment effect is the main contributor of the export impact on firm productivity gap between large and small firms. For the FDI, the return effect is more important than the endowment effect.

We further decompose the difference in TFP growth using dynamic Blinder-Oaxaca method. According to our calculation, export and FDI can explain about 23.9% of the productivity convergence. For export and FDI, the endowment change effect and the return change effect are both important channels for the convergence.

The rest of the paper is organized as follows. Section 2 describes the development of Chinese small private firms in the reform era. Section 3 discusses the data. Section 4 presents the basic productivity evolution patterns. Section 5 reports panel data regression results. We conduct static and dynamic decomposition in Sections 6 and 7. And Section 8 concludes.

2. Background: Development of Small Private Firms in China

Chinese government's policy toward small firms is sometimes self-conflicting. On the one hand, it continued to discriminate against private firms. On the other hand, the government made policies that tried to promote SMEs development. In China, small firms and private sector are closely related. Most private firms are small firms. At the same time, as shown in Table 3, share of private firms among small firms increased dramatically from 13% in 1999 to 67% in 2007.

The private firms emerged in the early 1980s as a consequence of the rapid expansion of the economy. The new private firms were intended to play a role that is "supplementary" to the state sector. They were not allowed to officially register until 1988, when first law governing private firms became available. In 1989, China's private sector suffered a major setback as a result of Tiananmen Square event. However, the new wave of reform in 1992, following Deng Xiaoping's Southern Tour, provided favorable environment for rapid growth of the private sector. In addition, China's entry into WTO in 2001 brought both opportunities and challenges to the private entrepreneurs.

Chinese private firms flourished as ideological barriers gradually fell. In the 1980s, China's private firms operated in an openly hostile political atmosphere. Recognizing the contribution of the private sector, in 1997, the 15th Party National Congress lifted the status of the private sector from "complementary" to "an important component" of the economy. The revision of party constitution in 1999 further equated the private sector and the state sector. The constitutional amendment in 2004 helped better safeguard the private property rights.

Despite the improvement of the environment, China's private firms still face severe discrimination from the government and the banks. Such discrimination includes legal discrimination, entry barriers and financial discrimination. Because of government interference in Chinese banks - especially the requirement that banks must fund state-owned enterprises - the domestic financial sector privileges the least efficient state-owned enterprises and deprives the emerging private enterprises of access to bank funding.

Realizing the important contribution of small firms, in 2003, Chinese government passed the "Law of the People’s Republic of China on Promotion of Small and Medium-sized Enterprises". The law specifies several measures to protect and promote the small firm development. Chinese government vowed to protect the legal rights of SMEs, including their rights of property and the rights of fair competition. The government launched the SME Growth Project in 2006, aiming at better targeting the priority area for the SME development. In 2011, the government revised the SME law and further strengthened its support to the SMEs.

Economics literature on the development of small private firms in transition countries mainly focuses on government policy and access to external finance. Johnson, McMillan and Woodruff (2002) find in a survey of private manufacturing firms in Romania, Slovakia, Ukraine, and Russia that it was the lack of property rights protection that discouraged the firms from investing. IFC (2000) finds that Chinese local government and officials tend to over-expand their duties and focus on rent-seeking opportunities. They find the roles of government bureaus are often overlapped and ill-defined. Chinese local government policy on private enterprises could be a key determinant of private firm development. For example, Chinese local governments have the incentive to use their power over private small firms in order to protect their large SOEs (McMillan, 1995). External finance itself is important for the small private firms (Song, Storesletten and Zilibotti, 2011). If banks credits are not available, private entrepreneurs may not be able to take the advantage of investment opportunities. It is found that in transition economies smaller firms have lower rates of investment because their investment depends on the availability of internal funds (Lizal and Svejnar, 2002). The problem of external finance is more serious in China than other transition countries. Chinese small private firms still face numerous financial obstacles such as discrimination of bank credits (Brandt and Li, 2002). Chinese entrepreneurs started their businesses relying almost exclusively (90.5%) on self-financing. In comparison, this ratio is 66% in Russia and 79%in Vietnam (IFC, 2000). Manova, Wei, and Zhang (2012) document that the financial constraints of Chinese private firms hamper their export growth, and this operating disadvantage is systematically greater in sectors with higher levels of financial vulnerability.

We study the development of small private firms from a different angle. Instead of government policy and external finance, we focus on export and FDI and how these factors affect firms with different sizes.

3. The Data

In this study, we use 1999-2007 firm-level data for all state-owned industrial firms and non-state owned firms with sales above RMB 5 million.[4] Unfortunately, the non-state smaller firms (sales under RMB 5 million) are excluded in our data. The information is collected through annual surveys by the National Bureau of Statistics (NBS) and discussed in detail in Brandt, Van Biesebroeck and Zhang (2012). The sample size ranges from 160,000 firms in 1999 to 330,000 firms in 2007. The firms in the sample account for 61% of the total industrial value added in 1999 and 94% in 2007. We exclude observations with missing values for key variables and those that fail to

[4] We also have 1998 data. Since 1998 is the year of Asian financial crises, we decide not to use 1998 data.

satisfy some basic error checks. The dataset contains detailed information of firm ID, address, ownership, output, value added, four-digit industry code, six-digit geographic code, exports, employment, and capital stock.

Following Jefferson, Rawski and Zhang (2008), we drop all firms with less than eight employees as they fall under a different legal regime. As a result, 13% of firms in the original data set are dropped from the sample in 1999. The percentage excluded drops to 6% in 2007.

For the analysis in the paper, we only use manufacturing firms. As a result, we drop all observations from mining and utilities industries. To create a panel dataset, we use firm ID to link the firms over time. However, as firm ID may change if a firm went through restructuring or M&A activity, we have supplemented the firm IDs with information on the firm's name, sector, and address to establish links across different years.

To measure firm performance, we estimate firm TFP using Olley-Pakes (1996) procedure.

4. Descriptive Analyses

Table 1 shows large and small firms' shares in some key variables. Small firms accounted for 89% of all firms in 1999, but its share slightly dropped to 88% in 2007. Although large firms were small in number, they dominated the economy in almost all other aspects. In both 1999 and 2007, large firms contributed more than half of the value added, employment, revenue, asset and capital. Note that large firms' share of profit dropped sharply from 91% in 1999 to 68% in 2007. In contrast, large firms' advantage of export was further strengthened as their share in total export value increased from 62% in 1999 to 69% in 2007.

Table 1. Share of Large and Small Firms

	Large	Small	Large	Small
	1999		2007	
share in total number of firms	0,11	0,89	0,12	0,88
share in total value added	0,64	0,36	0,62	0,38
share in total employment	0,52	0,48	0,53	0,47
share in total revenue	0,64	0,36	0,57	0,43
share in total asset	0,69	0,31	0,70	0,30
share in total capital	0,70	0,30	0,71	0,29
share in total export	0,62	0,38	0,69	0,31
share in total profit	0,91	0,09	0,68	0,32

Table 2. Comparing Large and Small Firms (Mean Values)

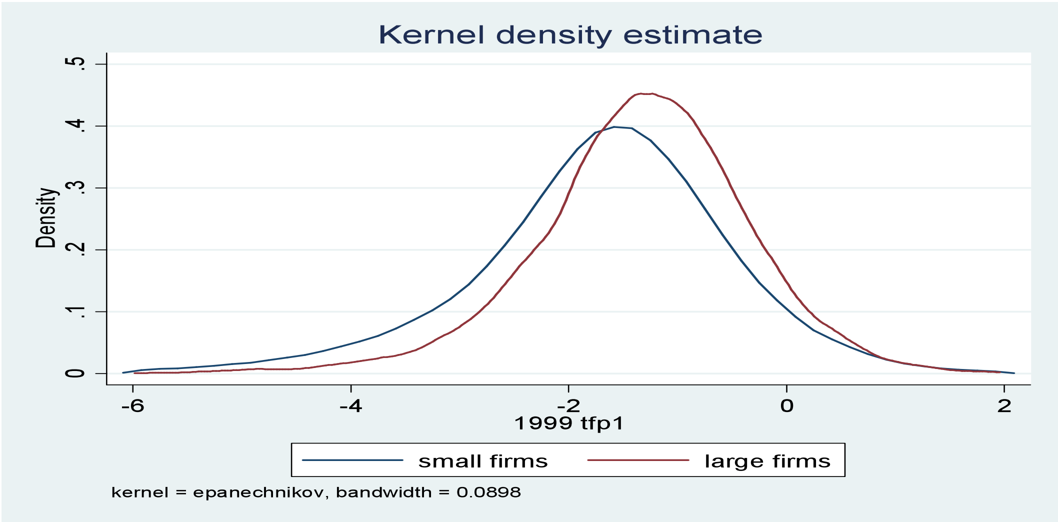
	Large	Small	Large	Small
	1999		2007	
ln(TFP)	-1,31	-1,71	-0,25	-0,50
ln(employment)	6,85	4,67	6,59	4,36
ln(revenue)	11,61	9,02	12,37	10,01
ln(total asset)	12,02	9,22	12,22	9,47
age	20,30	13,20	25,10	4,36
capital_intensity	113,15	97,63	140,19	104,10
profitability	0,05	0,03	0,07	0,05
exporter dummy	0,38	0,19	0,36	0,22
FDI dummy	0,23	0,17	0,22	0,21

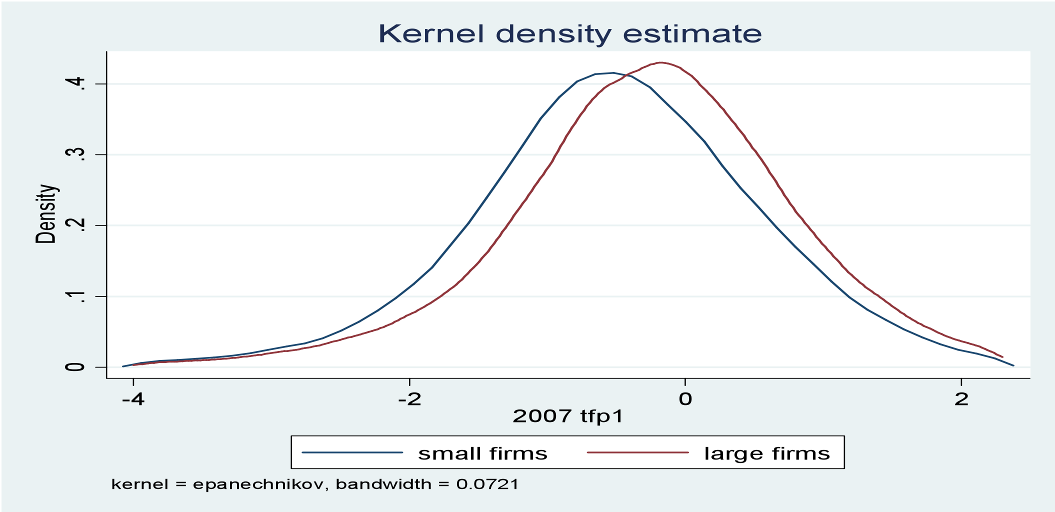
Table 2 compares main characteristics between large firms and small firms. Here capital intensity is defined as capital labor ratio. Profitability is the profit to value added ratio. In 1999 and 2007, large firms were more productive, older, more capital intensive and more profitable. The productivity gap between large and small firms was about 40% in 1999 and 25% in 2007. While the productivity of both large and small firms improved substantially, the small firms' productivity increased even faster, cutting the productivity gap by 15 percentage points. This is a remarkable productivity convergence in a short span of 8 years.

Table 2 also shows that the average age of small firms fell significantly from 13.2 years in 1999 to 4.4 years in 2007, while the age of large firms actually increased in this period. This is mainly due to the government liberalization measures that allowed large entry of small firms following the WTO entry.

In Table 2, the exporter dummy is equal to 1 if the firm's export is positive and 0 otherwise. The definition of FDI dummy is based on the ownership information reported by firms, including both foreign firms and those firms invested by Hong Kong, Macau and Taiwan. As we can see from the last two rows of Table 2, the shares of exporters and foreign invested firms decreased for large firms but increased for small firms. Large firms share in total export value increased (Table 1), but the share of exporters decreased (Table 2). This is because exporters of large firms exported significantly higher value in 2007 than they did in 1999.

Figure 2: ln(TFP) Distribution in 1999 and 2007





The result of productivity comparison in Table 2 is limited to the mean values. To further study the comparison of productivity distribution, we create kernel density plots for 1999 and 2007. Figure 2 shows the kernal density of the ln(TFP) from large firms and small firms in 1999 and 2007. The curves of both large and small firms shift to the right, but it appears that the large-small TFP gap became narrower in 2007.

Table 3. Ownership Distribution of Large and Small Firms

	Number of Firms	Share	Number of Firms	Share
	Large		Small	
Panel A: 1999				
State	7.840	0,48	41.980	0,32
Collective	3.569	0,22	48.788	0,37
Private	1.022	0,06	16.980	0,13
Foreign	3.770	0,23	22.636	0,17
Panel B: 2007				
State	6.969	0,22	15.753	0,06
Collective	3.485	0,11	13.127	0,05
Private	14.256	0,45	175.907	0,67
Foreign	7.096	0,22	56.185	0,21

We report ownership distribution of large and small firms in Table 3. Between 1999 and 2007, the share of state-owned firms decreased dramatically, whereas the share of private firms increased more than five-fold for both large and small firms. At the same time, we observe that in 1999 and 2007, large firms on average had more SOEs and fewer private firms, relative to small firms.

Figure 3a: ln(TFP) Difference Between Large and Small Firms (All Firms)

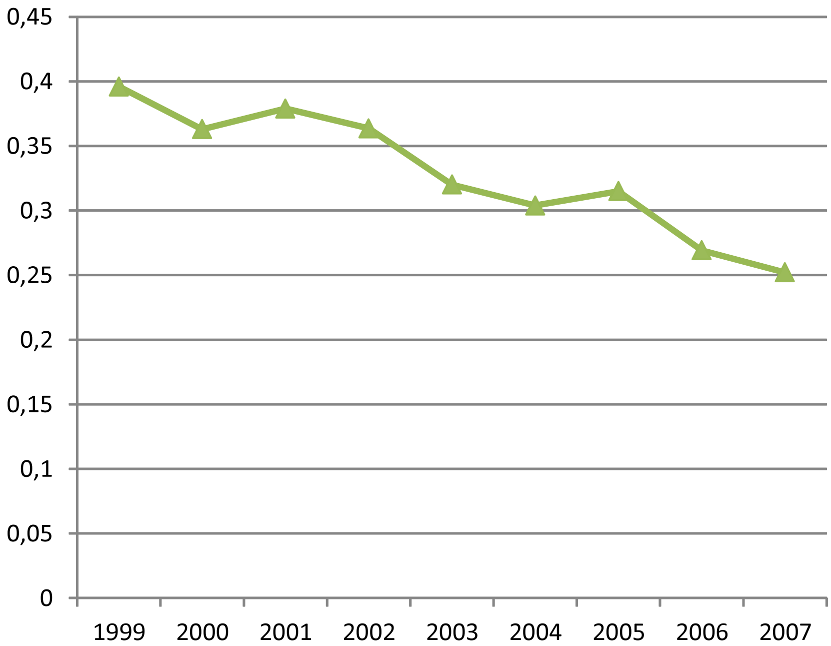
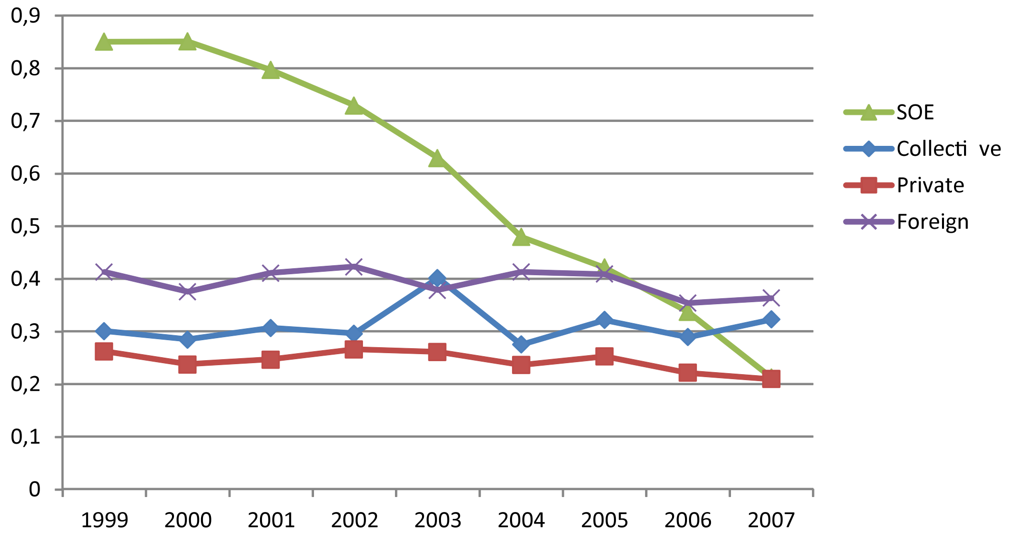


Figure 3b: ln(TFP) Difference Between Large and Small Firms (by Onwership)



To give a full picture of the evolution of productivity gap between large and small firms, we regress ln(TFP) on the dummy of large firms. We run the regression for each year over the period 1999-2007. Figure 3a shows the estimated coefficients of large firm dummy that illustrate the gap between large firms and small firms and how this gap evolved over time. We can see that productivity gap gradually declined after 1999. It decreased every year except 2001 and 2005 when there were small rebounds. Figure 3b illustrates the productivity gap evolution for the subsamples of SOEs, collective firms, private firms and foreign firms. We observe a dramatic decrease of productivity gap between large firms and small firms for the SOEs. One reason is that most of the inefficient small SOEs have been privatized before 2007 and therefore they are no longer in the sample of SOEs.

Table 4: Share of Small Firms by Industry

	1999		2007	
	# of firms	output	# of firms	output
Average of all industries	0,84	0,40	0,86	0,44
Processing of Food from Agricultural Products	0,93	0,62	0,93	0,60
Foods	0,92	0,49	0,88	0,43
Beverages	0,83	0,27	0,85	0,34
Tobacco	0,47	0,04	0,41	0,01
Textile	0,84	0,41	0,89	0,50
Textile Wearing Apparel, Footware and Caps	0,92	0,61	0,90	0,54
Leather, Fur, Feather and Related Products	0,90	0,51	0,88	0,49
Timber, Wood, Bamboo, Rattan, Palm and Straw Products	0,94	0,60	0,96	0,73
Furniture	0,93	0,67	0,89	0,54
Paper and Paper Products	0,90	0,53	0,91	0,47
Printing, Reproduction of Recording Media	0,95	0,60	0,92	0,60
Articles For Culture, Education and Sport Activities	0,90	0,55	0,89	0,53
Petroleum, Coking, Processing of Nuclear Fuel	0,81	0,08	0,78	0,11
Raw Chemical Materials and Chemical Products	0,86	0,39	0,91	0,46
Medicines	0,85	0,37	0,85	0,39
Chemical Fibers	0,72	0,16	0,86	0,22
Rubber	0,86	0,33	0,88	0,35
Plastics	0,93	0,64	0,93	0,65
Non-metallic Mineral Products	0,90	0,55	0,91	0,60
Smelting and Pressing of Ferrous Metals	0,82	0,15	0,85	0,18
Smelting and Pressing of Non-ferrous Metals	0,83	0,30	0,88	0,39
Metal Products	0,93	0,63	0,93	0,60
General Purpose Machinery	0,90	0,46	0,92	0,50
Special Purpose Machinery	0,89	0,41	0,90	0,44
Transport Equipment	0,84	0,20	0,84	0,20
Electrical Machinery and Equipment	0,87	0,26	0,87	0,36
Communication Equipment, Computers and Electronic Equipment	0,86	0,35	0,74	0,10
Measuring Instruments and Machinery for Cultural Activity	0,81	0,20	0,87	0,33
Artwork and Other Manufacturing	0,89	0,39	0,93	0,61
Recycling and Disposal of Waste	n.a.	n.a.	0,97	0,85

Table 4 reports large and small firms' industry distribution in 1999 and 2007. It shows the average share of small firms in total number of firms and in total output by two digit industry. Small firms accounted for the majority of the firms in all industries except tobacco which is highly regulated by the government and dominated by a few giant SOEs. Regarding the share of output, small firms had disadvantages in capital intensive industries such as petroleum processing, communication equipment and transport equipment.

5. Panel Data Analyses

To analyze the relationship between firm size and globalization variables (namely, exporter dummy and FDI dummy), we take advantage of the panel nature of our data and estimate the following firm fixed effect model:

$$\ln(TFP)_{it} = \alpha_i + \beta_1 exporter\_dummy_{it} + \beta_2 FDI\_dummy_{it} + \beta_3 exporter * \ln(output)_{it}$$

$$+ \beta_4 FDI * \ln(output)_{it} + other\_controls + \varepsilon_{it} \qquad (1)$$

where other controls include ln(output), ln(wage) and ln(capital intensity).

Table 5: Firm Fixed Effects Regressions Dependent Variable: ln(TFP)

	(1)	(2)	(3)
exporter dummy	0.192***	0.141***	0.167***
	(18.51)	(17.91)	(4.81)
FDI dummy	0.202***	0.136***	0.154***
	(16.07)	(13.64)	(7.04)
exporter*ln(output)			-0.038***
			(-3.37)
FDI*ln(output)			0.074***
			(8.29)
ln(output)		0.324***	0.148***
		(20.38)	(21.62)
ln(wage)		0.124***	0.170***
		(7.40)	(7.26)

ln(capital intensity)		-0.087***	-0.106***
		(-14.21)	(-13.01)
firm fixed effects	Yes	Yes	Yes
N	1.773.836	1.769.080	1.769.080

Notes: The sample includes all firms from 1999-2007. Numbers reported in parentheses are t-statistics. *** indicate significance at the 1% level.

Since firm fixed effect captures all time-invariant firm-level variables, the identification of exporter dummy and FDI dummy comes from those observations that switched their export status and FDI status during the sample period. Table 5 reports the regression results. In the first column, exporters are on average 19% more productive than non-exporters and FIEs are about 20% more productive than Chinese local firms. These coefficients are statistically significant at the 1% level. Both of them decrease in column (2) where we include more firm-level control variables. We add interaction terms in column (3). Given the negative sign of the interaction term between export dummy and firm output, it seems that exporters' premium is higher for smaller firms. In contrast, FDI premium is lower for smaller firms.

6. Static Blinder-Oaxaca Decomposition

To quantify the globalization effects on the performance difference between large and small firms, we conduct decomposition analyses. Our methods come from Blinder-Oaxaca decomposition in the literature on racial and gender wage discrimination in labor economics. Blinder-Oaxaca decomposition (Blinder, 1973; Oaxaca, 1973) separates the difference in average wages of the comparing groups into two components:

(1) The component that exists because of the differences in average observable characteristics of the individuals;

(2) The component that is the result of the differences in the rewards to those characteristics.

In particular, our decomposition uses the following equation:

$$y^S - y^L = (x^S - x^L)\beta^S + x^L(\beta^S - \beta^L) \tag{2}$$

In racial discrimination literature, the left hand side is the mean difference of earning between black and white workers. x is a vector of average values of the independent variables such as education and experience and β^j is a vector of coefficient estimates for race j. The first term is the "explained part," while the second term is often regarded as "discrimination."

In our case, the left-hand side variable is the average ln(TFP) difference between large firms and small firms. x is a vector of variables that determine firm TFP, including exporter dummy, FDI dummy, firm wage rate, firm age, capital intensity, and a full set of industry and provincial dummies. β is a vector of the coefficients of these variables.

Our interpretation of equation (2) is different from labor economists. Use exporter dummy as an example. The first term shows "the endowment effect", or the effect brought by the difference in mean value of exporter dummy. The second term is the "return to export effect". It comes from the difference in the coefficients of exporter dummy. Intuitively, even when large firms and small firms have same endowment (same percentage of exporters), export may still benefit large firms and small firms differently, leading to different estimates of the coefficients. FDI dummy can be explained in the similar way.

To implement the decomposition,

(1) we run separate regressions for large firm sample and small firm sample, and get the coefficients;

(2) then we calculate the means of the independent variables;

(3) use equation (2) to calculate the two terms.

Table 6: Regressions of Large and Small Firms 1999 and 2007 Dependent Variable: ln(TFP)

	(1) 1999 Small firms	(2) 1999 large firms	(3) 2007 Small firms	(4) 2007 large firms
exporter dummy	0.148***	0.132***	0.219***	0.152***
	(3.78)	(2.69)	(4.81)	(3.84)
FDI dummy	0.098***	0.214***	0.166***	0.223***
	(5.81)	(4.67)	(7.04)	(6.64)
ln(wage rate)	0.034***	0.039***	0.067***	0.074***
	(13.28)	(6.40)	(14.39)	(8.32)
ln(firm age)	-0.314***	-0.278***	-0.165***	-0.146***
	(-7.32)	(-6.13)	(-6.18)	(-5.36)
ln(capital intensity)	-0.098***	-0.053***	-0.075***	-0.063***
	(-8.01)	(-7.21)	(-13.01)	(-11.56)
four digit industry dummies	Yes	Yes	Yes	Yes
provincial dummies	Yes	Yes	Yes	Yes
adj R-sq	0,4431	0,3017	0,5149	0,4791
N	117.494	15.814	262.549	30.986

Notes: Numerbs in parentheses are t-statistcs corrected for four-digit industry clustering. *** indicates statistical significance at the 1% level.

Table 6 reports the results of TFP regressions with large firm and small firm subsamples in 1999 and 2007. In all columns, wage rate has a positive effect on firm productivity, while firm age and capital intensity appear to have negative effects. For the exporter dummy, in both 1999 and 2007, the coefficients of small firms are larger than those of large firms. The opposite is true for the FDI dummy. The FDI coefficients of large firms are always larger. It is interesting to see that the coefficients of export and FDI are all larger in the 2007 regressions than their counterparts in the 1999 regressions.

But the size of the increase is bigger for small firms. To facilitate the decomposition analyses, we list the main parameters in Table 7.

Table 7: Summary of the Decomposition Parameters

	exporter dummy		FDI dummy	
	small firms	large firms	small firms	large firms
1999				
x (endowment)	0,187	0,376	0,174	0,233
β (coefficient)	0,148	0,132	0,098	0,214
2007				
x (endowment)	0,220	0,356	0,214	0,224
β (coefficient)	0,219	0,152	0,166	0,223

Note: This table summarizes the decomposition parameters that will be used in Table 8 and Table 9. The parameters come from Table 2 and Table 6.

Table 8: Static Blinder-Oaxaca Decomposition of Productivity

	1999		2007	
		share in TFP difference		share in TFP difference
Small firms ln(TFP)	-1,713		-0,503	
Large firm ln(TFP)	-1,317		-0,251	
Difference (small - large)	-0,396		-0,252	
Exporter dummy				
endowment effect	-0,028	0,071	-0,030	0,118
return effect	0,006	-0,015	0,024	-0,095
export total effect	-0,022	0,055	-0,006	0,024
FDI dummy				
endowment effect	-0,006	0,015	-0,002	0,007
return effect	-0,027	0,068	-0,013	0,051
FDI total effect	-0,033	0,083	-0,014	0,057
Other variables	-0,341	0,862	-0,232	0,919

Table 8 reports the results of the static Blinder-Oaxaca decomposition using the 1999 sample and the 2007 sample. In 1999, the ln(TFP) difference between small and large firms is 0.396. Let us look at the export dummy of 1999 decomposition first. The export endowment effect, or the first term in equation (2), contributes 0.028 log points, or about 7.1% (=0.028/0.396) of the observed difference in productivity. Since the coefficient of exporter dummy is even higher for small firms, the export return effect, or the second term in equation (2), is actually negative. These two effects combined can explain about 5.5% of the productivity gap. The FDI endowment effect is small, contributing only 1.5% of the productivity gap. But the FDI return effect is relatively large, due to the large difference of the two coefficients in the regressions. The total effect of FDI is about 14% of the productivity gap. Now we can interpret the 2007 decomposition results in a similar way. Again, the export return effect is negative, and the FDI total effect is stronger than the export total effect.

7. Dynamic Blinder-Oaxaca Decomposition

In the static analysis, we can disentangle the effect of major variables on TFP gap between large firms and small firms. As we observed from Figure 2, there is a fast and strong convergence of TFP between these two groups. How do export and FDI affect this convergence? To answer this question, we adopt a dynamic version of Oaxaca-Blinder decomposition (i.e., Baker and Drolet, 2010). If we want to explain the change of ln(TFP) gap between large and small firms during 1999-2007, we can decompose it in the following way:

$$(y_1^S - y_0^S) - (y_1^L - y_0^L) = [(x_1^S - x_0^S)\beta_1^S - (x_1^L - x_0^L)\beta_1^L] + [x_0^S(\beta_1^S - \beta_0^S) - x_0^L(\beta_1^L - \beta_0^L)] \quad (3)$$

It can be easily shown that equation (2) implies equation (3). Note that there are four terms on the right hand side of equation (3). The two terms in the first bracket can be regarded as the effect of change in endowment. The third and fourth terms in the second bracket show the effect of change in return.

Table 9: Dynamic Blinder-Oaxaca Decomposition of Productivity Growth

		share in total difference in TFP change
Small firms ln(TFP) change between 1999 and 2007	1,210	
Large firm ln(TFP) change between 1999 and 2007	1,066	
Difference in ln(TFP) change (small - large)	0,144	
Exporter dummy		
change in endowment effect (first and second terms)	0,010	0,071
change in return effect (third and fourth terms)	0,006	0,040
exporter total effect	0,016	0,111
FDI dummy		
change in endowment effect (first and second terms)	0,009	0,060
change in return effect (third and fourth terms)	0,010	0,068

FDI total effect	0,018	0,128
Other variables	0,110	0,761

The left-hand side of equation (3) is the change in ln(TFP) gap, which is equal to 0.144. From Table 9, we can see that for the exporter dummy, the effect from the change in endowment is stronger than the effect from the change in return. In total, export can contribute 11.1% of the productivity catch-up. For the FDI dummy, the endowment change effect and return change effect are more equal, accounting for 6.0% and 6.8% of the convergence, respectively. And the FDI total effect is 12.8%.

The trade liberalization and the domestic market liberalization brought by the WTO entry can offer some explanations of the convergence. For example, after the WTO entry, it became easier for the entrepreneurs to start up new businesses. Simplified procedure of exporting may benefit small exporters more than large exporters. After Chinese government removed many FDI entry barriers, small foreign firms could enter the Chinese market that was almost exclusively reserved for large multinationals before the WTO entry.

8. Concluding Remarks

This paper studies the productivity gap and productivity convergence between large and small firms in China. We find that firm size matters for productivity. On average, small firms are less productive than large firms. We also find that the productivity gap became narrower during 1999-2007. Using the static and dynamic Blinder-Oaxaca decompositions, we quantify the effects of export and FDI on productivity gap and productivity convergence. By examining the endowment effect and the return effect, we find that globalization factors have impacts on large and small firms through different channels.

Our study has important policy implications. Promoting the development of small firms has been one of the priorities of national economic policies for many countries. In China, those government programs that targeted external finance, innovation and taxation only had limited success. This paper explores new channels - globalization channels - that can benefit small firm growth. We find that export and FDI accounted for nearly 24% of the productivity convergence between 1999 and 2007. In order to encourage the productivity growth of small firms, the government could focus on helping small firms to become exporters and strengthening their ability to benefit from exporting. Foreign participation is also important for small firms. As the multinationals are a critical source of technology and knowledge, the government should guide more FDI into small firm sector.

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CHAPTER 5

Changes in Competition of Small vs. Large Firms from International Trade[*]

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Using Korean plant level manufacturing data, this paper examines the effect of lowering trade barriers on changes in markups of small and large firms, exporter and non-exporters. We find that the large firms decide on higher markups in each sector as they have higher market powers in integrated markets, also exporters set higher markups through relatively higher observable productivity than non-exporters. Even after controlling productivity and other firm characteristics, markups are proportional to market share, which can be interpreted that market power purely influences firm price strategy. Interestingly, the markup distribution which is more closely related to the competition from globalization has been decreasing over time while the performance gap measured as sales has been stable over time. It cautions that even if performance gap measured in quantity may be widening, this does not imply that the level of competition between large and small firms is weakened.

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1. Introduction

Globalization has been regarded as one of the main driving forces which changes market environments such as degree of competitiveness between firms. Intuitively, more integrated markets confer a benefit on more productive firms to sell their products in a bigger market. The firm selling its product in the domestic market can grow as a global company. This leads to the exit of less productive firms in the market, thereby firm performance has been polarized. On the other hands, the surge of foreign products from the world makes market environment more competitive, so firms with monopolistic power due to market frictions can lose their market power in the domestic market. It creates a level playing field to all firms, so firms of a second mover with small market share can enjoy more equal benefits. It alleviates inequality between firms, especially in terms of firm size.

Since globalization has two opposite effects on inequality between firms, it is a natural question whether more integrated markets have equal benefits to all firms or not. There are full amount of literature studying the relationship between globalization and its effect on aggregate output or firm performance, but it is relatively rare to investigate the different impact of globalization on firm performance.

For policy administration, firm size is a convenient measure to be observed. In many countries, firm policy has been implemented discriminately according to firm size. Tax benefits accrue more to small firms, and regulations are stronger to large firms. Even if firm size contains many characteristics suggesting productivity, firm age, market power, size itself is actually obscure property. For example, firm size is not directly linked to productivity. There are on-going debates about why large firms are large. Are they big because of their advanced technology or just benefit as an early entry making them a first mover. Economists who had thought that small firms are the engine of growth and the entity of creative destruction now have realized that many small firms are actually in the low level of innovation. (Eric Hurst and Pugsley (2011)) However there is a general consensus that market share is the obvious characteristic of market power. Thus it is plausible to study the effect of globalization on changes in market power of firms. As a proxy variable capturing market power, markups are commonly investigated.

In this paper, we investigate whether more integrated markets through globalization expand or shrink the gap of market power between large and small firms. Using the plant level data of Korean annual survey of manufacturing, we rigorously estimate plant markups and keep track of trend of markups over time. Then we examine empirically the effect of lowering trade barriers on changes in markups of small and large plants. Through this exercise, we can test the educational guess of markup variations in small and large firms in the international models. Furthermore, we can directly observe gap of market power between small and large firms measured by markups, and investigate whether this gap supposedly converges when markets are more open through trade liberalization.

For the theoretical literature, our paper is closely associated to recent development of heterogeneous model of international trade. Markups have many attentions from economists and policymakers in a sense that it measures the effect of various competition and trade policies on market power. Recently the theoretical study of firm heterogeneity in terms of productivity or size combines with heterogeneity in markups. Melitz and Ottaviano (2008) suggest a monopolistically competitive model of trade with firm heterogeneity. In their model, the market size and the trade affect the toughness of competition. Larger and more integrated markets through trade exhibit lower markups. However, this paper does not point out the difference between small and large firms. Decreases in markups when market size is bigger through trade, is linear in terms of productivity.

Another types of theoretical model of endogenous markups, such as Atkeson and Burstein (2008), Oh (2013), and Edmund, Midrigan and Xu (2013) emphasize the increasing schedule of optimal markup with respect to market share of a firm. These types of models rely on the similar setting of monopolistically competitive market except that the number of competitors is small in an industry or a product level. In this setting, firms take into account the effect of their pricing decisions
on the equilibrium of the prices of industry goods. The price elasticity of demand decreases in a firm's market share. Thus an optimal markup, which is the inverse of the price elasticity, increases in firm size. Large firms assign higher markups than small firms. A reduction in trade barriers reduces the industry share of domestic producers, thus reducing their markups. Interestingly, the optimal markup is convex-increasing in a

firm size. Therefore, the adjustment of markup of large firms is larger than that of small firms with the same reduction of market share from international trade.

This notion of differences in markups by small and large firms has hardly been investigated empirically. Roberts and Supina (1996) show that plant-specific markups of price over marginal cost vary across size distribution of producers. In three products, markups decline in size and in two cases they increase. Edmund, Midrigan and Xu (2013) accurately calibrate their model with Taiwanese manufacturing plant level data and argue that endogenous markup setting shows much larger gains from trade than Ricardian models. Bigger welfare gains in their model are driven by the significant reduction of large firm's markups. They imply that import competition reduces the gap between large and small in terms of firm markup. However, they never show any empirical evidence that plant specific markups decrease after trade barriers are lower.

Our empirical main findings confirm many theoretical predictions. First the level of markup is obviously higher in more productive firms as predicted by Melitz and Ottaviano (2008). Second, markup increases as market share rises. This reinforces increasing relationship between markup and market share. As Atkeson and Burstein (2008) and Oh (2013) expect, larger market share leads to higher markup because large firms can enjoy more market power which comes from lower level of demand elasticity. Third, markups of exporters are higher on average. This makes sense that exporters are mostly more productive and larger firms which can afford to pay fixed costs for exporting as Melitz (2003) predicts. Fourth, we create distributions of firm markups at every point in year, and compare them. Interestingly, the mean of markups has decreased over time, and the dispersion also has been densely packed. Even though we cannot identify the main force for convergence of markups, competition effect from globalization is definitely one of the plausible factors. In order to identify and quantify the effect of import competition on markup dispersions, we regress industry markup dispersions on industry import penetrations. Generally speaking, import competition makes markup dispersion shrinked. Lastly, although the overall picture of markup distribution has been more condensed over time, we find that individual firms expanding market share which might go to the overseas market increase their markups.

The remainder of this paper is organized as follows. We introduce our theoretical model and briefly provide theoretical predictions about emprical results in Section 2. Section 3 introduces our empirical framwork and our estimation routine. Section 4 provides main empirical results and discussion. The final section concludes.

2. Theoretical Background

In this section, we illustrate how variations in firm size is theoretically related to the different level of firm markup. We first lay out the market structure in the model to examine the mechanisms involving market share and markup. This model is based on the monopolistic competition suggested by Dixit and Stiglitz (1977), except that it has a few competitors rather than a continuum of firms. The goods market features differentiated oligopoly competition with a quantity-setting game.

We construct a model of imperfect competition in which final goods consist of a continuum of industry goods and each industry goods market consists of N_j firms. The final good is produced using a constant returns to scale production function, which aggregates a continuum of industry goods.

$$Y = \left(\int_0^1 y_j^{1-1/\eta} dj \right)^{\frac{\eta}{\eta-1}} \tag{1}$$

where y_j denotes the output of industry j. The elasticity of substitution between any two different industry goods is constant and equals η. Final goods producers behave competitively.

In each industry, there are N_j firms producing differentiated goods that are aggregated into industry goods through a CES aggregating function. The output of goods in industry j[‡] is given by

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[‡] The term N1-11P implies that there is no variety effect in the model.

$$y_j = N^{\frac{1}{1-\theta}} \left(\sum_{i=1}^{N_j} y_{ij}^{1-1/\theta} \right)^{\frac{\theta}{\theta-1}} \tag{2}$$

where y_{ij} is the output of firm *i* in industry *j*. Within each industry of N_j firms, a firm sets its quantity. The elasticity of substitution between any two intra-industry goods is constant and equals θ. It is assumed that the elasticity of substitution between any two goods within an industry is higher than the elasticity of substitution across industries, $1 < \eta < \theta$.

The final good producer solves a static optimization problem that results in the usual conditional demand for each industry good,

$$y_j = \left(\frac{P_j}{P} \right)^{-\eta} Y,$$

where p_j is the industry *j* price and *P* is the price of final goods,

$$P = \left(\int_0^1 P_j^{1-\eta} dj \right)^{\frac{1}{1-\eta}}, \tag{3}$$

Denoting the price of good *i* in industry *j* by p_{ij} ,

$$P_j = N_j^{\frac{1}{\theta-1}} \left(\sum_{i=1}^{N_j} p_{ij}^{1-\theta} \right)^{\frac{1}{1-\theta}}, \tag{4}$$

the inverse demand functions for goods within an industry are given by:

$$\left(\frac{p_{ij}}{P}\right) = \left(\frac{y_{ij}}{y_j/N_j}\right)^{-1/\theta} \left(\frac{y_j}{Y}\right)^{-1/\eta}.$$

Dixit and Stiglitz (1977) assume that each firm is small relative to the economy, and therefore does not influence the equilibrium price and quantity. In this model, the assumption of a small number, *N*j, of firms in each industry implies that a firm's quantity choice affects the industry price. Within a given industry, each firm takes into account the effect that the pricing and production decisions of other firms has on the demand for its own goods. Therefore, the price elasticity of demand ϵ (S_{ij}) of firm (*i*) is a decreasing function of the firm's when the substitutability of within-industry goods is higher than that of between-industry goods (η < θ). In equation (6), the demand elasticity is a market share weighted average of two values [η, θ]: when yij is near zero, the perceived demand elasticity of firm *i* in industry *j* is equal to θ, which is the same as in Dixit and Stiglitz (1977). On the other hand, if yij is near one, the demand elasticity of firm i is the same as that of the monopoly firm in industry j[§].

$$\epsilon(S_{ij}) = \left[\frac{1}{\theta}(1 - S_{ij}) + \frac{1}{\eta}S_{ij}\right]^{-1} \tag{5}$$

From eq (4) and eq (5), these market shares can be written as a function of prices in equation (7)

$$S_{ij} = \frac{p_{ij}y_{ij}}{P_j Y_j} = \frac{p_{ij}^{1-\theta}}{\sum_{i=1}^{N_j} p_{ij}^{1-\theta}} \tag{6}$$

Directly from the demand elasticity in equation (6), the firm markup is an increasing function of its market share from (8).

[§] firms compete in aprice-setting game (Bertrand competition) within an industry, the demand elasticity would be $\epsilon_{y,p} = \theta(1 - s_i) + \chi s_i$.

$$\mu_{ij}(S_{ij}) = \frac{\epsilon(S_{ij})}{\epsilon(S_{ij})-1} = \frac{1}{1-\frac{1}{\theta}(1-S_{ij})-\frac{1}{\eta}S_{ij}} \tag{7}$$

Firm markups are combined into aggregate industry markup ($\bar{\mu}_j$). Aggregate markup can be expressed in two ways: the input-share weighted average of firm markup, which is equal to the revenue-share weighted harmonic average of firm markup.

$$\bar{\mu}_j = \sum_{i=1}^{N_j} x_{ij}\mu_{ij} = \left(\sum_{i=1}^{N_j} \frac{S_{ij}}{\mu_{ij}}\right)^{-1} \tag{8}$$

where $x_{ij} = \frac{Input_{ij}}{Input_j}$ is the input share[**] of firm i in industry *j*.

In a symmetric industry equilibrium, aggregate industry markup $\bar{\mu}_j$ is equal to aggregate markup $\bar{\mu}$. Going forward, I will restrict attention to symmetric industry equilibrium.

The assumption of ($\theta > \eta$) implies that each firm's markup of its price over marginal costs is an increasing function of that firm's market share within an industry. At one extreme, if the firm has a market share S_i approaching zero, it faces only the industry elasticity of demand 0 and chooses a markup equal to $\theta / (\theta — 1)$. At the other extreme, if the firm has a market share approaching one, it faces the lower elasticity of demand across industries η and sets a higher markup equal to $\eta / (\eta — 1)$. The difference $\theta — \eta$ actually determines how much the demand elasticity changes in response to shifts in market share. As $\theta — \eta$ gets bigger, the effect of market share on demand elasticity and markup becomes increasingly significant.

$\Gamma(s)$ refers to the elasticity of the markup with respect to market share. Note that $\Gamma(s)$ is an increasing and convex function of s. In the constant markup model, $\Gamma(s) = 0$.

[**] In the case that input prices are common to all firms, input shares of any input are equal within firms. For instance, the labor input share $\frac{h_{ij}}{H_j}$ of firm *i* in industry *j* is the same as the capital input share $\frac{k_{ij}}{K_j}$, if firms face the same wage rates and capital rental prices.

$$\Gamma(s) = \frac{s}{1 - \frac{1}{\theta}(1-s) - \frac{1}{\eta}s}\left(\frac{1}{\eta} - \frac{1}{\theta}\right)$$

This convexity plays an important role in the dynamics of aggregate markup. Due to this convexity, aggregate markup increases as market shares across firms become more dispersed or unequal.

In addition to convexity, the level of aggregate markup is influenced by a composition effect. Since aggregate markup is the input-share weighted average of firm markups, a large firm's high markup weighted by its high input-share contributes significantly to raising aggregate markup, and vice versa. This composition effect implies that the pricing behaviors of large firms play a dominant role in the dynamics of aggregate markup.

It is worth mentioning that a firm's markup does not change unless its market share changes. When there are uniform changes such as cost reductions for all firms, relative prices do not change between firms; therefore, market share stays constant. This is an important departure from a generic sticky price model in which an exogenous price-setting friction causes variations in markup for the representative firm.[††] In our model, aggregate fluctuations cannot change aggregate markup. Only changes in relative productivity between firms matter in determining aggregate markup.

The described model above can apply to how globalization can influence firm decisions in terms of markups. In terms of increases in importing, the trade liberalization and the surge of imported goods make domestic markets more competitive. The rises in import penetration in an industry naturally reduces market share of domestic firms. Based on the theoretical framework above, this effect lowers the level of domestic markups. Furthermore, the speed of lowering markups is accelerated in large firms rather than small firms due to the convex schedule of optimal markup. In this sense, we can say that globalization generates more competitive and reduces market power inequality between large and small firms.

When it comes to globalization through exporting, it is ambiguous to apply for this

[††] It follows that my model can explain why large firms are reluctant to cut prices in recessions - due to the low demand elasticity they face

modified imperfect competition framework. It is obvious for domestic firms to lose their domestic market share to foreign competitors. For exporting producers, domestic market share may not change at all after participating exporting, but entry to exporting may change the firm distribution through selection process.

Related to the literature, we can lean on the endogenous markup model suggested by Melitz and Ottaviano (2008). Even if the details are different, the basic mechanism is closely related to the model above. Competition from entry lowers the level of markups. Melitz and Ottaviano (2008) theoretically prove that the mean of markups decreases and the average level of productivity of firms increases as markets are more integrated through trade liberalization. This makes sense that the selection effect pushes the least productive firms out of market. More competitive environment makes firms to reduce price and markups as well. Interestingly, they also expect the dispersion of the firm performance measures such as price, markup, and firm size: the variance of cost, prices, and markups are lower in bigger markets because the selection effect decreases the support of these distributions. On the other hand, the variance of firm size (in terms of either output or revenue) is larger in bigger market due to the direct magnifying effect of market size on these variables.

Regarding the dispersion of firm performances, these two different directions about price and quantity are very fascinating. Even if the degree of competition increases, the firm size distribution can be viewed to be more unequal. The better measure is the markup distribution than firm size distribution in order to answer the question that globalization actually increases the level of competition or benefit more to the large firms. Going forward, we will show the empirical results about the dispersion of markups.

On the other hand, the effect of increases in export on firm markups is ambiguous in terms that variations of markups across firms in cross-sectional may not show the same pattern in time series. Thus, the real effect of international trade on the difference in markups by size should be measured empirically. De Loecker and Warzynski (2012) show that exporting makes firms increase markups in time-series as well as in cross-sectional.

3. Estimation

3.1. Production function Estimation

The problem of estimating the production function is an important issue since the beginning of the economics because production functions are a fundamental component of all economics. In fact, the econometric subject is the possibility that the major determinants of firm's production decision might be unobservable to econometricians. Thus, this measurement error induces the endogeneity problem due to the relation between observed inputs and unobserved productivity shocks. Olley and Pakes (1996, hereafter as OP model), Levinsohn and Petrin (2003, hereafter as LP model), Ackerberg, Caves and Frazer (2006, hereafter as ACF model), and De Loecker and Warzynski (2012, hereafter as DLW model) are seminal papers leading to the introduction of new techniques for identification of production functions. OP model and LP model cannot avoid the multicollinearity issue when they estimate the labor coefficient of production function in the estimation scheme. DLW model owes ACF model in terms of the full identification in the second stage of structural estimation. In addition, these papers are somewhat more structural in nature-using observed input decisions to control for unobserved productivity shocks (De Loecker and Warzynski (2012)). These techniques have been used in a large number of recent empirical papers including Pavcnik (2002), Fernandes (2007), Criscuola and Martin (2009), Topalova and Khandelwal(2011), Blalock and Gertler (2004), and Alvarez and Lopez (2005).

3.2. Markup Estimation

Estimating markups has a long tradition in industrial organization and international trade. Re-searchers in industrial organization are interested in measuring the effect of various competition and trade policies on market power through estimating unobservable markups. In this paper, we use a simple empirical framework in DLW model to estimate markups. Our approach following DLW model nests the price-setting model used in applied industrial organization and international trade and relies on optimal input demand conditions obtained from standard cost minimization and the ability to identify the output elasticity of a variable input. This framework removes out issues related to input adjustment costs. Also, this methodology derives that the output elasticity of a variable factor of production is exactly equal to its expenditure share in total revenue as price equals marginal cost of production solving the cost minimizatioin problem. Therefore, the markup under imperfect completeness of market drives some gap between the input's revenue share and its output elasticity.

Markup estimates are obtained using production data where we observe output, total expen-ditures on variable inputs, and revenue plant-level datasets. Especially, DLW model requires a measure of output that does not pick up price differences across firms. Therefore, we use real out-put value in Korean data. In literature, those types of datasets from several countries are becoming increasingly available to empirical researchers, making empirical approach very much suitable to these data (Foster, Haltiwanger, and Syverson (2008) and Goldberg et al. (2010) and Kugler and Verhoogen (2008), De Loecker and Warzynski (2012)).

Some assumptions are released following DLW model. First, constant returns to scale is not imposed, and second, the user cost of capital do not need to be observed or measured in our model. This relaxation leads to a flexible methodology and reliable estimates such as DLW model. We then use our empirical model to verify whether exporters, on average, charge higher markups than their domestic counterparts in the same industry, and how markups change as the firm size, i.e., the market share changes. This framework is well suited to relate markups to any observed plant-level activity potentially correlated with plant-level productivity.

3.3. Local Constant Kernel Model

In recent decade, the literature on nonparametric econometric methods has offered solutions for the problems related to the parametric misspecification of econometric regression models. This misspecification problem can be generically generated in production or markup estimations because the functional form of production is wholly determined by the researcher's arbitrary decision. However, nonparametric regression techniques basically do not make the researcher to assume and specify a functional form of production for the relationship between the firm's decision variables and the production variable (output production or value added production). Fully nonparametric model is most often applied to cross-sectional data, while they are seldom applied to panel data sets (Czekaj and Henningsen (2013)[‡‡]).

There still exists a possibility that DLW model has the multicollinearity problem because DLW model uses the nth order nonparametric series regression with inter-variable components in the first stage of structural estimation even though it fully estimates coefficients necessary to compute the markups in the second stage formed by GMM structure. Therefore, we use local constant kernel model (hereafter, LCK model) with unordered discrete data in the first stage of structural estimation. LCK model is fully nonparametric model that uses the time variable and the individual identifier as additional (categorical) explanatory variables (Racine and Li (2004)). In this formation we do not need to consider separately the production part of labor and capital, and the productivity shock observed to firm managers before the input decisions (labor, investment and materials so on), but unobservable to econometricians. The fully nonparametric regression, that is, LCK model only focuses on how well to estimate data. At the same time LCK model captures non-linear individual and time effects which do not need to be assumed to be additive and separable.

In our analysis we use a fully nonparametric and nonseparable panel data model (LCK model) that has been suggested by Henderson and Simar (2005), Racine (2008), and Gyimah-Brempong and Racine (2010). They estimate a undefined function as a fully nonparametric two-ways effects panel data model with individual and time as categorical explanatory variables using the nonparametric regression method proposed by Li and Racine (2004) and Racine and Li (2004). Those papers use both continuous and categorical explanatory variables for fully nonparametric specification. This estimator does not require any data transformation with a loss of observations. In addition, the intercept of the dependent variable and the slopes of the explanatory variables on the dependent variable are not fixed according to the interaction between time periods and individuals on the fully nonparametric model. Hence, this estimator does not imply any restrictions on the most general specification of panel data models. Furthermore, the bandwidths of the explanatory variables can be selected using data driven cross-validation methods. The overall shape of the relationship between the

[‡‡] Czekaj and Henningsen (2013) only compare the fittability of OLS, semiparametric and fully nonparametric regressions. Their purpose is not to solve unbiased estimators for unobserved productivity shocks in firm decisions

dependent variable and the covariates, the individual, and time is entirely determined by the data.

Finally, we compare the empirical results with LCK, DLW and conventional OLS models. It is found that LCK model is more fitted to the production data and more consistent to the economic theory compared with DLW and OLS models. This means that LCK model captures the non-linear individual and time effects by the dicrete smoothing parameter, and the fitted value added is determined by the local weighted average rather than by labor, capital, and material variables.

3.4. **Structure to Estimate Markups**

We explain the structural model to obtain plant-level markups relying on standard cost minimiza-tion conditions for variable inputs following DLW model. These conditions derives that the markup is the output elasticity of an input to the share of that input's expenditure in total sales and the firm's markup (DLW model). To obtain output elasticities, we need estimates of the production function, for which we rely on proxy methods developed by DLW model. We follow the restrictions that DLW imposes, and we discuss our model in detail in below given DLW model.

3.4.1. *Deriving Markups*

A firm i produces output at time t with the implicit production technology:

$$Q_{it} = Q_{it}\left(X_{it}^{1}, \ldots, X_{it}^{N}, K_{it}, z_{it}\right),$$

in which it relies on N variable inputs such as labor, intermediate inputs, and electricity. In addition, a firm relies on a capital stock, K_{it}, which is treated as a dynamic input in production, which means the amount of investment at t is determined given the information at $t - 1$. The productivity shock z_{it} evolves exogenously following an first order markov process, and the labor in production is a non-dynamic input, which means the amount of labor at t is related to the observed productivity shock z_{it}. However, the only restriction we impose on Q_{it} to derive an expression of the markup is that Q_{it} is continuous and twice differentiable with respect to its arguments.

Producers have the cost-minimization problem such as the associated Lagrangian function:

$$\mathcal{L}\left(X_{it}^{1},\ldots,X_{it}^{N},K_{it},z_{it}\right)=\sum_{j=1}^{N}P_{it}^{X^{j}}X_{it}^{j}+r_{it}K_{it}+\chi_{it}\left(Q_{it}-Q_{it}\left(\cdot\right)\right),$$

in which $P_{it}^{X^j}$ and r_{it} show a firm's input price for a variable input *j* and capital, respectively. The first-order condition for any variable input is

$$\frac{\partial\mathcal{L}_{it}}{\partial X_{it}^{j}}=P_{it}^{X^{j}}-\chi_{it}\frac{\partial Q_{it}\left(\cdot\right)}{\partial X_{it}^{j}}=0,$$

in which χ_{it} is the marginal cost of production at a given level of output as $\partial\mathcal{L}_{it}/\partial Q_{it}=\chi_{it}$. Then we can generate the following expression after some calculus:

$$\frac{\partial Q_{it}\left(\cdot\right)}{\partial X_{it}^{j}}\frac{X_{it}^{j}}{Q_{it}}=\frac{1}{\chi_{it}}\frac{P_{it}^{X^{j}}X_{it}^{j}}{Q_{it}}. \tag{9}$$

The equation (9) can be rewritten as following DLW (2012) such that

$$\mu_{it}\frac{P_{it}^{X}X_{it}}{P_{it}Q_{it}}=\epsilon_{it}^{X},$$

in which the output elasticity on an input X is denoted by ϵ. This expression shows that the markup is the measure for the output elasticity on an input divided by the share of an input's expenditure in total sales such that

$$\mu_{it}=\frac{\epsilon_{it}^{X}}{\sigma_{it}^{X}}, \tag{10}$$

where σ_{it}^{X} is the share of expenditures on input X_{it} in total sales $P_{it}Q_{it}$. This means that an estimate of the output elasticity of one variable input in production and data on the expenditure share are enough to obtain a measure of plant-level markups using production data. The expenditure share can be directly obtained from observed micro data.

This derivation is standard and has been used throughout the literature, especially DLW model (2012), their contribution is to provide consistent estimates of the output elasticities while allowing some inputs to face adjustment costs and recover firm-specific estimates of the markup related to various economic variables.

3.4.2. Output Elasticities and Markups

For estimates of the output elasticities $_{\text{Eit,}}$ production functions are implicitly assumed to be with a scalar Hicks-neutral productivity term and with common technology parameters across the set of producers. But, when taking the log of production, the overall function can be estimated by fully nonparametric regression, LCK model. The latter does not imply that output elasticities of inputs across firms are constant, except for the special case of Cobb-Douglas.

The production function is

$$Q_{it} = G\left(X_{it}^{1}, \ldots, X_{it}^{N}, K_{it}, z_{it}; \beta\right) = F\left(X_{it}^{1}, \ldots, X_{it}^{N}, K_{it}; \beta\right) \exp\left(z_{it}\right),$$

in which a set of common technology parameters β govern the transformation of inputs to units of output, combined with the firm's productivity z_{it}.

This expression contains most specifications used in empirical work such as the translog production function. The main advantage of restricting production technologies of this form is proxy methods suggested by LCK, DLW, and OLS to obtain consistent estimates of the technology para-meters β in the second stage. In the first stage, the total function of production G will be estimated. We consider the log version of equation (10) given that the output elasticity of a variable input *j*, $\epsilon_{it}^{X^j}$ is given by a $\partial \ln G(\cdot) / \partial \ln X_{it}^{j}$ and is by definition independent of a firm's productivity level.

We implicitly assume that there exist the measurement error in output observed in the data and for unanticipated shocks to production, which we combine into v_{it}. It is assumed that the log output is given by $q_{it} = \ln Q_{it} + v_{it}$, where v_{it} are unanticipated shocks to production and i.i.d. shocks including measurement error. Also, the first stage of our estimation separates the overall production part and the measurement error from the data. From literature it is important to emphasize that we explicitly count on the fact that firms do not observe v_{it} before optimal input decisions.

Therefore, the production function we estimate for each industry separately, is defined as

$$q_{it} = f(x_{it}; \beta) + z_{it} + \nu_{it},$$

in which we collect all variable inputs in x_{it}, and β contains all relevant coefficients. We con-sider flexible approximations to f (.), therefore we can use LCK model, and explicitly write the production function we estimate on the data in general terms. For instance, our main empirical specification relies on any functional form that implies that f (-) is approximated by a fully non-parametric specification (LCK model), or a second order nonparametric series where all (logged) inputs, (logged) inputs squared, and interaction terms between all (logged) inputs are included (DLW model). We recover the translog production function when we drop higher-order and inter-action terms. The departure from the translog production function (DLW model) is important for our purpose to compare the empirical results.

Our fully nonparametric approach can nest various specifications of the production function, and only need the proper order of approximation of production functions in the second stage of structural estimation framework. However, in order to obtain consistent estimates of the production function in the second stage, we need to control for unobserved productivity shocks, which are potentially correlated with input choices such as the insight of OP and LP models, and we use DLW model approach while relying on materials to proxy for productivity. In this case, we do not need to reconsider the underlying dynamic model when considering modifications to OP setup when dealing with additional state variables. We describe the estimation framework while relying on a dynamic control for capital and discuss the additional assumptions.

We follow DLW model (2012) and use material demand,

$$m_{it} = m_t(k_{it}, z_{it}, \mathbf{x}_{it}),$$

to proxy for productivity by inverting m(.), where we collect additional variables potentially af-fecting optimal material demand choice in the vector x_{it}. The inclusion of these additional control variables shows the only restriction we impose on the underlying model of competition (DLW model). Once those variables are appropriately accounted for in the estimation routine to obtain output elastiticities, we can analyze how markups are different across firms and time, and how they relate to firm-level characteristics such as the globalization or export status.

$z_{it} = m_t^{-1}(k_{it}, m_{it}, \mathbf{x}_{it})$ is used to proxy for productivity in the production function estimation. The use of a material demand equation to proxy for productivity is important for researchers con-sidering the multicollinearity and estimating output elasticities and markups. Especially, as long as $\partial m/\partial z > \mathbf{0}$ conditional on the firm's capital stock and variables captured by $\mathbf{x}_{it},\ m_t^{-1}(k_{it}, m_{it}, \mathbf{x}_{it})$ can be used to proxy for zit being used to index a firm's productivity. In this setting, DLW model (2012) finds it useful to refer to Melitz and Levinsohn (2006) who also rely on intermediate inputs to proxy for unobserved productivity while allowing for imperfect competition. Melitz and Levinsohn (2006) shows that this monotonicity condition holds as long as more productive firms do not set lower markups than less productive firms. This is the main part of DLW model's idea.

3.4.3. Steps for Estimating Markups

Basically, our analysis departs from De Loecker and Warzynski (2012) and give up on identifying any parameter in the first stage since conditional on a nonparametric function in capital, materials, and other variables affecting input demand, identification of the labor coefficient is not plausible. Even though they use nonparametric series regression with inter-variable components with high order, we use the fully nonparametric regression with continuous and discrete data. Given that we are concerned with more flexible production functions and allow for a undefined functional form between the various inputs, identification of the labor coefficients in the first stage.

Our procedure consists of two steps and follows DLW model. However, let us consider a value added production function with the general form, which is given by

$$q_{it} = \Phi\left(k_{it}, l_{it}, m_{it}, \iota_i, \iota_t, \mathbf{x}_{it}\right) + \nu_{it}, \tag{11}$$

also for the comparison with DLW model, given by

$$q_{it} = \beta_l l_{it} + \beta_k k_{it} + \beta_{ll} l_{it}^2 + \beta_{kk} k_{ik}^2 + \beta_{lk} l_{it} k_{it} + z_{it} + \nu_{it}, \tag{12}$$

in which lower case means the natural logarithms. k_{it} and l_{it} are log labor and log capital in firm i in period t and q_{it} denotes log value added, and l_i and l_t in (11) are the individual and time identifiers as categorical explanatory variables.

In the first stage, we run a fully nonparametric kernel regression (LCK model) of (11), then we obtain estimates of expected output ($\hat{\Phi}_{it}$) and an estimate for v_{it}. Expected output is given by

$$\hat{\Phi}_{it} = \frac{\sum_{i=1}^{n} q_{it} \mathcal{K}_\delta\left(k_{it}, l_{it}, m_{it}, \iota_i, \iota_t, \mathbf{x}_{it}\right)}{\sum_{i=1}^{n} \mathcal{K}_\delta\left(k_{it}, l_{it}, m_{it}, \iota_i, \iota_t, \mathbf{x}_{it}\right)}, \tag{13}$$

in which K is the kernel function for the vector of mixed variables[§§]. For DLW model,

$$\hat{\Phi}_{it} = \hat{\beta}_l l_{it} + \hat{\beta}_k k_{it} + \hat{\beta}_{ll} l_{it}^2 + \hat{\beta}_{kk} k_{ik}^2 + \hat{\beta}_{lk} l_{it} k_{it} + \hat{f}_t\left(k_{it}, l_{it}, m_{it}\right) + \nu_{it},$$

in which $\hat{f}_t$ is estimated by high-order polynomial series of k_{it}, l_{it}, and m_{it}. Note that under a value added production function in the first stage of estimation is identical on each estimation model.

The second stage estimates coefficients for the production function through the law of motion for productivity such that

[§§] We kindly refer to Racine (2008) and Racine and Li (2004) for details of fully nonparametric estimation with continuous and discrete data, and how to find optimal smoothing parameters for discrete data. Also, see Appendix A for basics of nonparametrics

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$$z_{it} = g\left(z_{it-1}\right) + \eta_{it}.$$

Following DLW model, we allow for the potential of additional (lagged and observable) decision variables to affect current productivity outcomes (in expectation), in addition to the standard in-clusion of past productivity. By allowing plant-level decisions such as export participation and investment which directly affect a firm's future profit, DLW model tackles down concerns of De Loecker (2010) who discusses potential problems of restricting the productivity process to be com-pletely exogenous.

After the first stage, we can compute productivity for any value of β, where $\beta = (\beta_l, \beta_k, \beta_{ll}, \beta_{kk}, \beta_{lk})$, , using $z_{it}(\beta) = \hat{\Phi}_{it} - \beta_l l_{it} - \beta_k k_{it} - \beta_{ll} l_{it}^2 - \beta_{kk} k_{ik}^2 - \beta_{lk} l_{it} k_{it}$. The innovation to productivity given $\beta, \eta_{it}(\beta)$ is recovered by regressing $z_{it}(\beta)$ on its lag $z_{it-1}(\beta)$. . Then, we use generalized moment conditions to estimate parameters of the production function such that

$$\mathbb{E}\left[\eta_{it}(\beta) \times \left(l_{it-1}, l_{t-1}^2, l_{t-1}k_t, k_{it}, k_{it}^2\right)'\right] = 0.$$

The moments above are from DLW model and exploit the fact that the capital is assumed to be decided a period ahead and therefore should not be correlated with the innovation in productivity. We use lagged labor to identify the coefficients on labor since current labor is expected to react to shocks to productivity, and hence $\mathbb{E}\left[l_{it}\eta_{it}\right]$ is expected to be nonzero. In fact, DLW (2012) require input prices to be correlated over time while using lagged labor as a valid instrument for current labor, and they already find very strong evidence for that requirement by running various specifications that essentially relate current wages to past wages.

The estimated output elasticities are computed using the estimated coefficients of the production function. Under a translog value added production function, the output elasticity for labor (1) is given by

$$\hat{\epsilon}^l_{it} = \hat{\beta}_l + 2\hat{\beta}_{ll} l_{it} + \hat{\beta}_{lk} k_{it}.$$

In addition, a CD production implies that the output elasticity of labor is simply given by $\hat{\beta}_l$. .Finally, using expression (10) and our estimate of the output elasticity, we compute markups directly. However, we only observe $\tilde{Q}_{it}$, which is given by $Q_{it} \exp(\nu_{it})$. The first stage of our procedure gives us with an estimate for ν_{it} and we use it to compute the expenditure share such that

$$\hat{\sigma}^X_{it} = \frac{P^X_{it} X_{it}}{P_{it} \frac{\tilde{Q}_{it}}{\exp(\hat{\nu}_{it})}}.$$

This correction exactly same as DLW model is important as it remove any variation in expendi-ture shares coming from variation in output not correlated with $\Phi(k_{it}, l_{it}, m_{it}, \iota_i, \iota_t, \mathbf{x}_{it})$, or output variation not related to variables impacting input demand including input prices, productivity, technology parameters, and market characteristics, such as the elasticity of demand and income levels. These estimates for the markup as given by equation (10) for plant i at time t are computed while allowing for considerable flexibility in the production function, consumer demand, and competition (DLW (2012)).

4 Empirical Results

In this section, we use our empirical model to estimate markups for Korean manufacturing firms, and test whether exporters and non-exporters, also large and small plants have, on average, different markups. In addition, we rely on substantial how markups change with correlation with market share and export status, additionally, industry import penetration, and as such we are the first, to our knowledge, to provide robust econometric evidence of this relationship with unbalanced fixed effect regression and dynamic unbalanced panel regression.

After estimating the output elasticity of labor and materials, we can compute the implied markups from the FOCs as described above. We use our markup estimates to discuss several major findings. First, we compare our markup estimates to DLW model and OLS model. Second, we look at the relationship between markups and plant-level export status and market size, and industry import penetration effect in both the cross-section and the time series. Third, we briefly discuss the relationship between markups and other economic variables.

4.1. Background and Data

We use a plant-level dataset covering firms selected in Korean manufacturing during the period 1980–2001. The data are provided by the Korean Statistical Office and contains plant-level accounts for an unbalanced panel of 91,522. We have the information about market entry and exit, as well as detailed information on plant-level export status and export sales. At every point in time t, we know whether the firm is a domestic producer, an export entrant, an export quitter, or a continuing exporter. Table 1 provides some summary statistics about numbers of observations, observation period, manufacturing industries, and plants in data. In addition, Table 2 presents basic statistics of input variables related to production, value added, export, material cost, labor and capital. The unit of variables except monthly average employees is Mil. KRW.

Table 1: Data Statistics

This table lists numbers of observations, observation period, manufacturing industries, and plants in data.

	Value
Number of Observations	576,690
Observation Period	> 5 year
Number of Industries	69
Number of Plants	91,522

Table 2: Statistics of Input Variables

This table lists basic statistics of input variables related to production, value added, export, material cost, labor and capital. The unit of variables except monthly average employees is Mil. KRW.

Variable	Min	Median	Max	Mean	Std. Dev.
Nominal Production	2	400	17,100,000	4,150	81,154
Nominal Export	0	0	8,466,105	1,230	44,315
Nominal Material Cost	0.2	161	9,288,284	2,271	46,490
Real Material Cost	0.0	3.1	140,137	42	819
Monthly Average Employees	2	13	33,553	45	315
Property, Plant and Equipment	0.5	141	9,041,855	2,010	43,344
Real Production	2.1	495	16,500,000	4,676	82,190
Real Value Added	0.0	195	5,107,007	1,461	26,035

4.2. Estimated Markups

We obtain an estimate of each plant's markup and unobservable productivity shock (or total factor productivity, TFP) and compare the average or median with DLW and OLS approach (simple regression of the first stage without the second stage of structural estimation) in Table 3. Although our focus is not so much on the exact level of the markup and TFP, we want to highlight that the markup estimates and TFPs are comparable to those obtained with different methodologies, but are different in an important way.

Our procedure generates industry-specific production function coefficients which in turn deliver firm-specific output elasticity of variable inputs. The latter are plugged in the FOC of input demand together with data on input expenditure to compute markups. We list the median markup using aset of specifications to highlight our results in Table 3. We first present results using our standard methods using LCK model. We present our results using value added functions (for value added production functions, we rely on the output elasticity of labor to compute markups), allowing for nonparametric series regression (DLW model) and conventional OLS model (CD production).

Table 3: Statistics of TFPs and Markups

This table lists the statistics of TFPs and markups estimated by local constant kernel (LCK) model, De Loecker and Warzynski (DLW: 2012) model, and OLS model. The root mean squared error (RMSE) shows the deviation of fitted value added (VA) from real value added. The lower panel shows correlations of LCK, DLW, and OLS markups.

Model		RMSE	1%	Median	99%	Mean	Std. Dev.
LCK							
	q	0.39					
	TFP		1.08	3.45	4.55	3.32	0.65
	Markup		0.41	1.61	8.93	2.09	2.51
DLW							
	q	0.65					
	TFP		0.72	3.45	6.32	3.33	0.98
	Markup		-0.57	1.68	9.75	2.21	2.27
OLS							
	Markup		0.62	2.05	9.35	2.57	2.39
Correlation		LCK	DLW		OLS		
LCK		1					
DLW		0.54	1				
OLS		0.87	0.48		1		

As you see Table 3, the RMSE of LCK model is much lower than DLW model. This means the measurement error from LCK model is estimated to be small as long as suitable to data compared to DLW model. In addition, the median of LCK model is slightly lower than DLW model, but much lower than OLS model. The literature argues that the simple OLS model (based on CD function) has biased estimates for coefficients so that markup estimates from OLS model might have relatively upward-bias compared to other structural estimation. However, the interesting thing is that OLS markups are higher correlated to LCK markups than DLW markups. The correlation between LCK and DLW markups is only 0.54, which is much lower than we expect because LCK and DLW markups basically share the estimation framework except the first stage for ϕ_{it}. Figure 1 shows distributions of markups estimated by LCK, DLW, and OLS models respectively, which are left-skewed sequentially by list. In addition, Figure 2 presents distributions of LCK markups over time from 1980 to 2001. As time goes by, the distributions of markups are getting dense and lower, which can be interpreted as changes of the competition and the globalization in Korean economy must have effect on firms' markups.

Figure 1: Distributions of Markups According to Estimation Models

This figure shows distributions of markups estimated by local constant kernel (LCK) model, De Loecker and Warzynski (DLW: 2012) model, and OLS model. The vertical line shows the frequency of distributions, and the horizontal line shows markups from 0 to 10 in the figure. The solid line represents the distribution of LCK markups, the dashed line is for DLW markups, and the dot line is for the distribution of OLS markups

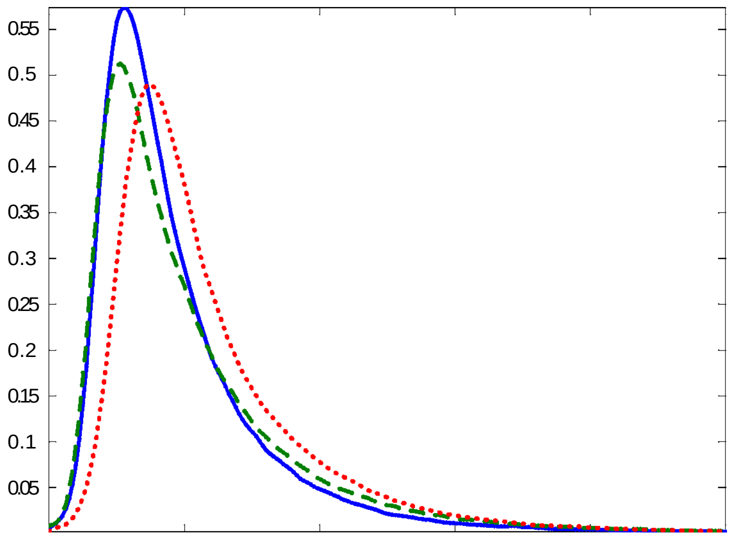


Figure 2: Distributions of Markups over Time

This figure shows distributions of LCK markups and standard deviations of LCK markups and log of sales over time from 1980 to 2001. The vertical line in upper panel shows the frequency of distirbutions over time, and the horizontal line shows markups from 0 to 5 in the figure. The arrow shows the direction of medians of markups over time. The solid line in lower panel represents standard deviations of LCK markups and the dashed line is for standard deviations of log of sales in real term.

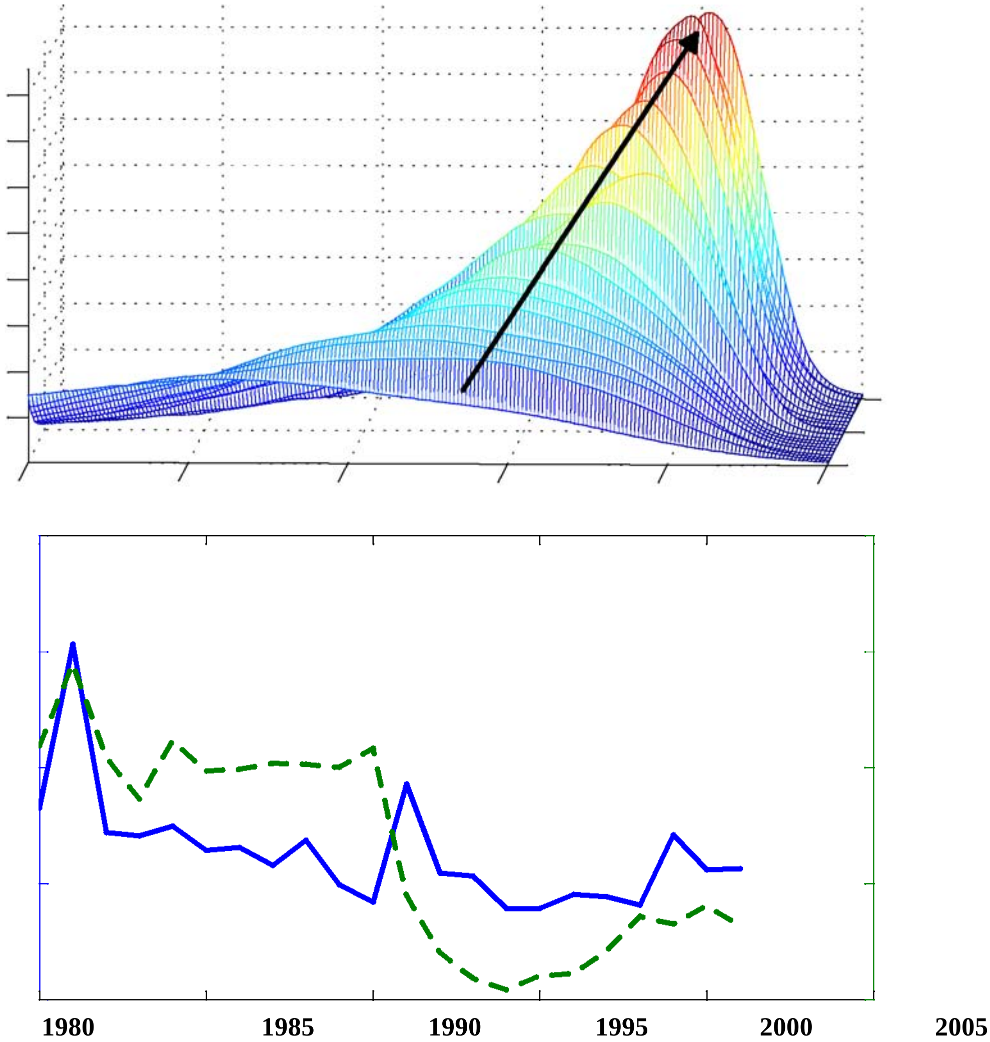


Table 4 presents means of four groups' markups (LCK model) as independent sorts of size and globalization (export status). The small plants are in lower 30% of sales in each industry at each time period, and the large plants are in upper 30% of sales in each industry at each time period, and the other sort is exporter or non-exporter. As you see

Table 4, mean differences between large firms and small firms given export status is relatively larger than mean differences between exporters and non-exporters control on firm size. We can interpret that firm markups are affected by firm size rather than by firm globalization strategy. Figure 3-5 show distributions of exporters and non-exporters, large and small plants, and four groups' markups as independent sorts of size and globalization. As you see the lower panel in Figure 5, mean and median differences of large and small firms' markups given the export status is bigger than those of exporters and non-exporters control on size over time. However, we can see that mean and median differences decrease in time, which is contrary to the notion that the polarization between large and small or exporters and non-exporters would be getting worse over time. This phenomenon might occur due to the tighter competition in the industry, in other words, the markup gap decreases in the degree of competition intensified over time even though the innovation polarization gets worse over time.

Table 4: Means and Differences of Markups

This table lists means of four groups' markups (LCK model) as independent sorts of size and globalization. The small plants are in lower 30% of sales in each industry, and the large plants are in upper 30% of sales in each industry, and the other sort is exporter or non-exporter. Numbers of plants are annual average through 1980 to 2001. t-statistics in parentheses are for mean differences, defined as mean difference divided by the standard error (the standard deviation of mean difference divided by the square root of number of years).

Means of Markups			
	Exporter(A)	Non-Exporter(B)	(A)–(B)
Large Plant(C)	3.63	2.84	0.79 (12.7)
Small Plant(D)	2.05	1.97	0.08 (2.96)
(C)–(D)	1.57	0.86	
	(16.4)	(16.2)	

Numbers of Plants

	Exporter	Non-Exporter
Large Plant	880	8,551
Small Plant	2,569	7,551

Figure 3: Distributions of Exporters and Non-Exporters' Markups

This figure shows distributions of exporters and non-exporters' markups. The solid line in the upper panel represents the distribution of exporters' markups, and the dashed line is for the distribution of non-exporters' markups. The solid line in the lower panel shows the difference between medians of exporters and non-exporters' markups over time, and the dashed line is for the difference between means of exporters and non-exporters' markups over time.

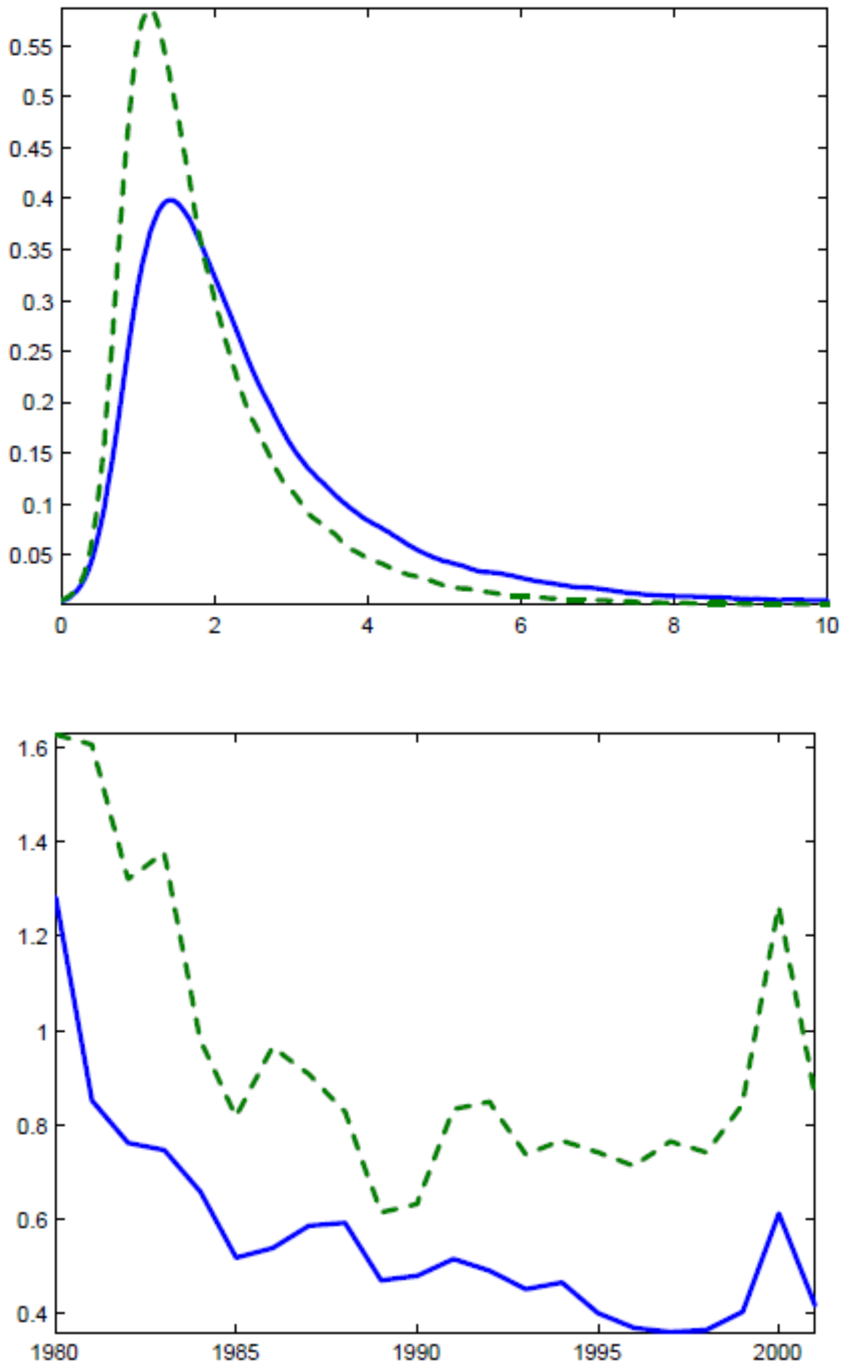


Figure 4: Distributions of Small and Large Plants' Markups

This figure shows distributions of small plants and large plants' markups. The small plants are in lower 30% of sales, and the large plants are in upper 30% of sales. The solid line in the upper panel represents the distribution of large plants' markups, and the dashed line is for the distribution of small plants' markups. The solid line in the lower panel shows the difference between medians of large and small plants' markups over time, and the dashed line is for the difference between means of large and small plants' markups over time.

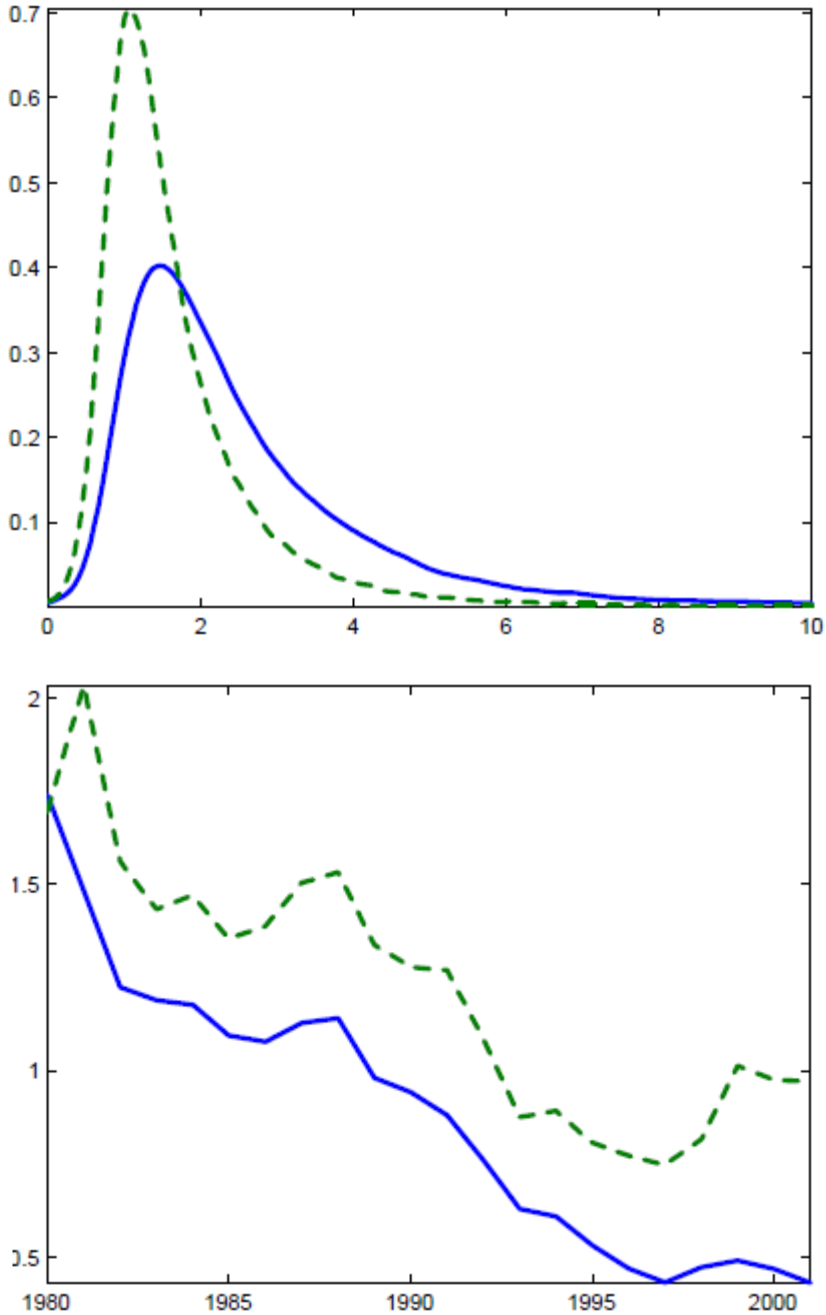
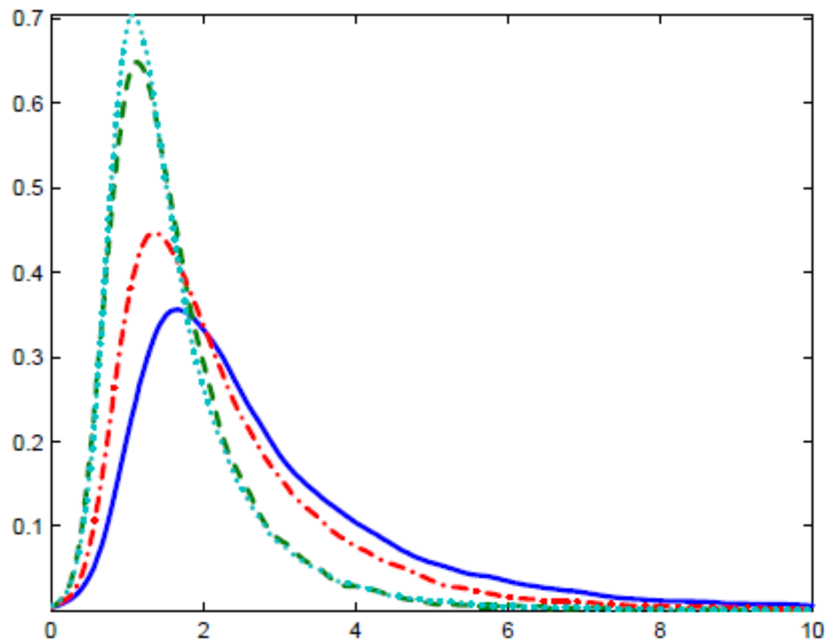
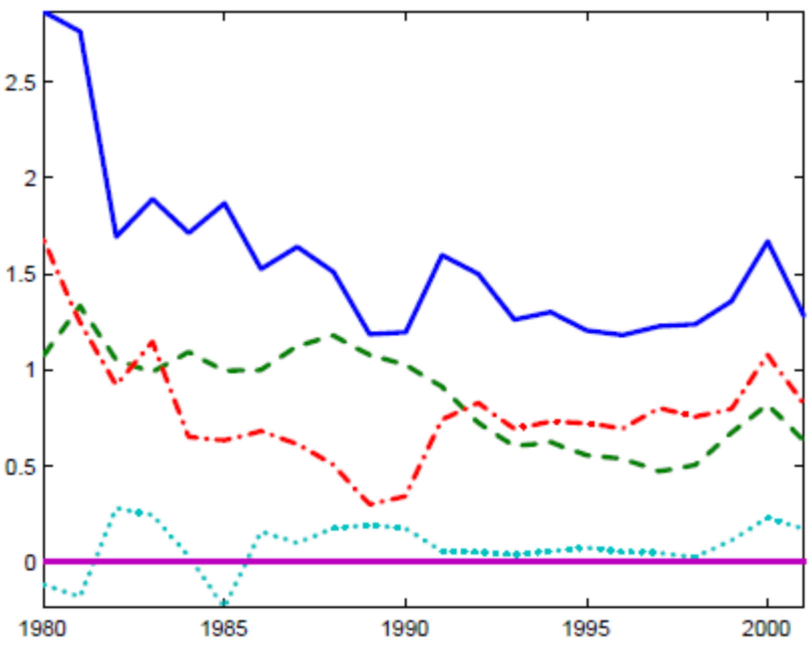


Figure 5: Distributions of Markups of Plants sorted by Size and Globalization

This figure shows distributions of four groups' markups as independent sorts of size and globalization. The small plants are in lower 30% of sales in each industry, and the large plants are in upper 30% of sales in each industry, and the other sort is exporter or non-exporter. The solid line in the upper panel represents the distribution of large and exporting plants' markups, the dashed line is for the distribution of small and exporting plants' markups, the dashed-dot line is for the distribution of large and non-exporting plants's markups, and the dot line is for the distribution of small and non-exporting plants' markups. The solid line in the lower panel shows the difference between medians of large and small exporters' markups over time, the dashed line is for the difference between medians of large and small non-exporters' markups, the dashed-dot line is for the difference between medians of large exporters and non-exporters over time, and the dot line is for the difference between medians of small exporters and non-exporters over time.





4.3. Unbalanced Panel Data Analysis for Markups

We can now turn to the main focus of our application, whether size, globalization and productivity shock on average have higher markups and whether markups change when the import penetration in industry increases. We discuss unbalanced panel data analysis for markups in fixed effects regression and dynamic panel regression.

The estimation framework introduced above was not explicit about firms selling in multiple markets. In light of our application we want to stress that our measure of markups for globalization is a share-weighted average markup across the multi-markets, where the weight by market is the share of an input's expenditure used in production sold in that market. We can correctly compare markups across producers and time without requiring additional information on input allocation across production destined for different markets. To compare markups across markets within a plant, we do require either more data or more theoretical structure to pin down the input allocation by final market.

Given plant-specific markups, we can simply relate a plant's markup to its size and globalization (export status) in a regression framework. As noted before, we are not interested in the level of the markup and we instead estimate the percentage difference in markups depending on its size (market share in industry and export status). The unbalanced panel specification we take to the data is given by

$$\ln \hat{\mu}_{ijt} = X_{ijt}\gamma + \iota_i + \iota_j + \iota_t + \xi_{ijt},$$

in which ι_i, ι_j, and ι_t are individual, industry and time effects, respectively. X_{ijt} is an indepen-dent vector with industrial import penetration ratio, log (z_{it}), log (K_{ijt}/L_{ijt}), log(market share$_{ijt}$), export dummy, and export dummy x log(market shareijt). We control for labor and capital use, log(K_{ijt}/L_{ijt}), in order to capture differences in factor intensity, as well as full year-industry inter-actions to take out industry specific aggregate trends in markups (ι_j). We collect all the controls in a vector X_{ijt} with γ the corresponding coefficients.

We rely on our approach to test whether, on average, exporters have different markups as well as different slope for exporter's market share. The latter, to our knowledge, has not been documented and we see this as a first important set of results. We are interested in the coefficients on the various control variables, so later we will discuss the separate coefficients of other economic variables such as total factor productivity and industry import penetration. We estimate this fixed effect regression at the manufacturing level and include a full interaction of year and industry dummies. Once we have estimated coefficients of export dummy and export dummy x log(market share$_{ijt}$), we can compute the level markup difference by applying the percentage difference to the constant term, which captures the domestic markup average. We denote this markup ratio between exporter's markup μ_{ijt}^{E} and non-exporter's markup μ_{ijt}^{N}, and we compute it by applying

$$\mathbb{E}\left[\frac{\mu_{ijt}^{E}}{\mu_{ijt}^{N}} | X_{ijt} \text{ except export status}\right] = \exp\left[\gamma^{E} + \gamma^{E\times\log(\text{market share})}\log\left(\text{market share}_{ijt}\right)\right]$$

after estimating the relevant parameters. Table 5 presents our results.

Table 5: Market Share and Export Effects on LCK Markups in Unbalanced Panel

This table shows results of fixed effect regressions in unbalanced panel data for markups estimated by local constant kernel (LCK) model such as

$$\ln \hat{\mu}_{ijt} = X_{ijt}\gamma + \iota_i + \iota_j + \iota_t + \xi_{ijt},$$

in which l_i, l_j, and l_t are individual, industry and time effects, respectively. X_{ijt} is an indepen-dent vector with industrial import penetration ratio, log(z_{it}), log(K_{ijt}/L_{ijt}), log(market share$_{jjt}$), export dummy, and export dummy x log(market share$_{ijt}$) - ** and * refer to the statistical signif-icance levels at 1% and 5%, respectively. Robust standard errors in brackets are clustered within plants.

	(1)	(2)	(3)	(4)	(5)
Import Penetration	0.000		0.000		
	[0.000]		[0.000]		
Log(z_{ijt})	1.333**	1.065**			
	[0.027]	[0.018]			
Log(K_{ijt}/L_{ijt})	0.071**	0.072**	0.065**	0.062**	0.062**
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Log(market share$_{jjt}$)	-0.077**	-0.039**	-0.016**	0.012**	0.016**
	[0.002]	[0.001]	[0.002]	[0.001]	[0.001]
Dummy(exporter)	0.344**	0.329**	0. 176**	0.131**	0.042**
	[0.015]	[0.013]	[0.018]	[0.013]	[0.002]
Dummy(exporter)	0.047**	0.040**	0.022**	0.011**	
xLog(market share$_{ijt}$)	[0.002]	[0.001]	[0.002]	[0.001]	
Industry dummy (L~)	yes	yes	yes	yes	yes
R-sq: within	0.31	0.40	0.14	0.27	0.27
Num. of Plants	61,549	78,803	61,557	78,812	78,812
Num. of Obs	320,385	565,899	320,679	566,756	566,756

We run the fixed effect regression for the various estimates of the markups as described above. The parameter γ^E is estimated very significantly in all specifications (1) — (5) and values are between 0.042 and 0.344, which means that the exporter's markup is, on average, about 4.2% to 34.4% greater than non-exporter's markup, and values for coefficient - $\gamma^{E \times \log(\text{market share})}$ is around from 0.011 to 0.047. The parameter for the log maket share is around from -0.077 to 0.016. As expected, all the results except base of market share level relying on a translog technology are very similar because the variation in markups is almost identical across the various specifications. One important message that comes from this table is that the parameter of market share has not consistent signs. Therefore, this unbalanced fixed effects regression might has the omitted variables.

Under assumptions of dynamic unbalanced panel data (Arellano and Bond (1991)), we take to the data is given by

$$\Delta \ln \hat{\mu}_{it} = \alpha \Delta \ln \hat{\mu}_{it-1} + \Delta X_{it} \gamma + \Delta \xi_{it},$$

in which Xit is an independent vector with industrial import penetration ratio, log(z_{it}), log(K_{it}/L_{it}), log(market share$_{it}$) export dummy, export dummy x log(market share$_{it}$) and time dummy. The second lags of log(z_{it}), log(K_{it}/L_{it}), log(market shareit), export dummy x log(market share$_{it}$), and the first differences of industrial penetration ratio, export dummy, time dummy are used as instrument variables in difference GMM system. Table 6 presents our results. The parameter γ^E is estimated very significantly in all specifications (1) — (5) and values are between 0.054 and 0.396, which are slightly higher than values in Table 5, and values for coefficient $\gamma^{E \times \log(\text{market share})}$ is around from 0.010 to 0.043, which are similar to results of fixed effects regressions. The parameters for the log maket share in all specifications have robust positive signs. The significances for the import penetration ratio are weak, thus we need to consider another variables capturing the indus-trial characteristics. In addition, similarly to DLW (2012), TFP increases the markup on average by from 16.3% to 24.0%.

Table 6: Market Share and Export Effects on LCK Markups in Dynamic Unbalanced Panel

This table shows results of difference GMMs in dynamic unbalanced panel data (Arellano and Bond (1991)) for markups estimated by local constant kernel (LCK) model such as

$$\Delta \ln \hat{\mu}_{it} = \alpha \Delta \ln \hat{\mu}_{it-1} + \Delta X_{it} \gamma + \Delta \xi_{it},$$

in which Xit is an independent vector with industrial import penetration ratio, log(z_{it}) , log(K_{it}/L_{it}) , log(market share$_{it}$) , export dummy, export dummy x log(market share$_{it}$) , and time dummy. The second lags of log(z_{it}) , log(K_{it}/L_{it}) , log(market share$_{it}$) , export dummy x log(market share$_{it}$) , and the first differences of industrial penetration ratio, export dummy, time dummy are used as instrument variables in difference GMM system. ** and * refer to the statistical significance levels at 1% and 5%, respectively. Robust standard errors in brackets are estimated by the finite-sample corrected two-step covariance matrix.

	(1)	(2)	(3)	(4)	(5)
Log(markup$_{it-1}$)	0.169**	0.175**	0.179**	0.185**	0.184**
	[0.005]	[0.004]	[0.006]	[0.004]	[0.004]
Import Penetration	0.000		0.001*		
	[0.000]		[0.000]		
Log(z_{it})	0.240**	0.163**			
	[0.075]	[0.038]			
Log(K_{it}/L_{it})	0.079**	0.045**	0.074**	0.036**	0.034**
	[0.008]	[0.005]	[0.009]	[0.005]	[0.006]
Log(market share$_{it}$)	0.080**	0.115**	0.079**	0.109**	0.118**
	[0.015]	[0.010]	[0.016]	[0.011]	[0.012]
Dummy(exporter)	0.121	0.396**	0.054	0.383**	0.063**
	[0.134]	[0.102]	[0.152]	[0.107]	[0.006]
Dummy(exporter)	0.010	0.043**	0.002	0.042**	
x Log (market share$_{ijt}$)	[0.017]	[0.013]	[0.020]	[0.014]	
Num. of Plants	48,674	76,472	48,686	76,502	76,502
Num. of Obs	199,926	370,917	200,203	371,701	371,701

For comparison of DLW and OLS models, Table B.1-B.4 shows the results of unbalanced fixed effects and dynamic panel regressions. Tables for DLW model shows that DLW model still has the negative signs for market share, and weak consistent signs for the parameter of productivity shock. OLS model has negative signs for variables related to export dummy. Therefore, results of LCK model are robustly consistent to the industrial organization and international economic theories compared to those of DLW and OLS models.

For the last exercise, we directly quantify how import competition can influence the dispersion of markups. Since large firms set the higher markups than small firms, the dispersion of markups is closely related to the gap of markups between small and large firms. Table 7 reports the industry panel fixed-effect regressions. It shows that import competition measured as import penetration makes differential of firm markups reduced. In the first column, the standard deviation of industry markups decreases by about 0.07% with 1% point increase of import penetration. The inequality of markups between firm decreases with intensified international competition as the theory expects.

Table 7: Import Penetration Effect on Dispersion of Markups

This table shows results of industry panel fixed-effect regressions

$$\ln SD_{jt} = \alpha + \beta_1 \ln IMPR_{jt} + \beta_2 \ln K/L_{jt} + \beta_3 \ln \mu_{jt}$$

in which 5Djt is a standard deviation of markup in an industry *j*, IMPR is an industry import penetration, log(K_{jt}/L_{jt}) is an industry capital-labor ratio, and μ_{it} is log industry average markuup. Overall import penetration can be categorized into two types. One is only import from China, and the other is import from the rest of the world. This classification comes from Bernard, Jensen and Schott (2006). They emphasize that the response of industry employment to import competition from low-wage countries such as China can be different from usual import competition from the other world. The dependent variable of column (1) and (2) is the standard deviation of industry markups, and the column (3) and (4) use inter-quartile range of industry markups as a response variable. ** and * refer to the statistical significance levels at 1% and 5%, respectively.

	(1)	(2)	(3)	(4)
Import Penetration	-0.067**		0.068	
	[0.019]		[0.039]	
Import Penetration(Other)		-0.099**		0.057
		[0.020]		[0.043]
Import Penetration(China)		1.162**		0.504
		[0.315]		[0.675]
$Log(K_{jt}/L_{jt})$	0.240**	0.211**	0.378**	0.368**
	[0.035]	[0.033]	[0.069]	[0.072]
$Log(\mu_{it})$	0.040**	0.056**	0.113**	0.119**
	[0.016]	[0.015]	[0.031]	[0.033]
Num. of Industry	16	16	16	16
Num. of Obs	130	130	130	130

We further exercise whether the import competition from low-wage countries such as China has stronger effect on domestic firm behaviors. Interestingly, the second column reveals positive sign of import penetrations from China on markup dispersion while import penetration from the rest of the world still keeps the negative effect on markup dispersion. In some sense, it is embarrassed, but it can be possible if forces of import competition are concentrated on only very small firms. Products from China are usually low-quality and low prices. These types of goods are commonly made by domestic small firms. We can think that if the good markets are segmented by high and low quality goods, and the substitution between high and low quality products are very low, then import competition from low-wage countries can affect low and cheap price goods only. If domestic small firms face to the stronger competition from low-wage countries, they have to cut down prices to stay in the market, while the big firms with high quality can generally maintain their own prices. In this case, the standard deviation of markups rises up with increase of import penetration.

As for the robust check, we also use inter-quartile range of markups as markup dispersion in each industry as a dependent variable. However import penetration has insignificant effect on markup dispersion in this case. It indirectly implies that the part of changes from import penetration is concentrated on lower tail or upper tail of the support of markups. If the changes in markup dispersion occur uniformly or in overall support, the same result should come out when we use the standard deviation as a dispersion measure. We can conjecture that very small firms or very large firms are more influenced by import penetration considering the different results of the standard deviation and inter-quartile range.

5 Conclusions

In this paper, we show that the large firms decide on higher markups in each industry as they have higher market powers in integrated markets, also exporters set higher markups through relatively higher observable productivity than non-exporters. This is empirically consistent to the theory that the firm conditional on higher observable productivity decide on higher markups. Interestingly, even after controlling productivity and other firm characteristics, the level of markup is proportional to the market share. One percent increase of market share leads to 0.080.12% increase of markup. It draws attention since it is the evidence that the firm strategy of price is reflected by pure market power.

To the question that whether globalization confers unequal benefits to small and large firms, we generate markup distribution and find out that the mean and the dispersion of markups have been decreasing over time. On the other hand, the average firm size and firm size distribution have been increasing. These patterns are exactly predicted by the theoretical model of trade. The main hurdle is to identify the effect of globalization. In order to investigate the effect of globalization, we use industry panel fixed-effect regressions. For the proxy of globalization, the import penetration is used. It is a disadvantage that import penetration only captures the one side effect of importing although globalization includes both import and export. It turns out that import competition makes the markup gap between small and large firms reduced as the prediction of theory.

Methodologically, we develop De Loecker and Warzynski (2012) and control endogeneity problem using the difference GMM in dynamic unbalanced panel data suggested by Arellano and Bond (1991). Compared to De Loecker and Warzynski (2012), our estimate of markups has smaller errors and reasonable level of average and median of markups.

This paper provides an important message to enterprise policies. Even if the performance gap measured as output or sales between large and small firms is widened, this cannot be interpreted by that globalization interferes the welfare of consumers. It is likely that globalization strengthens competition between all firms, so the gap of price or markup shrinks due to the selection effect. These are all beneficial to consumer welfare. Thus a protective policy for SME from globalization may interfere the selection process and harms the productivity growth.

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Appendix

A. Local Constant Kernel Regression

A.1 Basics of LCK Regression

The nonparametric model is taken as

$$y_i = g(x_i) + u_i, \;\; i = 1, \ldots, n,$$

in which the functional form g (•) is unknown. If g (•) is a smooth function, then we can estimate g (•) nonparametrically using kernel methods so that we consider g (•) as the conditional mean of y given x such that

$$g(x) = \mathbb{E}[y_i | x_i = x],$$

due to the general result of nonparametric theory. Then, we note that $\mathbb{E}[y_i | x_i = x] = \int y f_{y,x}(x, y)\, dy$ can be replaced by $\int y \hat{f}_{y,x}(x, y)\, dy$ with the unknown probability density function $f_{y,x}(x, y)$ estimated by kernel method such that

$$\hat{f}_{y,x}(x, y) = \frac{1}{nh_0 \ldots h_q} \sum_{i=1}^{n} \mathcal{K}\left(\frac{x_i - x}{h}\right) k\left(\frac{y - y_i}{h_0}\right), \tag{14}$$

in which $\mathcal{K}\left(\frac{x_i - x}{h}\right) = k\left(\frac{x_{i1} - x_1}{h_1}\right) \times \ldots \times k\left(\frac{x_{iq} - x_q}{h_q}\right)$ and where k is a kernel function satisfying basic conditions of nonparametrics, h_0 is the smoothing parameter associated with y, and $h_0 \ldots h_q$ are bandwidths for x_i. From equation (14), we obtain the estimate

$$\hat{g}(x) = \frac{\sum_{i=1}^{n} y_i \mathcal{K}\left(\frac{x_i - x}{h}\right)}{\sum_{i=1}^{n} \mathcal{K}\left(\frac{x_i - x}{h}\right)}, \quad (15)$$

which is simply a weighted average of yi because we can rewrite (15) as

$$\hat{g}(x) = \sum_{i=1}^{n} y_i w_i,$$

in which $w_i = \mathcal{K}\left(\frac{x_i - x}{h}\right) / \sum_{j=1}^{n} \mathcal{K}\left(\frac{x_j - x}{h}\right)$ is the weight attached to y_i

A.2 Cross-Validation Method for Bandwidth

Once we have the continuous explanatory variables xi, then the optimal bandwidth h is determined by the cross-validation method minimizing

$$CV(h_1, \ldots, h_q) = \min_{h} \frac{1}{n} \sum_{t=1}^{n} \left(y_t - \hat{f}_{-t}(x_t)\right)^2 m(x_t), \quad (16)$$

in which $\hat{f}_{-t}(x_t) = \frac{\sum_{l \neq t}^{n} y_l \mathcal{K}\left(\frac{x_t - x_l}{h}\right)}{\sum_{l \neq t}^{n} \mathcal{K}\left(\frac{x_t - x_l}{h}\right)}$ is the leave-one-out kernel estimator of $f(x_t)$ and $m(x_t)$ i weight function that rules out boundary observations and $\leq m(\cdot) \leq 1$. Then, the asymptotic res of optimal bandwidth is

$$n^{1/(q+4)} \hat{h} = \hat{a} \rightarrow_p a,$$

in which a is unquely defined, positive, and finite to asymptotically minimize the first leading term of $CV(h)$.

A.3. LCK Regression with Mixed Data

We now turn to a nonparametric approach with continuous and discrete variables. From a statistical point of view, smoothing discrete variables may introduce some bias, however it is also known that it reduces the finite-sample variance resulting in a reduction in the finite-sample mean squared error of the nonparametric estimator.

Coming back to a nonparametric regression model given by

$$y_i = g\left(x_i^c, x_i^d\right) + u_i, \ i = 1, \ldots, n,$$

in which x^c and x^d are continuous and discrete variables, respectively. Then we define the estimate of unknown PDF as

$$\begin{aligned} \hat{f}_{y,x}(x,y) &= \frac{1}{nh_0 \ldots h_q} \sum_{i=1}^{n} \mathcal{K}_\delta \left(\frac{x_i - x}{h}\right) k \left(\frac{y - y_i}{h_0}\right) \\ &= \frac{1}{nh_0 \ldots h_q} \sum_{i=1}^{n} \mathcal{W}_h \left(\frac{x_i^c - x^c}{h}\right) L\left(x^d, x_i^d, \lambda\right) k \left(\frac{y - y_i}{h_0}\right), \end{aligned}$$

in which $\delta = (h, \lambda)$, $\mathcal{W}$ is a symmetric, nonnegative univariate kernel function, and $L\left(x^d, x_i^d, \lambda\right) = \prod_{s=1}^{r} \lambda_s^{1\left(x_{is}^d \neq x_s^d\right)}$ where $1\left(x_{is}^d \neq x_s^d\right)$ is an indicator function which equals one when $x_{is}^d \neq x_s^d$ and zero otherwise. The smoothing parameter for x^d is assumed to be $0 \leq \lambda \leq 1$. Then,

$$\hat{g}\left(x_i^c, x_i^d\right) = \frac{\sum_{i=1}^{n} y_i \mathcal{K}_\delta\left(x, x_i^c, x_i^d\right)}{\sum_{i=1}^{n} \mathcal{K}_\delta\left(x, x_i^c, x_i^d\right)},$$

which is analogue to equation (13).

Least squares cross-validation selects 9 = (h, A) to minimize the following function:

$$CV(h, \lambda) = \min_{h,\lambda} \sum_{i=1}^{n} \left(y_i - \hat{g}_{-i}\left(x_i^c, x_i^d\right)\right)^2 m\left(x_i^c, x_i^d\right),$$

in which $\hat{g}_{-i}\left(x_i^c, x_i^d\right)$ and $m\left(x_i^c, x_i^d\right)$ are the same as (16). Note that when $\lambda = 1, \ L\left(x^d, x_i^d, \lambda\right)$ becomes unrelated to $\left(x^d, x_i^d\right)$ i.e. x_s^d is smoothed out. Finally, the asymptotic results of smoothing parameter δ is

$$n^{1/(q+4)}\hat{h} = \hat{a} \to_p a,$$
$$n^{2/(q+4)}\hat{\lambda} = \hat{b} \to_p b,$$

in which a and b are unquely defined, positive, and finite to asymptotically minimize the first leading term of $CV(h, \lambda)$.

B. Additional Tables

Table B.1: Market Share and Export Effects on DLW Markups in Unbalanced Panel

This table shows results of fixed effect regressions in unbalanced panel data for markups estimated by De Loecker and Warzynski (DLW: 2012) model such as

$$\ln \hat{\mu}_{ijt} = X_{ijt}\gamma + \iota_i + \iota_j + \iota_t + \xi_{ijt}.$$

Other descriptions remain the same as Table 5.

	(1)	(2)	(3)	(4)	(5)
Import Penetration	0.000		0.000		
	[0.000]		[0.000]		
Log(zzjt)	0.656**	0.238**			
	[0.043]	[0.013]			
Log(Kzjt/Lzjt)	0.030**	0.016**	0.027**	0.016**	0.015**
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Log(market sharezjt)	-0.086**	-0.042**	-0.075**	-0.036**	-0.027**
	[0.002]	[0.001]	[0.002]	[0.001]	[0.001]
Dummy(exporter)	0.316**	0.302**	0.263**	0.262**	0.029**
	[0.016]	[0.013]	[0.015]	[0.012]	[0.002]
Dummy(exporter)	0.043**	0.035**	0.036**	0.030**	
xLog(market sharezjt)	[0.002]	[0.001]	[0.002]	[0.001]	
R-sq: within	0.14	0.27	0.12	0.27	0.27
Num. of Plants	60,843	78,231	60,872	78,289	78,289

Num. of Obs	313,937	557,260	314,374	559,753	559,753

Table B.2: Market Share and Export Effects on DLW Markups in Dynamic Unbalanced

Panel This table shows results of difference GMMs in dynamic unbalanced panel data (Arellano and Bond (1991)) for markups estimated by De Loecker and Warzynski (DLW: 2012) model such as

$$\Delta \ln \hat{\mu}_{it} = \alpha \Delta \ln \hat{\mu}_{it-1} + \Delta X_{it}\gamma + \Delta \xi_{it}.$$

Other descriptions remain the same as Table 6

	(1)	(2)	(3)	(4)	(5)
Log(markupit-1)	0. 199**	0.201**	0.197**	0.205**	0.205**
	[0.006]	[0.004]	[0.006]	[0.004]	[0.004]
Import Penetration	-0.000		-0.000		
	[0.000]		[0.000]		
Log(zit)	0.147**	-0.083**			
	[0.051]	[0.017]			
Log(Kit/Lit)	0.068**	0.018**	0.067**	0.026**	0.027**
	[0.009]	[0.006]	[0.009]	[0.006]	[0.006]
Log(market shareit)	0.082**	0.051**	0.073**	0.068**	0.083**
	[0.017]	[0.011]	[0.016]	[0.011]	[0.012]
Dummy(exporter)	0.286*	0.627**	0.292*	0.594**	0.042**
	[0.130]	[0.097]	[0.128]	[0.099]	[0.006]
Dummy(exporter)	0.032	0.077**	0.033	0.072**	
xLog(market shareijt)	[0.017]	[0.012]	[0.017]	[0.012]	
Num. of Plants	47,608	75,658	47,648	75,752	75,752
Num. of Obs	194,394	363,654	194,777	365,723	365,723

Table B.3: Market Share and Export Effects on OLS Markups in Unbalanced Panel

This table shows results of fixed effect regressions in unbalanced panel data for markups estimated by OLS model such as

$$\ln \hat{\mu}_{ijt} = X_{ijt}\gamma + \iota_i + \iota_j + \iota_t + \xi_{ijt}.$$

Other descriptions remain the same as Table 5.

	(1)	(2)	(3)
Import Penetration	0.001		
	[0.000]		
Log(Kijt/Lijt)	0.077**	0.089**	0.088**
	[0.001]	[0.001]	[0.001]
Log(market shareijt)	-0.084**	-0.068**	-0.056**
	[0.002]	[0.001]	[0.001]
Dummy(exporter)	0.289**	0.278**	-0.024**
	[0.018]	[0.013]	[0.002]
Dummy(exporter)	0.043**	0.039**	
xLog(market shareijt)	[0.002]	[0.001]	
Industry dummy (tj)	yes	yes	yes
R-sq: within	0.13	0.29	0.29
Num. of Plants	61,579	78,834	78,834
Num. of Obs	321,010	567,279	567,279

Table B.4: Market Share and Export Effects on OLS Markups in Dynamic

Unbalanced Panel This table shows results of difference GMMs in dynamic unbalanced panel data (Arellano and Bond (1991)) for markups estimated by OLS model such as

$$\Delta \ln \hat{\mu}_{it} = \alpha \Delta \ln \hat{\mu}_{it-1} + \Delta X_{it}\gamma + \Delta \xi_{it}.$$

Other descriptions remain the same as Table 6

	(1)	(2)	(3)
Log(markupit-1)	0.176**	0.181**	0.181**
	[0.006]	[0.004]	[0.004]
Import Penetration	0.001**		
	[0.000]		
Log(Kit/Lit)	0.095**	0.054**	0.052**
	[0.009]	[0.005]	[0.005]
Log(market shareit)	0.038**	0.079**	0.091**
	[0.016]	[0.010]	[0.011]
Dummy(exporter)	-0.009	0.292**	0.040**
	[0.155]	[0.104]	[0.005]
Dummy(exporter)	-0.002	0.033*	
xLog(market shareijt)	[0.020]	[0.013]	
Num. of Plants	48,744	76,573	76,573
Num. of Obs	200,519	372,262	372,262

CHAPTER 6

Import Penetration, Export Orientation and Plant Size in Indonesian Manufacturing

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1. Introduction

The trade theory emphasizing firm heterogeneity suggests that globalization generates both winners and losers among firms within an industry and these effects are magnified by heterogeneity (Melitz and Trefler, 2012). Better-performing firms can grow because of market expansion while some worse-performing firms are forced to exit from markets due to increased competition, indicating that responses to globalization differ among firms even within narrowly defined industries because of firm heterogeneity. The impact of trade liberalization on inequality always attract the attention of policy makers, for the reason that it may determine the extent of public support for the engagement of a country in more globalized economic activities. One of the fears is that only relatively large firms can benefit from globalization and smaller firms tend to lose market shares. This view is consistent with prediction of firm heterogeneity theory (e.g., Melitz 2003, Helpman, Melitz, Yeaple 2004). While theoretical analyses on the impact of globalization have focused on the welfare effects of trade liberalization, only a few works have intensively examined on the effects of liberalization on the size of firms. This paper answers a question of what kinds of plants are potentially impacted by the development of globalization by empirically examining the its differential impacts on the size of plants with different characteristics including not only initial (relative) plant size but also import and export statuses, and ownership.

Only a few previous empirical studies have analyzed the impact of trade liberalization on the size of manufacturing plants (Head and Ries 1999, Gu, Sawchuk and Renninson 2003, and Baldwin and Gu 2009). One of the differences from the previous studies, which examined Canadian manufacturing industries, is that this study focuses on manufacturing industries in a developing economy, Indonesia. Developing economies are different from developed economies in some important respects in this study. One difference stems from the fact that most of the world's advanced technology is controlled by multinational corporations based in a few advanced countries (Blomström and Kokko, 1997). In developing economies where research and development activities are limited, importing intermediate inputs in production is more important channel of access to worldwide sophisticated technology. Therefore, it is more likely in developing economies that firms importing intermediate inputs can grow in size at a faster rate compared to non-importers. In addition to the presence of the size advantage of importing inputs, this paper finds that the advantage diminishes when imported output penetrates in the local markets. Regarding to the presence of productivity advantage of importing intermediate inputs, results of empirical studies are mixed. For example, Amiti and Konings (2007) found that the reduction in intermediate inputs tariff has a positive impact on Indonesian firms' productivity while Vogel and Wagner (2010) could not find clear evidence for productivity gain from being importers in German manufacturing. The finding in this paper indicates that the advantages of importing intermediate inputs depend on the extent of import penetration of output.[1]

Market structure may also be different between developed and developing economies. In a developing economy, some strategic industries have been protected under import substitution industrialization policy. These industries tend to be dominated by a relatively small number of large (government-owned) firms. One of the reasons why developing countries have promoted trade liberalization last decades is that it has been believed that the pro-competitive effects of trade can improve efficiency in less competitive industries where a few large firms dominates.

[1] Regarding productivity advantage of exporting, some previous studies found supporting evidence for "learning-by-exporting effect" (e.g., Lileeva and Trefler, 2010) while other studies find no such effects (e.g., Clerides, Lach and Tybout, 1998; Bernard and Jensen, 1999) See Wagner (2012) for review.

Indonesian government has also undertaken policy reforms aiming to switch from import substitution to export oriented since the mid-1980s. Using plant-level microdata for the Indonesian manufacturing, the paper examines the impact of trade liberalization on plant size taking account for industry characteristics including concentration and the extent of dominance by large plants.

The reduction in trade cost due to tariff reduction can affect the size of plants via at least two channels. One is via increased factor market completion (Melitz 2003) and another is via increased product market competition (Melitz and Ottaviano 2008). The paper focuses more on the latter channel and, as indicated above, it examines the impact of import competition on the size of plants whereas the previous studies mainly examined that of tariff reductions. Tariff reduction is a part of trade cost among others including transportation costs. Furthermore, trade cost is a determinant of the degree of import competition among other factors including change in exchange rates and demand in domestic and foreign markets. These indicate that the degree of import competition changes even if tariff rates do not change, causing omitted variable biases in regression analysis.

The rest of the paper is organized as follows. Next section reviews theoretical and empirical studies related to the impacts of trade liberalization on firm/plant size. Section 3 introduces dataset examined in this paper and explains empirical methodology to examine the impacts. Section 4 presents results of the econometric estimation and Section 5 provides some concluding remarks.

2. Impacts of Trade Liberalization on Plant Size

2.1. Trade Liberalization and Plant Size

As noted above, trade theory with firm heterogeneity suggests that globalization generates both winners and losers among firms within an industry: better-performing firms can grow faster because of market-expanding effect while some worse-performing firms are forced to exit from markets due to increased competition. Melitz (2003) developed a model explaining the mechanism. In the model, firms are heterogeneous in terms of marginal cost of production. According to the level of the cost that firms can learn after incurring a fixed cost to entry into markets, they decide whether to exit, to produce for domestic markets or to serve foreign markets. The decision is made based on cutoff points of production (C^D) and export (C^X). Firms with marginal cost higher than C^D, indicating low productivity, decide not to produce. Firms with marginal cost between C^D and C^X decide to produce only for domestic markets and firms with marginal cost lower than C^X serve foreign markets as well as domestic markets. In the model, trade leads to the expansion of production in most productive firms to serve foreign markets. On the other hand, the increased demand for labor by large, exporting firms causes higher real wages in labor markets and thus causes the decreases in the cutoff C^D forcing some least productive, small firms to exit. In its extension of Melitz and Ottaviano (2008), potential pro-competitive effects induced by increased import competition is incorporated instead of the factor market competition. The increased competition in domestic product markets forces less productive, small firms to lose market share or exit.

In these models, the consequences of trade liberalization on firm size depend on the balance between reductions in import and export costs. In other words, the impacts on firms performance depends critically upon the balance between domestic firms' access to foreign markets (market-expanding effects), and foreign firms' access to domestic markets (competition effects) (Tybout 2009). Melitz and Ottaviano (2008) indicate that the gap in size between large and small firms is widened in the case of symmetric bilateral trade liberalization and, on the other hand, the gap is narrowed in the case of unilateral trade liberalization. Related hypotheses were empirically examined by Baldwin and Gu (2009). They further extended the Melitz and Ottaviano model by allowing firms to produce multiple products.[2] In their theoretical model, firms respond to the increased competition by reducing the number of products concentrating on best-performing products. This leads smaller size of firms. Using Canadian manufacturing data, they examined the impacts of bilateral trade liberalization between Canada and United States on firm performances

[2] Other papers that developed models with multi-product firms includes Nocke and Yeaple (2006), Eckel and Neary (2010), Bernard, Redding and Schott (2011), and Mayer, Melitz, and Ottaviano (2011).

such as the number of products, product diversification, plant size, and product-run length. In the analysis, symmetric bilateral trade liberalization was assumed between the two developed countries. In this present study on the Indonesian manufacturing, the import competition and market-expanding effects are separately examined allowing asymmetric liberalization.

2.2. Import and Export Status and Foreign Direct Investment

A related important prediction from the theoretical models is the differential impact of trade liberalization between exporting firms and non-exporting firms. Tariff reduction has a negative impact on the size of non-exporters via import competition while the impact on exporter depends on the balance of market-expanding and import competition effects. Baldwin and Gu (2009) provides supporting empirical evidence on this hypothesis. In the theoretical models, less productive firms are relatively small in size and less profitable so that they cannot cover the fixed costs to serve foreign markets. Therefore, it is predicted that trade liberalization have more of negative impacts on relative small firms compared to large firms. In real world, however, there are some large firms that are not exporting and there are also some small exporters. Which does determine the extent of the impact of trade liberalization on firm size, initial firm size or export status? This question is asked in empirical part of this paper. It should be noted that the size of firms can be changed in two ways in a globalizing world. First, being an exporter is thought to expand its production. This advantage over non-exporters is called as size advantage of exporting in this paper. Second, trade liberalization can increase the size advantage because import completion has more of negative impacts on non-exporters. Therefore, examining the differential impacts on exporters and non-exporters is same as examining the impact on the size advantage of exporting. This paper examines and compares the impacts on the size advantages of exporting and initial firm size.

Importing can also be an important determinant of firm size. Importing intermediate inputs can enhance firm productivity because imports from advanced economies embody sophisticated technology. For example, Kasahara and Rodrigue (2008) examined panel dataset from Chilean manufacturing and the results suggest that being an importer of foreign intermediates can improve productivity. The results of empirical analysis by Amiti and Konings (2007) suggest that the reduction in intermediate inputs tariff has a positive impact on Indonesian firms' productivity, indicating that there exist productivity gain from importing.[3] The improvement of productivity indicates larger firm size. The difference in size between importing and non-importing firms is called as size advantage of importing in this paper. The size advantage of importing can also be affected by trade liberalization. For example, automakers importing parts and components, which embody leading technology, from advanced economies can enjoy advantage over non-importing automakers in a developing economy. However, when import tariff on automotive is reduced and import competition is increased, the advantage would diminish because imported cars embody the leading technology. Furthermore, import has been thought as an important channel of international technology diffusion for developing economies. The increase in imports can promote the improvement of technologies not only in industries producing the products but also in upstream industries producing intermediate products. The improvement of technologies in the upstream industries leads to decline in the size advantage of importing over non-importers.

Another characteristic of firms that is examined in this paper is foreign ownership. Helpman, Melitz and Yeaple (2004), which extended the Melitz model by incorporating not only exporting but also foreign direct investment as methods to serve foreign markets, predicts that the responses to trade liberalization are also different between exporting firms and FDI firms. In the model, most productive firms invest abroad and they can benefit more from trade liberalization compared to others. In the Indonesian manufacturing, only a small number of local firms are investing abroad while there are many foreign MNEs. They account for a large portion of output in some industries. For example, the share of output produced by foreign-owned plants is more than 90 percent in motor vehicle industry. Although foreign MNEs in the Indonesian manufacturing are not Indonesia-based firms, the

[3] On the other hand, Vogel and Wagner (2010), which examined panel dataset from German manufacturing, could not find clear evidence for productivity gain from being importers while their analysis provides evidence for a positive impact of productivity on importing.

prediction of different responses can be applied to the responses of exporters and foreign-owned plants in the Indonesian manufacturing sectors.

3. Methodology and Data

3.1. Previous empirical studies

Head and Ries (1999) is one of a few studies that examined the effects of trade liberalization on plant size. They empirically examined whether trade liberalization promotes efficiency through increased scale by analyzing Canadian manufacturing industries. The results suggest that reduction in Canadian tariffs decreased average plant size and reduction in U.S. tariffs increased plant size. Gu, Sawchuk and Renninson (2003) also examined the effects of tariff reduction on plant size and turnovers using Canadian manufacturing data. However, they could not find any evidence indicating that tariff cut has statistically significant effects on firm size.

More recently, Baldwin and Gu (2009) examines the impact of trade on product diversification in the Canadian manufacturing. They developed a model of trade with multi-product firm/plants to examine the effect of market size and trade on product specialization and production-run length. Their model predicts that the effect of bilateral tariff reductions on plant size depends on the export status of a plant. Bilateral tariff cuts reduce the plant size of non-exporters as they reduce the number of products while the effect of tariff cuts on the plant size of exporters is ambiguous. The results of their empirical analysis suggest that lower tariffs lead to a decline in the size of relatively large non-exporters and that the effects on plant size of smaller firms are statistically insignificant.

3.2. Estimation model

One of the important predictions derived from the firm-based theoretical model developed by Baldwin and Gu (2009) is that bilateral tariff reductions lead to a decline in the size of non-exporters. To provide empirical evidence, they estimated a following model

$$\Delta \ln Y_{it} = \beta_1 \Delta\tau_{it} + \beta_2 D_{i,t-1}^{export} + \beta_3 S_{i,t-1} + \beta_4 \Delta\tau_{it} \cdot D_{i,t-1}^{export} + \beta_5 \Delta\tau_{it} \cdot S_{i,t-1} + \alpha_i + \gamma_t + \beta_6 X_{it} + \varepsilon_{it},$$

where Y is real output (a measure of plant size), τ is output tariff, D^{export} is a dummy variable having value 1 if a plant is exporting, S is relative plant size, X is a set of other plant characteristics. In this model, the marginal of effect of tariff changes on plant size can be expressed as follows:

$$\text{M.E. of tariff changes} = \beta_1 + \beta_4 D_{i,t-1}^{export} + \beta_5 S_{i,t-1}.$$

If the coefficient β_1 is significantly positive, it indicates that a reduction in tariff rates decreases the size of non-exporters as the theoretical model predicted. The impact of tariff reduction on exporters can be measured by $\beta_1 + \beta_4$. If the sum of the parameters is significantly positive, it indicates that a reduction in tariff rates decreases the size of exporters. In their empirical analysis which examines the impact of bilateral tariff reductions between Canada and United States, tariff change is calculated as the sum of bilateral import tariff changes between the two economies because their theoretical model considers the case of symmetric bilateral trade liberalization.[4]

The model estimated in this paper is different from Baldwin and Gu (2009) in some points. One is that this paper examines impacts of the increase in import penetration instead of tariff reduction. Import penetration is thought to have more direct impacts on plant size compared to tariff reduction which can affect plant size through the increase in imports. In addition, the impacts on plant size of reduction in Indonesia's import tariffs and its trading partners' import tariffs (tariffs on Indonesia's exports) are examined separately in this paper. The developing country has diversified exports and imports and its trading partners include both developed and developing economies. Differently from the assumption in Baldwin and Gu

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[4] Another reason is to avoid a multicolinearity problem arising from high correlation of import tariffs between Canada and United States.

(2009), this indicates that structure and reduction in tariffs are not always symmetric with that of main trading partners although both Indonesia and its trading partners have reduced import tariffs.

As suggested by Baldwin and Gu (2009), the impact through market-expanding effects due to trade liberalization is greater for exporters compared to non-exporters. Similarly, the impact through import competition effects can also be different between plants importing intermediate goods, in which advanced technology is thought to be embodied, and non-importers, especially in less developed economies. Therefore, the impacts of import penetration on importer and non-importers are also compared. Additionally, locally owned plants and foreign-owned plants are also compared because foreign MNCs are thought to have firm-specific intangible assets including marketing network which enables them to benefit from trade liberalization. In this present study, import dummy (D^{import}) and foreign ownership dummy ($D^{foreign}$) and their interactions with trade liberalization variables are also included in estimation model.[5] The estimated model can be expressed as follows:

$$
\begin{aligned}
\Delta \ln Y_{it} = {} & \beta_1^I \Delta\tau_{it}^I + \beta_2^I \Delta\tau_{it}^I \cdot S_{i,t-1} + \beta_3^I \Delta\tau_{it}^I \cdot D_{it}^{export} + \beta_4^I \Delta\tau_{it}^I \cdot D_{it}^{import} \\
& + \beta_5^I \Delta\tau_{it}^I \cdot D_{it}^{foreign} \\
& + \beta_1^X \Delta\tau_{it}^X + \beta_2^X \Delta\tau_{it}^X \cdot S_{i,t-1} + \beta_3^X \Delta\tau_{it}^X \cdot D_{it}^{export} + \beta_4^X \Delta\tau_{it}^X \cdot D_{it}^{import} \\
& + \beta_5^X \Delta\tau_{it}^X \cdot D_{it}^{foreign} \\
& + \beta_6 S_{i,t-1} + \beta_7 D_{i,t}^{export} + \beta_8 D_{it}^{import} + \beta_9 D_{it}^{import} + \beta_{10} \ln K/L_{it} \\
& + \beta_{11} \ln Ln/L_{it} + \alpha_i + \gamma_t + \varepsilon_{it},
\end{aligned}
$$

where the dependent variables is a change in real output in plant i at year t. $\Delta\tau^I$ refers to the change in import tariffs or import penetration variable (explained below). $\Delta\tau^X$ refers to the change in tariffs on Indonesia's export imposed by trading partners or export ratio variable (explained below). $\ln K/L$ is a log of capital labor ratio and

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[5] Kasahara and Lapham (2013) indicates that there is also difference in the responses to trade liberalization between importers and non-importers.

$\ln Ln/L$ is a log of the non-production worker ratio to total number of labors employed in the plants. α_i and γ_t are plant and year dummies, respectively.

3.3. Real Output Variables

Nominal output data for each manufacturing plant was taken from annual manufacturing surveys conducted by Indonesia's statistical agency (BPS-Statistics).[6] From the raw micro-level data, I constructed a panel dataset for 1993-2011.[7] The survey covers manufacturing plants employing 20 or more and contains various information on plant performance including output, value added, ownership, capital stock, the number of workers by type, export and import status and other variables which enables us to estimate the above model. Based on the main product, each plant is classified into the Indonesian Standard Industrial Classification (ISIC) at a 5-digit level, which corresponds to the International Standard Industrial Classification.[8,9] In this empirical analysis, classification at a 3-digit level is used to make a concordance between the industrial classification and commodity classification for wholesale price index. For each category, corresponding wholesale price index was constructed from the most detailed wholesale price index which has 190 categories. Real output variable was created at constant 2000 price using the detail wholesale price index. The relative size variable (S) was defined as the difference between the log of real output and its corresponding median of each 3-digit industry. [10]

3.4. Measuring Import Penetration and Export Orientation

The increases in import and export suggest increases in competition and market size. However, the degree of the impacts of globalization is not always proportional

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6 The aggregated figures are published in *Large and Medium Industrial Statistics* (BPS-Statistics).

7 The survey data is available from 1975 but data on capital stock is available since 1988. Data for 1993-2011 is used in this analysis because detailed trade data is available since 1993.

8 The two classification are almost same. One of the main differences is in detail classification of Other non-metallic mineral industry (ISIC #26).

9 The surveys used ISIC revision 2 for 1993-1998 and revision 3 for 1999-2011. The codes of ISIC revision 2 for 1993-1998 were converted to ISIC revision 3 using concordance provided by BPS-Statistics.

10 Another definition is to use industrial mean of the log of real output instead of median. To avoid undesirable effects of outliers, median was used instead of mean.

to the dollar values of import and export. Import penetration and export orientation would be more appropriate measures to capture the globalization effects. In addition, although tariff changes are one of the causes of the increases in import and export, they do not capture the actual impacts of trade liberalization. The reduction in import tariffs does not always induce the increase in import and reduction in tariffs on exports does not always induce the increase in export because tariff is a part of the cost incurred to import or export among other factors including change in exchange rates and demand in domestic and foreign markets.

In order to measure the impacts of globalization, which is partially induced by tariff reductions, import penetration variable and export orientation variable are included in the estimated model instead of changes in tariffs on imports and exports. The import penetration and export orientation variables are created at ISIC 3-digit level as expressed in a following equation: [11]

$$\text{Import penetration} = \frac{\text{total import}}{\text{total output} + \text{total import}},$$

$$\text{Export orientation} = \frac{\text{total export}}{\text{total output}}.$$

3.5. Trade Liberalization on Indonesian Manufacturing

During the last decades, Indonesian government undertook a rather massive policy reform aiming to switch from import substitution to export oriented. Trade and investment regime were radically liberalized along with major reforms in banking sectors. Tariffs were further reduced and more NTBs were eliminated under the reforms per the IMF agreements after the economic crisis in 1997/98.

For empirical analysis in this paper, tariff data at 3-digit level of International Standard Industrial Classification is taken from World Integrated Trade Solution

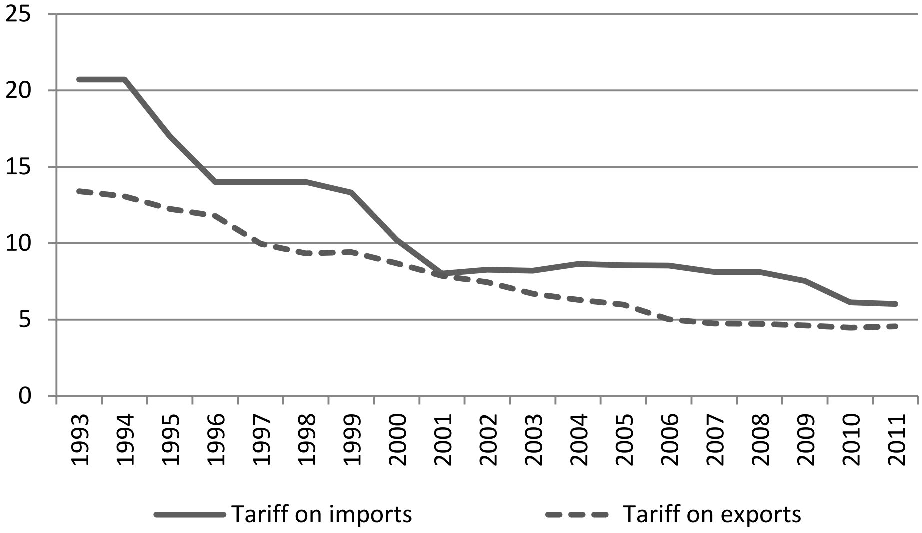
[11] These indices should be measured in real term. However, the import and export price indices are only available at a broader category level (16 categories) compared to wholesale price index (131 categories at a 4-digit level of ISIC). Partially, this causes unreliable estimates of import penetration and export ratio for some industries. Therefore, these indices are measured in nominal term.

(WITS, World Bank). In the dataset, the tariff data is calculated as an average of effective tariff rates on commodities correspond to the industrial classification code. To create import and export tariff variables, top 20 trading partners are selected using total value of import and export with each trading partners during 1993-2011. Import tariff variable is calculated as simple average of tariffs imposed on imports from the top 20 origins of imports for each category of ISIC 3-digit level.[12] Export tariff variable is also calculated by a similar way.

Figure 1 shows the trend of average tariff rates of manufacturing products in Indonesia during 1993-2011. Average rate of tariffs on manufacturing imports decreased from 21 percent in 1993 to 14 percent in 1996 and the rate further decreased after the economic crisis to 8.0 percent in 2001. In 2004, the rate increased slightly but the rise was mainly caused by the adoption of new tariff classification under "ASEAN Harmonized Tariff Nomenclature" (AHTN) as part of Indonesian commitment under AFTA.[13] More recently, the average import tariff declined further from 7.5 percent in 2009 to 6.o percent in 2011. Indonesia's main trading partners also decreased tariff rates on exports from Indonesia. The average export tariff rates was much lower than the average import tariffs but it continuously declined from 13 percent in 1993 to 4.6 percent in 2011.

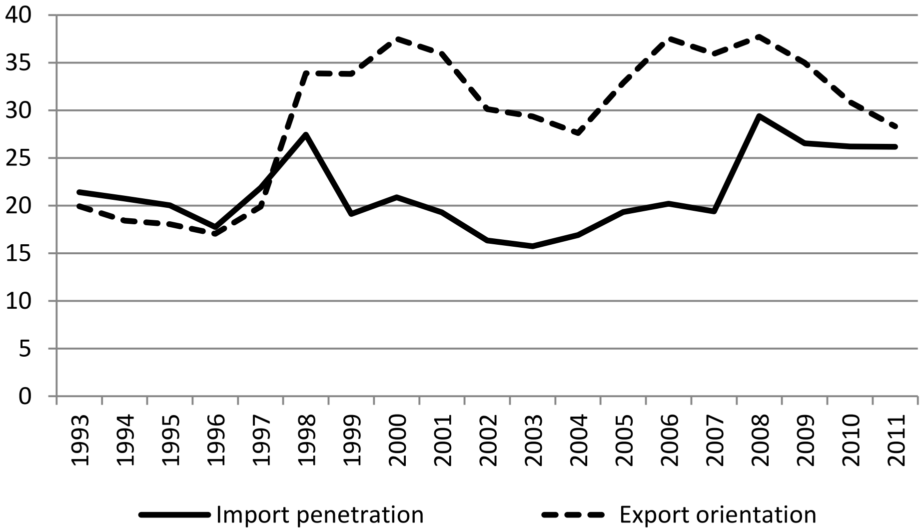
[12] In the WITS dataset, for some countries, there are several years for which tariff rates are missing. Those missing values are replaced with available tariff rates for previous years.
[13] Due to the change, total tariff lines increased drastically from 7,540 in 2003 to 11,163 in 2004.

Figure 1: Change in Import and Export Tariffs in the Indonesian Manufacturing (%)



Partially reflecting the reductions of tariffs, manufacturing imports drastically increased especially after the economic crisis from USD 39.3 billion in 2001 to USD 116 billion in 2011 while import also increased from USD 25.3 billion to USD 155 billion during the period. Figure 2 shows the trend of import penetration and export orientation. According to the average import penetration and export orientation estimated by the equations explained above, both import penetration and export orientation were about 20 percent in the manufacturing. The import penetration temporally increased during the economic crisis but declined until 2003. Since then the import penetration tended to have increased and reached 26 percent in 2011 after temporally increased to 29 percent in 2008. On the other hand, export orientation swung much more compared to import penetration. Partially reflecting weak rupiah, export orientation increased to 37 percent in 2000 before declining to 28 percent in 2004. More recently, the rate increased to 38 percent in 2008 before declining to 28 percent in 2011 reflecting sluggish foreign demand.

Figure 2: Import Penetration and Export Orientation (%)



4. Econometric Results

4.1. Effects of Trade Liberalization on Plant Size

Estimation results of above equation are presented in Table 1. As trade liberalization variable, column 1 includes import penetration and column 2 includes both import penetration and export orientation variables. On the other hand, column 3 includes import tariffs and column 4 includes both import tariffs and export tariffs (tariffs imposed by trading partners). In all equations, initial relative plant size ($\ln(size)_{-1}$), export dummy, import dummy and foreign ownership dummy are statistically significant at 1 percent significance level. The negative coefficient on the initial plant size suggest that relatively small plants grow at a faster rate compared to larger plants in terms of real output. The positive coefficient on export dummy suggests that there exists size advantage of exporting. Similarly, Plants importing intermediate inputs and foreign-owned plants grow faster compared to non-importing plants and locally owned plants, respectively. Capital intensity ($\ln K/L$) is positively correlated with the growth of real output, suggesting that plants with higher capital intensity can grow at a faster rate. The coefficient of non-production worker ratio ($\ln Kn/L$), which is sometime used as a proxy for a ratio of skilled workers, is significantly negative. This suggest that plants with a relatively large number of unskilled workers can grow faster compared to others in the unskilled worker abundant economy.

In column 1, the coefficient on change in import penetration variable is significantly negative. This indicates that the increase in import penetration has negative impacts on the size of manufacturing plants. After including export orientation variable and its interactions (column 2), the estimated magnitude of the negative effect turns to be smaller, but still significantly negative. In both columns 1 and 2, the interaction term of initial plant size and import penetration is statistically insignificant. There is no difference in the magnitude of negative impacts of import penetration on the size of larger and smaller plants after accounting for the plant characteristics. This is confirmed by a statistical test, whose results are shown in the lower part of the table. The marginal effect of import penetration on the size of smaller plants (evaluated at the lower quartile of size distribution) is -0.207 while corresponding effect (evaluated at the upper quartile) is -0.219. The difference (-0.012) is not statistically significant even at 10 percent significance level.

On the other hand, the increase in import penetration has more of negative impacts on the size of plants importing intermediate inputs than that of non-importing plants, suggested by significantly negative coefficient on the interaction term of import dummy and import penetration. In other words, the size advantage of importing intermediate inputs is lowered when import penetration is increased. As indicated by the estimation results, some plants importing intermediate inputs in which advanced technology is embodied can enjoy size advantage, but the advantage is decreased when import of the products that they produce is increased because the advanced technology is also embodied in the imports. Therefore, import competition has greater negative impact on plants importing intermediate inputs compared to non-importing plants.

The coefficient on export orientation variable is significantly negative, suggesting that the increase in export orientation at an industry-level has negative impact on plant size. However, its interaction term with export dummy is significantly positive and the sum of the two coefficients is statistically insignificant. These suggest that the increase in export orientation does not affect the size advantage of exporting. On the other hand, the results also suggest that the increase in export orientation has negative impact on the size of non-exporters. When export orientation at an industry-level increases, exporters can keep growing while non-exporters loses market share in domestic markets.

Table 1: Effects of Tariff Reduction/import Penetration and Export Orientation

	[1]	[2]	[3]	[4]
	Import penetration and export orientation		Import tariffs and export tariffs	
	b/se	b/se	b/se	b/se
Δimport tariff or import	-0.245	-0.128	0.074	0.063
	[0.039]***	[0.040]***	[0.054]	[0.054]
x ln (size)-1	-0.011	-0.005	-0.04	-0.038
	[0.023]	[0.023]	[0.029]	[0.029]
x Dexport	-0.043	-0.211	0.168	0.151
	[0.112]	[0.115]*	[0.133]	[0.133]
x Dimport	-0.301	-0.19	-0.342	-0.345
	[0.086]***	[0.092]**	[0.131]***	[0.131]***
x Dforeign	-0.184	-0.202	0.263	0.271
	[0.145]	[0.151]	[0.182]	[0.182]
Δexport tariff or export		-0.244		0.779
		[0.025]***		[0.124]***
x ln (size)-1		-0.011		-0.194
		[0.014]		[0.072]***
x Dexport		0.27		0.297
		[0.049]***		[0.333]
x Dimport		-0.116		-0.113
		[0.054]**		[0.385]
x Dforeign		0.064		0.024
		[0.081]		[0.687]
ln (size)$_{-1}$	-0.502	-0.502	-0.502	-0.503
	[0.005]***	[0.005]***	[0.005]***	[0.005]***
Dexport	0.042	0.042	0.044	0.046
	[0.007]***	[0.007]***	[0.008]***	[0.008]***
Dimport	0.182	0.182	0.177	0.176
	[0.010]***	[0.010]***	[0.011]***	[0.011]***
Dforeign	0.171	0.17	0.172	0.173
	[0.029]***	[0.029]***	[0.029]***	[0.030]***
ln (K/L)	0.017	0.017	0.017	0.017
	[0.002]***	[0.002]***	[0.002]***	[0.002]***
ln (Ln/L)	-0.015	-0.015	-0.014	-0.015
	[0.003]***	[0.003]***	[0.003]***	[0.003]***
Plant dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
M.E. of import at p25 of size	-0.308***	-0.207***	0.101***	0.084
M.E. of import at p75 of size	-0.331***	-0.219***	0.014	0.002
- difference	-0.024	-0.012	-0.087	-0.083
M.E. of export at p25 of size	-	-0.201***	-	1.000***
M.E. of export at p75 of size	-	-0.226***	-	0.577***
- difference	-	-0.024	-	-0.423***
# of plants	34,278	34,278	34,419	34,419
# of observations	203,936	203,936	204,727	204,727
Adj. R^2	0.272	0.272	0.271	0.272
F-stats.	514.622	439.332	516.697	439.298

Notes: "***", "**", "*" indicate statistically significant at 1 percent, 5 percent, or 10 percent level, respectively.

The interaction term of export orientation and initial plant size is not statistically significant. Similarly with import penetration effect, there is no difference in the magnitude of negative impacts of export orientation on the size of larger and smaller plants after accounting for other plant characteristics. The negative coefficient on the interaction of export orientation and import dummy suggests that export orientation decreases the size advantage of importing. One possible interpretation is that the increase in export orientation promotes technology level of upstream industries in local markets, and this causes the decrease in the size advantages of importing intermediate inputs, although further examination of the backward linkage effects is required before interpreting so.

In columns 3 and 4, the coefficients on changes in import tariffs are positive. These results are consistent with the results of import penetration explained above and suggest that import tariff reduction has negative impact on the size of plants. However, the coefficients are not statistically significant. On the other hand, the coefficients on change in export tariffs is significantly positive, suggesting that reduction in tariffs imposed by trading partners on Indonesia's exports have negative impact on plant size. One notable difference from the results shown in column 2 is that the interaction term of export tariffs and initial relative size is significantly negative in column 4. This indicates that export tariff reduction has more of negative impact on the size of smaller plants than that of larger plants. Furthermore, the interaction term of import tariffs and import dummy is significantly negative, suggesting that import tariff reduction have more of negative impacts on the size of non-importers than that of importers. These results are inconsistent with the results of import penetration and export orientation. Probably, the inconsistency arises from the fact that tariff reductions are weakly correlated with import penetration and export orientation. Import penetration and export orientation depend on not only tariff reductions but other factors including foreign exchange rates, domestic and foreign demand and characteristics of products.

4.2. Analysis by Industry Group

For further investigation of the relationships between import penetration and export orientation on one hand and size advantages of importing, exporting and foreign ownership, above equation is estimated using subsamples from the plant level panel dataset. The models based on firm heterogeneity suggest that responses to tariff reduction differ not only among firms with different size and export status but also across industries with difference characteristics. For example, in the Melitz and Ottaviano model, the marginal effect of tariff change on plant size is a function of fixed sunk entry cost as well as parameters of utility function and distribution function of productivity. These are generally thought to vary across industries. In Baldwin and Gu model, the marginal effect is a function of fixed overhead cost which affects the extent of scale economies within variety. These indicates that the effect of tariff reduction on plant size differ across industries. Instead of incorporating the effects of required cost of initial investments at an industry-level, in this empirical analysis, industries are classified into groups, and then the above model is estimated using the subsamples and the results are compared.

First grouping at an industry-level is done based on shares of relatively large plants in total output. Here, large plants are defined as plants with 300 or more workers. If the share of large plants in total output is more than 70 percent in an industry, then the industry is classified into large enterprise (LGE)-dominated group. [14] Other industries are classified into less LGE-dominated group. In this group, both large and small plants are surviving, indicating that the extent of scale economy and initial entry cost are relatively small. Second grouping is done based on average capital intensity. Industries where capital intensity is higher than median of industry average are classified into capital-intensive group. Traditional trade theory suggests that a labor-abundant economy have comparative advantages in labor-intensive industries and comparative disadvantages in capital-intensive industries. Therefore, the negative impact of import penetration is expected to be greater for capital-intensive group than for labor-intensive group. Third grouping is done based on the dominance of foreign-owned plants. Similarly with LGE-dominated group, MNE-dominated group includes industries where share of foreign-owned plants in total

[14] Note that plants employing 100 or more workers are defined as large plants in the manufacturing survey. During this classification process, some industries were dropped from sample because of a small number of observations.

output is greater than 30 percent. Forth grouping is done based on concentration measured by Herfindahl index. Industries where the index is higher than median of total manufacturing are classified into Concentrated group.

Estimation results using these subsamples are presented in Table 2. For some groups, estimation results are different from the results of estimation using total sample in table 1. First, the impact of import penetration is not statistically negative in LGE-dominated (column 1), Labor-intensive (column 3) Less MNE-dominated (column 5) and concentrated groups (column 8). The coefficient is significantly positive in Concentrated group and is weekly positive in LGE-dominated groups. Regarding the former group, the impact is positive only for local non-importers because foreign dummy is significantly negative. These results suggest that the impacts of import penetration vary across industries and the negative impacts are smaller for non-importers in industries dominated by large plants, in which they can exploit market power in domestic markets.

Another difference is the negative coefficient on the interaction of export orientation and export dummy in Capital-intensive group (column 4). In this group, on the other hand, the interaction term with foreign ownership dummy is statistically positive at a 10 percent level. These results suggest that increase in export orientation decreases size advantage of exporting while it increases the advantage of foreign ownership. In the industries having comparative disadvantages, exporting status is not enough to benefit from exporting but foreign ownership is more important.

Table 2: Effects of Import Penetration and Export Orientation by Industry Group

	[1] LGE-dominated b/se	[2] Less LGE-dom. b/se	[3] Labor-intensive b/se	[4] Capital-intensive b/se
Δimport penetration	0.106	-0.377	0.012	-0.478
	[0.056]*	[0.062]***	[0.045]	[0.091]***
x ln (size)-1	-0.014	-0.028	0.004	-0.072
	[0.030]	[0.033]	[0.028]	[0.039]*
x Dexport	-0.255	-0.192	-0.210	0.153
	[0.166]	[0.159]	[0.157]	[0.178]
x Dimport	-0.477	0.016	-0.330	-0.027
	[0.128]***	[0.129]	[0.130]**	[0.145]
x Dforeign	-0.057	-0.276	0.011	-0.258
	[0.208]	[0.213]	[0.241]	[0.201]
Δexport orientation	-0.266	-0.204	-0.209	-0.243
	[0.034]***	[0.040]***	[0.028]***	[0.064]***
x ln (size)-1	-0.009	-0.005	-0.017	-0.005
	[0.017]	[0.022]	[0.015]	[0.028]
x Dexport	0.227	0.258	0.317	-0.246
	[0.063]***	[0.077]***	[0.054]***	[0.121]**
x Dimport	-0.14	-0.034	-0.111	0.092
	[0.071]**	[0.080]	[0.063]*	[0.103]
x Dforeign	0.188	-0.081	0.046	0.235
	[0.107]*	[0.129]	[0.103]	[0.136]*
ln $(size)_{-1}$	-0.516	-0.552	-0.517	-0.524
	[0.006]***	[0.007]***	[0.006]***	[0.008]***
Dexport	0.036	0.05	0.035	0.063
	[0.010]***	[0.011]***	[0.008]***	[0.014]***
Dimport	0.19	0.187	0.179	0.2
	[0.014]***	[0.016]***	[0.012]***	[0.020]***
Dforeign	0.153	0.191	0.193	0.161
	[0.039]***	[0.047]***	[0.038]***	[0.047]***
ln (K/L)	0.021	0.016	0.018	0.017
	[0.003]***	[0.004]***	[0.003]***	[0.005]***
ln (Ln/L)	-0.014	-0.017	-0.016	-0.014
	[0.004]***	[0.006]***	[0.004]***	[0.007]**
Plant dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
M.E. of import at p25 of size	-0.001	-0.407***	-0.071	-0.400***
M.E. of import at p75 of size	-0.031	-0.471***	-0.063	-0.589***
- difference	-0.03	-0.064	0.008	-0.189*
M.E. of export at p25 of size	-0.234***	-0.158***	-0.153***	-0.229***
M.E. of export at p75 of size	-0.252***	-0.169***	-0.188***	-0.242***
- difference	-0.018	-0.01	-0.035	-0.014
# of plants	20,325	15,388	26,416	8,715
# of observations	117,078	86,858	153,076	50,860
Adj. R^2	0.284	0.294	0.279	0.291
F-stats.	260.083	244.441	320.664	156.438

Notes: "***", "**", "*" indicate statistically significant at 1 percent, 5 percent, or 10 percent level, respectively.

Table 2 (continued): Effects of Import Penetration and Export Orientation by Industry Group

	[5] Less MNE-dom. b/se	[6] MNE-dominated b/se	[7] Less b/se	[8] Concentrated b/se
Δimport penetration	-0.047	-0.376	-0.287	0.221
	[0.045]	[0.096]***	[0.051]***	[0.079]***
x ln (size)-1	-0.022	-0.056	0.022	-0.036
	[0.026]	[0.045]	[0.032]	[0.032]
x Dexport	-0.212	-0.027	-0.234	-0.121
	[0.147]	[0.193]	[0.156]	[0.173]
x Dimport	-0.247	-0.043	-0.166	-0.347
	[0.115]**	[0.163]	[0.124]	[0.140]**
x Dforeign	0.083	-0.325	-0.01	-0.517
	[0.206]	[0.219]	[0.225]	[0.200]***
Δexport orientation	-0.219	-0.264	-0.189	-0.398
	[0.027]***	[0.071]***	[0.029]***	[0.054]***
x ln (size)-1	-0.034	0.055	-0.022	-0.004
	[0.014]**	[0.035]	[0.016]	[0.025]
x Dexport	0.343	-0.089	0.312	0.159
	[0.053]***	[0.131]	[0.056]***	[0.110]
x Dimport	-0.136	-0.026	-0.112	-0.018
	[0.061]**	[0.117]	[0.063]*	[0.102]
x Dforeign	0.084	0.068	-0.1	0.412
	[0.098]	[0.145]	[0.104]	[0.136]***
ln $(size)_{-1}$	-0.52	-0.506	-0.52	-0.516
	[0.005]***	[0.010]***	[0.005]***	[0.011]***
Dexport	0.039	0.054	0.041	0.062
	[0.008]***	[0.016]***	[0.008]***	[0.019]***
Dimport	0.17	0.208	0.176	0.225
	[0.012]***	[0.023]***	[0.011]***	[0.029]***
Dforeign	0.152	0.194	0.167	0.177
	[0.039]***	[0.045]***	[0.032]***	[0.079]**
ln (K/L)	0.018	0.013	0.017	0.019
	[0.003]***	[0.006]**	[0.003]***	[0.006]***
ln (Ln/L)	-0.015	-0.014	-0.014	-0.017
	[0.004]***	[0.009]	[0.004]***	[0.007]**
Plant dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
M.E. of import at p25 of	-0.092	-0.383***	-0.385***	0.142**
M.E. of import at p75 of	-0.139***	-0.532***	-0.337***	0.069
- difference	-0.047	-0.149	0.048	-0.074
M.E. of export at p25 of	-0.143***	-0.344***	-0.132***	-0.352***
M.E. of export at p75 of	-0.213***	-0.198***	-0.181***	-0.359***
- difference	-0.071**	0.146	-0.049	-0.008
# of plants	27,969	7,039	27,073	8,233
# of observations	166,206	37,730	158,651	45,285
Adj. R^2	0.279	0.291	0.282	0.281
F-stats.	346.433	112.487	374.794	96.297

Notes: "***", "**", "*" indicate statistically significant at 1 percent, 5 percent, or 10 percent level, respectively.

5. Concluding Remarks

Using a plant-level panel dataset from the Indonesian manufacturing, this paper has examined the impacts of trade liberalization on the size of plant measured by real output. Several findings were emerged from empirical analysis. First, there exist size advantages of exporting, importing intermediate inputs and foreign ownership. Second, the increase in import penetration has negative impact on the plant size and decrease the size advantage of importing. Third, the increase in export orientation has negative impact on the size of non-exporting plants while it can enhance the size advantage of exporting. Forth, despite a fear that only relatively large firms can benefit from globalization and smaller firms tend to lose market shares, the results of empirical analysis suggest that both import penetration and export orientation do not have differential impacts on the size of larger and smaller plants after accounting for other plant characteristics.

These results have some policy implications. First, plant size is not necessary appropriate criteria when the extent of public support for manufacturing plants to benefit from globalization is determined. Second, more important policy is to support for non-exporters to start exporting. The empirical results suggest that exporters can benefit from trade liberalization while non-exporters are negatively impacted. Third, promoting inward foreign direct investment is also important because foreign MNEs are thought to have firm-specific intangible assets including world-wide marketing network and because foreign ownership is a crucial factor to benefit from exporting in capital-intensive industries that have comparative disadvantages in Indonesia. Finally, although the increase in import penetration decreases the size advantage of importing intermediate inputs, the promotion of the import can be an important measure because the decrease in the size advantage of importing may reflect the development of technology embodies in local products.

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CHAPTER 7

Understanding the Relationship Between Globalization and Survival of Philippine SMEs

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This paper examines whether firms of heterogeneous size are affected differently by globalization. Are there differences in the survival of SMEs and large enterprises the higher their exposure to imports and lower tariffs? To do this, both tariffs and effective protection rates are used as globalization proxy variables and added to the factors that affect firm shutdowns consisting of firm characteristics such as age, size, productivity, capital intensity, ownership, export, and R&D. Government subsidy and price cost margins at the industry level are also included. To capture firm heterogeneity, firm size was interacted with tariffs and effective protection rates as well as with firm characteristics such as productivity, ownership and export. Using data on the Philippine manufacturing industry from 1996 to 2006, the results confirm previous research finding that firm size, age, and productivity are important determinants of firm exit. Controlling for these attributes, the results show that tariffs are negatively correlated with firm exit and the probability of exit is higher in small firms that face tariff reduction. Firm exit is greater for small enterprises characterized by low productivity, non-exporter and without foreign equity. Firms that have high level of productivity, engaged in export activities and have foreign equity are better able to survive.

Keywords*:* globalization, survival, SMEs, Philippine manufacturing
JEL Classification*:* F60, F10, L10

1. Introduction

There is wide recognition that small and medium enterprises (SMEs) play a critical role in the economic growth and industrial development of developing countries worldwide. SMEs are seen as key to boost the economy and strengthen the industrial structure, given their substantial contribution both in terms of number of enterprises and workers. As such, the government has implemented a wide range of policies and programs to promote SME growth and development. Implicit in these policies is the assumption that once SMEs grow and develop, they will continue to contribute to the economy. Firm survival is significant in terms of achieving the long-term growth and employment goals of the country. Giovannetti et al (2011) pointed out that the survival of young firms is fundamental for increased entrepreneurship and a consequent increase in jobs and sustained economic growth. As Ausdretsch (2004) emphasized, SMEs are an important source of innovation, growth and competitiveness.

In the light of rising competition arising from the globalization trend and increasing economic integration; there are concerns that SMEs would be negatively affected by the intense competition arising from trade liberalization. The more recent empirical literature on trade and productivity shows that in the presence of firm heterogeneity, trade liberalization allows more productive firms to expand while less efficient firms either exit or shrink. Melitz (2003) shows that trade can contribute to the Darwinian evolution of industries by forcing the least efficient firms to contract or exit while promoting the growth of the more efficient ones. In studies examining the determinants of survival, firm size and age are highlighted as critical factors with older enterprises having a higher survival rate than new ones (Carroll and Hannan 2000; Nelson and Winter 1982 as cited in Cao 2012).

In studies assessing the impact of trade liberalization on firm survival, the main finding suggests that tariff reduction or elimination together with higher import competition will increase exit. In the US, Bernard and Jensen (2002) showed that import penetration sharply increases the probability of plant death. Bernard, Jensen and Schott (2003) also indicated that lower trade costs increase the probability of plant death, especially for lower productivity, non-exporting plants. In another study, Bernard, Jensen and Schott (2006) found that plant survival and growth are disproportionately lower in industries with higher exposure to imports from low wage countries.

Couke and Sleuwaegen (2008) indicated that in developed countries, increasing competition from imports from low-wage countries is associated with higher firm level exit, with less productive and more labor-intensive firms being relatively more affected. Looking at the impact the Canada-US Free Trade Agreement (FTA) tariff cuts on Canadian manufacturing firms; Gu, Sawchuk and Whewell (2003) showed that FTA tariff cuts increased the exit rate of Canadian manufacturing firms and the FTA-induced increase in the exit rate was bigger for small firms than for large firms.

In the Philippines, while studies analysing the competitiveness and performance of Philippine SMEs abound, there are very few studies focusing on firm survival and its determinants mainly due to the paucity of micro level data. Using a probit model, Aldaba (2011) examined the determinants of firm exit for Philippine manufacturing enterprises. The results show that individual firm characteristics matter with lower probability of exit associated with highly productive, larger, older, foreign-affiliated and export-oriented firms. This analysis may have masked some of the underlying relationships affecting the survival of SMEs and large manufacturing enterprises. It is important to understand whether there are significant differences in the determinants of survival of SMEs and large enterprises in order to correctly design adjustment policies and programs to increase the survival probability of SMEs. In a highly globalized environment, firms must adapt their strategies to heightened competition in order to survive and benefit from the opportunities offered by globalization (Coucke at al 2010).

This paper aims to understand whether there are differences in the survival of firms the higher their exposure to imports and lower tariffs. Are firms of heterogeneous size affected differently by globalization? Are there differences between factors affecting the survival of SMEs and large enterprises? The paper will be divided into six sections. After the introduction, section II will discuss the policies affecting SMEs along with an analysis of their recent performance and contribution to the economy. Section III will briefly review the literature on the determinants of SME survival particularly on how SMEs are affected by globalization. Section IV will present the data, variables, and method of estimation applied in the analysis. Section V will analyse the results and on this basis, the final section will formulate the policy implications and recommendations of the paper.

2. SME Policies, Performance and Challenges

Since the 1980s, the Philippines has made considerable progress in opening-up the economy not only by removing tariff and non-tariff barriers but also by deregulating prices, entry and other administrative rules and liberalizing foreign investment restrictions. As a result, the current regime is substantially more open, particularly in the manufacturing industry.

From the early 1980s till the 1990s, the Philippines liberalized its trade policy by reducing tariff rates and removing import quantitative restrictions. Philippine average tariffs are already low with manufacturing at 6.8% and agriculture at 11.2%. About 55% of total tariff lines are clustered around the 0-3% tariff levels and about 29% are found in the 5-10%. In recent years, the uncertainty in the successful conclusion of the World Trade Organization (WTO)'s multilateral trade negotiations has led to a new wave of regionalism through the surge in free trade agreements (FTAs). The Philippines has participated in these initiatives by signing seven free trade agreements covering Japan-Philippines, Korea-ASEAN, China-ASEAN, AFTA, Japan-ASEAN, ASEAN-India and ASEAN-Australia and New Zealand. The government policy on FTAs is to maintain active engagement in several multilateral and bilateral trade and investment agreements. Philippine participation in these agreements is seen to pave the way for the country's deeper trade and investment integration in the global economy.

No unilateral trade reforms took place in recent years as the country's trade policy has been driven mostly by its FTA commitments, particularly the AFTA. Under the ASEAN Trade in Goods Agreement (ATIGA which came into force in 2010), the Philippines has reduced all tariffs to 0-10% except for the highly sensitive agriculture products such as rice. The China-ASEAN FTA (CAFTA) was also implemented on January 1, 2010 simultaneous with the ATIGA. Under CAFTA, tariffs are expected to be eliminated on 90% of products ranging from textiles to rubber, vegetable oil, and steel between China and the ASEAN 6 (Brunei, Indonesia, Malaysia, Philippines, Thailand, and Singapore). Import duties will be removed on 6682 Chinese products. Average tariffs are reduced to 0.6% (from 9.8% in ASEAN and 12.8% in China).

In terms of foreign direct investment policy, the Philippines changed considerably from a restrictive and complicated regulatory system towards a more open one. Given the need to expand exports and the potential economic contribution of FDI through the transfer of knowledge and experience, the Philippines adopted more open and flexible policies toward FDI. This was carried out simultaneously with the country's market-oriented reforms in the 1990s. In June 1991, the country accelerated the FDI liberalization process through the legislation of Republic Act 7042 or the Foreign Investment Act (FIA).

From the seventies to the present, the overall SME policies and programs have evolved with their focus shifting from inward-looking towards a more external-oriented approach. In the 1990s, government policy on SMEs concentrated on improving market access, export expansion, and increasing competitiveness. In 1991, the Magna Carta for Small Enterprises was passed to consolidate all government programs for the promotion and development of SMEs into a unified framework. The Magna Carta also mandated all lending institutions to set aside 8% of their total loan portfolio to SMEs. Access to finance has remained one of most critical factors affecting the competitiveness of MSMES. Many are unable to qualify for bank loans because they lack the necessary track record and collateral. Moreover, most do not have the financial expertise to manage a healthy cash flow. The lack of credit information has deterred banks from lending to MSMEs.

The 2011-2016 MSME Development Plan focuses on addressing the critical constraints to the growth and development of the MSME sector. Measures will be implemented to create an enabling business environment, improve access to finance, expand market access, and strengthen MSME productivity and competitiveness as well as to deepen linkages with large enterprises and value chain networks. The Plan targets a 40% contribution of the MSME sector to total value added and creation of two million jobs by 2016.

In 2011, micro enterprises dominated the economy accounting for 91% of the total while small enterprises accounted for only 9% (Table 1).[1] Middle enterprises a very small proportion of the total. Since 2003, the total number of enterprises has fallen from 839,114 to 783,165 in 2006. In 2011, this went up to 820,255 but still lower than the total number of enterprises in 2003. In terms of employment contribution, micro enterprises accounted for a share of 28% in 2011 while small enterprises registered a share of 26%. Medium enterprises posted a share of 7% while large enterprises contributed 39% during the same year.

Within manufacturing, micro enterprises accounted for 89% of total establishments while small enterprises recorded a share of 9% in 2011 (Table 2). Medium and large enterprises registered a share of 0.8% and 0.9%, respectively. In terms of employment share, large firms contributed the highest with a share of 53% of the total. Small and medium enterprises contributed 20% and 9% respectively while micro enterprises posted a share of 18%. Medium enterprises constitute a small share not only of the SME sector but also of the overall manufacturing and total Philippine industry structure, such that the country's industrial structure has remained "hollow".

Table 1: Total Number of Enterprises and Employees in the Philippines

Number of Enterprises

Year	Micro	%	Small	%	Medium	%	Large	%	Total
1995	449.950	91	39.848	8	2.712	1	2.447	0,5	495.057
2000	747.740	91	67.166	8	3.070	0,4	2.984	0,4	821.060
2003	762.573	91	69.175	8	3.521	0,4	3.745	0,4	839.114
2006	720.191	92	57.439	7	2.839	0,4	2.596	0,3	783.165
2010	709.899	91	61.979	8	2.786	0,4	3.023	0,4	777.687
2011	743.250	91	70.222	9	3.287	0,4	3.496	0,4	820.255

[1] Micro enterprises have from 1-9 employees. Small enterprises are defined as having 10-99 employees; medium as having 100-199 employees; and large as having over 200 employees (The National Statistics Office and Small and Medium Enterprise Development Council Resolution No. 1, Series 2003).

Number of Employees

Year	Micro	%	Small	%	Medium	%	Large	%	Total
1995	1.345.175	31	945.401	22	366.890	8	1.664.076	39	4.321.603
2000	2.165.100	37	1.522.227	26	416.686	7	1.798.173	30	5.902.256
2003	2.214.278	34	1.556.206	24	485.891	8	2.218.419	34	6.474.860
2006	1.667.824	33	1.279.018	26	381.013	8	1.657.028	33	4.984.950
2010	1.729.100	30	1.417.672	25	386.163	7	2.136.362	38	5.669.297
2011	1.778.353	28	1.642.492	26	451.561	7	2.473.336	39	6.345.742

Source: National Statistics Office.

Table 2: Manufacturing Total Number of Enterprises and Employees

Number of Enterprises

Year	Micro	%	Small	%	Medium	%	Large	%	Total
1995	86.900	89	8.928	9	1.027	1	982	1	97.837
2000	108.998	87	14.121	11	1.110	0,9	1.238	1	125.467
2003	107.398	89	11.910	10	853	0,7	1.024	0,8	121.184
2006	105.083	90	10.274	9	1.004	0,9	985	0,8	117.346
2010	101.072	90	9.471	8	823	0,7	938	0,8	112.304
2011	**100.837**	89	**10.029**	9	**899**	0,8	**1.024**	0,9	**112.789**

Number of Employees

Year	Micro	%	Small	%	Medium	%	Large	%	Total
1995	271699	22	227949	18	137384	11	615874	49	1252906
2000	354025	22	354328	22	150734	9	730127	46	1589214
2003	360576	25	285027	19	118896	8	698173	48	1462672
2006	259664	19	252931	18	132332	10	727984	53	1372911
2010	259.204	20	244.156	19	114.274	9	685.410	53	1.303.044
2011	**253.945**	18	**270.123**	20	**124.524**	9	**724.775**	53	**1.373.367**

Source: National Statistics Office.

While the Philippines has put in place a number of policies and programs designed specifically to boost SME productivity and competitiveness in the country, the performance of SMEs in the last decade has not been vigorous enough to boost the Philippine manufacturing industry. Although some notable improvements in terms of number of enterprises, value added, and employment contribution have been posted, the overall economic performance of SMEs in the last decade has been subdued. Thus, they have not substantially generated sufficient value added and employment to increase competition, improve industrial structure and increase the country's overall manufacturing growth. The weak performance of SMEs has been largely attributed to the large number of barriers particularly access to finance, access to technology, and skills as well as the presence of information gaps and difficulties with product quality and marketing.

As such, the deepening of high technology industries in terms of the creation of backward linkages has remained weak. Though the country's exports of high technology products have grown rapidly, the value added of these exports is very low due to the limited links of large domestic and foreign companies to the domestic economy. Given rapid changes in the international trade and the growing complexity of global production system, making small and medium manufacturers internationally competitive have posed a significant challenge to Filipino SMEs.

3. Brief Literature Review

In studying the life cycle of an enterprise, there are three major hypotheses that have emerged in the literature: "liability of newness", "liability of adolescence", and "liability of senescence" (Carroll and Hannan 2000; Nelson and Winter 1982 as cited in Cao 2012). The first shows that newer and younger enterprises have a higher rate of death risk than older ones as newer enterprises gradually adapt to the environment, form processes and establish relationships as they grow. The second, the hypothesis of "liability of adolescence", shows that with age, SMEs' death risk follows an inverted U-shape pattern rather than a linear decline over time. Its death risk increases over time until it is able to adapt to the environment when its death risk starts to fall. The hypothesis of "liability of senescence" indicates that older enterprises face an increasing death risk as they find it difficult to adapt to the changing and competitive market environment because they are more rigid than younger enterprises (Baum 1989; Hanna 1998 as cited in Cao 2012). Hence, when an enterprise reaches a certain age, its death risk will once again increase.

In determining the way in which companies are affected by globalization, the literature shows that firm heterogeneity seems to matter decisively. Bernard et al

(2006) and Couke and Sleuwaegen (2008) indicated that in developed countries, increasing competition from imports from low-wage countries is associated with higher firm level exit, with less productive and more labor-intensive firms being relatively more affected. As trade integration deepens, the market selects those firms that are more fit to international competition while their "unfit" counterparts are forced to exit.

Colantone, I., Coucke, and Sleuwaegen (2010) analysed, both theoretically and empirically, the relative competitive position of small and large firms within the same industry in the context of increasing import competition. The authors cited two factors that have traditionally been identified as sources of comparative advantage for small firms relative to their large firm competitors. First, small firms are normally characterized by high marginal cost flexibility. While they tend to produce at higher marginal costs of production at a given point in time, they are also likely to incur lower adjustment costs as demand fluctuates (Brock and Evans 1989, Acs and Audretsch 1990). Second, small firms usually display a strong "niche-filling" attitude. They tend to specialize in specific market-niches as a strategy to make-up for their lack of economies of scale and remain viable (Poter 1980, Dean et al 1998).

The findings of Colantone, I., Coucke, and Sleuwaegen (2010) showed that within the framework of an oligopolistic rivalry model characterized by Cournot competition between domestic and foreign producers, firms of heterogeneous size may be affected differently by diverse sources of import competition. Due to their marginal cost flexibility and ability to specialize in specific market-niche products, small firms may enjoy a relatively favorable competitive position versus their larger counterparts in the face of import penetration from low-wage countries. Following heightened import competition from China and other low wage countries, large domestic firms incur a stronger decrease in survival probabilities than small firms. This is also confirmed by their empirical analysis that looks at firm exit for 12 manufacturing sectors in 8 European countries from 1997 to 2002. Their results showed that firms of different size are affected differently by diverse sources of import competition.

Empirical studies also suggest that lower trading cost through tariff reduction or elimination and higher import competition will increase exit. In assessing the role of import competition from low wage countries on the survival of US plants, Bernard and Jensen (2002) showed that import penetration sharply increases the probability of plant death. Their results confirmed findings from previous research that plant size, age and productivity are important determinants of plant survival. The probability of plant shutdown is significantly decreasing in plant size, age, and productivity. Exporting plants are far less likely to shut down than non-exporters. Both capital and skill-intensive plants are also less likely to die and death rates are greater for plants with low capital-labor ratios and those with relatively low skilled workers.

Using disaggregated US import data and trade cost, Bernard, Jensen and Schott (2003) examined the impact of changes in tariff and transport costs on industries and plants. Their results highlighted the following: *first*, lower trade costs increase the probability of plant death, especially for lower productivity, non-exporting plants; *second*, surviving high productivity, non-exporters are more likely to enter the export market and expand their sales; and *third*, existing exporters see their exports grow more quickly as trade costs fall. The results showed that the interaction of trade cost and productivity is negative and statistically significant, the probability of death is lower for high productivity plants in the face of falling trade costs. With respect to other plant characteristics, the study indicated that larger, older, and more capital intensive firms are more likely to survive as are plants that pay higher wages or produce multiple products.

In another study, Bernard, Jensen and Schott (2006) examined the role of international trade in the reallocation of US manufacturing within and across industries from 1977 to 1997. Their results indicated that across industries, plant survival and growth are disproportionately lower in industries with higher exposure to imports from low wage countries. Within industries, the higher the exposure to low-wage countries, the bigger is the relative performance difference between capital-intensive plants and labor-intensive plants in terms of survival and growth.

Looking at the impact the Canada-US FTA tariff cuts on Canadian manufacturing firms; Gu, Sawchuk and Whewell (2003) showed that tariff reductions affected productivity growth through its effect on firm turnover. They found that the FTA tariff cuts increased the exit rate of Canadian manufacturing firms. The FTA-induced increase in the exit rate was bigger for small firms than for large firms which is consistent with the view that the FTA tariff cuts forced the least productive firms to exit. The authors concluded that productivity grows through a mechanism or restructuring process of market selection where low productivity firms exit and are replaced by higher productivity entrants while higher productivity incumbents gain market share.

Using Canadian firm level data, Baggs (2005) also examined the impact of the Canada-US FTA by investigating simultaneously the effect of falling Canadian tariffs and American tariff changes on Canadian firms. The results showed that both firm and industry level characteristics are important determinants of survival and while Canadian tariff reductions reduced the probability of survival, US tariff reductions exhibited the opposite effect. Falling Canadian tariffs decrease the probability of survival since declining domestic protection increase threats. Falling US tariffs increase the probability of survival among Canadian firms since opening foreign markets increase opportunities.

Alvarez and Vergara (2006) analysed the relationship between survival, employment growth and firm size in Chile, an economy that has reduced its trade barriers in the last three decades. Their results showed that compared to firms of the same size in less globalized industries, SMEs are more likely to survive in industries more exposed to external competition. In terms of employment, SMEs are more able to grow in more globalized industries. The other results showed that more productive and older firms are more likely to survive. In terms of factor intensities, skilled labor does not affect survival probability but more capital intensive plants are less likely to shutdown. Compared to large plants, small and medium plants are about 16 and 8 percent less likely to survive. Smaller plants are more likely to exit even controlling for other plant and industry characteristics.

The literature also shows that other factors such as firm level innovations and technological activity are important determinants of firm survival. Ausdretch and Mahmood (1995) showed that small firms that have a relatively higher innovation rate have higher survival rate than large firms. Studies also analysed the relationship between external finance and growth. Hytinen et al (2005) found that firm growth is highly dependent on external finance. Baldwin (1995) indicated that the length of survival is a function of industry characteristics such as efficiency, concentration, ownership and asset structure. Audretsch (1991) showed that the presence of substantial scale economies and a high capital-labor ratio tends to lower the likelihood of survival. Ausdretsch (1995) further showed that firms that are more capital-intensive often grow faster. Dunne and Hughes (1994) and Mata and Portugal (1994) also both showed a lower likelihood of survival in industries with a high degree of scale economies. In developing countries, Thorsten et al (2002) found that firm growth is determined by legal institutions, corruption and financing and small firms are affected the most. Liedholm and Mead (1998, 1999) examined the data of eight African countries and confirmed that firm age and firm size are important factors in assessing the enterprise life cycle.

In China, Liu and Pang (2003) found that based on China's listed SMEs, firm survival tends to increase with firm size and firm performance and operation stability helps firms become more competitive and more likely to survive and grow. State-ownership was found to increase the probability of large firm survival but not growth. R&D activities were found to influence firm survival but not growth.

In the UK, Holmes, Hunt and Stone (2010) examined the survival of newly established manufacturing firms in north-east England using data on 781 firms and applying log-logistic hazard models separately for (i) micro and (ii) small and medium enterprises. Their results showed that increases in initial plant size are seen to have a positive impact on the survival of SMEs. However, increases in plant size were found to impact negatively on micro-enterprise durations. Ownership of the enterprise was not identified as a significant variable. The results also showed that both micro-enterprises and SMEs exhibited clear evidence of initial positive duration dependence, followed by a negative duration dependence with enterprises displaying increased probabilities of death for the first eight to nine years. Macroeconomic variables such as unemployment, interest and exchange rates were also included in the analysis and the main findings indicated that higher rates of unemployment were not associated with survival chances. For microenterprises, low interest rates at establishment enhance firm survival, while beyond the first year of operation, increases in the real interest and exchange rates impact negatively on survival probabilities.

Facanha, Resende, and Cardoso (2012) investigated the survival of newly created SMEs in Brazilian manufacturing for the period 1996-2005 using a time-varying version of the proportional hazard rate model that controls for unobserved heterogeneity. The main results indicated that firm size, industry size, and industry growth have a positive influence on survival while industrial concentration and entry rate exert a negative influence.

Based on two subsamples of SMEs and applying probit regressions, Nunes and Serrasqueiro (2012) examined whether the survival determinants of young SMEs are different from those of old SMEs. Their results showed that the survival determinants of young SMEs are considerably different from old SMEs with determinants related to scale effects, financial condition and macroeconomic situation explaining their survival. For old SMEs, technological intensity is of greater relative significance.

4. Description of Data and Methodology

4.1 Data

The dataset consists of firm level information from the Annual Survey of Establishments and Census of Establishments of the conducted by the National Statistics Office (NSO). The dataset contains the following variables: sales revenues, employment, compensation, physical capital, exports (only for certain years) and production costs. The firms are identified by unique establishment numbers that allowed the creation of a panel dataset. The dataset covered the period 1996 to 2006, with three missing years in between: 1999, 2001, and 2004. 1996, 1997, 1998, 2002, 2003, and 2005 are surveys years 2000 and 2006 are census years. The dataset includes only firms with at least two observations and excludes all firms with only one observation during the eight-year period 1996-2006. Firms with missing, zero or negative values for any of the variables listed above were dropped as well as those firms with duplicates. These were mostly firms with less than 10 workers. The total number observations is 20,815.

Entry and exit are traced based on the establishment unique numbers. However, there is no information whether exits are due to mergers and acquisitions. Entry and exit may be due to true entry and exit but may also be due to firms being included in the sample or not. Entry is defined as the year when the firm started its operations. This is based on information provided by the firm. Firm exit is indicated when the firm no longer appears in the dataset. Entry and exit also occurs when a firm's 2-digit PSIC code changes. The firms are classified based on the following definitions:

- New Entrant: firm that enters a given industry sector in a given year t
- Exitor: firm is present in a given year t but will not be present in subsequent year t+1
- Survivor: firm is neither a new entrant nor exitor, it is present in a given year t as well as in subsequent year t+1

Table 3 presents the number of firms in the dataset along with calculated annual entry, exit, and survival rates in the manufacturing industry. The exit rate dropped from 36% in 1997 to about 17% in 2000. This went up to 22% in 2002 and to 24% in 2006. Entry rates are low relative to exit rates declining from 33% in 1996 to about 8% in 1998 and 6% in 2006. The average turnover rate was 24% during the years under review.

Table 3: Summary of Number of Firm Entrants, Exitors, and Survivors

Year	Total	Entrants	Exitors	Survivors	Turnover Rate	As % of total		
		(N)	(X)	(S)	(in %)	N	X	S
1996	2.576	858				33,3		
1997	2.599	9	927	1.663	36	0,4	35,7	64
1998	2.263	177	180	1.906	16	7,8	8	84,2
2000	2.043	28	344	1.671	18	1,4	16,8	81,8
2002	2.072	6	455	1.611	22	0,3	22	77,8
2003	2.031	32	359	1.640	19	1,6	17,7	80,8
2005	3.365	20	505	2.840	16	0,6	15	84,4
2006	3,866*	221	942	2.703	30	5,7	24,4	68,9
Total	20.815	1.351	3.712	14.034	24	6,5	17,8	67,4

**Note*: Firm exit and survival in 2006 were based on whether the firm operated in 2008 as reflected in the 2008 Survey of Business Establishments.

Table 4 shows that exitors are, in general, relatively younger, smaller in terms of employment size, less productive and less capital-intensive than survivors. They seem to be more oriented towards the domestic market with their share of exports to output lower than survivors. Entrants are larger than exitors in terms number of workers. They are also more capital intensive, more productive and are more export-oriented than exitors. Their tariffs are higher than exitors and survivors.

Table 4: Firm Characteristics of Exitors, New Entrants, and Survivors (Mean Values)

	Exitors	Entrants	Survivors
Export share	0,1258033	0,2374911	0,2117632
TFP	0,9775679	1,000022	1,009972
Tariff	12,23409	17,40083	12,15751
Age	12,26192	2,907476	15,78112
Size: workers	189,2605	267,1088	297,1154
Capital-intensity	129591,1	146782,1	181049,3

It is evident from Table 5 that in terms of firm characteristics, SMEs have lower productivity and are younger, have less workers, more domestic-oriented, have lower capital/worker and lower price cost margin than large enterprises. Mean exit as measured by number of firms that exited as proportion of the total is higher for SMEs at 0.21 compared to 0.12 for large enterprises.

Table 5: Summary Statistics

	All Enterprises			Small and Medium			Large		
Variable	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.
TFP	20815	1,004	0,113	13938	0,97	0,104	6877	1,069	0,099
Tariff	20815	12,511	8,99	13938	12,24	8,931	6877	13,07	9,09
Age	20806	14,318	16,2	13938	13,997	15,36	6870	14,97	17,78
Size	20815	275,934	648,353	13938	66,75	49,73	6877	699,895	999,49
Export	13341	0,199	0,378	9036	0,15	0,335	4305	0,31	0,4359867
KL	20815	169648,5	830337	13938	141190,5	804137,9	6877	227326	878286
PCM	20813	0,188	0,12	13938	0,182	0,116	6875	0,2	0,127
Exit	20815	0,178333	0,382802	13938	0,207921	0,405834	6877	0,118366	0,32064

4.2 Methodology

To examine whether firms of different size are affected differently by globalization, a probit model is estimated where the dependent variable is set to one if the firm exited and zero if it survives the next year. Globalization will be indicated by trade liberalization using tariffs and effective protection rates as proxy variables.

As earlier discussed, there is already a large body of literature examining the determinants of firm survival. In many of these studies, the importance of firm characteristics such as age, size, wage, and R&D as well as industry features such as capital intensity, productivity, industry growth and concentration have been highlighted (see Ferragina et al 2010).

The baseline model specified below will be estimated separately for SMEs and large enterprises. The criterion used for defining SMEs is the total number of employees. In the Philippines, SMEs are defined as enterprises with 10 to 199 workers while large enterprises are those employing 200 or more workers. The baseline model is given by:

$$\Pr(exit_{it} = 1) = F\begin{pmatrix} TRADE_{jt}, TFP_{it}, OWNERSHIP_{it}, AGE_{it}, SIZE_{it}, EXPORT_{it}, KL_{it}, \\ PCM_{jt}, R\&D_{it}, Subsidy_{it}, Dummy\ Variables \end{pmatrix} \quad (1)$$

where *i* indexes firms, *j* industry, and *t* year. The explanatory variables include firm-level controls such as productivity (*TFP*), foreign ownership (*OWNERSHIP*), age (*AGE*), number of workers (*SIZE*), export (*EXPORT*), capital intensity (*KL*), price cost margin (PCM), R&D and subsidy indicators along with industry and year dummies.

To capture firm heterogeneity, firm size was interacted with tariffs (*SIZE*Tariff*) and effective protection rates (*SIZE*EPR*) as well as with firm characteristics such as ownership (*SIZE*OWNERSHIP*) and export (*SIZE*EXPORT*).

TRADE is the trade policy variable proxied by tariff rates and effective protection rates (EPRs) in sector *j*. Effective protection rates take into account both the tariff on the firm's output and the tariffs on the inputs that the firm uses. EPRs are important because tariffs vary considerably along the production stage generally exhibiting an escalating structure with inputs having lower protection while final goods receive higher protection. It is assumed that liberalization tends to suggest a negative effect on the exit rate and a positive effect on firm survival. This implies that a lower (higher) tariff or EPR increases (decreases) the probability of exit and reduces (increases) the firm's survival likelihood.

TFP is the firm's total factor productivity defined as the residual of a Cobb-Douglas production function and estimated using the methodology of Levinsohn and Petrin (2003). In estimating the production function, data on value added (output less cost of materials and energy) and two factors of production, labor and capital, were used. Fuel and electricity data were employed as proxy for productivity shocks.[2] A production function was estimated for 11 industry-sectors. The estimates of firm i's TFP is obtained by subtracting firm i's predicted y from its actual y at time t. To make the estimated TFP comparable across industry-sectors, a productivity index is created. Firms with higher productivity are expected to have higher survival rates.

OWNERSHIP is an indicator of firm ownership, it is equal to 1 if the firm has 10% or more foreign equity. Higher foreign equity participation decreases the probability of exit and has a positive effect on survival.

AGE is the difference between year t and the year the firm started its operations. It is expected that the probability of exit declines with the age of the firm. As earlier discussed, there are three major hypotheses in the literature. The hypothesis of "liability of newness" shows that newer and younger enterprises have a higher rate of death risk than older ones because newer enterprises must gradually adapt to the environment and establish themselves over time. The hypothesis of "liability of adolescence" shows that with age, SMEs' death risk follows an inverted U-shape pattern rather than a linear decline over time. In the enterprise's life cycle, its death risk increases over time and until it is able to adapt to the environment when its death risk starts to fall. The hypothesis of "liability of senescence" indicates that older enterprises face an increasing death risk as they find it difficult to adapt to the changing and competitive market environment because they are more rigid than younger enterprises. When an enterprise reaches a certain age, its death risk will once again increase.

[2] To address the simultaneity problem in input choice when estimating the production function by ordinary least squares (OLS), a semi-parametric estimator with an instrument to control for unobserved productivity shocks is applied. For this instrument, Olley and Pakes (1996) use investment while Levinsohn and Petrin (2002) suggest the use of intermediate inputs.

SIZE is measured by total number of workers. In most studies, firm size is reported to have an important role in explaining survival particularly in relation to scale efficiency. Larger firms are more likely to have levels of output close to the minimum efficient scale (MES), *ceteris paribus*, and thus smaller firms have an inherent size advantage (P. Holmes, et al 2010). Most studies suggest a positive relationship between plant size and survival (Audretsch and Mahmood, 1995; McCloughan and Stone, 1998; Disney et al, 2003; Perez et al 2004; Persson, 2004).

EXPORT is a ratio of the firm's total exports to total output. A negative coefficient is expected indicating that a higher export ratio reduces the probability of exit.

KL is capital intensity measured as the ratio of the book value of assets to total workers. It is expected that with high capital intensity, the probability of exit declines.

PCM is price cost margin, which following Aghion et al (2002), is used as an indicator of product market competition. The PCM is an indicator of the level of competition or degree of monopoly power of firms in industries. Note that while high PCM implies market power, it could also indicate high firm efficiency particularly if these high mark-ups or margins are the result of internal efficiency improving measures or represent gains from product innovation or techniques that a firm employs.

The PCM is measured as [Total Revenue-Compensation-Total Cost-Financial Cost of Capital]/Total Revenue where Total Cost is the sum of raw materials, fuel, electricity, depreciation and other costs while the Financial Cost of Capital=[Index of Investment Goods*Real Interest Rate]*Book Value of Assets.

The degree of competition measured by concentration ratio is expected to have an impact on firm survival with the general argument that increased concentration in the industry will make the environment more difficult for new entrants, leading to greater risk of failure (P. Holmes et al 2010). However, the results in the empirical literature are quite mixed, while Balwin and Rafiquzzaman (1995) and McCloughan and Stone (1998) find a significant relationship between concentration and firm duration, Wagner (1994) finds no such relationship for German manufacturing. P. Holmes et al (2010) obtained the same finding as Wagner (1994).

R&D is a research and development expenditure dummy variable reported by the firm and which is used as proxy for innovation. R&D expenditures refer to amount spent on any systematic and creative work undertaken to increase the stock knowledge and the use of the knowledge to devise new applications (NSO, 2000 Census of Philippine Business and Industry).

Subsidy is a dummy variable representing that the firm is a recipient of fiscal assistance or support from the government. Subsidies are defined as special grants in the form of financial assistance or tax exemption or tax privilege received from the government to aid and develop an industry. These include tax credit, tax and duty exemptions, price support, interest rate subsidy and price discount (NSO, 2000 Census of Philippine Business and Industry).

The summary statistics of the covariates are presented in Table 5. The same dataset will also be used to provide a detailed examination of the duration of survival of SMEs and large enterprises and whether there are considerable differences between factors affecting the survival of SMEs and those affecting large enterprises. The duration of the life of a firm is important in examining the factors affecting firm survival. One major problem encountered in analysing duration data is censored data (most commonly encountered form is right censoring) which refers to firms that are still alive or surviving at the time when the data was last collected. Ordinary regression models cannot correctly incorporate information from both censored and uncensored data in estimating parameters.

To overcome the problems caused by censored data, survival models are applied. Using a hazard rate approach, survival models consider not only whether a firm will stop operating but also the length of time the firm has operated. The hazard rate model of the duration of the life of a firm provides a statistical representation of the relation between the survival time of a firm and certain explanatory variables or covariates. This involves modelling the conditional probability that a firm will stop operating over a specified period of time. The hazard rate can be thought of as the rate at which firms die after duration t, given that they survive at least until time t (Holmes et al 2010).

A survival analysis technique will be tested using a Cox Proportional Hazards model to be estimated as follows:

$$h(t) = h_0(t)e^{(\beta_i X_i)}$$

..........(2)

where *h(t)* is the rate at which firms exit at time *t* given that they have survived in *t-1* and h_0 is the baseline hazard function (the parametric form of which is not specified) when all of the covariates are set to zero. The covariates or explanatory variables X_i measure the impact of policy as well as firm and sector characteristics on firm survival. Interaction terms (SIZE*TRADE, SIZE*OWNERSHIP, SIZE*EXPORT) are also introduced in the model.

Each independent variable coefficient, β_i (i=1,2…n), estimates the change in the hazard rate of a one-unit change in the given independent variable, holding all other variables in the model constant. The hazard ratio can be expressed as $e^{\beta i}$, indicating the effect of a one-unit change in the independent variable on the hazard function h(t) or the exit probability. A hazard ratio of 1.0 that suggests a one unit change in the independent variable has no effect on the likelihood of exit holding all other variables constant. A hazard ratio of less (more) than 1.0 suggests a lower (higher) likelihood of exit.

5. Empirical Results

5.1. Probit Model

Tables 6a and 6b present the results for the Probit model estimation for all enterprises and SMEs and large enterprises, respectively. Using tariffs as trade proxy variable and without interaction terms, Table 6a Model 1 shows that firm size is negatively correlated with the probability of exit indicating that smaller firms are more likely to exit. The results also show that firms that are more productive, older, with foreign ownership, and engaged in export activities are less likely to exit. Capital intensity, though it has a negative coefficient, is not statistically significant. The coefficient on PCM is negative but is not statistically significant and while the coefficient on R&D is negative, it is not significant. Firm subsidy is negatively correlated with the probability of exit and is highly significant. Meanwhile, the coefficient on tariff is negative and highly significant indicating that lower tariffs are associated with higher probability of firm exit.

Table 6a: Firm Exit, Probit Regressions: All Enterprises

	Tariff		Effective Protection Rate	
Variables	Model 1	Model 2	Model 3	Model 4
TFP	-1.047244*** (.1425722)	-1.081724*** (.1529636)	-1.004758*** (0.1419652)	-1.054157*** (0.1520611)
Trade	-.0091453*** (.0020584)	-0.006943*** (0.0021641)	0.0000178 (0.0007349)	0.0005352 (0.0009306)
Age	-.0052233*** (.000887)5	-0.0049492*** (0.0008919)	-0.0050008*** (0.0008828)	-0.0047668*** (0.0008868)
Export	-.3598736*** (.0466114)	-.3763548*** (0.0517314)	-0.3581515*** (0.046579)	-0.4021739*** (0.0512962)
Ownership	-.1595802*** (.0382081)	-.1646349*** (0.0428813)	-0.152594*** (0.0381538)	-0.1647362*** (0.0429594)
Size	-.0000957*** (.0000316)	-0.001418*** (0.0003756)	-0.0000975*** (0.0000317)	-0.0017592*** (0.0003501)
PCM	-.1197328 (.1251199)	-0.1452372 (0.1251877)	-0.1200158 (0.125423)	-0.1490802 (0.1254149)
KL	-1.83e-08 (2.31e-08)	-2.42e-08 (2.43e-08)	-1.30e-08 (2.15e-08)	-1,69E-08 (0.0000000224)
Subsidy	-.1198715*** (.0378025)	-0.1130349*** (0.0378696)	-0.1934975*** (0.0341531)	-0.185377*** (0.0342471)
R&D	-.0997363 (.0635185)	-0.1082948* (0.0638537)	-0.0949012 (0.0634787)	-0.0949576 (0.063696)
Size*trade		-0.0000114*** (4.02e-06)		-0,000000827 (0.00000101)
Size*Ownership		0.0001023 (0.000070)1		0.0001323* (0.0000699)
Size*Export		0.000096 (0.0000705)		0.0002086*** (0.0000628)
Size*TFP		0.0011636*** (0.0003223)		0.0013002*** (0.0003109)
Year	Y	Y	Y	Y
Industry	Y	Y	Y	Y
Obs	11964	11964	11964	11964
Log likelihood	-5110,3628	-5086,7056	-5120,4061	-5100,0844

Notes: Size is measured by number of workers. ***significant at 1%, ** significant at 5% and * significant at 10%. Numbers in parentheses are error terms while coefficients represent marginal effects (dy/dx).

Model 2 presents the results with the introduction of interaction variables. The coefficient on the interaction between size and tariff shows a highly significant negative coefficient indicating that not only do tariff reductions increase the probability of firm exit but this negative effect of tariff is even larger for small firms. Size was also interacted with ownership and export but the coefficients are not statistically significant. The final interaction term is productivity and the results show a highly significant positive coefficient indicating that lower probability of exit is associated with highly productive small firms.

The results obtained for the other control variables are the same as those obtained earlier. Productivity, age, export, foreign ownership, and subsidy are important determinants of firm exit. In particular, exit is lower for firms that are older, with high productivity level, with high export shares, have foreign equity, and receive government subsidy. The results also show a significant negative coefficient on R&D indicating that lower probability of exit is associated with firms that have R&D activities.

Models 3 and 4 use effective protection rate as trade policy variable. In both models, however, the coefficient on EPR is positive but not significant. For the control variables, the same basic results are obtained with older, larger, more productive, exporting firms, and firms that receive government subsidy being less likely to exit. For the interaction terms, the results show that lower probability of exit is associated with small firms that export, have foreign equity, and have high productivity level. This indicates that while small firm size is correlated with higher probability of exit, this can be mitigated for firms with higher exports, have foreign equity, and higher level of productivity.

Table 6B presents the probit results explaining the probability of exit for SMEs and large enterprises. For SMEs using tariff as trade policy variable, the results indicate the same general findings with larger, older, and more productive firms being less likely to exit. Firms with foreign ownership as well as those that are export-oriented are also less likely to exit. The coefficient on tariff is negative and highly significant indicating that firms facing reduced tariffs on their products are more likely to exit. PCM, capital intensity, subsidy, and R&D are not significant (Model 1).

Table 6b: Firm Exit, Probit Regressions by Size

	SMEs		Large Enterprises	
Variables	Tariff (Model1)	EPR (Model 2)	Tariff (Model 3)	EPR (Model 4)
TFP	-0.745647*** (0.1662213)	-0.698467*** (0.1657536)	-0.4541954 (0.3394225)	-0.4155275 (0.3379418)
Trade	-0.0072473*** (0.0023317)	-0.0003142 (0.0010683)	-0.0152819 *** (0.0046655)	0.000595 (0.001196)
Age	-0.005743*** (0.0010881)	-0.0055342*** (0.0010834)	-0.0020324 (0.0015726)	-0.0018522 (0.0015593)
Export	-0.3453928*** (0.0599165)	-0.3453696*** (0.0598976)	-0.4014646*** (0.0788897)	-0.3867686*** (0.0785919)
Ownership	-0.1351471*** (0.0500852)	-0.1261903*** (0.049986)6	-0.0752524 (0.0643945)	-0.0680808 (0.06424)
PCM	-0.1110403 (0.1491764)	-0.1155588 (0.1494533)	-0.1230318 (0.2476057)	-0.1060085 (0.2488562)
KL	-5.06e-09 (2.18e-08)	-2.84e-09 (2.10e-08)	-1.99e-07** (8.43e-08)	-1.78e-07** (8.34e-08)
Subsidy	-0.0548808 (0.0445656)	-0.1161833*** (0.0400493)	-0.255653*** (0.0743938)	-0.3487164*** (0.0692689)
R&D	-0.0754337 (0.0829556)	-0.0716218 (0.0829817)	-0.176838* (0.1013023)	-0.1624211 (0.1010247)
Year	Y	Y	Y	Y
Industry	Y	Y	Y	Y
Obs	7925	7925	4039	4039
Log likelihood	-3847,5155	-3852,3566	-1192,6463	-1198,1152

Notes: ***significant at 1%, ** significant at 5% and * significant at 10%. Numbers in parentheses are error terms while coefficients represent marginal effects (dy/dx).

Using EPR as globalization variable, the results show that the negative coefficient on EPR is not significant. For firm characteristics, the findings confirm the earlier results. For SMEs, low probability of exit is associated with firms that are older, more productive, able to export, have foreign ownership, and receive government subsidy (Model 2).

For large enterprises, the results show that the coefficient on the trade variable is negative and highly significant only in Model 3. Though the coefficient on TFP is negative it is not statistically significant both models. Capital-intensity is significant with its negative coefficient indicating that more capital-intensive firms are less likely to exit. Export and subsidy are significant in both models. The coefficient on foreign ownership, though negative, is not statistically significant. The coefficient on R&D is negative and significant only in Model 3.

Using tariff as globalization variable, the results show that for both SMEs and large enterprises, the coefficient on tariff is negative indicating that firms facing reduced tariffs on their products are more likely to exit. The results highlight the importance of improving productivity, allowing foreign ownership, and engaging in export activities to increase the probability of SME survival. For large enterprises, R&D, capital intensity and export-orientation are significant determinants of survival.

5.1. Non-parametric Analysis

When no covariates exist or when covariates are qualitative in nature, non-parametric methods like Kaplan and Meier can be applied to estimate the probability of survival past a certain time. Figures 1a and 1b show the Kaplan and Meier estimates of firm survivor function or the probability of survival until time t. The left graph Figure 1A shows that survival of manufacturing firms in the Philippines declines immediately from the first year leaving the survival probability around 86% (see Table 7). At the end of the eleventh year, only 42% of the sample firms are still surviving.

Figure: 1a

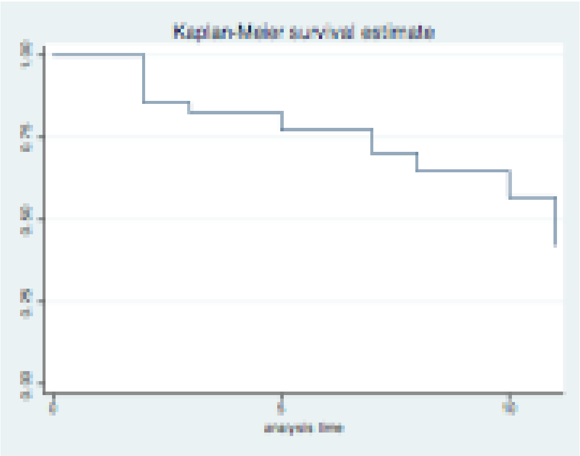
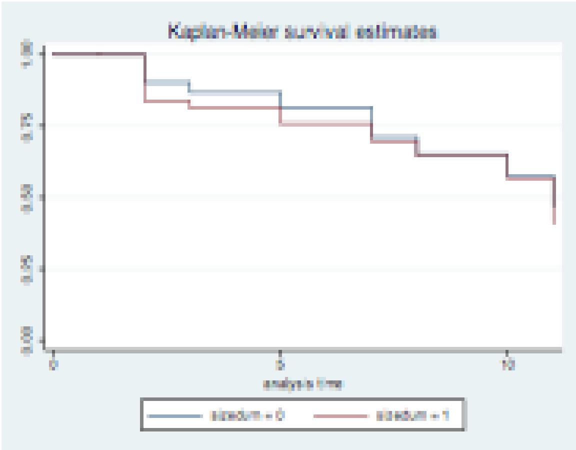


Figure: 1b



The right graph Figure 1b compares the survival probabilities of SMEs and large enterprises. After the first year, the survival probabilities of both decline with large enterprises having higher probabilities of survival. A log-rank test for equality was conducted to compare the survival experience of the two groups of firms. The result showed a significant difference between the two survivor functions (p-value is 0.0003 and the null hypothesis of equality is rejected).

Table 7: Survivor Function

Time	ALL	SMEs	Large Enterprises
2	0,855	0,8393	0,903
3	0,8269	0,8134	0,8682
5	0,7735	0,7595	0,8163
7	0,7023	0,6985	0,7128
8	0,6467	0,6444	0,6522
10	0,5693	0,5668	0,5758
11	0,4213	0,4075	0,4672

5.1 Semi-parametric Analysis: Cox Proportional Hazards Model

Tables 8 and 9 show the results estimated for two groups: all enterprises (Tables 8a and 8b) and SMEs and large enterprises (Tables 9a and 9b). Tables 8a and 9a present the results containing the Cox regression coefficients while Tables 8b and 9b contain the hazard ratios estimates calculated from the coefficients (exponentiated coefficients).[3] A hazard ratio greater than one is interpreted as decreasing firm survival, ceteris paribus, or if it is less than one it is increasing firm survival, all other things held constant.

The results in Table 8a, which cover all enterprises, show that larger, older, and more productive firms are less likely to exit. Firms that export, have foreign ownership as well as those that engage in R&D activities are also less likely to exit. These results are generally consistent with the earlier findings based on the probit regressions earlier presented. For capital intensity and PCM, the coefficients are not significant in both models using tariff and EPR as trade variables.

For tariff, the results show that firms in liberalized industries are less likely to exit. This is not consistent with the earlier Probit regression result which showed that the probability of exit is negatively associated with tariff reduction. For subsidy, the results are also not consistent with the earlier results. For the interaction terms, the results are the same as those obtained using Probit regression. Table 8b shows that tariffs, EPRs, and subsidy reduce firm survival while TFP, Age, Export, Ownership, R&D, and Size increase firm survival.

[3] This shows a difference only in how results are reported but not in the results themselves.

Table 8a: Cox Regression Coefficients: All Enterprises

	Tariff		Effective Protection Rate	
Variables	Model 1	Model 2	Model 3	Model 4
TFP	-1.282465*** (0.2326023)	-1.268221*** (0.24927)	-1.305329*** (0.2324436)	-1.320246*** (0.2482345)
Trade	0.0118659*** (0.0033614)	0.0146819*** (0.0035288)	0.0034157** (0.0014337)	0.0045196*** (0.0015842)
Age	-0.0124783*** (0.0018497)	-0.0122047*** (0.0018583)	-0.0127375*** (0.0018511)	-0.012554*** (0.0018606)
Export	-0.1708526** (0.0862863)	-0.2091858** (0.0940029)	-0.1780997** (0.0862421)	-0.2395161*** (0.0943428)
Ownership	-0.2982231*** (0.0657143)	-0.2842318*** (0.075896)	-0.2981939*** (0.065726)	-0.3018069*** (0.0760727)
Size	-0.0002116*** (0.0000715)	-0.0020188*** (0.000742)	-0.0002116*** (0.0000714)	-0.0025278*** (0.0006623)
PCM	-0.0990906 (0.2025448)	-0.1096344 (0.2024222)	-0.081342 (0.2017234)	-0.1042922 (0.2011097)
KL	-6,61E-09 (0.0000000382)	-1.68e-08 (4.07e-08)	-1,09E-08 (0.0000000395)	-1.91e-08 (4.14e-08)
Subsidy	0.9053235*** (0.1038228)	0.9080318*** (0.1034824)	0.9330335*** (0.103237)	0.9392586** (0.1028273)
R&D	-0.2175792** (0.111292)	-0.2286217** (0.1120463)	-0.2159311** (0.1112454)	-0.2231774* (0.1119451)
Size*trade		-.00002** (0.00000883)		-3.36e-06* (1.97e-06)
Size*Ownership		0.0000932 (0.0001575)		0.0001627 (0.0001584)
Size*Export		0.000159 (0.0001397)		0.0003113** (0.0001314)
Size*TFP		0.0016375** (0.0006317)		0 .00185*** (0.0005961)
Year	Y	Y	Y	Y
Industry	Y	Y	Y	Y
Obs	11753	11753	11753	11753
Log likelihood	-15546,413	-15529,819	-15549,679	-15535,037
Test of proportional-hazards assumption	chi2 74.92 Prob>chi2 0	chi2 66.56 Prob>chi2 0	chi2 74.67 Prob>chi2 0	chi2 67.84 Prob>chi2 0

Notes: ***significant at 1%, ** significant at 5% and * significant at 10%. Numbers in parentheses are error terms.

Table 8b: Cox Hazards Function Estimation Results: All Enterprises

	Tariff		Effective Protection Rate	
Variables	Model 1	Model 2	Model 3	Model 4
TFP	0.2773527*** (0.0645129)	0.2813318*** (0.0701276)	0.2710834*** (0.0630116)	0.2670696*** (0.0662959)
Trade	1.011937*** (0.0034015)	1.01479*** (0.003581)	1.003422** (0 .0014386)	1.00453*** (0.0015914)
Age	0.9875992*** (0.0018268)	.9878695*** .001835 8	.9873432*** (0.0018277)	.9875245*** (0.0018374)
Export	.8429458** .072734 6	0.8112445** (0.0762593)	0.836859** (0.0721725)	0.7870086*** (0.0742486)
Ownership	0.7421357*** (0.0487689)	0.7525921*** (0.0571187)	0.7421574*** (0.0487791)	0.7394808*** (0.0562543)
Size	0.9997884*** (0.0000715)	0.9979832*** (0.0007405)	0.9997884*** (0.0000714)	0.9974754*** (0.0006606)
PCM	0.9056606 (0.1834369)	0.8961617 (0.181403)	0,9218783 (0.1859644)	0.900962 (0.1811922)
KL	1 (0.0000000382)	1 (0.0000000407)	1 (0.0000000395)	1 (0.0000000414)
Subsidy	2.472732*** (0.2567259)	2.479438*** (0.2565782)	2.542209*** (0.2624501)	2.558084*** (0.263041)
R&D	0.8044639** (0.0895304)	0.7956295** (0.0891473)	0.8057908** (0.0896406)	0.7999729** (0.089553)
Size*trade		0.99998** (0.00000883)		0.9999966* (0.00000197)
Size*Ownershi p		1.000093 (0.0001575)		1.000163 (0.0001584)
Size*Export		1.000159 (0.0001397)		1.000311** (0.0001314)
Size*TFP		1.001639*** (0.0006328)		1.001852*** (0.0005972)

Notes: Size Dummy is equal to 1 if firm is SME and 0 otherwise. ***significant at 1%, ** significant at 5% and * significant at 10%. Numbers in parentheses are error terms.

One of the main assumptions of the Cox proportional hazard model is proportionality[4]. Using the Schoenfeld residuals or phtest in Stata, the proportionality of the model as a whole is tested (null hypothesis is the proportional hazards or PH assumption holds for all variables). If the tests are not significant (p-value over 0.05), then we cannot reject proportionality and we assume we do not have a violation of

[4] A key assumption of the Cox model is that the hazard rates for two observations are proportional to one another and that proportionality is maintained over time. The relative hazard for any two observations I and j must obey the following relationship: $\frac{h_o(t)e^{X_i\beta}}{h_o(t)e^{X_j\beta}} = \frac{e^{X_i\beta}}{e^{X_j\beta}}$

the proportional assumption.[5] The results show that in all four models, the proportionality assumption is violated. Note that given the violation of the proportional hazard assumption, great care must be exercised in interpreting the results. Violation of the proportional hazard assumption would tend to overestimate the effect of variables whose hazard ratios are increasing over time and underestimate the effect of variables whose hazard ratios are decreasing.

Table 9a examines the survival of SMEs and large enterprises. In Models (1) and (2) using tariffs, the results show that older and more productive firms are less likely to exit. Firms that export and have foreign equity are also less likely to exit. However, for subsidy and tariffs, the results are not the same as those obtained using Probit regression. The Cox regression results show that firms receiving government subsidy are more likely to exit while tariff is positively associated with the probability of exit. Table 9b shows that for SMEs, tariffs and subsidy increase firm survival while TFP, Age, Export, and Ownership decrease firm survival. Note, however, that in both models based on tariffs and EPR, the proportionality assumption is violated.

For large enterprises, the results show that capital-intensive firms and those engaged in R&D and export activities are less likely to exit. The results also indicate that while productivity, age and size have the correct signs, they are not significant. Tariffs, subsidy, and PCM are also not significant. Based on the hypothesis of "liability of senescence", elder enterprises that cannot better adapt to the changing and competitive environment because they are more rigid than the younger enterprises are again faced with death risk increases. This may explain the importance of capital-intensity, foreign partnership, and R&D activities to the survival of large enterprises to help them in adjusting to the changing and highly competitive market environment.

[5] http://www.ats.ucla.edu/STAT/stata/seminars/stata_survival/default.htm

Table 9A: Cox Regression Coefficients by Size

	SMEs		Large Enterprises	
Variables	Tariff (Model 1)	EPR (Model 2)	Tariff (Model 3)	EPR (Model 4)
TFP	-1.067301*** (0.2572119)	-1.096158*** (0.257092)	-0.2461041 (0.6336783)	-0.2371803 (0.6336249)
Trade	0.0126339*** (0.0036184)	0.0037748** (0.0017184)	0.0032592 (0.0090646)	0.0032434 (0.0027427)
Age	-0.0133611*** (0.0021591)	-0.0136428*** (0.0021617)	-0.0048546 (0.0034741)	-0.0049709 (0.0034703)
Export	-0.1847539* (0.1048389)	-0.1895398* (0.1047557)	-0.2833838* (0.1623095)	-0.2872382* 0.1619031
Ownership	- .2479716*** .0815659	- .2551554*** .0814813	-0.1803728 (0.1197515)	-0.1730197 (0.1200182)
PCM	0.0956431 (0.231748)	0.1135925 (0.2302657)	-0.4267731 (0.4561601)	-0.4192014 (0.4572815)
KL	2.01e-08 (3.36e-08)	1.76e-08 (3.50e-08)	- 0.000000319* (0.000000169)	- 0.000000321* (0.000000169)
Subsidy	1.255046*** (0.1234556)	1.287554*** (0.122512)	0.0503866 (0.1968305)	0.0549929 (0.1968498)
R&D	-0.1749905 (0.1373236)	-0.1795886 (0.1372452)	-0.3679606* (0.1923418)	-0.3627136* (0.1924064)
Year	Y	Y	Y	Y
Industry	Y	Y	Y	Y
Obs	7785	7785	3968	3968
Log likelihood	-12065,056	-12068,687	-2463,3978	-2462,702
Test of proportional-hazards assumption	chi2 58.14	chi2 59.24	chi2 20.37	chi2 17.79
	Prob>chi2	Prob>chi2	Prob>chi2	Prob>chi2
	0	0	0,4982	0,6621

Notes: ***significant at 1%, ** significant at 5% and * significant at 10%. Numbers in parentheses are error terms.

Table 9b: Cox Hazards Function Estimation Results by Size

	SMEs		Large Enterprises	
Variables	Tariff (Model 1)	EPR (Model 2)	Tariff (Model 3)	EPR (Model 4)
TFP	0.3439355*** (0.0884643)	0.3341525*** (0.0859079)	0.7818408 (0.4954356)	0.7888491 (0.4998344)
Trade	1.012714*** (0.0036644)	1.003782** .001724 9	1.003265 .009094 2	1.003249 (0.0027517)
Age	0.9867278*** .002130 5	0.9864498*** (0.0021324)	0.9951572 (0.0034572)	0.9950415 (0.0034531)
Export	0.8313088* (0.0871535)	0.8273398* (0.0866685)	0.7532307* (0.1222565)	0.750333* (0.1214813)
Ownershi p	0.7803821*** (0.0636525)	0.7747961*** (0.0631314)	0.8349589 (0.0999876)	0.8411211 (0.1009498)
PCM	1.100366 (0.2550076)	1.120295 (0.2579656)	0.6526116 (0.2976954)	0.6575718 (0.3006954)
KL	1 (0.0000000336)	1 (0.000000035)	0.9999997* (1.69e-07)	0.9999997* (1.69e-07)
Subsidy	3.507999*** (0.4330823)	3.623913*** (0.4439728)	1.051678 (0.2070022)	1.056533 (0.2079783)
R&D	0.839465 (0.1152783)	0.8356139 (0.114684)	0.6921444* (0.1331283)	0.6957857* (0.1338736)

Notes: ***significant at 1%, ** significant at 5% and * significant at 10%. Numbers in parentheses are error terms.

Table 9b shows that for large enterprises, the results show that Export, capital intensity (though the hazard ratio is very close to 1), and R&D increase firm survival. The hazard ratios of Trade and Subsidy are greater than one, but are not statistically significant. The proportionality of the model as a whole was tested. For both Models 3 and 4, the proportionality assumption is not violated (given the p-values of 0.4982 and 0.6621, respectively)[6] indicating that proportionality cannot be rejected.

[6] P-value less than 0.05 indicate violation of proportional hazards assumption.

6. Conclustions and Policy Implications

The paper aims to examine the relationship between globalization and the survival of SMEs using both tariffs and effective protection rates as globalization proxy variables. These are added to the factors that affect firm exit consisting of firm characteristics such as age, size, productivity, capital intensity, ownership, export, and R&D. Government subsidy and price cost margins at the industry level are also included. To capture firm heterogeneity, firm size was interacted with tariffs and effective protection rates as well as with firm characteristics such as productivity, ownership and export.

Data on the Philippine manufacturing industry covering eight years from 1996 to 2006 are used in the empirical analysis. Two estimation methods are employed: Probit and Cox proportional hazard models. However, given the violation of the proportionality assumption, the results of the Cox regression must be interpreted with care. The Probit results confirm previous research finding that firm size, age, and productivity are important determinants of firm exit. Controlling for these attributes, the results show that tariffs are negatively correlated with firm exit and in the face of tariff reduction, the probability of exit is higher for small firms. Firm exit is greater for small enterprises characterized by low productivity, non-exporter and without foreign equity. Firms that have high level of productivity, engage in export activities and have foreign equity are better able to survive. These suggest that firm characteristics such as high productivity level, exports, and ownership structure can mitigate the effects of declining tariffs.

For the other control variables, the results show that firm subsidy is negatively correlated with the probability of exit and is highly significant. The results also show a significant negative coefficient on R&D indicating that lower probability of exit is associated with firms that have R&D activities.

The dataset was further divided into two groups: SMEs and large enterprises and analyzed the determinants of survival for each group separately. Using tariff as globalization variable, the results indicate the same general findings with older and more productive firms being less likely to exit. Firms with foreign ownership as well as those that are export-oriented are also less likely to exit. The coefficient on tariff is negative and highly significant indicating that firms facing reduced tariffs on their products are more likely to exit.

SMEs face a number of constraints such as scale disadvantage, lack of high-level employees, and financial access. To grow and adapt to the market environment and increase their survival probability, they need to increase their size. As many previous studies suggest, larger firms are more likely to have levels of output close to the minimum efficient scale (MES), ceteris paribus, hence smaller firms have an inherent size disadvantage (Holmes, Hunt, and Stone, 2010). Apart from scale disadvantage, smaller firms also suffer from lack of financial access. It is important to note that firms with foreign equity are more likely to survive due to the financial backing which is likely to be provided by the foreign partner.

Meanwhile, for large enterprises, the results show that the coefficient on the trade variable is negative and highly significant. Capital-intensity is significant with its negative coefficient indicating that more capital-intensive firms are less likely to exit. Export, subsidy, and R&D are also significant. The Cox regression results also show that for large enterprises, capital-intensive firms and those engaged in R&D and export activities are less likely to exit. Large enterprises must continue to learn to adapt quickly to the highly changing competitive environment by upgrading and innovating because as the "liability of senescence" shows, upon reaching a certain age, enterprises again face a rising death risk.

All these tend to show that in a more open trade and investment policy regime, firms need to adopt efficient methods to reduce cost, improve quality and enable more productive firms to grow more rapidly and increase their survival. It is widely accepted that multinational firms are a vital source of international capital and technology and their entry can facilitate the transfer of technical and business know-how resulting in productivity gains and competitiveness among domestic firms. The entry of multinational firms may also increase competition and force domestic firms to imitate and innovate. Multinationals also have established global or regional production bases where domestic firms can link with by serving as potential suppliers. With their extensive marketing networks, multinational firms also have the potential of making significant contributions to facilitating the marketing of exports of their domestic partners.

Government SME policy should be directed towards measures that would enhance firm productivity and attracting more foreign direct investment especially those that would improve SME linkages with multinational companies. Deepening linkages with multinational firms' international production networks would be important in realizing the potential gains from the trade and investment liberalization arising from regional economic integration through the ASEAN Economic Community. At the same time, policies should focus on carefully crafted support programs that would improve SME productivity to help them grow and develop. For large enterprises, policies should be directed on programs that would enhance innovation and upgrading activities.

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CHAPTER 8

The Exporting and Productivity Nexus: Does Firm Size Matter?

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The main purpose of this study is to examine whether the relationship between exporting and productivity differs across firm size in the Malaysian manufacturing sector. A firm-level panel data from the Study on Knowledge Content in Economic Sectors in Malaysia (MyKE) is used in the study. Overall, it is found that exporters are more productive than non-exporters. This productivity gap becomes less important as firms become larger. There is evidence that the selection process for exporting is binding only for small firms. Policies to encourage small firms to export need to focus on enhancement of human capital and foreign ownership.

Keywords: Globalization, Firm Size, Exporting, Productivity

JEL Classification: L60, O30, F14

1. Introduction

Firm-level heterogeneity has been an important feature of recent theories and empirical work in international trade.[1] This heterogeneity can take many forms such as - in terms of both characteristics (e.g. employment size, revenues, R\&D expenditure and exporting status) and performance (e.g. profitability, productivity and innovation). A key area of focus within this research literature is the positive relationship between exporting and productivity (Greenaway and Keller, 2007).

Firm size is an important dimension in the linkage between exporting and productivity for a number of reasons. First, large firms are often considered to have higher level of productivity than smaller sized firms. Second, given that exporting is often associated with high-level productivity, this suggests that larger firms have a higher tendency to export their products compared to smaller firms. This has significant policy implications especially given the importance of small and medium-sized enterprises (SMEs) in most economies.

The issue of how firm size might matter in the relationship between exporting and productivity is particularly important for countries that have a large proportion of SMEs and rely heavily on exporting as a driver of industrialization and economic growth. Malaysia is such a country. About 98.5 percent of the 78,000 firms in the country are SMEs (SME Annual Report 2012). These firms contribute towards 59 percent of total employment in the country. Despite this, SMEs contribution to total manufactured exports is only 30 percent. This state of affairs raises important questions about firm size, exporting and productivity.

To explore these issues, this paper seeks to examine whether the relationship between exporting and productivity differs across firms of different sizes. Findings from the study will contribute to existing body of empirical literature on the linkage between exporting and productivity. There has been relatively few studies on this topic from developing countries. It is also hoped that this study will strengthen evidence-based policy making in this area.

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[1] For surveys of these literatures, see Harrison et al. (2011), Redding (2011) and Bernard et al (2012).

The outline of the paper is as follows. Section 2 provides a review of the relevant literature. Methodological issues are discussed in Section 3. The empirical results are presented and discussed in Section 4. Policy implications are drawn in Section 5. Section 6 concludes.

2. Literature Review

The relationship between exporting and productivity is a key focus of the heterogeneous firm literature in international trade.[2] It was primarily motivated by earlier empirical evidence on exporters being more productive than non-exporters (Redding, 2011). Two distinct hypotheses have been articulated in the literature. Both differs in terms of the direction of causality between exporting and productivity.

In the `self-selection hypothesis' (SS Hypothesis), the causality runs from productivity to exporting in which firms with high ex-ante productivity choose to export because of the high sunk cost incurred in exporting. The theoretical support for this hypothesis can be found in the seminal paper by Melitz (2003) in which only the most productive firms export whilst less productive firms either supply only to domestic markets or exit the market. In contrast, the `learning by exporting hypothesis' (LE Hypothesis) proposes that firms gain higher ex-post productivity after exporting. This is due to a number of factors such new knowledge and expertise from buyers (innovation), scale economies and exposure to competition (reduction of ex-inefficiency). The earlier empirical literature have mostly found evidence in support of the self-selection hypothesis (see surveys by Greenaway and Kneller, 2007 and Wagner, 2007). However, more recent studies such as De Loecker (2013), De Loecker (2013) and Manjon et al (2013) with improved modelling of the productivity process have provided some evidence supporting the learning by exporting hypothesis.

Whilst the debate on the direction of causality between exporting and productivity continues, there has been increasing interest in the role of firm size. Firm size has traditionally be assigned as a control variable in the literature. Most studies have found

[2] The seminal contributions in the literature include Melitz (2003), Bernard et al (2003) and Helpman et al (2004).

exporters to be are larger in size than non-exporters (Wagner, 2007). This raises important questions about the sources of productivity gains related to exporting and more specifically, whether such sources are related to firm size. Internal sources of productivity growth include managerial talent, quality of factor inputs, IT, R&D, learning-by-doing and innovation (Syverson, 2011). Small and large firms could differ in terms of access to these sources of productivity growth (Leung et al, 2008). External factors such as regulations and access to financing could also be responsible for productivity differentials between small and large firms (Tybout, 2000).

One key study that has attempted to examine whether the learning by exporting and self-selection effects are affected by firm size is Mez-Castillejo et al (2010). In the study, the authors found that self-selection effects are only binding on small firms whilst learning by exporting effects are relevant to both small and large firms.

Finally, in the more recent literature, the role of firm size in trade has been analyzed by examining how trade affects firm size distribution. For example, di Giovanni et al (2011) has showed that the distribution of exporting firms has a lower power law exponent compared to non-exporting firms. The theoretical explanation for this result is that more productive firms are able to sell their products beyond the domestic markets (i.e. abroad). In addition, once a firm starts exporting to a given market, it is easier to export to other markets. In other papers, firm size distributions have important implications for welfare effects and volatility associated with trade (di Giovanni and Levchenko, 2012 and 2013).

3. Methodology

3.1. Theoretical Considerations

How might one think of a theoretical framework for analyzing the relationship between firm size, exporting and productivity? The self-selection hypothesis and learning by exporting hypothesis suggests that there are two distinct views on the relationship between exporting and productivity.

The theoretical argument for the self-selection hypothesis can be found in Melitz (2003) in which inter-firm productivity differentials amongst an otherwise ex ante identical potential entrant firms are generated via random draws from a given probability density function. Subsequent works have often adopted the Pareto distribution for productivity which has the following form:[3]

$$G_{\theta}(\theta) = 1 - \left(\frac{\theta_{min}}{\theta}\right)^{z} \qquad \text{, for } \theta \geq \theta_{min} > 0 \text{ and } z > 1$$

Note that there is no direct relationship between productivity and firm size at this stage of the modelling exercise. This size-productivity relationship is only establish via a selection process in which less productive firms exit the market whilst more productive ones continue to grow (size increase).[4] Thus, over time, more productive firms tend to be larger (Melitz, 2003, p.1700.).

The relationship between exporting and productivity is then established by characterizing exporting as an activity that incurs fixed cost. This implies that only firms with (higher) productivity exceeding a given threshold θ^* will be able to export. As productivity is positively related to firm size, larger firms are more likely to be exporters compared to smaller firms. From the perspective of firm size distribution, this implies that trade is associated with lower power law exponent due to its greater impact on large firms (di Giovanni, 2011).

These effects are attenuated by trade liberalization which increases the number of potential trading partners and reduces the fixed and variable costs of trading (Melitz, 2003). In so far as productivity is positively related to firm size, trade liberalization will have greater impact on larger firms. Thus, trade liberalization is likely to bring about changes in the distribution of productivity and firm size.

Unlike the self-selection hypothesis, the theoretical arguments used to support the learning by exporting hypothesis has mainly focused on endogenizing the evolution of

[3] See Helpman et al (2010) and di Giovanni et al (2011).

[4] A stationary equilibrium for productivity distribution is obtained in this model when two conditions are met, namely a zero-cutoff profit condition and a free entry condition.

productivity.[5] This is clearer in De Loecker (2011)'s comparison between an exogenous and endogenous models for the evolution of productivity (w):

$$w_{it} = g_1(w_{it}) + \xi_{it+1} \qquad \text{(Exogeneous)}$$

$$w_{it} = g_2(w_{it}, \mathbf{E}_{it}) + \xi_{it+1} \qquad \text{(Endogenous)}$$

where ξ is productivity shock and $\mathbf{E}$ is export experience.

Thus, the learning by exporting effects can be better estimated by taking into account productivity gains arising partly from exporting. Furthermore, this suggests the need to control for selection effects when estimating the learning by exporting effects (Mez-Castillejo et al, 2010).

The theoretical considerations in the literature suggest that it might be useful to begin with an analysis of the empirical distribution of firm size and productivity. This can be undertaken visually via density plots and more formally by using stochastic dominance tests. This can then be followed by testing the self-selection hypothesis and the learning by exporting hypothesis.

3.2. Empirical Models and Specifications

(a) Firm Size and Productivity Distributions

The starting point in analyzing exporting and productivity is an analysis of how firm size and productivity are distributed. This can be undertaken by examining the plots for probability density functions for both variables. This is undertaken using a non-parametric approach implemented with a kernel density smoother (Cabral and Mata, 2003, p.1076). Changes in the distribution of firm size and productivity can be discerned by comparing the density plots for year 2002 and 2006.

[5] The exogeneity of productivity change can come from assuming a fixed productivity distribution and a fixed productivity threshold for exporting. It would be interesting to see estimations of productivity thresholds for exporting.

Aside from visual examination, more formal test can be undertaken to examine the nature of the distributions. The Shapiro-Wilk test is used to test whether the size and performance variables are normally or lognormally distributed.

Another approach that has been used to study the relationship between firm size and trade involves the estimation of the power exponent (ξ_{LR}) from firm size distribution. A simple method involves regressing the natural log of ($\text{Rank}_i - 1/2$):

$$ln(\text{Rank}_i - 1/2) = \text{Constant} + \xi_{LR} lnS_i + \varepsilon_i$$

Theory suggests that the exponent of the power law is lower for exporting firms compared to non-exporting firms (di Giovanni, 2011). The Gini coefficient is also used to examine changes in the inequality of firm size and productivity distribution.

(b) Productivity Differentials by Firm Size

Stochastic dominance tests such as the Kolgomorov-Smirnov (KS) test can be used to test for productivity differences between three sets of firms belonging to different size class (small, medium and large) for 2002 and 2006. This is done by comparing the productivity distribution functions for the firms (F_t, G_t):

$$F_t(y_t) \text{ vs } G_t(y_t) \ , \ t = 2002, 2006$$

Comparing the test results for two separate period will help ascertain whether the productivity gap between small, medium and large firms have diverged over time. In addition, the KS test is applied to exporters and non-exporters. The size classification can be further broken down by exporting and non-exporting status to examine whether firm size and productivity is related to exporting.

(c) Self-Selection and Firm Size

The Kolgomorov-Smirnov test can also be used to test the self-selection hypothesis. As theorized by Melitz (2003), the productivity of export starters exceed the productivity threshold for exporting $\theta*$ for small, medium and large firms. In contrast, non-exporters's productivity will be less than $\theta*$

Thus, one approach of testing the hypothesis is by comparing at the productivity levels at t-1 for firms that started to export at time t ($\theta_{t-1}^{exp_t=1}$) with the productivity of non-exporters at t-1 ($\theta_{t-1}^{exp_t=0}$). If the hypothesis holds, then:

$$F_{t-1}(\theta^{exp_t=1}) > G_{t-1}(\theta^{exp_t=0})$$

This can be directly tested using the K-S test. The test can also be applied for three class of firm sizes to see if firm size matters in the self-selection to exporting.

(d) Learning by Exporting and Firm Size

The learning by exporting hypothesis can be tested using matching techniques. Matching techniques entail the selection of a control group from non-exporters with similar characteristics to export starters in the pre-export entry period. The impact of exporting on productivity growth for firm \$i\$ which started exporting in period \$t\$ can be expressed as:[6]

$$\Delta y_{i(t-1)+s}^{1} - \Delta y_{i(t-1)+s}^{0}$$

where $\Delta y_{i(t-1)+s}^{1}$ is productivity growth for export starter and $\Delta y_{i(t-1)+s}^{0}$ productivity growth for non-exporter. The average effect can then be expressed as:

$$E(\Delta y_{i(t-1)+s}^{1} \mid D_{it} = 1) - E(\Delta y_{i(t-1)+s}^{0} \mid D_{it} = 1)$$

where $D_{it} \in \{0,1\}$ is an indicator for non-exporter and exporter.

[6] This follows from the exposition in Manjon et al (2013).

As $\Delta y^{0}_{i(t-1)+s}$ for an export starter is not observable, the above expression has to be revised by incorporating a counterfactual for the term and a distribution of observable variables (*X*) that affects productivity growth and exporting:

$$E(\Delta y^{1}_{i(t-1)+s} \mid X_{it-1}, D_{it-1} = 1) - E(\Delta y^{0}_{i(t-1)+s} \mid X_{it-1}, D_{it} = 0)$$

The set of variables in *X* includes firm size, foreign ownership, computer utlization, R&D investments, government support, average MFN tariff and industry effects. The use of the above expression is premised upon the assumption that condition on *X*, firms are randomly exposed to exporting. The matching procedure entails two steps. First, a logit model is used to estimate the probability of starting to export:

$$P\left(D_{it} = 1\right) = F\left(X_{it-1}\right)$$

This procedure provides the propensity scores that are used to: (i) match the non-exporters and export starters, and (ii) compare the productivity growth of similar export starters and non-exporters.

3.3 Data Source and Definitions

(a) Data Source

This study employs manufacturing survey data from the Economic Planning Unit's *Malaysian Knowledge Content Survey* (MKCS). The data covers two years period, namely 2002 and 2006. The 2002 MKCS and 2006 MKCS contain 1,118 firms and 1,148 firms, respectively. A balanced panel can be constructed for 753 firms. In datasets, information on exporting status is available in percentage of total revenues derived from export. The R&D variable is a dummy variable constructed from R&D expenditure in the datasets. Two sources of government assistance is included, namely, (i) support for research, commercialization and technology acquisition (Govt Research), and (ii) support for finance, accounting and taxation taking the form of advice and referral (Govt Finance). Other variables used in the propensity score matching includes natural log of the number of computers used, firm size (natural log of number of employees), foreign ownership dummy variable (proxied by foreign head office), percent of employee with degree and average MFN tariff (trade liberalization).

(b) Firm Size Definitions

Firm size is classified into four categories based on the official definition used in Malaysia. They are as follows for the manufacturing sector:

- Micro - Annual sales turnover of less than RM250,000(USD83,300) or full time employees less than 5
- Small - Annual sales turnover from RM250,000 (USD83,300) to less than RM10 mil (USD3.3 mil) or full time employees from 5 to less than 50
- Medium - Annual sales turnover from RM10 mil (USD3.3 mil) to less than RM25 mil (USD8.3 mil) or full time employees between 51 and 150
- Large - Annual sales turnover exceeding RM25 mil (USD8.3 mil) or full time employees exceeding 150

Firm size is defined in terms of the total number of employees. Based on the above definitions, small and medium enterprises (SMEs) are firms with total employees not exceeding 150 employees.

4. Emperical Results

4.1. Summary Statistics

A brief summary statistics of the unbalanced and balanced datasets used in this study is presented in **Table 1**. Overall, there are significant variations in firm size (measured in terms of number of full time employees). The mean firm size in MKCS2002 and MKCS2006 fall into the category of large firm based on the Malaysian official definition i.e. more than 150 employees. In the datasets, SMEs account for 70 percent of total firms. This is below the national average of about 98 percent indicating that the balanced sample contain more large firms compared to the firm population.

Table 1: Basic Descriptive Statistics

Unbalanced Data				
Size (employees)	**Mean**	**Std. Dev.**	**Min.**	**Max.**
MKCS2002	202,00	400,00	3,00	6086,00
MKCS2006	230,00	567,00	2,00	9879,00
Size Category	**Small**	**Medium**	**Large**	**Total**
MKCS2002	332,00	441	345	1118
(%)	(29.7)	(39.5)	(30.8)	(100.0)
MKCS2006	389	410	349	1148
(%)	(33.9)	(35.7)	(30.4)	(100.0)
Exporting Status	**Exporter**	**%**	**Non-Exporter**	**%**
MKCS2002	846	75.7	272	24.3
MKCS2006	646	56.3	502	43.7
R&D Activity	**Yes**	**%**	**Non-Exporter**	**%**
MKCS2002	295	26.4	823	73.6
MKCS2006	336	29.3	812	70.7
Balanced Data				
Size (employees)	**Mean**	**Std. Dev.**	**Min.**	**Max.**
MKCS2002	232	442	3,00	6086,00
MKCS2006	263	561	2,00	8471
Size Category	**Small**	**Medium**	**Large**	**Total**
MKCS2002	172	315	266	753
(%)	(22.9)	(41.8)	(35.3)	(100.0)
MKCS2006	189	285	279	753
(%)	(25.0)	(37.9)	(37.1)	(100.0)
Exporting Status	**Exporter**	**%**	**Non-Exporter**	**%**
MKCS2002	586	77.8	167	22.2
MKCS2006	463	61.5	290	38.5
R&D Activity	**Yes**	**%**	**Non-Exporter**	**%**
MKCS2002	225	29.9	528	70.1
MKCS2006	242	32.2	511	67.8

Source: MKCS2002 & MKCS2006, Economic Planning Unit.

The sampling bias can also be detected in terms of the percentage of firms in the datasets that are exporting. About 75 percent of the firms in MKCS2002 are exporters. The incidence of exporting in the MKCS2006 sample is lower at 56 percent. In the 2005 Census, the proportion of firms exporting are much lower, i.e. between 16 percent to 49 percent. This indicates that both datasets contain a higher proportion of exporters compared to the national average. The proportion of firms undertaking R\&D activities is lower at around 30 percent in both datasets.

Recall that the number of observations in the unbalanced datasets is 1,118 for MKCS2002 and 1,148 for MKCS2006. The balanced dataset has 753 observations. Thus, the balance datasets are about 33 percent smaller than the unbalanced datasets. Despite this reduction in sample size, the characteristics of balance datasets are similar to that of the larger unbalanced datasets. The incidence of exporting and R\&D is slightly higher in the balanced datasets compared to the unbalanced datasets.

4.2. Firm Size and Productivity Distributions

The density plot for firm size (number of employees) for unbalanced data is presented in **Figure 1**. Both plots suggest that the distribution of firm size for 2002 and 2006 is non-Gaussian. The mass of the density function is skewed more towards the left compared to the normal distribution indicating a very high proportion of the firms are smaller-sized firms. This is clearer in the lognormal plot for firm size distribution (**Figure 2**). The lower tail of the density functions is higher than what one would expect for the Gaussian distribution. The opposite holds for the upper tail of the distribution. The non-Gaussian nature of the firm size distribution is confirmed from the results from the Shapiro-Wilks test. These results are consistent with the general empirical findings on firm size distribution, namely they are skewed (Axtell, 2001) as well as the assumptions made in the theoretical literature (Helpman et al, 2004).

Figure 1: Firm Size Distribution (Unbalance), 2002 & 2006

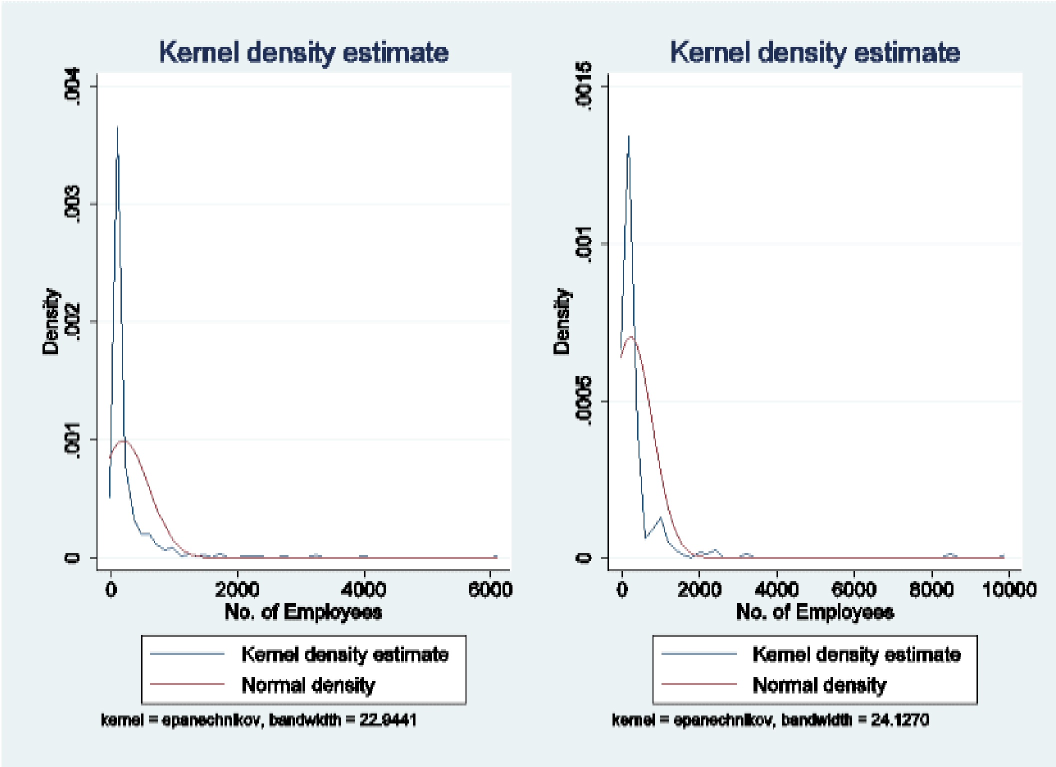
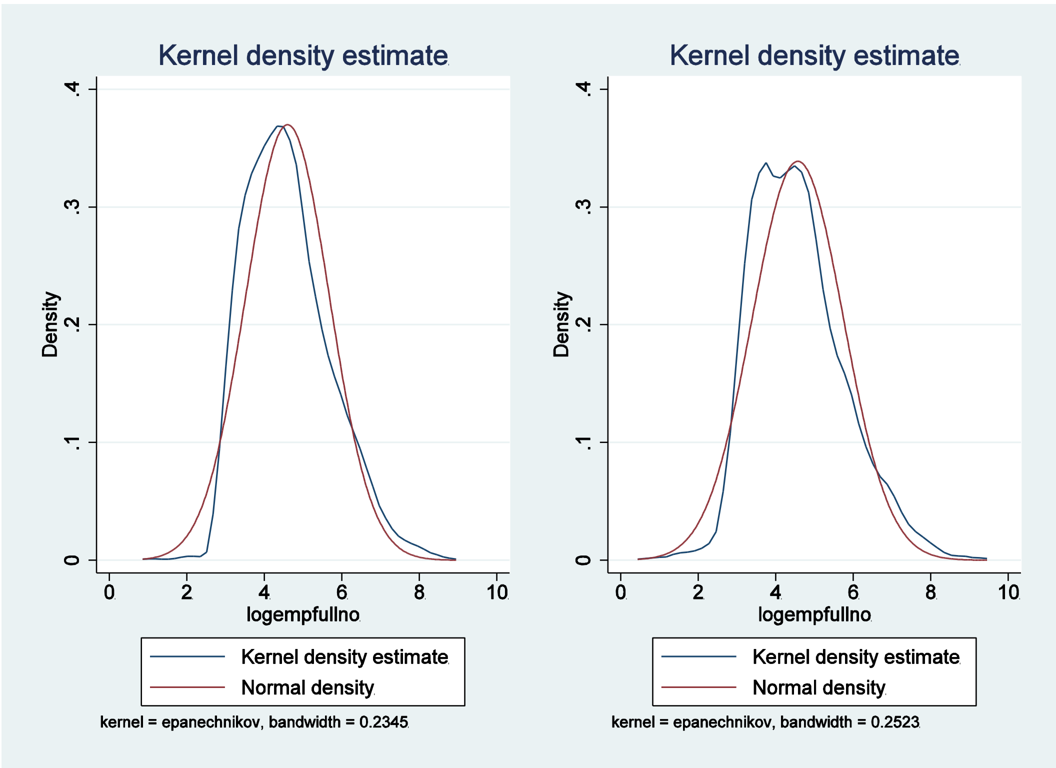
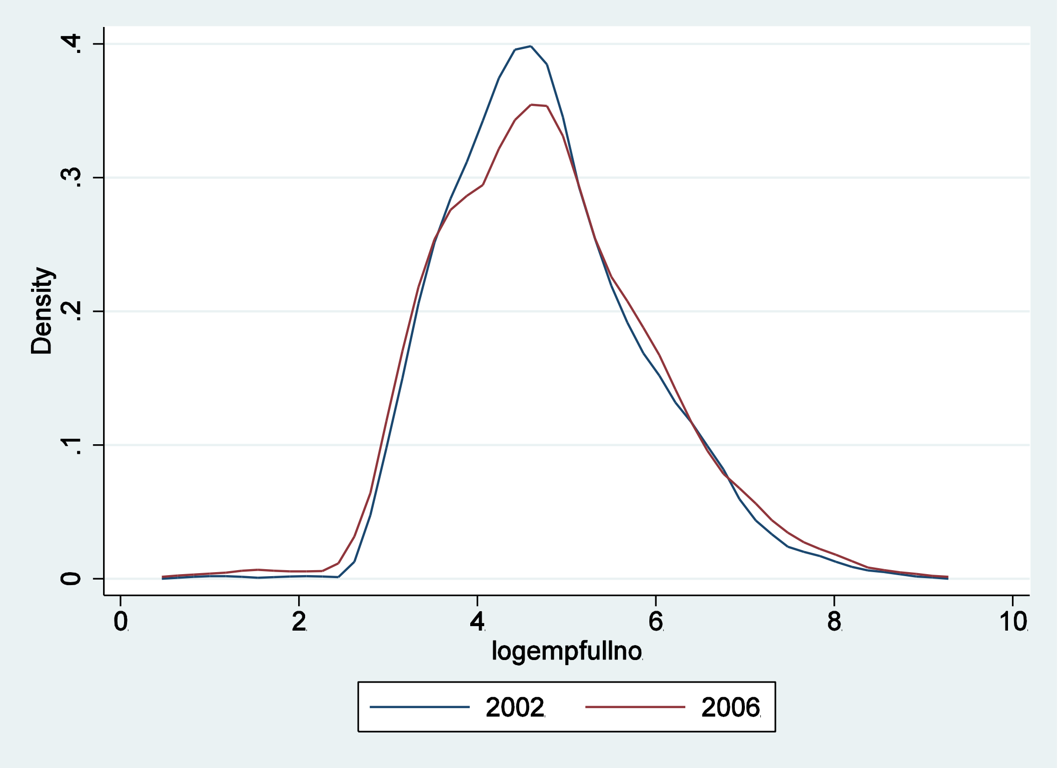


Figure 2: Firm Size Distribution (Lognormal, Unbalanced), 2002 & 2006



The lognormal density plots for firm size distribution for years 2002 and 2006 two years using balanced datasets are presented in **Figure 3**. It would appear that the density plot for 2006 is slightly ‘flatter’ compare to that obtained for 2002 - suggesting a greater dispersion of firm size. As the lower and upper tails of the distribution for 2006 is higher than that of 2002 - it suggests greater inequality in firm size distribution. This is supported by a slight increase in the Gini coefficient for firm size from 0.614 in 2002 to 0.648 in 2006.

Figure 3: Firm Size Distribution (Balanced), 2002 & 2006



Comparing the productivity distribution for 2002 and 2006 indicates that there is an overall increase in the productivity of firms over the 2002-2006 period (**Figure 4**). More interestingly, whilst almost all exporting firms experienced an increase in productivity (**Figure 5**), the same cannot be said for non-exporters (**Figure 6**). Productivity gains are largest at higher levels of productivity for exporters and non-exporters - suggesting that larger firms might be experiencing larger productivity gains.

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Figure 4: Productivity Distribution (Balanced), 2002 & 2006

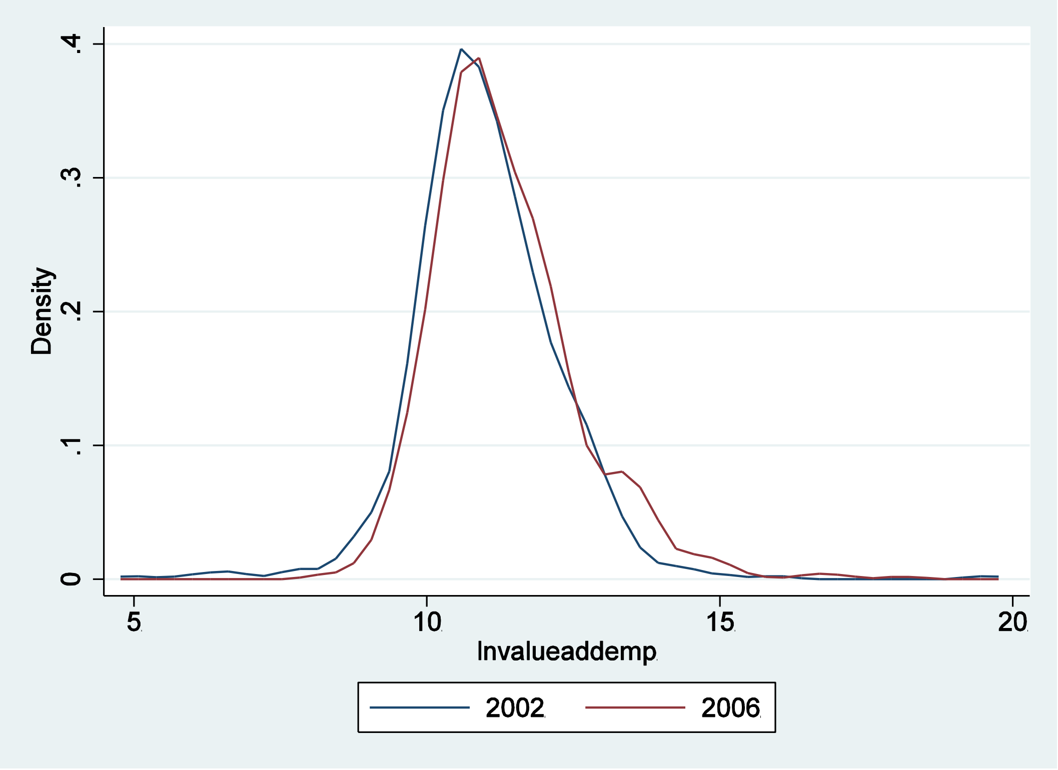


Figure 5: Exporters Productivity Distribution (Balanced), 2002 & 2006

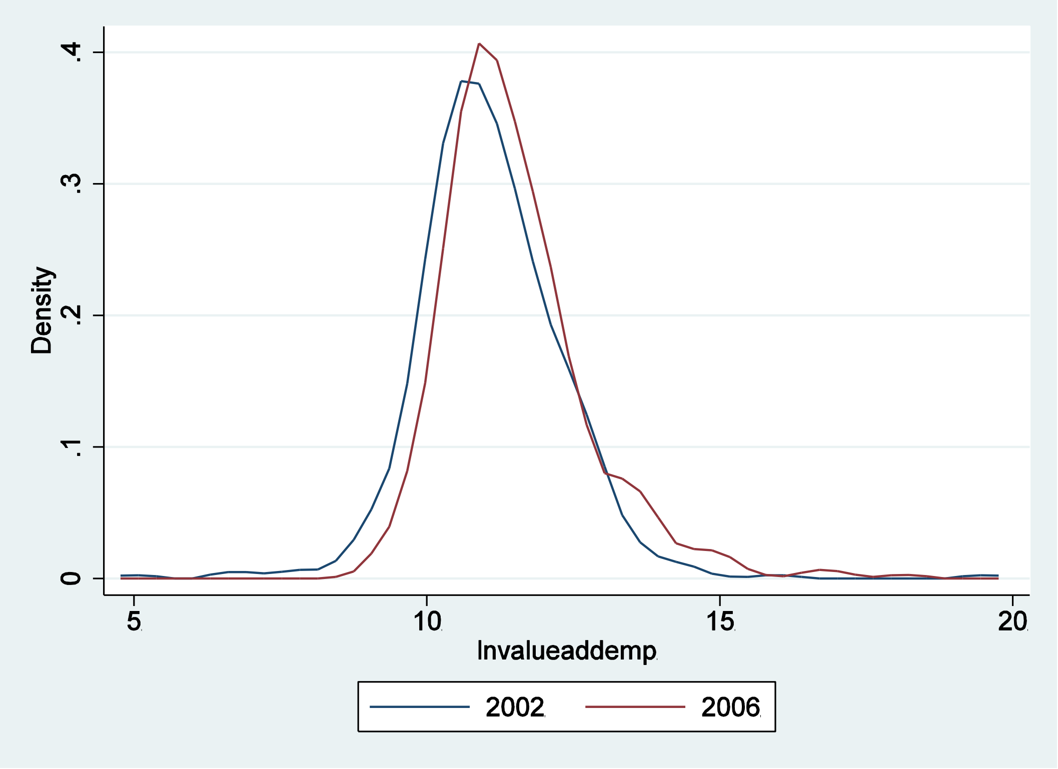
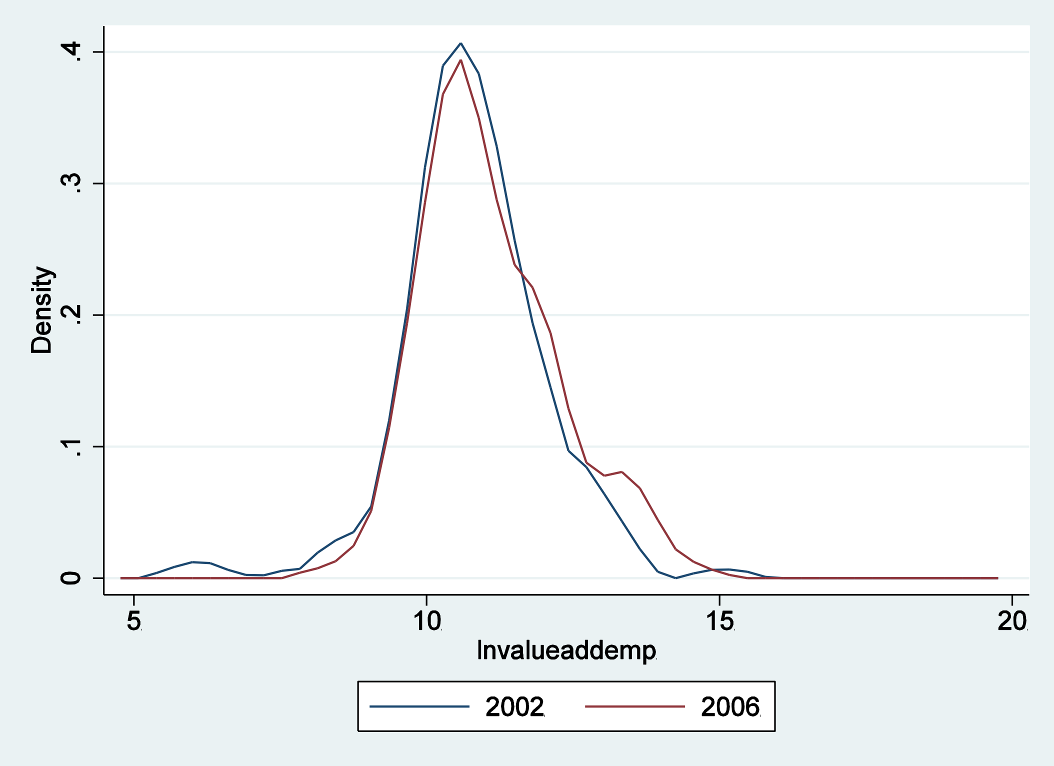


Figure 6: Non-Exporters Productivity Distribution (Balanced), 2002 & 2006



4.3. Productivity Differentials by Firm Size

Results from the Kolgomorov-Smirnov tests indicates that, in general, there is transitivity in productivity across different firm size: large firms have higher productivity than medium-sized firms, which in turn have higher productivity levels than small firms (**Table 2**). The exception is the difference in productivity of medium and large firms for year 2002. The productivity gap between these different categories of firm size have decline when we compare the 2002 and 2006 datasets.

Table 2: Differences in Productivity Between Small, Medium and Large Firms

MKCS2002, Value Added per Worker			
Smaller Group	**D**	**P-Value**	**Corrected**
Small	0,2553	0,088	
Medium	-0,0577	0,883	
Combined K-S	0,1572	0,176	0,122
MKCS2006, Value Added per Worker			
Smaller Group	**D**	**P-Value**	**Corrected**
Small	0,1313	0,001	
Medium	-0,0024	0,998	
Combined K-S	0,1313	0,002	0,002
MKCS2002, Value Added per Worker			
Smaller Group	**D**	**P-Value**	**Corrected**
Medium	0,1062	0,504	
Large	-0,0511	0,853	
Combined K-S	0,1062	0,883	0,84
MKCS2006, Value Added per Worker			
Smaller Group	**D**	**P-Value**	**Corrected**
Medium	0,091	0,044	
Large	-0,0362	0,61	
Combined K-S	0,091	0,088	0,075

Source: Author's computation.

As expected, exporters have higher productivity than non-exporters. This result is more robust for the 2006 dataset (**Table 3**). The productivity gap between non-exporters and exporters seem to have decline when we compare the results from 2002 and 2006.

Table 3: Differences in Productivity Between Non-Exporters and Exporters

MKCS2002, Value Added per Worker			
Smaller Group	**D**	**P-Value**	**Corrected**
Non-Exporter	0,2149	0,145	
Exporter	-0,0543	0,884	
Combined K-S	0,2149	0,288	0,213
MKCS2006, Value Added per Worker			
Smaller Group	**D**	**P-Value**	**Corrected**
Non-Exporter	0,1592	0,000	
Exporter	-0,0062	0,979	
Combined K-S	0,1592	0,000	0,000

Source: Author's computation.

Table 4 provides a summary of the KS test for differences in productivity within samples of small, medium and large-sized firms. Within each category of firm-size, the productivity gaps between exporters and non-exporters are less significant. However, comparing the productivity gap across firm size, it appears that the productivity gap between exporters and non-exporters become less important as firm size increases.

Table 4: Differences in Productivity Between Non-Exporters and Exporters

MKCS2002			
Small Firms, Value Added per Worker			
Smaller Group	**D**	**P-Value**	**Corrected**
Non-Exporter	0,2667	0,357	
Exporter	-0,1238	0,801	
Combined K-S	0,2667	0,682	0,573
Medium Firms, Value Added per Worker			
Smaller Group	**D**	**P-Value**	**Corrected**
Non-Exporter	0,3049	0,251	
Exporter	-0,1473	0,724	
Combined K-S	0,3049	0,493	0,364
Large Firms, Value Added per Worker			
Smaller Group	**D**	**P-Value**	**Corrected**
Non-Exporter	0,2887	0,723	
Exporter	-0,2324	0,810	
Combined K-S	0,2887	0,997	0,990
MKCS2006			
Small Firms, Value Added per Worker			
Smaller Group	**D**	**P-Value**	**Corrected**
Non-Exporter	0,2229	0,000	
Exporter	-0,0076	0,990	
Combined K-S	0,2229	0,000	0,000
Medium Firms, Value Added per Worker			
Smaller Group	**D**	**P-Value**	**Corrected**
Non-Exporter	0,0997	0,140	
Exporter	-0,0566	0,530	
Combined K-S	0,0997	0,279	0,240
Large Firms, Value Added per Worker			
Smaller Group	**D**	**P-Value**	**Corrected**
Non-Exporter	0,0935	0,347	
Exporter	-0,0492	0,746	
Combined K-S	0,0935	0,665	0,608

Source: Author's computation.

4.4. Self-Selection and Firm Size

Comparing the stochastic dominance tests for productivity between export starters (in 2006) and non-exporters across different firm sizes yield some interesting results (**Table 5**). For all firms, export starters generally have higher productivity levels compared to non-exporters (prior to exporting). Even though the productivity gap between export starters and non-exporters are larger for large firms compared to small firms, the statistical significance becomes weaker as firm size increases. This suggests that the role of productivity in self-selection is greater for small firms compared to large firms. This finding is consistent with Mes-Castillejo et al (2010) which also found that self-selection effects are only binding on small firms.

Table 5: Differences in Productivity Between Export Starters and Non-Exporters

All Firms, Value Added per Worker			
Smaller Group	**D**	**P-Value**	**Corrected**
Non-Exporter	0,1612	0,000	
Exporter	-0,0031	0,994	
Combined K-S	0,1612	0,000	0,000
Small Firms, Value Added per Worker			
Smaller Group	**D**	**P-Value**	**Corrected**
Non-Exporter	0,224	0,000	
Exporter	-0,0076	0,990	
Combined K-S	0,224	0,000	0,000
Medium Firms, Value Added per Worker			
Smaller Group	**D**	**P-Value**	**Corrected**
Non-Exporter	0,1036	0,000	
Exporter	-0,055	0,539	
Combined K-S	0,1036	0,223	0,189
Large Firms, Value Added per Worker			
Smaller Group	**D**	**P-Value**	**Corrected**
Non-Exporter	0,0976	0,308	
Exporter	-0,00534	0,703	
Combined K-S	0,0976	0,598	0,539

Source: Author's computation.

One possible explanation for this observation is that small firms that are exporting may focus on selling products that are less sophisticated markets (Mes-Castillejo et al, 2010) . There is some indirect evidence for this in the sample of firms in this study (**Table 6**). Smaller firms tend to focus on domestic markets (within state and national).

In addition, small exporting firms tend to focus more on ASEAN+3 markets rather that outside ASEAN+3 markets (possibly more advanced markets in EU and the United States).

Table 6: Main Market Destinations for Firms

Main Market	Frequency	Percent	Cummulative
All Firms			
Within state	264	35,1	35,1
National	232	30,8	65,9
ASEAN + 3	119	15,8	81,7
International	138	18,3	100,0
Total	753	100,0	
Large Firms			
Within state	56	21,1	21,1
National	84	31,6	52,6
ASEAN + 3	48	18,0	70,7
International	78	29,3	100,0
Total	266	100,0	
Medium Firms			
Within state	126	40,0	40,0
National	95	30,2	70,2
ASEAN + 3	50	15,9	86,0
International	44	14,0	100,0
Total	315	100,0	
Small Firms			
Within state	81	47,4	47,4
National	53	31,0	78,4
ASEAN + 3	21	12,3	90,6
International	16	9,4	100,0
Total	171	100,0	

Source: Author's computation.

4.5. Learning by Exporting and Firm Size

Results from all three matching estimators were consistent (**Table 7**). Overall, the differences in productivity growth between exporters and non-exporters were not significant for large firms but were weakly significant for medium-sized firms. The number of observations for small-sized firms were insufficient to apply propensity score matching. This result differs slightly from evidence from the existence literature which has found the learning by exporting to be relevant for firm of different size categories. The difference in result could be due to the fact that the effects of exporting on productivity growth in this study is only estimated four years after firms started exporting. Additional evidence on annual productivity growth may be required to examine the dynamics of productivity growth after firms start to export.

Table 7: Productivity Growth for Export Starters

Sample **Neighbor**	Treated	Controls	Difference	S.E.	T-stat	Untreated	Treated	Obs.
All Firms								
ATT	0,305485	0,324006	-0,01852	0,176939	-0,1	209	373	582
Large								
ATT	0,327929	0,321177	0,006753	0,20889	0,03	136	326	462
Medium								
ATT	0,298447	-0,24962	0,548071	0,353619	1,55	67	35	102
Small								
ATT	.	.	.	.	.	.	.	.
Kernel								
All Firms								
ATT	0,305485	0,316825	-0,01134	0,137164	-0,08	209	373	582
Large								
ATT	0,340984	0,365516	-0,02453	0,17203	-0,14	136	326	462
Medium								
ATT	0,342088	-0,04845	0,390542	0,305772	1,28	67	35	102
Small								
ATT	.	.	.	.	.	.	.	.
Radius								
All Firms								
ATT	0,305485	0,205587	0,099898	0,064824	1,54	209	373	582
Large								
ATT	0,327929	0,298253	0,029676	0,067641	0,44	136	326	462
Medium								
ATT	0,298447	0,07474	0,223707	0,213651	1,05	67	35	102
Small								
ATT	.	.	.	.	.	.	.	.

Source: Author's computation.

5. Policy Implications

The productivity differentials between exporters and non-exporters suggest that Malaysia should continue to promote export oriented industrialization to achieve higher productivity-driven growth. Given that productivity differentials are particularly significant for SMEs than for large firms, industrial policies should continue to have a firm-size dimension. Different incentives and support services are likely to be needed for SMEs and large firms given the differences in importance of productivity differentials between exporters and non-exporters.

The evidence from this study also suggests that policies that enhance productivity are likely to be important to encourage small firms to start exporting. These include policies that enhance human capital.[7] Foreign participation in SMEs might be another important area of focus given the linkage between export destinations and productivity. More efforts are likely to be needed to provide support for foreign participation in SMEs to encourage them to start exporting.

6. Conclusions

Firm size and productivity distributions are found to be both skewed indicating that inequality is a common feature in the manufacturing sector. In terms of firm size, large firms have higher productivity than medium-sized firms, which in turn have higher productivity levels than small firms.

Productivity growth has been widespread across the board for exporters compared to non-exporters. Overall, exporters are more productive than non-exporters - a finding that is consistent with existing evidence in the literature. However, The productivity gap between non-exporters and exporters have declined during the 2002-2006 period. Furthermore, the productivity gap between exporters and non-exporters tends to decline with firm size - implying that the relationship between productivity and exporting is

[7] For example, independent variable such as percentage of employee with degrees is statistically significant in regressions involving labour productivity for small-sized export starters.

likely to be stronger for small firms compared to large firms. This is consistent with the finding that the selection effects are binding only for small sized firms. There is some evidence of learning by exporting effects for medium sized firms but there is insufficient data to examine whether such effects apply to small sized firms as well.

The policy implications from this study suggest that efforts should be targeted towards enhancing productivity to encourage firms to start exporting. This is particularly relevant for small firms. Such policies include enhancement of human capital in small firms. Foreign ownership in such firms are also likely to be an important area of focus.

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CHAPTER 9

Small and Large Firm Performance Gaps in Indonesia in the Era of Globalization: Evidences from Micro-Data on Manufacturing Establishments

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1. Introduction

Globalization is a process whereby countries become more integrated via movements of goods, capital, labor and ideas. Firms now have to compete domestically and internationally. Fast changing business environment is fact of life that has to be faced by corporations in the globalization. To survive firms need to adapt quickly with ever changing market demand. In this respect the ability to adapt would differ between different types of firms. One important observable feature that distinguishes one firm from another is its size. Our understanding on firm evolution with respect to the size has progressed a long way from the Gibrat Law which postulates that firm size is independent of its size. To the contrary, the seminal paper by Evans (1987) found that firm size is related to its performance measured by firm growth. More recent empirical works however no longer view firm size as the sole indicator to measure performances. Instead, they employ indicators such as profitability, productivity, sales etc. The conventional wisdom at present is that although the initial size is still important, the process is more complex and is taken within the light of factors external to the firm.

One important factor considered above is access to external borrowings. Firm performances are affected by high borrowing cost and limited access to external financing. The channels through which these factors operate to affect firm performances are entrepreneur in carrying out investment and how they finance it (Fazzari et. al.

[1988]) and Hubbard [1998]). In this setting, a firm is considered as financially constrained if the cost or availability of external funds prevents a firm to exercise the level of the optimum investment which leads to suboptimal performances. Firm size is considered as an important leverage for external borrowing, the larger is the firm the better is its access to external financing (Hariss et.al [1994] and Bhaduri [2005]).

In other examples however, small size is often considered as an advantage (Porter [1977] and Caves, Porter [1979], Agarwal and Audrescth [2001]). Small firms can avoid being confronted by the lower likelihood of survival by occupying a strategic niche. In Kuncoro (2007) being small is meat to avoid harassment from corrupt bureaucrats and rigid labor market.

There is a concern that in the era of globalization the gap between small and larger firms is increasing in favor of the later. For policy makers, given the different roles of small and large firms in the economy, this pose a challenge that needs to be addressed since a strong and sustained growth in East Asian economies would require a healthy gap between small and larger firms if the suspected gap does indeed exist. In the end whether larger firms perform better than the smaller firms is a matter of empirical question. The advancement of globalization while on one hand it makes the picture more complicated, in reality it does not change the facts that each type of firm – small or large – has its own survival strategy. To resolve this one needs to conduct a rigorous empirical study.

2. Research Questions

The relationship between globalization and firm performance is a complex one. Increasing imports and inward FDI brought by decreasing trade barrier would intensify competition in the domestic market and erode the domestic firms' profitability. This will force domestic firms to produce efficiently (Berthschek [1995]). In the long-run it may produce a healthier industry as weaker firms are eliminated through competition. On the other hand imperfection or market failure for example in the capital market may make small firms with less access to capital and information technology to fail. The results are just the opposite where the whole branch of industry dominated by small firms may disappear altogether (Braga and Wilmore [1991]). In the Indonesian context to which direction the relationship between globalization and small firm performance would turn is still unclear.

For this, the purpose of the study is to examine of the impact of globalization on the performance gap between small and large firms in Indonesian manufacturing. The first research question is whether there is gap between small and large firms, and if so whether it is increasing or decreasing with and without controlling for firm characteristics such as age, finance and export orientation as well as, industry and macroeconomic environment. The second questions is having to do with the globalization itself, whether the opening of domestic market through trade and FDI liberalization affect firms disproportionately according to their size. In particular, whether small firms are more of recipients of negative impacts in terms of declining sales, profitability while the potential gains from globalization such as international networking and access to market information is mostly out of reach. Besides firm from different sizes, the distinction between firms is also based on certain types of facilities (range from tax incentives to custom and location facilities) due to investment sizes versus to those without facilities. Two indicators based on growth and productivity will be constructed to measure the performance gap between different sizes.

3. Policy Context: Mid 1980s to 2000s

Firms will operate optimally if their environments are supportive. Although some risks can be anticipated, firms will not operate if uncertainties are too large. While it is agreed that the primary functions of government include maintaining law and order, providing basic infrastructures, and regulation of firms and transactions to address information asymmetries, externalities and market power, there also other government policies and behavior that play critical role in affecting the costs, risks, and barrier to competition faced by firms. They include approaches to regulation and taxation, the functioning to of markets for finance and labor, and broad aspect of governance including corruption.

Firms assess investment opportunities and related government policies and behavior as a package, not in a partial fashion. Firms' investment decisions reflect their expectation about future. Not just current conditions. That makes it essential for government to foster credibility and stability. Finally firms will operate optimally if their environments are supportive. While it is agreed that the primary functions of government include maintaining law and order, providing basic infrastructures, and regulation of firms and transactions to address information asymmetries, externalities and market power, there also other government policies and behavior that play critical role in affecting the costs, risks, and barrier to competition faced by firms. They include approaches to regulation and taxation, the functioning to of markets for finance and labor, and broad aspect of governance including corruption.

Perhaps, the most crucial regulations pertaining to private firms have been laws governing investment in Indonesia which are designed to minimize uncertainties. The investment law in Indonesia started in 1967 by the introduction of Law number 1 on foreign direct investment to be followed later in 1968 by Law number 6 on domestic investment. Facilities given to investors may include net income tax deduction up to certain level of investment within predetermined period, import duty holiday or reduction for imported capital goods imports, machinery or equipment unavailable domestically, import duty holiday and reduction for imported raw and supporting materials for production unavailable domestically for certain period and certain conditions, accelerated depreciation or amortization and property tax reduction for certain businesses in certain regions. Having investment tax law is only a prerequisite for a modern economy. This advantage might not be able to be exploited if most sectors are only the playground for state own enterprises but mostly closed to private investors both domestic and foreign.

3.1. Trade Policy and Other Regulatory Reforms mid 1980s

The pivotal moment came in 1986 when as a response of the fall of oil price which was then the main source of Indonesian export and government revenues, the government started to deregulate the economy. The economists started the reform program with measures to liberalize the banking sector and then gradually moved to trade and other regulatory reforms. Economic reform, or as it was called at the time, economic deregulation – which was implemented through structural adjustment packages – began in 1983. It covered four broad categories of measures relating to: (1) exchange rate management, (2) monetary and financial policies, (3) fiscal policy, and (4) trade policy and other regulatory reforms. In the end, reform of the financial sector was more pronounced than that of the real sector, where monopolies controlled by business interests close to Suharto were more prevalent.

Indonesia adopted a series of measures that had the effect of significantly liberalizing trade. In January 1982, a package of policies was introduced to simplify export/import approval procedures, giving exporters greater freedom in the use of their export proceeds, providing subsidized export credit, and strengthening the obligations of foreign holders of government contracts to arrange export to the equivalent value of imported material used.

Tariffs were reduced across the board and the number of tariff categories was cut in March 1985. In May 1986, those industries producing for export were allowed to purchase imported inputs without restriction and without import duties. In October 1986, the import licensing system was revamped and import restrictions were lifted from a wide range of products (Thorbecke et al., 1992).

Other major regulatory reforms were related to investments. In April 1985, approval procedures for foreign investments were simplified. The number of required documents was cut by half, application fees were discontinued, and the typical application processing time was reduced from more than six months to less than two months. In 1986, a package of reforms was introduced to provide foreign companies with the same privileges as domestic companies in securing local credit, flexibility in reinvesting profits and the right to distribute products directly rather than going through an Indonesian intermediary. The reforms also reduced foreign equity requirements, and relaxed the requirements for divesture.

A major restructuring program directed toward reducing Indonesia's heavy dependence on oil as a revenue source and improving the country's overall economic efficiency was instituted. This reform program was designed to sustain a momentum of economic development over the medium- to long-term. Market-based reforms were an important element in this program and were directed at reducing the high level of regulations and administrative control that had long existed in the Indonesian economy (CIPE, 2001).

3.2. Economic Reforms during 1991-1997

In 1991, there was no looming crisis of the magnitude seen in the 1960s and 1980s, but concern for the apparent slowing down of non-oil exports became the focus of many observers. The government indicated its concern in April 1994 and started to establish an inter-Ministry team headed by the Coordinating Minister for Industry and Trade to study the cause of the decline (Pangestu and Azis, 1994). One reason behind the economic slowdown was the slackening of the pace of deregulation. One indication was that the nominal tariff that showed a decreasing trend in the previous period hardly changed at all during the 1991-94 period. The same pattern could also be observed for products subject to import license.

In 1994, in response to this situation, the government announced a bold economic deregulation, mainly related to investment and trade policies, which included the abolition of the limitation on foreign ownership, a reduction of the trade barrier in the form of tariff cuts, and the opening up of 10 previously closed sectors to foreign investment (Azis and Pangestu, 1994). The divestment rule, which had been major deterrent to foreign investors, was abolished. Under the new rule, foreign investors were allowed to form either a joint venture with 95 percent majority equity ownership without any further divestment obligation or to have full ownership (100 percent stake) of a business entity in Indonesia with the provision that within 10 years some unspecified divestment would take place in favour of Indonesian partners. In addition, firms 100 percent owned by foreigners were also allowed to invest in all areas in Indonesia.

The deregulation also eliminated the minimum investment requirements, which previously were set at USD 1 million.[1] Another aspect of the deregulation was the opening up of nine sectors previously closed to foreign investment, which included sea

[1] In May 1989, this was lowered to US$ 250,000 for certain sectors such as distributions of the joint venture's products.

ports; production, transmission and distribution of electricity; telecommunications; shipping; civil aviation; drinking water; railways; nuclear power generation; and the mass media. One sector that remained closed to foreign investment, despite much expression of interest, was domestic distribution and retailing.

Another trade reform, called the May package, was introduced in 1995. The package encompassed a significant and almost across the board reduction in tariffs, as well as a pre-announced schedule of further tariff reductions to the year 2003. Further, more transparent tariff surcharge was enacted to replace the remaining non-tariff barrier (NTB). Perhaps the best part of the May package was the components that improved trade, investment and business facilities. A simpler industrial permit replaced the permanent business permit. It also modified customs procedures by waiving pre-shipment inspection of imported goods transported by air. These could now be cleared through normal custom procedures at the airports. It also waived custom inspection of exports goods moved between bonded zones and entry ports. Finally, the package extended duty free treatment of capital goods and other imported inputs used in production to businesses that used at least 30 percent of their investment for restructuring or capacity expansion.

3.3. Post Asian Crises

The Asian economic crises in 1998 slowed down the economic growth considerably. The economic and investment growth remained subdued. It took almost 5 years for the economy to recuperate. The reason behind the slowdown can be tracked to the worsening investment climate due the chaotic days of the Abdurrahman Wahid Presidency, his eventual impeachment and the ascension of Vice President Megawati to the presidency. This political development had big impact on the market confidence (Siregar [2001]). The launching of decentralization law in 2001 also created huge uncertainty on the part the business sector (Deuster [2002]).

The severe global recessions in 2008-09 once again put a brake on the economy. There has been no big bang policy on economic deregulation as pivotal as in mid 1980s. In 2007 the new investment law is launched with the purpose of combining domestic and foreign investment laws but there has been no major policy change. In terms of economic policy, Indonesia has continued to rely on a combination of deregulation, market liberalization and a series of fiscal incentives to lure investors both foreign and domestic.

To boost overall growth, there has been a renewal interest to boost the performance of small firms. There have been numerous policy interventions to improve the performance of small firms. The latest is the KUR (Kredit Usaha Rakyat) program which has been in place since 2007. Some of manufacturing firms the medium ones (less than 100 employees) may have been eligible and exposed to this program.

3.4. Manufacturing Sector Performances

Table 1 summarizes the performance of Indonesian manufacturing over three decades starting in 1983 to the present time. Structurally the Indonesia economy has undergone transformation during three decades going from an agriculture-dominated economy into a manufacturing-dominated one signifying transformation to a more modern economy. The structural transformation has changed the growth dynamic. Now anything that hinders growth in manufacturing will be translated to diminished GDP growth despite the fact that other sectors provide some offsetting factors. The slow growth of manufacture provides some explanation about the modest growth of GDP in the post-crisis period.

Table 1: Sectoral Average Annual Growth 1983-2009

	83-93		94-96		00-03		04-09	
	%G	Share	%G	Share	%G	Share	%G	Share
Agriculture	3.6	20.6	2.7	17.1	3.2	15.2	3.5	14.0
Mining	2.2	16.9	6.2	8.7	1.4	9.8	1.5	10.6
Mfg	11.9	13.4	13.0	21.7	5.9	24.5	5.0	22.8
Utilities	12.6	0.6	14.0	1.2	7.4	0.8	8.6	0.9
Construction	7.7	5.7	13.7	7.6	5.5	6.0	7.7	7.9
Trade	7.5	15.4	7.9	16.6	4.9	16.4	6.5	14.8
Transportation	7.0	4.8	6.8	5.7	7.2	3.6	5.5	3.8
Communication	10.7	0.6	18.9	1.1	14.5	1.7	25.6	2.7
Finance	8.8	6.7	9.3	8.7	6.2	8.4	6.8	7.9
Services	5.2	11.1	3.1	8.9	3.4	9.6	5.9	10.1
GDP	6.1	100.0	7.9	100.0	4.5	100.0	5.6	100.0

Notes: Mfg: Manufacturing sector excluding oil and gas.
Source: CEIC Asia Database.

Various deregulation measures announced in the 1986-1996 period changed many aspects of economic incentives including consumption and investment activities, and export-orientation versus the domestic market. The growth slowed down as the deregulation phase came to an end in 1996 with almost completion of all deregulation measures in the list. After initial burst of growth in manufacturing the economic growth actually took place primarily in non-tradable sectors such as utilities, construction, communication and finance. At this stage innovations were supposed to take over the growth process in manufacturing but before it happened Indonesia was hit by AFC in late 1998.

In the post-crisis period manufacturing has gone from the primary driver of the economy to the one important source of the drag to the GDP growth simply because of its share in the economy (**Table 1**). The reason behind the slow growth of manufacturing may come from the same factors that make investment grows slowly, namely deterioration of business climate, policy uncertainty and labor market rigidity. Competition from cheap low-end manufacturing products from China may also be a factor. The appreciation of exchange rate due to capital inflows makes things more precarious for manufacturing. There is also another argument that put the blame on the reluctance of the banking sector to provide loan to the real sector.

3.5. Methodology

Based on the policy context above our research strategy is to use mid 1980s as a dividing line between heavily deregulated versus more open and less deregulated economy to examine whether given their size or status, it would have any impacts on manufacturing firms' behavior.[2] This exercise is repeated to compare the 1986-90 where the reforms are mostly trade related and 1991-96 periods where the reforms mainly investment and input importation to examine the behavior changes between those two

[2] In the post-2000 years there are no obvious dividing line to separate the period into two distinct regimes.

periods. The samples for the 1991-96 and after the AFC (2000-2008) will be analyzed the same fashion to examine any behavior changes.

Data

The main data sets used in this study is the series of annual manufacturing survey from 1980 to 2008. It covers all industries in the large and medium manufacturing and the series are long. Potentially we can construct a long panel data to study the dynamic of firm performances for all indicators mentioned above.

Performance Gap between Small and Large Firms

Although the term of firm performance is well understood, translating it into more ‘operational’ variables for empirical exercise is another matter. The conventional way to measure it is to use productivity and wages. To examine the general trend of gaps between small and large firms, the indicator in question will be measured at the firm level.

Defining small versus large is also problematic. The census on small firm is only conducted every 10 years by BPS (Central Statistical Agency) so examining a long-run trend in a year to year basis is out of question. Alternatively, one can use the portion of medium and large manufacturing survey from BPS which can be considered as small and medium let say a firm size below 100 workers.

Globalization can be considered as a regime change from relatively highly regulated and protected economy to more open and deregulated one. One can think about as a simple evaluation policy where a number of different industries present before the policy is enacted and on the same industries after it is enacted. Any economic reform that involves trade and/or investment liberalization will suit into this definition.

Let us define S (small) a dummy variable if a firm total number of workers do not exceed 100, M (medium) a dummy variable for a firm with workers above 100 and 500, and L (larger) for those with workers above 500.We examine whether the opening of domestic market in 1986 affected firms disproportionately according to their size. In particular, the question is whether small firms are more of prone to negative impacts such as of declining sales, and profitability. For this purpose we use performance indicators discussed above. To put this into a regression model

$$Y_{it} = \beta_0 + \alpha_1.S_{it} + \alpha_2.L_{it} + \delta.t + \gamma.g_i + X_{it}\Gamma + \varepsilon_t \quad (1)$$

In equation (1) Y_{it} is the dependent variable measuring the firm level performance discussed above for each firm small or large. The variable S_{it} is defined as equal to one if it is a small firm and the year is from 1986 onward or else equal to zero, L_{it} will have the value of one if it is large firms and the time is after 1985 or from 1986 onward or equal to zero otherwise. The variable g_i captures firms' fixed effects. Lastly vector X captures all other covariates. In the second set regression the cutting off for the time dummy is the year of 1990s as the dividing line between first phase (mainly trade) and the second phase (mainly investment) of economic liberalization. Finally before and after AFC periods are compared using 2000 as the cut-off year.

Following Kokko (1994) and Takii (2005) they are defined as the average wage gap, and the average labor productivity. While productivity is a straightforward measurement of technological gap, wage gap is worth of explanation. If the wage gap between small and large firms is indeed large and getting larger, it would be difficult for small firms to lure workers to leave large firms because they could not offer a large wage premium. As a result there would be very little knowledge spillover from large to small firms through employment turnover. Small firms would remain lag behind unable to reap the benefits of globalization.

3.6. Firm Dynamic

Table 2: Firm Composition in Indonesian Manufacturing by Size

Year	% small	% medium	% large	Total Firms
1981	77.8	16.8	5.5	7942
1985	77.9	16.8	5.4	12909
1988	75.5	18.8	5.7	14664
1996	71.3	20.9	7.8	22968
2000	69.7	21.9	8.5	22174
2008	73.7	19.3	7.0	25684

Source: calculated from Manufacturing Surveys various years.

Table 2 and table 3 present the composition of the manufacturing sector in Indonesia. Small firms are the most numerous entities of about 70 to 77% of total manufacturing firms. Medium firms come in second of 16 to 21% of total stock of firms. Finally, large firms contribute to 5 to 9% of total firms. These positions are reversed when value added creation is considered. Large firms are the biggest contributor with the share between 61 to 73%, to be followed by medium category (23 to 31%) and small firms (6 to 12%). In later years the contribution of larger firms are declining to as low as 61% as small and medium size are increasing their portions. Still, due to its commanding share, any slowdown or improvement of manufacturing growth observed after 2000 is partly attributable to the performance of large firms (Table 2).

Table 3: Manufacturing Value Added Composition by Size (%)

Year	Small	Medium	Large
1981	7.0	23.8	69.2
1985	12.4	30.9	56.6
1988	9.3	28.5	62.2
1996	6.7	20.6	72.7
2000	7.5	24.6	67.9
2008	7.2	313	61.5

Source: calculated from Manufacturing Surveys various years.

The drop of small firm presence in 2000 suggests that the AFC in 1998-1999 had hit them hard but things started to improve afterward. In 2008 the increase of the share of small firms and the decrease of both medium and large size in manufacturing reflects the situation where the net entry is once again dominated by small firms as in 1981 and 1985.

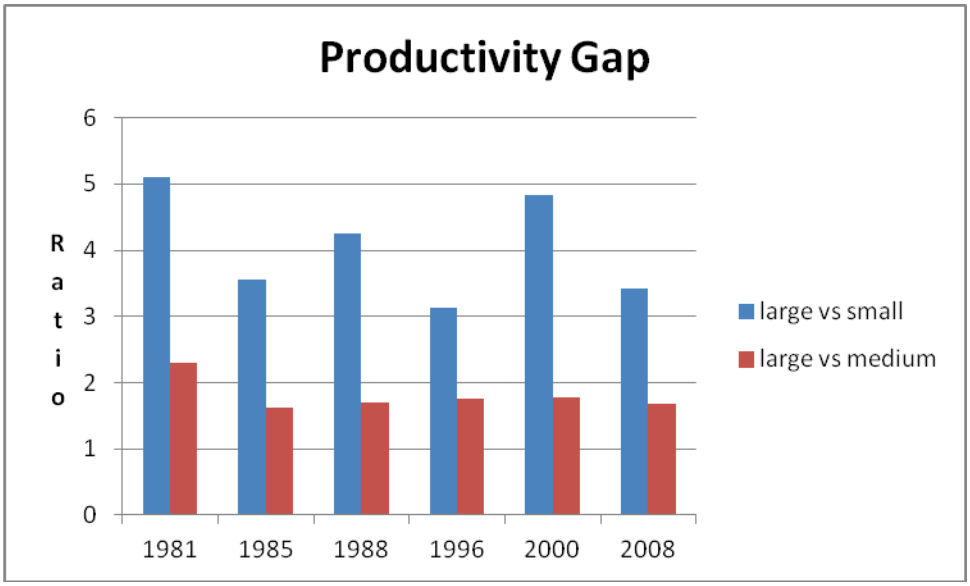
The entry of new firms is a good thing in the sense that it may bring new technology and knowledge to the industry. The process is however is not easy particularly for small firms. Small firms need to overcome many obstacles related to market information, financial access and accumulated. Information on productivity, wage, profitability and output gaps may provide hints how well small firms can adapt and survive in the industry.

In Figure 1 using medium size firms as a point of reference labor productivity gap between small and large firms are plotted for the periods of 1981 to 2008. The overall pattern suggest that while the gap between large and medium size are almost unchanged overtime. Small firms are able to catch up with large ones at least to narrow the gaps but afterward the gap persists.[3] Interestingly, the introduction of economic reforms and

[3] The gap between medium and large size is almost unchanged overtime suggesting a “middle size trap” when a firm attempts to graduate to large size.

market liberalization tends to widen the gap but the gaps then become smaller again though before going back to its long-run pattern.

Figure 1: Labor Productivity Gap in Indonesian Manufacturing

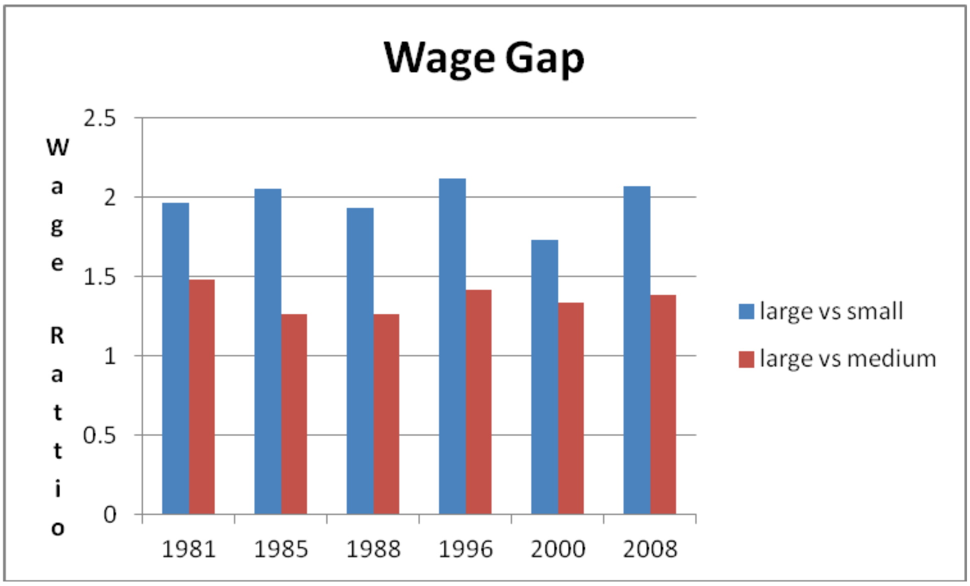


Source: calculated from Manufacturing Surveys various years.

One interesting illustration of this process is that the introduction of economic reforms and market liberalization in mid 1980s widened the gap (**Figure 1**). Large firms were in better position to cope with new found opportunities in more open and less regulated economy brought by the reforms. Overtime in 1996 however the gap was once again declining. Small firms were still in the process of narrowing the gap to large enterprises when the AFC struck in 1998. The AFC itself had made the gap to be larger again suggesting that small firms hap hard time to cope with the crisis but gradually coming back to a level before the crisis. At this point we have not determined precisely the avenue through which small firms narrowed the gaps but there were many alternatives: value-chain, agglomeration effects, labor market and/or general market information.

We performed an exercise to examine whether labor market serves small firms as a potential channel for catching-up. In **Figure 2** we plot the wage gap between small and large firms. Large firms pay workers about twice as much as small ones. There is a little evidence that small firms can match large ones' wage offers. It would be difficult for small enterprises to attract workers from large firms to move. In the labor market it may have difficulty to lure talented new entrants. So labor market is the less likely avenue of which small firms try to catch-up with large ones in terms of productivity.

Figure 2: Wage Gap by Firm Size



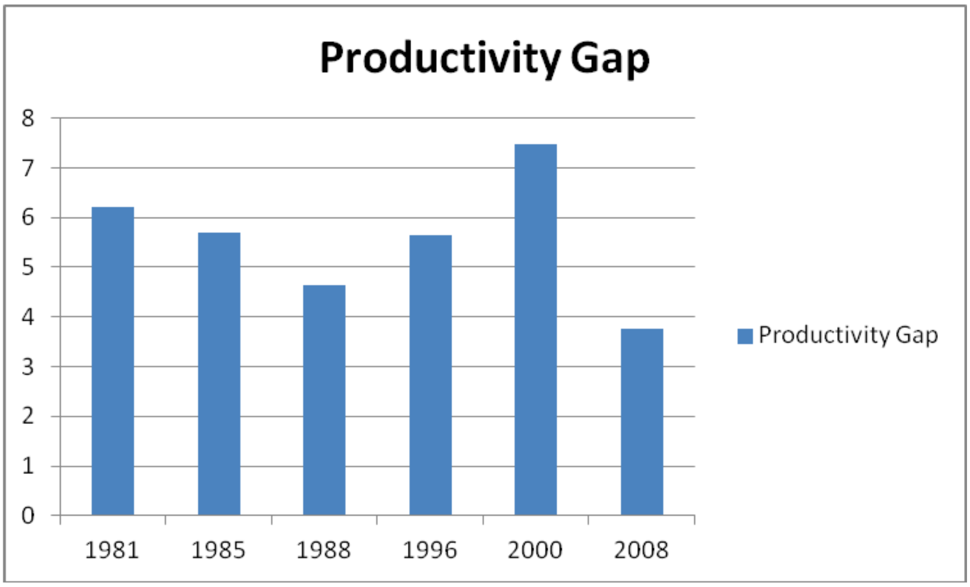
Source: calculated from Manufacturing Surveys various years.

FDI versus non FDI

The presence of FDI can be used to signify the extent of globalization at the firm, industry and national levels. Potentially FDI firms can function as sources of knowledge spillover as well as ‘sparring partner’ for domestic firms to increase their competitiveness. As the economy is opening up we expect domestic firms to learn their lesson in order to catch-up. In **Figure 3**, we examine labor productivity gap between FDI and non FDI firms.

Before mid 1980s the productivity gap between FDI and non FDI had been declining. In the aftermath of the mid 1980s economic reform the gap was widening again owing to the influx of new FDI firms which continue until 2000 when the gap is at the largest. At the same time the existing FDI firms also used this opportunity to improve its production technology by importing new machinery. This combination has resulted in the situation where at its peak the productivity in FDI firms is seven times as high compared to their non FDI counterparts.

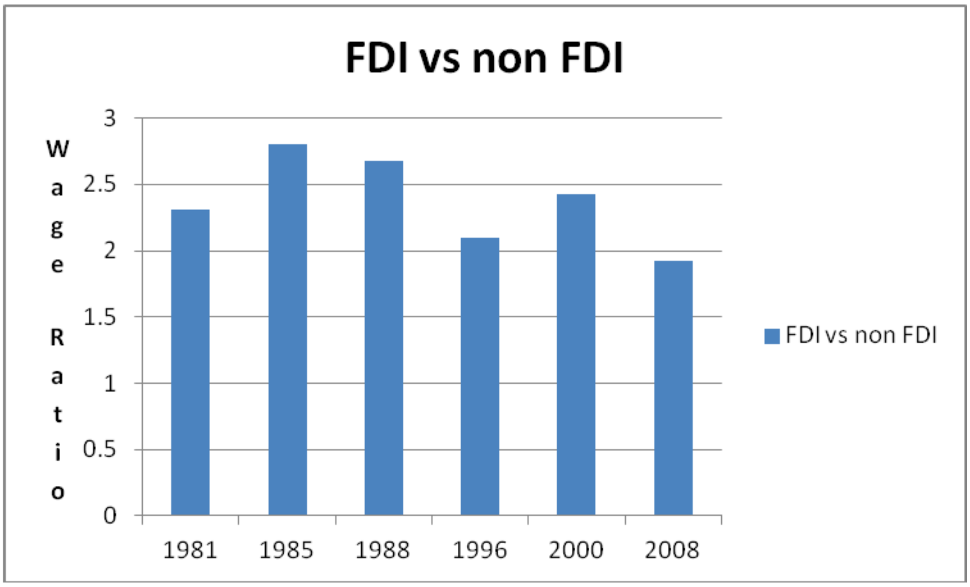
Figure 3: Labor Productivity Gap" FDI versus non FDI



Source: calculated from Manufacturing Surveys various years.

The AFC caused many non FDI firms to go out of business or changing hand. This turns out to be blessing in disguise as many bankrupt firms after 2000 have new owners and ready to enter market with new technology. As a result the labor productivity ratio between FDI and non FDI firms fell to 4, the lowest in 30 years. The wage gap while it has been large, it has never been excessive (**Figure 4**). Since 1988 the trend has been falling. In 2008 the ratio between FDI and non-FDI wages stood at slightly below 2. This gap however is not small enough to persuade workers from FDI sector to non-FDI, unless in the case of forced lay-off. Therefore the spillover between FDI and non FDI could not depend on labor turnover.

Figure 4: Wage Gap FDI versus non-FDI



Source: calculated from Manufacturing Surveys various years.

4. Empirical Results

The model of equation (1) is estimated for three periods under consideration above; 1981-90 with the year of 1985 as the dividing line between pre-reform (1981-1985) and first-period reform (1986-1990), 1986-1996 with the year of 1990 as the cut-off between the period of "trade" reform and "ownership-input and capital importation" and lastly before and after AFC. Capital intensity (ratio of capital to labor) is used to control for the initial size of firm. Besides investigating the growth of various indicators between small and large firms using the medium size we also consider other variables that may affect growth such as agglomeration, input importation, access to external loans, effective rate of protection (tariff) and export orientation.

Wage Growth

In **Table 4** the basic regressions of wage growth are estimated for three different time periods.

The size dummies indicate that the wages for large firms in 1981-85 and 1990-96 wages grow faster than small firms. After 1985 there is no sign that small firms are catching up, the time and size interaction is not significant for all size category. The results suggest that the labor market is not used by small firms to learn from large ones as they constitute different segment of market and very difficult for small firms to lure workers from large companies. Comparing before and after AFC in the subsequent period, large firms grow faster than small ones as the interaction between large and time is weakly significant at 10 percent level, so the gap will persist into the future.

In **Table 4** we also investigate whether agglomeration of industries is the way for small firms to close their gaps with large firms. Centralization of industrial location at least in the early stages may bring benefits to firms. One important benefit of agglomeration is that firms conducting R&D can learn from each other, to create a synergy that collectively boosts their average performances.

Agglomeration externality is meant to capture interaction among firms within a district. It is measured by a diversity index. For district i for example, the index of diversity is

$$g_i^s = \sum_{j=1}^{J} \left[\frac{E_{ij}(t)}{E_i(t)} - \frac{E_j(t)}{E(t)} \right]^2 \qquad (2)$$

E(t) is total national manufacturing employment and $E_j(t)$ is total national employment in industry j. Meanwhile, E_i and E_{ij} are the corresponding local magnitudes. The measure of urbanization economies $g^s_i(t)$ has a minimum value of zero, where in a district, each industry's share of local manufacturing employment is exactly the same as its national share, so the district is completely unspecialized because its industrial composition is merely a copy of the nation. At the other end, the maximum value of $g^s_i(t)$ will approach two for a district completely specialized in one industry, while at the same time national employment is concentrated in another industry. The higher is $g^s_i(t)$ the lower is the diversity, thus a district becomes more specialized.

The results suggest that with respect to wage growth, small and large firms do not enjoy benefits from industrial agglomeration. After AFC, wage for large firms grows slower relative to medium and small firms. The coefficient of interaction between time and large size is negative and significant at 10 percent level. This is a good sign for narrowing gap but tt is not certain however whether small firms can attract workers from large firms since the initial gap may have been large to begin with.

The agglomeration of FDI in vicinity has no impact on small and large firms (**Table 4**). None of the interaction between size, agglomeration and time dummy variables is significant. There is no differential effect between before and after reform or before and after AFC. It brings negative impact for wage growth of smaller firms after AFC. Overall, the positive impact of FDI on wage growth is only observed in the 1986-90 to 1990-196 samples. The impact becomes negative after AFC. It is hard for domestic firms to keep pace with FDI when it comes to pay wages especially after AFC.

We also examine the impact of external financing in the form of loans. Fazzari et. al. (1988) and Hubbard (1998) provided the theoretical and empirical framework underpinning of the relationship between cost/access of borrowing and investment. In this setting, a firm is considered as financially constrained if the cost or availability of external funds prevents a firm to exercise the level of the optimum investment I^*_{it} (Bhaduri [2005]) which eventually affect firm performances. In general, the access to external loans has no impact on wage growth (**Table 4**).

One way for a government to shield certain sectors from global competition is through tariff protection. This barrier will alter industry's relative profitability by creating an artificial price wedge. How the protection will affect firms of different size is at best ambiguous. If the market is contestable then the extra profit can reinvested in R&D to boost firms' competitiveness in anticipation for the day when the protection is eventually lifted. In **Table 4** we examine the impact of tariff in the form of effective rate of protection (ERP).

If large firms have cost advantages to carry out R&D over small companies then performances may deviate by size. On the other hand, high artificial profits could also make less pressure for firms to do R&D so the differences between large and small firms may not be apparent. To measure ERP we use the concept of effective rate of protection (ERP) as in Amiti and Konings (2005).

$$erp_{it}^{k} = \frac{(tariff_t^k - \alpha_{it}^{k} inputtariff_t^{k})}{(1-\alpha_{it}^{k}} \qquad (3)$$

Where α_{it}^{k} is the ratio of input to output for firm i in industry k at time t. A lower output tariff would decrease the protection enjoyed by industry k, while a lower input tariff would increase the protection received by industry k.

The impact of ERP is negative for wage growth especially for large firms in the 1986-90 to 1991-96 samples. In later half of the 1986-90 to 1991-96 periods the impact for small firms is also negative.

The ability to secure vital inputs is very important if a firm want compete globally. If such inputs are not available domestically then trade regime should be reasonably open for importation. The 1990 reform had made it easier to import inputs from abroad. The positive impact is enjoyed by large firms especially it moves from pre-reform to the early phase of reform era (the 1981-85 to 1986-90 samples) as well as from the first phase (1986-90) to the second phase of reforms (1991-96). The interaction between time, large size and foreign input is positive and significant at 5 percent level. The positive impact however dissipates after AFC (**Table 4**). So the overall impact with respect to foreign input importation increases the gap between small and large firms in the ability to attract the best workers into their establishments.

As a result of the dismantling trade barrier, a firm has options to go to export markets. For this they need to be more innovative and more efficient. There is two way relationships. First, export marker would discipline firms in order to compete. In the reversed direction, only those with sufficient level of innovation and cost efficient are able to enter export market. Export orientation and economic reforms are expected to show up in firms' good performance indicators. In general, for all size categories being exporter has no impact on wage growth. Also for all firms wage growth slows down after AFC (**Table 4**).

Labor Productivity Growth

All exercises above are repeated for labor productivity growth. The results are are presented in **Table 5**. In terms of labor productivity there is no sign that the growth is different between small and large firms. None of the interacted time and firm size is positive and significant. The only significant coefficient is for large firms. The growth of large firms is slower when it moves from the pre-reform era (1981-85) to the first reform era (1986-90).

Effective rate of protection in general has positive effect for large firms but negative for small firms. There is however no differential effect between before and after reforms as well as before and after AFC. Small firms also do not benefit from locating in industrial agglomeration areas in all cases of reforms and in the aftermath of AFC. After AFC the productivity growth of large firms in the agglomeration areas is slower compared to other size types.

Not everything is bad for small firms. Related to the issue of agglomeration is the impact of FDI firms in the vicinity as they may be the important source of technological spillover. The impact of the presence of FDI firms in the vicinity is positive for productivity growth in the 1981-85 to 1986-90 samples (from pre to first phase reform. The effect is statistically weaker in the second phase of reforms in the 1986-90 to 1991-96 samples. The same picture also applies to large firms. After further reforms are introduced in the 1991-96 periods, the impact of FDI turns negative for small firms. The interaction between time and small size is negative and significant while that of large firms is not significant. This suggests that eventually the productivity growth of small and large firms starts to diverge after almost all measures in the reform sequence have been introduced.

Excessive dependence on imported inputs seems to impact productivity growth negatively for both small and large firms if the pre-reform era. The negative effects however disappear after reforms are introduced or broadened. The interaction between imported input and time is mostly insignificant in the 1981-85 to 1986-90 and the 1986-90 and 1991-96 samples. This variable turns into positive and significant in the post AFC period as input importation become easier.

Being exporter is good for small firms in the sense that the productivity growth is higher compared to medium and large. In the post AFC however, productivity growth of small firm exporter is significantly lower than large firms suggesting the divergence path.

5. Policy Implication

This paper examines the impact of globalization in the form of two successive economic reforms from 1986 to 1994 on the performance gap between small and large firms in Indonesian manufacturing. Our empirical results suggest that opening up the economy through market liberalization would increase the gap between large and small firms for productivity and wages before it is stabilized again.

Overtime if there is no economic shock, small firms may be able to catch-up at least partially but the gaps although become narrower they would persist overtime. There are many avenues through which small firms could exploit knowledge spillover but labor turnover may not be the best source. For small firm positive externalities from industrial agglomeration are also minimal. Other factors such as financial access, export orientation have minimal impact on both large and small firms.

One important finding is that small firms however benefits from more open trade regime after AFC which enable them to acquire imported inputs. The policy option is to maintain open access for input importation. Medium and large firms have more chance to benefit from the opening up of the economy. To be able to reap the benefits the complementary factors such as FDI agglomeration are important. In this case however the benefits for small sized firms for all size are limited given their limitation to carry out R&D. The presence of FDI creates spillover for small firms at least at the early phase of economic reforms easing the necessity to do costly adaptation for both market and technological information. The spillover may not come from labor turnover as the wage gap continues to persist. But small firms located close to FDI sites may have supplier-buyer relationship and workers in their spare time may exchange information on how the businesses are done.

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Appendix: Regression Table

Table 4: Determinant of Wage Growth

VARIABLES	**Wage Growth** 1981-85 to 1986-90	1986-90 to 1991-96	1991-96 to 2000-08
	Year=1 after 1985	Year=1 after 1990	Year=1 after 2000
Year dummy	-0.0767***	0.0529***	0.106***
	(-4.050)	(2.854)	(11.32)
Small firms	-0.0356	0.0130	-0.00890
	(-1.615)	(0.835)	(-1.098)
Large firms	0.0593*	0.0118	-0.0236
	(1.667)	(0.399)	(-0.967)
Small X Year	0.0327	-0.0191	0.00185
	(1.486)	(-0.851)	(0.174)
LargeX Year	-0.0581	-0.0239	0.0494*
	(-1.645)	(-0.447)	(1.823)
ERP		-0.00852***	0.000525
		(-3.368)	(0.565)
ERP X Year		0.0411*	0.00314
		(1.675)	(0.520)
Small X ERP		0.0145	0.00347
		(0.959)	(0.728)
Large X ERP		-0.0939**	-0.00658
		(-2.118)	(-0.272)
Small X ERP X year		-0.0538*	0.0113
		(-1.776)	(0.821)
Large X ERP X year		0.0465	0.0239
		(0.811)	(0.847)
Agglomeration (yes)	0.00951	0.00591	0.0143**
	(0.628)	(0.501)	(2.298)
Agglo. X Year	-0.00956	-0.00361	-0.0315***
	(-0.630)	(-0.233)	(-3.847)
Small X agglo	-0.00108	0.00367	-0.00336
	(-0.0592)	(0.268)	(-0.474)
Large X agglo	0.0147	0.0212	0.0286**
	(0.512)	(1.068)	(2.055)
Small X aggloX year	0.000325	0.00452	0.0329***
	(0.0178)	(0.241)	(3.506)
Large X agglo X year	-0.0153	0.0170	-0.0392**
	(-0.535)	(0.610)	(-2.107)
Share of FDI value added	-0.0367	-0.0633	0.0932***
	(-1.042)	(-1.300)	(3.626)
Share FDI VA X year	0.0338	0.160***	-0.0601**
	(0.946)	(2.683)	(-1.960)

Small X share FDI VA	0.0452	-0.0730	-0.0110
	(1.031)	(-1.237)	(-0.385)
Large X share FDI VA	0.0502	0.125	0.0896
	(0.733)	(1.140)	(1.222)
Small X FDI share X year	-0.0292	0.0802	-0.0563*
	(-0.664)	(1.077)	(-1.653)
Large X FDI share X year	-0.0575	-0.0136	-0.125
	(-0.831)	(-0.0867)	(-1.531)
Imported input	0.0653***	0.0224	-0.00214
	(3.029)	(1.383)	(-0.226)
Imported input X year	-0.0705***	-0.0225	0.00747
	(-3.253)	(-1.390)	(0.572)
Small X imported input	-0.0261	0.00526	-0.00447
	(-0.994)	(0.280)	(-0.358)
Large X imported input	-0.114***	-0.0737***	0.0103
	(-2.936)	(-2.590)	(0.392)
Small X imp. input X year	0.0216	-0.00966	0.000959
	(0.823)	(-0.509)	(0.0560)
Large X imp. input X year	0.121***	0.0715**	-0.0164
	(3.102)	(2.512)	(-0.547)
Exporter (yes)		0.00715	0.00733
		(0.469)	(1.108)
Exporter X year		0.0160	-0.0193**
		(0.864)	(-2.313)
Small X exporter		-0.0260	0.0102
		(-1.196)	(1.025)
Large X exporter		-0.00742	-0.00837
		(-0.331)	(-0.594)
Small X exporter X year		0.0437	-0.00932
		(1.484)	(-0.758)
Large X exporter X year		-0.0130	0.0185
		(-0.413)	(1.063)
External loan (yes)	-0.00908	0.00593	-0.00498
	(-0.627)	(0.534)	(-0.715)
Loan X year	0.00854	-0.0151	0.00160
	(0.590)	(-0.965)	(0.178)
Small X loan	-0.00342	0.00824	0.000724
	(-0.171)	(0.589)	(0.0873)
Large X loan	-0.0211	-0.0187	0.0169
	(-0.806)	(-0.965)	(1.027)
Small X loan X year	0.00442	-0.0102	0.00904
	(0.221)	(-0.489)	(0.831)
Large X loan X year	0.0211	0.0419	-0.0200

	(0.803)	(1.285)	(-0.977)
Age	-0.000202*	-0.000139	6.07e-05
	(-1.698)	(-0.807)	(1.065)
Capital Intensity	-0.00182	0.0507	0.0104***
	(-0.572)	(1.586)	(4.841)
Industry dummy	yes	yes	Yes
Constant	0.0831***	0.00357	0.0868***
	(4.078)	(0.164)	(7.738)
Observations	4,325	5,424	21,507
R-squared	0.144	0.102	0.104

Note: Robust t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 5: Determinant of Productivity Growth

VARIABLES	Labor Productivity Growth 1981-85 to 1986-90	1986-90 to 1991-96	1991-96 to 2000-08
	Year=1 after 1985	Year=1 after 1990	Year=1 after 2000
Year dummy	-0.0194	-0.174*	0.124***
	(-0.470)	(-1.701)	(7.371)
Small firms	-0.0600	0.00849	-0.0121
	(-1.419)	(0.251)	(-0.737)
Large firms	-0.0864*	-0.0247	-0.0235
	(-1.747)	(-0.341)	(-0.719)
Small X Year	-3.70e-05	0.138	0.00870
	(-0.000725)	(1.296)	(0.427)
Large X Year	-0.00989	0.137	0.0253
	(-0.144)	(1.013)	(0.670)
ERP		-0.0112	0.0299***
		(-1.163)	(4.713)
ERP X Year		0.494**	0.0179
		(2.002)	(0.824)
Small X ERP		-0.0873**	0.0234
		(-2.441)	(0.982)
Large X ERP		-0.151	0.0752*
		(-0.955)	(1.688)
Small X ERP X year		-0.351	0.00168
		(-1.379)	(0.0459)
Large X ERP X year		-0.262	-0.0597
		(-0.844)	(-0.956)
Agglomeration (yes)	-0.0202	-0.0512**	0.0175
	(-0.480)	(-2.076)	(1.382)
Agglomeration X Year	-0.0649	0.0573	-0.0230
	(-1.417)	(1.544)	(-1.449)
Small X agglomeration	-0.0780	0.0361	-0.00687
	(-1.582)	(1.303)	(-0.494)
Large X agglomeration	0.00479	0.0392	0.0140
	(0.0889)	(0.816)	(0.634)
Small X agglo.X year	-0.0175	-0.0342	0.0192
	(-0.255)	(-0.812)	(1.092)
Large X agglo. X year	0.0176	-0.0146	-0.0522*
	(0.666)	(-0.246)	(-1.862)
Share of FDI value added	-0.155**	-0.203***	0.0354
	(-2.347)	(-2.582)	(0.708)
Share FDI VA X year	-0.0267	0.385***	-0.0494
	(-0.253)	(2.983)	(-0.843)
Small X share FDI VA	0.325***	0.184*	0.0692
	(3.282)	(1.758)	(1.304)

Large X share FDI VA	0.273**	0.308*	0.0886
	(2.566)	(1.677)	(0.867)
Small X FDI share X year	-0.137	-0.307**	-0.0881
	(-0.947)	(-1.967)	(-1.424)
Large X FDI share X year	0.0543	-0.293	-0.00987
	(0.257)	(-1.221)	(-0.0845)
Imported input	0.0892*	0.0436	0.0702**
	(1.957)	(1.412)	(2.380)
Imported input X year	-0.119**	-0.0437	-0.113***
	(-2.052)	(-1.415)	(-3.515)
Small X imported input	-0.0845	-0.0623*	-0.0920***
	(-1.593)	(-1.766)	(-2.725)
Large X imported input	-0.00893	0.0647	-0.0947**
	(-0.122)	(0.986)	(-2.343)
Small X imp. input X year	0.0649	0.0494	0.116***
	(0.988)	(1.393)	(3.028)
Large X imp. input X year	0.0989	-0.0671	0.0590
	(0.979)	(-1.022)	(1.285)
Exporter (yes)		-0.0529**	0.00982
		(-2.152)	(0.774)
Exporter X year		0.0893**	-0.0146
		(2.326)	(-0.957)
Small X exporter		0.0252	0.0391*
		(0.632)	(1.857)
Large X exporter		0.0446	0.0165
		(0.997)	(0.740)
Small X exporter X year		0.0537	-0.0746***
		(0.704)	(-3.116)
Large X exporter X year		-0.0759	-0.00983
		(-1.296)	(-0.367)
External loan (yes)	0.00644	0.0365	-0.00534
	(0.224)	(1.581)	(-0.333)
Loan X year	0.0360	-0.0494	0.00542
	(0.953)	(-1.276)	(0.288)
Small X loan	-0.0249	-0.0242	-0.00550
	(-0.528)	(-0.836)	(-0.315)
Large X loan	0.0114	-0.0774*	-0.0205
	(0.245)	(-1.898)	(-0.802)
Small X loan X year	0.00567	0.0235	-0.00945
	(0.103)	(0.501)	(-0.449)
Large X loan X year	-0.0847	0.0730	0.0497
	(-1.313)	(1.297)	(1.536)
Age	-0.000875***	-0.000268	0.000268***

	(-2.668)	(-0.808)	(2.842)
Capital Intensity	0.0396	0.0783	0.0191
	(0.990)	(0.818)	(1.558)
Industry dummy			
Constant	0.109**	0.0464	0.0627***
	(2.476)	(1.138)	(3.509)
Observations	4,321	5,429	21,517
R-squared	0.038	0.062	0.059

Note: Robust t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1

CHAPTER 10

Globalization and Performance of Small and Large Firm: Case of Vietnamese Firms

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This paper intends to study the productive performance of small (SMEs) versus Larger domestic and foreign firms. In particular, the paper also examines the determinants of productive performance of firms in terms of its linkages, spillovers, and ownership structures in form of foreign and public ownership. The findings suggest that there is no horizontal spillovers on the domestic firms from foreign activities in the Vietnamese manufacturing sector. However, we do observe positive backward linkages if we account the dynamic effects of the spillovers. We also observe state-owned enterprises play an important role in the backward spillover on the domestic economy. This directly relates to the role of SOEs in the development process of the Vietnamese economy.

1. Introduction

Globalization provides ample opportunity for domestic firms to increase their innovation capabilities and compete in the global environment. The opportunity to create linkages and network in the global production chain directly affect the investment decisions and hence the ability to improve their productive performance in the global environment. In particular, SMEs (Small Medium Sized Enterprises) play an important role to create the backward and forward linkages with larger domestic and foreign firms in the global production network. For the overall economy, the domestic capacities to absorb and diffuse technologies of SMEs are very important to increase the overall productive performance of the domestic industries and hence create a sustainable growth in the long-run.

In an open economy, the impact of globalization affects the smaller firms more than larger ones; since the larger ones have the investment capacity, economies of scale and scope to hedge the risk of external shocks. In contrast, the smaller ones are more vulnerable to the shocks due to smaller scale and lack of scope to move their operations and investments around.

Hence, the capacity of small firms to raise finance for investments and hence hedge the risk of investments and external volatilities is important for domestic firms to improve their productive capacity.

Foreign direct investment (FDI[1]) can enhance local SME development through beneficial linkages between foreign affiliates[2] and domestic SMEs. Such benefits can include increasing the purchase of local supplies, upgrading SME management skills, transferring technology, facilitating SME access to capital and markets, and assisting local SMEs to internationalize their business. These linkages can also benefit the affiliates of transnational corporations (TNCs) by lowering transaction costs,

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[1] FDI includes wholly-owned and joint venture enterprises as well as substantial non-equity arrangements such as long-term subcontracting. However, non-equity modes of investment are more directly related to other sets of FDI policies and mechanisms rather than creating linkages between foreign affiliates and domestic SMEs and therefore are not specifically covered in this study.

[2] As discussed in this study, linkages are relations that go beyond arm's length, one-off transactions to incorporate longer-term business arrangements between firms that can involve sustained exchanges of information, technology, skills and other assets. See UNCTAD (2001), p. 127.

providing greater flexibility, spurring local adaptations, and demonstrating corporate social responsibility.

This paper intends to study the productive performance of small (SMEs) versus Larger domestic and foreign firms. In particular, the paper also examines the determinants of productive performance of firms in terms of its linkages, spillovers, and ownership structures in terms of foreign and public ownership.

While the relationship between FDI and economic growth is apparent for Vietnam, the mechanism on a micro level is less clear. One prominent conjecture, suggested by many studies, looks at the domestic enterprises' potential productivity gains which arose from FDI inflows (Crespo & Fontoura, 2007; Okamoto, 1999). For instance, foreign investors can facilitate productivity spillovers to local private enterprises when these foreign conglomerates transfer advanced technology and expertise to the domestic firms. Alternatively, the entry of foreign competition in the domestic market can also induce local firms to improve their productivity in order to retain their competitive edge. Subsequently, the improvement in firm's productivity is the fundamental channel through which FDI had spurred economic growth at the aggregate level. This paper serves to investigate the extent to which the entry of foreign firms improve the productivity level of domestic firms, so as to gain a clearer insight into the link between FDI inflows and economic growth.

Productivity spillovers from FDI can be differentiated according to the two main types of production linkages between foreign and domestic enterprises - horizontal and vertical. Horizontal linkages refer to the relationship between foreign and domestic firms in the same industry. Vertical linkage[3] refers to the relationship multinational enterprises (MNEs) create with domestic firms either in the upstream sectors (known as backward linkage) or downstream sectors (known as forward linkage). Previous studies on developing countries have shown support for FDI-induced positive productivity spillovers for domestic firms through such production linkages. Lin et al. (2009) found that FDI from OECD countries resulted in positive horizontal productivity spillovers for domestic firms in China; while Thangavelu & Pattnayak (2006) showed the existence of similar positive horizontal spillovers in the

[3] The idea of backward and forward linkages were introduced by Hirschman (1958) as part of his advocacy for the unbalanced growth theory where slower-growing sectors form linkages with faster-growing sectors as a means for development.

Indian pharmaceutical industry; and Wang (2010) showed that there is evidence of positive backward and forward spillovers from FDI in Canadian manufacturing industries. However, this paper takes caution with oversimplifying the relationship between production linkages and improvement in domestic firms' productivity. The studies by Havránek & Iršová (2011) and Iršová & Havránek (2013) have also shown that many empirical studies had instead found non-significant positive spillovers or even negative effects of linkages. Hence, the authors emphasized that the presence and strength of the spillover effects are also dependent on control variables which are firm-, country- or industry-specific. Therefore, the inclusion of such variables would allow one to identify important determinants of productivity spillovers and derive important policy implications in terms of identifying the type of FDI to attract and the kind of domestic firms most likely to benefit from these FDI.

In this study, in addition to the impact of foreign firms, we also address the role of the state-owned enterprises (SOEs) in the Vietnamese economy, and its possible influence on the production linkages between foreign and local enterprises, which is largely unexplored in the literature. The role of SOEs were prominent in the development of experiences of Vietnam in terms of creating manufacturing base in the domestic economy. SOEs were used to manage and direct industry policies in the domestic economy, and it is also used to create industrial linkages and employment. As Adams & Tran (2010) and Vu Quoc Ngu (2002) highlighted, SOEs participate actively in various key industries and their prominence are apparent through their contribution to nearly half of the industrial output during the 1991-2000 period. However, it has been suggested that SOEs can potentially crowd-out foreign investments or production linkages between foreign and local enterprises (Hakkala & Kokko, 2007). While there is evidence of reforms taking place to reduce the dominance of SOEs in many sectors, the paper intends to explore the impacts of SOEs on the productivity spillovers from foreign firms and examine the role of SOEs in the manufacturing sectors.

The purpose of this paper is to investigate the productivity spillovers of horizontal and backward linkages on the Vietnamese manufacturing firms and this is done via a two-stage empirical strategy. First, with the use of micro-level panel data of 4146 firms from the *Annual Statistical Censuses & Surveys* during the period of

2004 to 2008, we employ the Generalized Method of Moments (GMM) estimation of total productivity factor (TFP) to control for the possible endogeneity of production inputs. In doing so, we also address several gaps in the literature as previous Vietnamese studies mainly used data up till 2005 and many were reliant on industry-level data which would not control for time-specific and firm-specific differences in TFP. Subsequently, proxies for horizontal and backward foreign linkages are incorporated into the empirical model, along with firm-specific characteristics such as quality of labor, and industry-level variables such as the presence of SOEs and level of competition. Econometric issues such as heteroskedasticity, unobservable firm-specific characteristics and endogeneity biases of the control variables are also controlled for to ensure robustness of results.

The rest of this paper can be outlined as follows. Section 2 provides an overview of the development in Vietnam. Section 3 details data construction and measurement. Section 4 estimates the productive performance of firms using two stage estimations: (a) estimating the firm level TFP and (b) identifying the sources of productive performance such as linkages and spillovers. Section 5 presents the parameter estimates and discusses the main findings. Section 6 concludes with some policy implications.

2. Leterature on Linkages and Spilovers

2.1. Key Trends in Vietnam

Vietnam transited into a market economy in the early 1990s via the Doi Moi Policies (Economic Renovation policies), which facilitated the inflows of FDI through initiatives such as the promulgation of Law on Foreign Investment as well as membership into ASEAN, APEC and WTO (Nguyen, Vu, Tran & Nguyen, 2006). Since then, Vietnam has experienced rapid GDP growth and FDI inflow.

Vietnam's economy has consistently achieved a high rate of economic growth, in addition to improved standards of living and rapid poverty reduction. During the period 2000-2010, the economy enjoyed an impressive GDP growth rate of 7.22

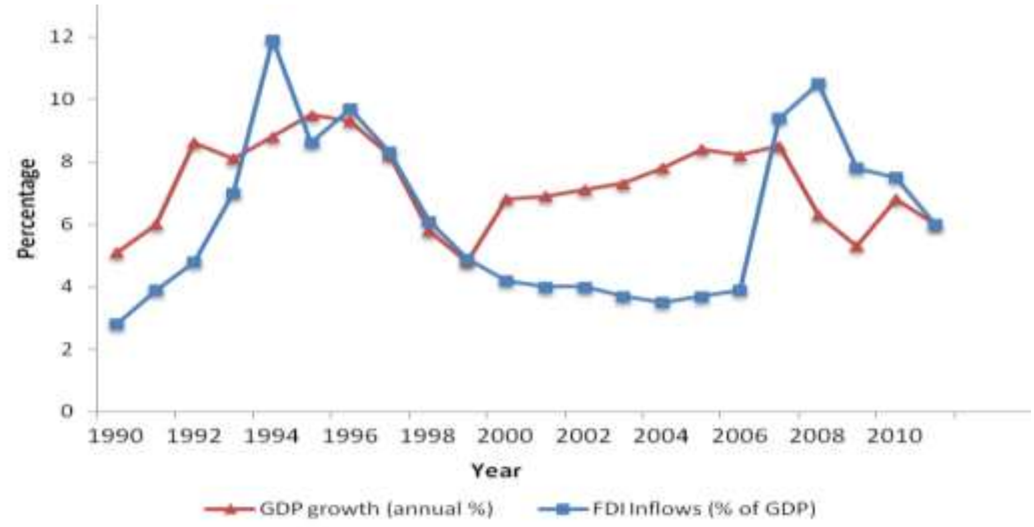
percent – the second highest among ASEAN+3 countries following China.[4] The accelerated pace of economic growth is fuelled largely by growth in the manufacturing and construction sectors which accounted for approximately 40 percent and realized the value added growth of 10.6 percent, on average, during the same period. As portrayed in Table 1, firm performance is equally remarkable in terms of output growth and contributions to employment. During 2000-2010, output and employment growth among firms in Vietnam reached the average rate of 7.5 and 2.3 percent, respectively. A breakdown of Vietnamese firms by types of ownership further indicates that firm performance is striking among foreign-owned enterprises.

Table 1: Output and Employment Growth by Ownership, 2000-2008.

	Output Growth (% p.a.)	Employment Growth (% p.a.)
Total	7.5	2.3
State	6.8	1.85
Non-state	7.3	1.93
Foreign Firms	10.4	20.41

Source: General Statistics Office, Vietnam.

Figure 1: Trends of GDP Growth (annual %) and FDI inflows (% of GDP) in Vietnam from 1990 to 2011.



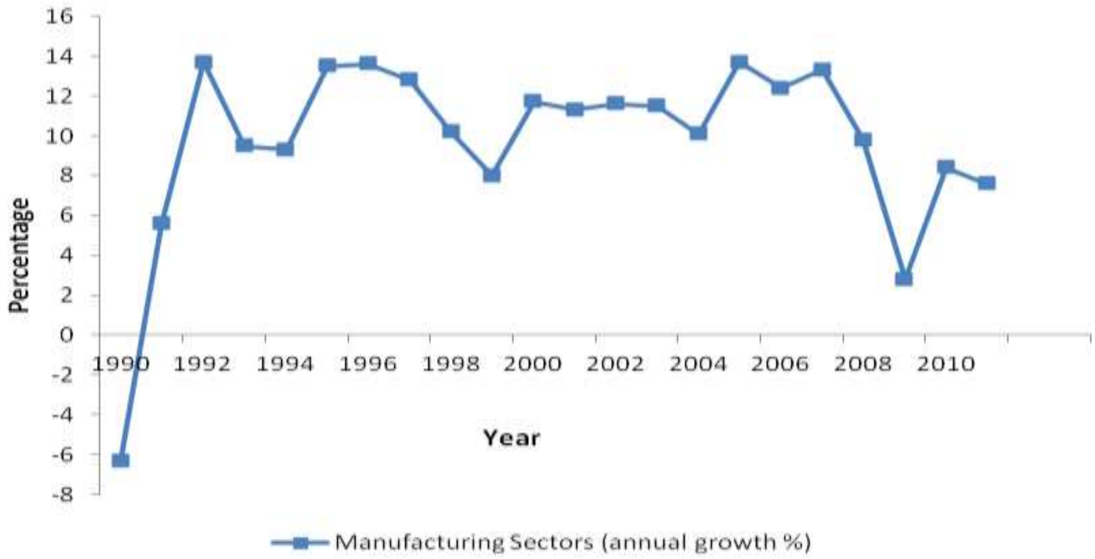
Source: World Development Indicators (WDI), the World bank

[4] The figure of the average GDP growth rate is calculated from *World Development Indicators*, the World Bank.

The trends of GDP growth and FDI inflows as a percentage of GDP in Vietnam since the transition in 1990 are given at Figure 1. The relationship is positive and strong up till the end of 1990s. However, it is also important to note that the correlation is less apparent thereafter; for instance, while FDI inflows grew steeply as a percentage of GDP from 2006 to 2008, GDP growth slowed. Thus, this calls to question the assumed positive relationship between FDI inflows and economic growth.

In addition, the manufacturing sector is also the key recipients of these FDI inflows across the industries. According to the Foreign Investment Agency (FIA) in Vietnam, the processing and manufacturing industries received the most newly and additionally registered FDI capital in 2012, accounting for 65.5 per cent of the total FDI. Figure 2 shows the value added growth of the manufacturing sectors since the Doi Moi policies facilitated the FDI inflows. From the beginning of 1990s, the annual growth largely remained above 8 per cent, except for the dip during the global recession in 2009. This provides preliminary signs of a positive correlation between the entry of foreign investments and the output productivity of enterprises.

Figure 2: Trends of Annual Growth (%) of Manufacturing Sectors in Vietnam from 1990 – 2011



Source: World Development Indicators (WDI), the World bank

2.2. Linkages between Foreign and Domestic Firms

Production linkages are important conduits for the positive impact and spillovers of multinational activities in the domestic economy. MNEs and foreign affiliates typically have more advance technology and better distributional networks than domestic firms in developing countries, which creates a potential for productivity spillovers on domestic firms when different production linkages are formed with their foreign counter-part (Girma, Gorg & Pisu, 2008).

As aforementioned, this paper focuses on horizontal and backward production linkages. Horizontal linkages have been widely researched on and positive productivity spillovers through such intra-industry relationship can occur through 4 channels – (a) competition effects, (b) demonstration effects, (b) labour mobility and (b) exports (Crespo & Fontoura, 2007).

The first channel refers to the entry of foreign firms into the domestic market as a form of competition with the domestic firms. As a result, domestic firms are incentivized to enhance productivity through better utilization of resources and usage of more advanced technology, thereby creating positive competition effects. However, as Aitken & Harrison (1999) suggested, domestic firms' market share can also be eroded by the entry of large foreign firms, especially when there is imperfect competition in the product market. Consequently, the competition effects become negative as firms either function with less efficiency due to higher average operating costs or exit the market.

On the other hand, demonstration effects occur when domestic firms adopt advanced technology or imitate better practices used by foreign firms, which subsequently improved their productivity. Similarly, domestic firms may also tap on knowledge and expertise of workers previously from MNEs for improving their productivity. Görg and Strobl (2005) did a relevant empirical investigation and found that owners of domestic firms who had worked in an MNE immediately prior to starting their firms in the same industry were more productive than their counterparts without the MNE experience. But as Sinani & Meyer (2004) highlighted, such labor mobility can be limited if foreign firms offer higher wages and attract skilled labor from domestic firms instead. In such cases, the entry of foreign firms may further drain the level of human capital in local companies. Lastly, the presence of MNEs and foreign affiliates can provide distributional networks and relevant knowledge which facilitate export performance. Hence, with horizontal linkages with the foreign firms, domestic firms can boost their export capacity and productivity levels as well (Anwar & Nguyen, 2011).

Vertical linkage had been mainly neglected in the earlier part of the empirical research but it is increasingly emphasized, as recent studies find positive and statistically significant vertical spillovers despite non-significant horizontal spillovers from FDI (Smarzynska, 2002; Havranek & Irsova, 2011). This is especially so for backward linkages. Similar to horizontal linkages, they can facilitate positive productivity spillover through the demonstration effect, competition effect, and labor mobility. A prominent example was highlighted by Lin & Saggi (2007), which examined foreign firms' engagement in contractual agreements with domestic suppliers for exclusive transfer of knowledge and technology. In such instances, the productivity of domestic suppliers can improve due to the adoption of higher quality technology and more efficient production processes. Ivarsson & Alvstam (2005) supported this by showing that foreign transnational corporation, Volvo, renders technical assistance to its local component suppliers in developing countries to improve their operations. Additionally, the entry of foreign firms in downstream sectors can create a competition effect amongst domestic suppliers to meet the increased demand for inputs, thereby encouraging domestic suppliers to enhance their output productivity. This is seen in Okamoto (1999) as U.S. parts suppliers in the automobile industry are observed to enhance their productivity with the entry of Japanese car makers in the market.

Several papers have highlighted the importance of domestic absorptive capacity in creating positive spillovers and linkages in the domestic economy. The analysis by Iršová & Havránek (2013) found that factors such as technology gap between domestic and foreign enterprises, full foreign ownership of firms, and trade openness of the host country limit the local firms' absorptive capacity and access to imitation of the expertise in foreign firms, and subsequently lessen the positive horizontal spillovers from linkages. On the other hand, enhancing factors of domestic firms' absorptive capacity such as high level of human capital in the country can encourage greater positive horizontal spillovers from demonstration effects. Correspondingly, Havránek & Iršová (2011) examined the literature on vertical linkages and their meta-analysis revealed that technology gap and wholly foreign ownership of firms also had a negative impact on vertical spillovers while trade openness of the host country instead enhanced the positive backward spillovers.

The study by Crespo & Fontoura (2007) highlighted that wholly foreign-owned firms may generate lesser positive spillover effects than partially-owned foreign firms. This is possibly because wholly foreign-owned firms operate as enclaves, which restricts the demonstration effects arising from transfer of technology or knowledge to domestic firms. The size of a domestic firm may also determine its scale of operation, technology capacities and labor quality, and thereby affecting its ability to compete with foreign firms in the same industry. Therefore, consistent with Aitken & Harrison (1999), Crespo & Fontoura (2007) found that smaller firms are likely to experience more negative horizontal spillover effects than its larger counterparts. However, smaller firms also tend to have larger technology gap as compared to their foreign counterparts and therefore, they have greater potential to benefit from the demonstration effects from the MNCs (Sinani, & Meyer, 2004; Girma & Wakelin, 2001). Hence, the overall impact of the firm's size is dependent on the trade-off between benefits of technology transfer and costs of eroded market share.

Other antecedents of spillover effects such as firm's export-orientation have also found to play a significant role. Girma et al. (2008) examined the influence of firms' export-orientation on spillover effects in United Kingdom's manufacturing sector and found that significant horizontal spillovers occur between export-oriented MNEs and domestic exporters but not with domestic non-exporters. This is consistent with the analysis in Crespo & Fontoura (2007), as the authors emphasized that export-oriented domestic firms already face immense competition in the international markets and are less likely to experience significant negative horizontal spillover effects arising from foreign competition effects as compared to their non-exporting counterparts. Le Quoc Hoi (2008) also found that exporting foreign firms did not significantly worsen the labor productivity of domestic firms while domestic-market-oriented foreign firms imposed more negative effects of competition as they edge out private local enterprises in the domestic market. With regards to backward spillovers, Girma et al. (2008) found that export-oriented MNEs have a negative backward spillover effect on domestic suppliers likely due to their enclaves operations[5], while domestic-market-oriented MNEs have a positive backward spillover effect for domestic suppliers.

Industry-level characteristics also played a part in determining the spillover effects, as Girma et al. (2008) found that non-exporting domestic firms generally face more negative competition effects than positive transfer of knowledge and technology, especially as the level of competition increases in the industry or in high-technology sectors where the technology gaps between foreign and local enterprises are likely to be smaller.

2.3. The linkages and Spillovers in Vietnam

As an emerging economy, the impact of foreign firms on the domestic economy of Vietnam critically depend on its domestic capacity. This is highlighted in Nguyen et al. (2006), where large FDI inflows had mainly entered the industrial sectors and were restricted in the form of joint ventures with state-owned enterprise before the 1997. In particular, the growth rate of industrial output produced by these FDI enterprises mostly exceeded the growth rate of the entire industrial sector from 1995 – 2003. Therefore, their greater level of productivity would impact positively on local firms.

Giroud (2007) conducted semi-structured interviews and found that initial linkages formed in Vietnam were weak and productivity spillovers were not as extensive as Malaysia due to lack of collaborative schemes and large technology gap between foreign and domestic firms. For example, foreign firms may have demand for higher quality inputs which domestic suppliers with limited technology capacities cannot produce. Hence, the backward linkages are not formed and productivity spillovers are limited. On the other hand, domestic-market-oriented FDI also enter the Vietnamese market with an advantage over domestic firms in terms of technology and knowledge. Consequently, this negative competition effect led to domestic firms experiencing a negative horizontal spillover.

[5] This was also suggested in Kokko, Zejan & Tansini (2001), as the authors suggested that export-oriented foreign firms in Uruguay may be operating in enclave sectors with few contacts with local suppliers.

Several empirical studies have shown that backward spillover effects are the dominating type of positive spillover in Vietnam, whether the spillover effects are in the form of labor productivity, output productivity or wages (Nyguen et al., 2008; Le Quoc Hoi, 2008; Le Quoc Hoi, 2007). However, the results for horizontal spillover effects remained mixed and inconclusive as it mainly depended on the aspect of spillovers examined and the empirical specification used (Pham, 2009).

Firms' heterogeneity constitutes an important part of the analysis as many studies included control variables at firm-level to investigate the possible determinants of spillover effects. The existing technology gap between domestic firms and their foreign counterparts remain an important part of many analyses on Vietnam as it consistently predicted negative spillover effects for domestic firms (Nguyen, 2008; Le Quoc Hoi, 2008). The scale of firms as a firm-specific factor was also found to be influential for the spillover effects on domestic firms in Vietnam. In Nguyen (2008), larger high-technology domestic firms have more opportunities to receive technology transfers from foreign firms than its smaller counterparts. Similarly in Le Quoc Hoi (2008), larger domestic firms are able to benefit more in terms of backward productivity spillovers.

The importance of state-owned enterprises is also highlighted as an important component of industry policy to attract FDI. The Vietnamese government plays an important role in the industry policy in terms of employment creation and driving the key industries in the economy. The breakdown of ownership structure from the *Annual Statistical Censuses & Surveys: Enterprises* from 2004 to 2008 is given at Table 1 below. It is very clear that SOEs play an important role in the industry policy of Vietnam.

Therefore, it is important to examine the possible impacts they have on domestic firms as well as the linkages formed between foreign and domestic enterprises. As pointed out by Nguyen & Dijk (2012) and Hakkala & Kokko (2007), SOEs typically have better access to market and financing as they are favored by state authorities. Hence, this unfair competition with domestic firms would directly create negative productivity spillovers for domestic firms which are not able to compete with SOEs. An example is the state-owned corporation Vinatex which has expanded its production of fibers, garments and textiles, so as to ensure competitive quality and supply for downstream industries, and edged out less productive private enterprises in the same sector. Indirectly, it is also likely to worsen the negative competition introduced by the foreign conglomerates, which can result in overall negative productivity spillovers from foreign enterprises.

SOEs might also crowd out positive foreign backward spillovers if many MNEs prefer to form partnership with SOEs instead of private local firms so as to tap on the fast access to market and regulatory authorities (Knutsen & Nguyen, 2004). However, while SOEs can crowd out positive productivity spillovers from foreign to domestic firms, SOEs also have the capacity to generate spillovers for local enterprises as well. For example, SOEs can support local firms by forming partnership with domestic suppliers which are not attractive to foreign investors and produce SOE-induced positive productivity spillovers through backward linkages. Therefore, from the existing literature, the preliminary hypotheses are that it is likely that the presence of SOEs indirectly lessen the positive horizontal and backward spillovers from foreign firms on domestic companies, as well as imposing a negative horizontal spillover on local firms in the same industry. However, there is a potential for positive backward spillovers as SOEs form production linkages with domestic suppliers.

3. Data Construction and Empirical Methodology

We construct our dataset of firms from *Annual Statistical Censuses & Surveys: Enterprises* from 2004 to 2008, gathered by the General Statistics Office of Vietnam. It provides firm-level information on foreign ownership and production characteristics, like the number of workers, gross revenue, working capital, materials, profits, and export/import status, on top of financial attributes such as liquid asset, fixed asset, liabilities and equity, among many others. In total, the panel data from 2004-2008 consisted of 4146 firms and span across 23 manufacturing sectors based on the Vietnam Standard Industrial Classification 2007 (VSIC 2007)[6]. Firms are

[6] VSIC (2007) is based on International Standard Industrial Classification revision 4 (ISIC Rev.4)

differentiated into three categories, (i) domestic-owned, if there is an absence of state and foreign capital, (ii) state-owned, if the enterprise owns central state or local state capital and (iii) foreign-owned, when there is the presence of foreign capital in the firm. This classification provides nearly 1446 domestic firms, 890 foreign firms, and nearly 1810 state-owned enterprises.

As discussed in next section, a set of variables is utilized in our empirical framework. First, the measurement of TFP rests with an estimation of a Cobb-Douglas production function which requires information on a firm's gross output as well as production inputs. Net output is measured by sales of goods produced net of materials and components purchases. There are three production inputs in the empirical model, labor, intermediate materials, and capital. Labor is the number of workers employed within a firm. Intermediate materials include parts and components that are used in the production processes. Capital is the values of land, building and construction, and machinery and equipment, less the depreciation of assets. All variables are deflated using GDP deflators in 2004 prices[7].

Several studies have highlighted the weakness of using the Ordinary Least Square (OLS) estimations for the measurement of TFP, it has been pointed out that the estimators might be biased since the OLS method assumes that the input levels are exogenous. Studies including Griliches & Mairesse (1998), Girma et al. (2008) and Lesher & Miroudot (2008) have pointed out that productivity shocks observable by firms may affect both their decisions for inputs level and the respective firm's TFP, thereby creating a simultaneity problem where the input variables in the OLS estimation are endogenous. Hence, to address this issue, the two-step Blundell-Bond GMM estimation was employed instead.

The simplest way to obtain parameter estimates in our base-line econometric specification (3) is to carry out the standard Ordinary Least Squares (OLS) estimations. However, our concern is that OLS estimations tend to convey biased estimates due to firm heterogeneity. The unobservable firm heterogeneity seems plausible given the knowledge that firms operate in a wide range of economic activities like manufacturing, financial intermediation, trade, real estate and consultancy services. To control for unobservable firm heterogeneity, we make use

[7] GDP deflators are constructed using information available from World Bank.

of Fixed Effects (FE) and Random Effects (RE) estimations. The former is undertaken by using OLS with heteroskedasticity-robust estimators to take into account the heteroskedasticity problem that arises from variation in firm size, whereas the latter is obtained by Generalized Least Squares (GLS) with the Swamy-Arora estimators.

FE and RE estimates may also be biased and inconsistent, however. The reason is that all of our structural variables, e.g. FDI, financial characteristics, high-tech capital investment, and human capital utilization are very likely to be endogenously determined by other unobserved variables. If the potential endogeneity bias problem exists, FE and RE estimates are not consistent and asymptotically efficient. There are at least two standard approaches to accounting for the potential endogeneity biases. The first is to employ the valid instrumental variables (IVs) – ones which are exogenous and strongly correlated with endogenous explanatory variables. However, this approach is data-intensive and thus may be inappropriate for our dataset. Alternatively, we go for the second approach, whereby lags of structural variables are chosen as IVs to correct any simultaneity bias in the estimations, using Generalized Method of Moment (GMM) to obtain two-step estimators (Blundell and Bond, 1998; and Arellano and Bover, 1995).

Therefore, the specification for the firm's production can be modified as such[8]:

$$y_{it} = \beta_0 + \beta_l l_{it} + \beta_k k_{it} + \beta_m m_{it} + \alpha_t + \eta_i + v_{it} + m_{it}, \qquad (1)$$

where η_i, v_{it} and m_{it} are the additive components of the error term and represent unobserved firm-specific effect, productivity shock (potentially autoregressive) and serially uncorrelated measurement errors, respectively. The two-step Blundell-Bond GMM estimation serves to isolate effects of unobserved firm-specific effect and productivity shock through the use of IVs to resolve the endogeneity issue for the production inputs.

[8] The econometric specification is adapted from Bundell & Bond (1998).

The effects of linkages on output productivity of domestic firms are then examined through the regression of the estimated TFP against the production linkages as well as the respective control variables.

The key variables of our study are the two types of production linkages foreign firms form with their domestic counterparts. The foreign horizontal linkage (FOR_*HORZ*) variable[9] aims to measures the presence of foreign firms in a particular manufacturing sector and is defined as the share of sales of foreign firms in that sector. Such measurements were also used in Girma et al. (2008) and Nyguen Ngoc Anh et al. (2008) and can be written as follows:

$$FOR\_HORZ_{jt} = \Sigma_{\forall j=i}\, y_{j,t} / Y_{i,t},$$

where $y_{j,t}$ represents the output of foreign firm i, operating in sector j at time t and Y_{jt} is the total output of sector j at time t. Hence, the FOR_*HORZ* variable increases with rising output share of the foreign firms. The foreign backward linkage (FOR_$BACK_{jt}$) variable serves to capture the extent of potential contacts between foreign firms and domestic suppliers, and akin to Smarzynska (2002) and Girma et al. (2008), it is defined as:

$$FOR\_BACK_{jt} = \Sigma_k\, \alpha_{kj}\, FOR\_HORZ_{kt} \text{ for } k \neq j,$$

where α_{kj} is the proportion of sector j output supplied to sector k[10] . Hence, the backward linkage variable increases with rising foreign presence in sectors supplied by industry j and increasing share of intermediates supplied to sectors with foreign presence.

Aside from the linkage variables, proxies for the presence of SOEs in the same or downstream sectors are important for capturing the direct effects of SOEs. Similar to the foreign linkage variables, they are constructed in an analogous manner. The SOE horizontal linkage (SOE_*HORZ*) variable aims to measures the presence of

[9] Smarzynska (2002) and Thangavelu & Pattnayak (2006) used the foreign equity participation averaged over all firms in the same sector (weighted by each firm's share in sectoral output), which would be more sensitive to the presence of foreign investment in the industry. However, the data limitation in the dataset only allowed us to capture the horizontal linkage as the foreign firm's share in sectoral output.

[10] α_{kj} is constructed with the use of an input-output table on Vietnam in early 2000s, retrieved from http://stats.oecd.org

SOEs in a particular manufacturing sector and is defined as the share of sales of SOEs in that sector. It can be written as follows:

$$SOE\_HORZ_{jt} = \Sigma_{\forall j=i}\ y_{j,t} / Y_{i,t},$$

where $y_{j,t}$ represents the output of SOE i, operating in sector j at time t and Y_{jt} is the total output of sector j at time t. Hence, the SOE_*HORZ* variable increases with rising output share of the SOEs. Correspondingly, the SOE backward linkage (SOE_$BACK_{jt}$) variable serves to capture the extent of potential contacts between SOEs and domestic suppliers, and it is defined as:

$$SOE\_BACK_{jt} = \Sigma_k\ \alpha_{kj}\ SOE\_HORZ_{kt} \text{ for } k \neq j,$$

where α_{kj} is the proportion of sector j output supplied to sector k. Hence, the backward linkage variable increases with greater state presence in sectors supplied by industry j and increasing share of intermediates supplied to sectors with SOEs.

Additionally, firm-specific characteristics are important in accounting for the presence and size of spillover effects on productivity as discussed in section 2. This study included a proxy for quality of labor in the empirical framework. While studies have used the ratio of skilled workers as a measurement of labour quality, this information is not available in our dataset. Hence, as suggested in Le Quoc Hoi (2008), the average wage of a firm is used a proxy instead, with the assumption that firms with higher average labour costs per worker employ higher skilled labour. The variable ($Labour\_Q_{ijt}$) is measured as such:

$$Labour\_Q_{ijt} = W_{ijt}/L_{ijt},$$

where W_{ijt} refers to the total wages paid in firm i, industry j at time t while L_{ijt} refers to the total number of employees in firm i, industry j at time t. This variable aims to capture the quality of human capital in each domestic firm. It is predicted that firms with higher quality of labor is likely to have greater output productivity due to increased efficiency.

An industry-level characteristic is examined through the *Concentration* variable ($CONC_{jt}$) and intends to capture the effects of industry concentration and competition. It is proxied by the Herfindahl index[11] as:

$$CONC_{jt} = \Sigma_i \, (x_{ijt}/X_{jt})^2$$

where x_{ijt} is the sales of domestic firm *i* in industry *j*; X_{jt} denotes the total sales of industry *j*. A higher value of the Herfindahl index indicates a high degree of industry concentration and thus, the presence of big firms withholding large market shares. Hence, it is predicted that a higher value of Herfindahl index is likely to have a negative impact on the productivity of domestic firms as they are unable to compete with larger firms.

The estimated model can be represented by the econometric specification as follows:

$$TFP_{ijt} = \alpha_0 + \alpha_1 \, \mathrm{FOR}\_HORZ_{jt} + \alpha_2 \, \mathrm{FOR}\_BACK_{jt} + \alpha_3 \, SOE\_HORZ_{jt} + \alpha_4 \, SOE\_BACK_{jt} + \alpha_5 \, LABOR\_Q_{ijt} + \alpha_6 CONC_{jt} + \delta_t + \delta_j + u_{it} \qquad (3)$$

where the subscript *i*, *j* and *t* refer to firms, industries and time respectively. δ_t and δ_j are the time and industry dummies, respectively, and u_{ijt} denotes the stochastic error term in the regression model.

However, there can be considerable unobserved firm-specific heterogeneity given that the firms span across the various segments of the manufacturing industry. Hence, Fixed Effects (FE) and Random Effects (RE) estimations are used to control for such time-invariant firm-specific effects. There are also concerns of the possible endogeneity of the explanatory variables as they might be determined by unobserved variables. In such cases, the FE and RE estimates will be biased. Hence, to address

[11] The Herfindahl index is a concentration ratio which captures the level of competition in a market or industry by comparing market shares of firms using the relative firm size. A high Herfindahl index indicates the presence of firms with large market shares and hence, a lower level of competition in the industry. Correspondingly, a low Herfindahl index indicates firms each having low market share and thereby, implying a high level of competition.

this issue, the two-step Blundell-Bond GMM estimation was employed again. So the final econometric specification can be written as follows:

$$TFP_{ijt} = \alpha_0 + \alpha_1 TFP_{ijt-1} + \alpha_2 \, FOR\_HORZ_{jt} + \alpha_3 \, FOR\_BACK_{jt} + \alpha_4 \, SOE\_HORZ_{jt} + \alpha_5 \, SOE\_BACK_{jt} + \alpha_6 \, LABOR\_Q_{ijt} + \alpha_7 CONC_{jt} + \eta_i + v_{it} + m_{it} \quad (4)$$

where TFP_{ijt-1} is included to account for the dynamic adjustments of the TFP in time period, t. Similar to the TFP estimation, η_i, v_{it} and m_{it} are the additive components of the error term. η_i and m_{it} represent unobserved firm-specific effect and serially uncorrelated measurement errors, respectively. v_{it} refers the unobserved variables which determine the explanatory variables. Two additional robustness checks are undertaken: The Sargan statistics[12] test is undertaken to test the null hypothesis that the over-identifying restrictions are valid and the Arellano-Bond (AR) Test examines the null hypothesis of no serial correlation.

3.2.Descriptive Statistics

Before proceeding to the econometrical tests, it is useful to perform preliminary descriptive analysis on the firms in the sample.

3.2.1. Comparisons between Foreign, State-owned and Domestic Firms

Firstly, a comparison is done among the foreign firms, state-owned enterprises and local enterprises with respect to their firm-specific characteristics. The descriptive statistics are presented in Table 1 below.

[12] Also known as Hansen test, it tests for the validity of instrumental variables used by checking for correlation between the residuals and exogenous variables to affirm the exogeneity of the instrumental variables.

Table 1: Descriptive Statistics

Type of ownership	**Quality of Labour* (mil. Dongs)**	**Wage to Sales Ratio* (%)**	**Employment Growth (% p.a.)**	**High-technology Investment***	**No of Observations**
Total	16.4	0.18	10.68	0.11	4146
Domestic	11.7	0.19	10.55	0.09	1446
Foreign	24.4	0.24	11.35	0.13	890
State-owned	16.3	0.16	10.53	0.11	1810

Note: Table 1: Firm-specific characteristics by type of ownership.
*Labor quality is measured as the average wage in each firm. Wage level is proxied by wages as a proportion of total firm sales. High-technology investment is taken as the number of computers per employee

Quality of Labor - Skilled workers require higher wages than low-skilled workers. Therefore, the average wage in a firm is an indicator for the level of human capital in a firm as firms with relatively more skilled workers are likely to also pay higher average wages. Correspondingly, average wage are used as a proxy for the quality of labor in each firm, which in turn signals the firm's level of productivity and ability to compete with its counterparts in the same industry (Foxs & Smeets, 2011). In our sample, the labor quality of domestic firms is below average while foreign enterprises comparatively employ higher quality labor. Hence, MNEs may impose a negative competition effect on the domestic firms as they gain a competitive edge and enjoy higher productivity.

Employment Creation – Employment creation across firms is dependent on the comparative attractiveness of the firms. An indicator of a firm's appeal is the relative wage level offered to employees of similar qualifications, and it is often observed that MNEs offer higher wages than local private enterprises (Lipsey & Sjoholm, 2004). In this case, the relative wage level is captured by the ratio of wages to firm's total sales, which proxied the firm's willingness to pay for each dollar of labor output. Hence, enterprises which offer higher wages to employees of similar caliber will have greater ratio of wages to their total sales. In our sample, the foreign firms have the highest ratio and therefore, they may have a draining effect on domestic and state-owned firms by better attracting more skilled workers. This limits the positive effect of labor mobility for which production linkages can facilitate. This trend is also consistent with the labor growth observed across the firms as foreign enterprises have faster labor growth than its domestic and state-owned counterparts.

High–technology Capital Accumulation – Accumulation of High–technology capital contributes to operating performance, research and development, and ultimately, improved productivity (Oliner & Sichel, 1994; Siegel & Griliches, 1992). While the dataset lacks information on the expenditure on all high–technology capital in the firms, a proxy can be constructed to examine the trends amongst firms of different ownership. In this case, the number of computers available in the firm per employee is used to compare the incentive for innovation and efficiency. Foreign enterprises display the highest average while domestic firms have the lowest mean.

However, greater high-technology capital accumulation does not necessarily translate into higher TFP. In the last panel, we see that SOEs has the highest average TFP despite fewer numbers of computers per employee than foreign firms. In fact, foreign enterprises have the lowest average TFP in our sample while domestic firms fared slightly better. Hence, with larger technology gap from SOEs, domestic firms may be able to receive greater productivity spillovers from the technology and knowledge transfers from SOEs than foreign companies.

3.2.2. GMM TFP and Production Linkages

Scattered plots between TFP estimates and the 4 production linkages are also constructed[13] to provide a preliminary illustration of the extent to which the presence of foreign and state firms affect the output productivity of domestic enterprises.

In Figure 3, the fitted plot between TFP of domestic firms and the foreign horizontal linkage showed a negative correlation. Therefore, it is likely that the effects of negative competition over-compensates for the positive effects of technology transfer.

[13] The figures are provided in Appendix 1.

On the other hand, in Figure 4, the fitted plot between TFP of domestic firms and the foreign backward linkage showed almost no correlation. This is indicative of the lack of productivity spillovers from foreign investors to domestic suppliers. Hence, the overall effects of FDI did not seem to improve the domestic firm's output productivity.

In Figure 5, the fitted plot between TFP of domestic firms and the SOE horizontal linkage showed a very slight positive relationship. Therefore, as compared to foreign firms, it is likely that SOEs induced less negative competition effects and more positive transfer of technology and expertise on the local private enterprises.

However, in Figure 6, the fitted plot between TFP of domestic firms and the SOE backward linkage also showed a modest negative relationship. Therefore, domestic suppliers do not seem to gain productivity spillovers from both foreign and state-owned enterprises. This could be due to the inability of domestic suppliers to meet the standards and variety of intermediate inputs demanded by foreign firms and SOEs (Rodriguez-Clare, 1996).

4. Empirical Results

4.1. Estimations of Production Technology

Table 2 provides the results of the estimation of the Cobb-Douglas production function. The first panel reports the OLS estimates with heteroskedasticity-robust estimators. However, as aforementioned, OLS estimates are likely to be biased due to potential endogeneity of input levels. For instance, in the context of a positive productivity shock which simultaneously affects both the production input choices and output levels, the input coefficients are likely to be biased upwards in OLS estimation. Therefore, to control for these biases, the second panel reports the GMM estimates, where the lagged dependent variable is used as a regressor and the lagged input variables are chosen as IVs. The input coefficients are lower than the OLS estimates and this suggests that there is likely to be simultaneity biases in the OLS estimation. Therefore, we adopt the GMM-estimated TFP for subsequent empirical analysis.

Table 2: Estimations of Production Technology by OLS and GMM for Manufacturing Firms in Vietnam: 2004 –2008

Dependent variable: y_{it}	**OLS**	**Two-Step GMM**
Labor, l_{it}	0.618***	0.318***
	(0.009)	(0.031)
Material inputs, m_{it}	0.258***	0.021***
	(0.0056)	(0.0077)
Capital, k_{it}	0.231***	0.128***
	(0.0067)	(0.0193)
Total	1.106	0.476
Number of Obs.	16172	13139

Note: 1) Heteroskedasticity-robust standard errors in parentheses 2)***, ** and * denote statistical significance at 1, 5, and 10 percent, respectively.

4.2.Baseline estimations of GMM TFP for domestic firms

Table 3 reports the baseline estimations of GMM TFP in econometric specifications (3) and (4). The first panel provides the OLS estimates with the heteroskedasticity-robust estimators. However, due to unobserved firm-specific differences and endogeneity of control variables, OLS estimates are inclined to be biased. Therefore, the second and third panels report the fixed effects (FE) and random effects (RE) estimates respectively, to control for effects of firm heterogeneity. There could also be lagged effects from the activities of MNCs and SOEs on the domestic firms. We also take the lag of spillover variables to understand the dynamic effects of spillovers of foreign and SOEs on the domestic firms. The results of the lagged effects are reported at Table 4.

Table 3: Baseline Estimations of GMM TFP by OLS, FE and RE for Domestic Manufacturing Firms in Vietnam: 2004 – 2008

Using GMM TFP	OLS	FE	RE	GMM
Constant	0.0520	-0.406	0.411**	-0.470
	(0.994)	(0.384)	(0.169)	(0.429)
TFP_{t-1}	0.574***	-0.328***	0.486***	0.0562
	(0.030)	(0.047)	(0.034)	(0.104)
FOR_HORZ	0.501	-0.205	-0.488**	-0.523
	(1.0231)	(0.329)	(0.156)	(0.340)
FOR_BACK	-2.0309	-0.765	-0.621***	-0.560
	(2.2818)	(0.893)	(0.168)	(0.884)
SOE_HORZ	-0.730	-0.179	-0.570**	-0.282
	(0.691)	(0.437)	(0.186)	(0.469)
SOE_BACK	1.4636	1.2964*	-0.107	1.963**
	(2.099)	(0.960)	(0.136)	(0.940)
LABOUR_Q	0.015***	0.014***	0.017***	0.014***
	(0.002)	(0.003)	(0.003)	(0.0029)
CONC	-2.5142	-2.3587***	-1.3353***	-2.1304***
	(2.602)	(0.487)	(0.377)	(0.557)
Number of observations	2029	2029	2029	1195
R-squared	.4829	.1472	.4563	----

Note: 1) Heteroskedasticity-robust standard errors in parentheses 2)***, ** and * denote statistical significance at 1, 5, and 10 percent, respectively.

Table 4: Estimations of GMM TFP by OLS, FE and RE for Domestic Manufacturing Firms in Vietnam (lagged): 2004 – 2008

Using GMM TFP	OLS	FE	RE	GMM
Constant	0.0425	-0.307	0.114**	-0.354
	(0.832)	(0.360)	(0.011)	(0.389)
TFP_{t-1}	0.560***	-0.310***	0.408***	0.052
	(0.021)	(0.038)	(0.035)	(0.140)
FOR_HORZ_{t-1}	0.411	-0.413	-0.486**	-0.523
	(0.053)	(0.323)	(0.160)	(0.340)
FOR_BACK_{t-1}	1.009**	0.850*	0.624***	0.512**
	(0.418)	(0.320)	(0.163)	(0.248)
SOE_HORZ_{t-1}	-0.621	-0.180	-0.512**	-0.223
	(0.616)	(0.473)	(0.185)	(0.430)
SOE_BACK_{t-1}	1.466**	1.264*	0.877**	1.635**
	(0.710)	(0.760)	(0.136)	(0.407)
LABOUR_Q	0.014***	0.013***	0.017***	0.015***
	(0.003)	(0.003)	(0.003)	(0.003)
CONC	-2.500	-2.387***	-1.353***	-2.304***
	(2.154)	(0.488)	(0.377)	(0.577)
Number of observations	1409	1409	1409	815
R-squared	0.490	0.172	.3563	----

Note: 1) Heteroskedasticity-robust standard errors in parentheses 2)***, ** and * denote statistical significance at 1, 5, and 10 percent, respectively.

Table 4 suggests the use of RE estimates over OLS estimates is more efficient. The statistics are statistically significant and rejects the null hypothesis that there is no random effect. Hence, the difference in estimates can be attributed to firm-specific differences not observed in OLS estimations. However, the Hausman's test also showed that FE estimates are favored over RE estimates since the statistics are statistically significant and rejects the null hypothesis that RE estimates are consistent. Lastly, we also observe that FE estimates are qualitatively similar to GMM estimates in Table 3, which suggests that any endogeneity biases did not qualitatively bias the FE estimates. However, to ensure the robustness of the estimates, the remaining discussions are focused on the GMM estimations of GMM-TFP to ensure firm heterogeneity and endogeneity biases are fully controlled.

Firstly, the coefficient estimates associated with foreign horizontal and backward linkages are negative in the FE and GMM estimations, albeit not statistically significant at Table 3. This suggests that there are generally no foreign productivity spillovers on the domestic manufacturing firms. However, at Table 4, the lagged of foreign backward variable indicates positive spillovers on the domestic firms for both the fixed effects and GMM estimation. This indicates that there is lagged effects of spillovers on the domestic firms and this might due to the learning-by-doing effects in the economy. Thus, we do observe technology and expertise spillovers to the domestic firms from foreign firms in Vietnam.

The results of the impact of SOEs are also reflected in Tables 3 and 4. Similarly, the negative but statistically insignificant parameter estimates for SOEs' horizontal spillovers on domestic enterprises. However, it is interesting to note that the relevant coefficient estimates for SOE backward spillovers are positive and statistically significant in the empirical model, and also with the lags, which suggests that SOEs have a positive impact on the output productivity of domestic suppliers. This implies that, unlike foreign conglomerates, SOEs have established production linkages with local private suppliers and induced productivity improvement. One possible explanation is the existing network and ties between SOEs and local private suppliers due to proximity. As Girma et al. (2008) proposed, exporting foreign firms often tap on the same distributional networks of the parent companies in their home countries for expediency and ease. Therefore, in the context of SOEs, it is more likely that they would approach local suppliers which they have worked with for continued partnership. Subsequently, the contact with SOEs can induce spillovers of knowledge and incentivize these local suppliers to improve the quality of their products by improving their productivity.

At the same time, the coefficient of quality of labor is found to be positive and statistically significant across all specifications. This highlights the importance of investment in human capital in local firms to improve their output productivity. Consistent with Iršová & Havránek (2013) and P. Nguyen (2008), this suggests that higher levels of human capital facilitate innovation and imitation of technology and expertise from MNEs and SOEs. On the other hand, the industry-level attribute (level of concentration) is shown to be negative and statistically significant for both the FE and GMM estimations. This provides evidence that high level of concentration in an industry would favor larger firms and disadvantage firms with small market shares, which subsequently impact negatively on the latter's productivity. This is especially true for industries where majority of market shares is dominated by large foreign or state-owned enterprises. In such instances, domestic firms are unable to compete and their productivity is affected by falling profit margins.

4.2.1. GMM Estimations of GMM TFP for Domestic and Foreign Firms by Scale

Given the negative horizontal spillovers from foreign and state-owned firms, it is apparent that the competition effects have a negative effect on domestic firms. However, as the literature review in section 2.2 suggested, the scale of a firm often determine its scale of operation, technology capacities and labor quality, which in turn affects each firm's ability to compete with MNEs and SOEs in the same industry. For that reason, small domestic firms are likely to experience more negative impacts as compared to the large domestic firms. Similarly, the negative backward spillovers from foreign firms may be indicative of the domestic suppliers' lack of appeal to foreign enterprises in terms of product quality and variety. Analogously, smaller firms would tend to experience more adverse impacts than their large counterparts due to relatively lower quality of products and less diversity of options. Therefore, we partition the sample into two groups by defining small domestic firms as firms with less than 100 employees and large domestic firms as those with more than 100 employees. GMM estimations based on the prior empirical framework are carried out on the groups separately to investigate any differential impacts on the productivity spillovers.

Our findings in Table 5 substantiate our hypothesis. The first panel shows the parameter estimates for small domestic enterprises and they correspond with the results in table 5; foreign firms have negative horizontal and backward productivity spillovers on domestic firms while SOEs in the same industry imposed negative productivity spillovers as well.

However, the second panel which provides the coefficient estimates for large domestic firms showed positive spillovers across the 4 types of linkages, albeit not statistically significant. This suggests that the adverse impacts of spillovers from foreign horizontal and backward linkages, as well as SOEs backward linkage in the previous estimates are mainly driven by the negative effects on small domestic firms. This is consistent with the explanations in Aitken & Harrison (1999) and Crespo & Fontoura (2007), where the scale of the domestic enterprises can determine the influence of spillovers through the firm's ability to compete in the market and attract partnerships with downstream firms.

Table 5: GMM Estimations of GMM-TFP by Scale of Domestic Manufacturing Firms in Vietnam: 2004 – 2008

Using GMM TFP	Small Domestic Firms	Large Domestic Firms	Foreign Firm
Constant	-0.696 (0.552)	-0.401 (0.490)	-0.305 (0.500)
TFP_{t-1}	0.075 (0.121)	-0.084 (0.138)	0.101 (0.090)
FOR_HORZ	-0.675 (0.422)	0.368 (0.513)	
FOR_BACK	-1.1168 (1.315)	0.099 (0.538)	
SOE_HORZ	-0.236 (0.665)	0.103 (0.531)	0.090 (0.523)
SOE_BACK	2.754** (1.265)	0.269 (0.539)	0.340* (0.205)
LABOUR_Q	0.018***	0.007***	0.080**

	(0.004)	(0.003)	(0.030)
CONC	-2.245***	1.414	1.500
	(0.622)	(2.102)	(2.130)
No. of observations	883	312	1530

Note: 1) Heteroskedasticity-robust standard errors in parentheses 2)***, ** and * denote statistical significance at 1, 5, and 10 percent, respectively.

The parameter estimates for SOE backward spillovers and the effects of labor quality remains qualitatively the same as the previous GMM estimation. However, it is important to note that the positive SOE backward spillovers are now only statistically significant for small domestic firms. This highlights that partnerships with SOEs are likely to benefit smaller domestic suppliers more, since small local enterprises tend to have greater technology gaps with SOEs and thus, greater potential for transfer of technology and knowledge. The coefficient estimates for effects of quality of labor remained positive and statistically significant, which emphasizes that high labor quality remains an important factor for productivity improvement for both small and large domestic firms. However, effects of concentration in the industry is only negative and statistically significant for small domestic firms, which supports the proposition that firms operating on a smaller scale have less ability to compete, especially when there are large competitors in the same market. Conversely, the positive parameter estimate for large domestic firms suggests that they are more able to contest other large competitors by improving their productivity. We also observe that SOEs create positive backward spillovers for the foreign firms. The industrial base is created by the SOEs and there is greater join ventures and collaborations between SOEs and foreign firms. Hence it is not surprising to observe that there is positive spillovers from SOEs on the foreign firms.

5. Policy Discussions

There are several policy implications for the development of small and medium sized enterprises for emerging economies such as Vietnam. In fact, the development of SMEs will be very crucial for Vietnam to attain sustainable development for its economy. The ability to create crucial linkages between local firms and foreign firms will be important for Vietnam to link to the global production network. This study will highlight the productive performance of domestic firms and the key determinants of the productivity growth.

Promoting the growth of domestic small and medium-sized enterprises (SMEs) represents an important national development objective in most countries for both economic and socio-political reasons. Although this observation applies generally, the goal has particular consequence in developing countries with limited local enterprises that may lack the resource base or sufficient market size to foster further internal expansion. Domestic SME development can increase employment, generate economic growth, create local value added, and improve national innovation and entrepreneurial capabilities. The current study will provide important insights on the growth of small and large firms in Vietnam.

In the long term, strong governmental support for relatively smaller domestic firms has to be in tandem with its FDI policies in order to tap on the full potential spillovers from FDI inflows. In particular, small and medium enterprises (SMEs) form a key part of the private sector and development of SMEs will augment these local firms' ability to compete with MNEs and SOEs. An important scheme put in place is the Fund for SMEs Credit Guarantee, which increases credit access for innovation, investments and scale expansion of SMEs. However, like many policies, the outreach and implementation remained limited in certain provinces; stricter monitoring and regulation are crucial for the effectiveness of such policies (Tran, Le & Nguyen, 2008). Given the importance of labor quality as a determinant of firm's productivity and the apparent disparity in levels of human capital between domestic and foreign enterprises, more of schemes such as the Program on Human Resource Training Support for SMEs are necessary. For instance, lower human capital investment in local private firms can manifest in the form of employees with fewer years of experience and education, and managerial personnel with less professional training. Consequently, this has a negative impact on the firm's efficiency and absorptive capacity for transfers of expertise and technology. By boosting the level of human capital through training, it encourages greater labor quality in domestic firms and induces positive competition and demonstration effects through intra-industry linkages.

Whether, or to what extent, this “win-win” scenario materializes can depend both on the existing endowments of a prospective host country to attract FDI and on creating a policy environment that recognizes and promotes beneficial FDI-SME linkages. Host governments may choose from an array of policy options and programmatic tools that best fit their individual national conditions and priorities.

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Appendix 1

Figure 3: A Fitted Plot between TFP of Domestic Firms and the Foreign Horizontal Linakge

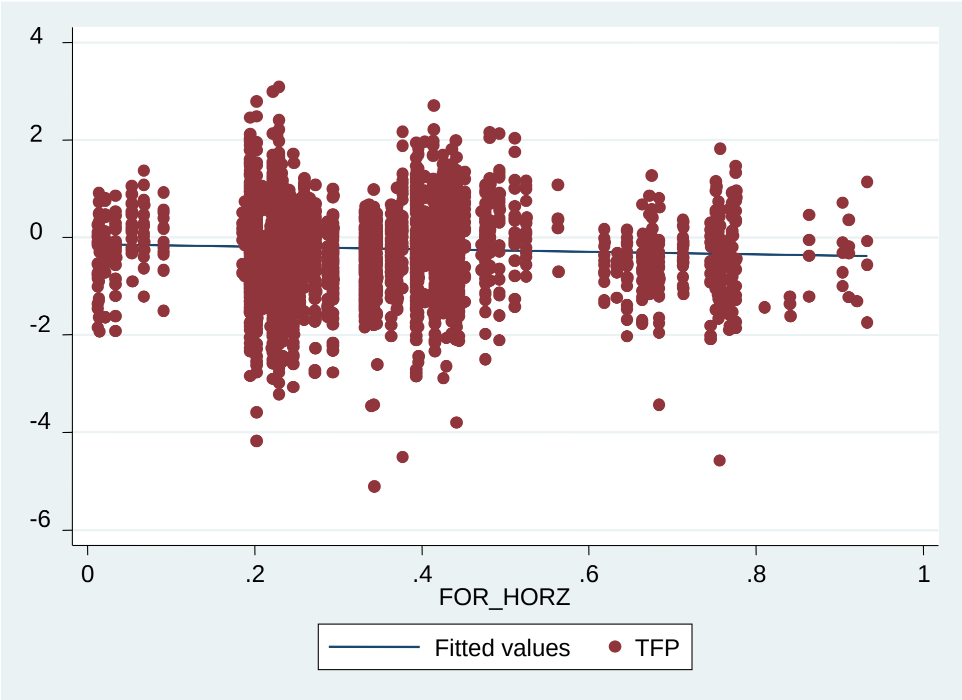


Figure 4: A Fitted Plot between TFP of Domestic Firms and the Foreign Backward Linakge

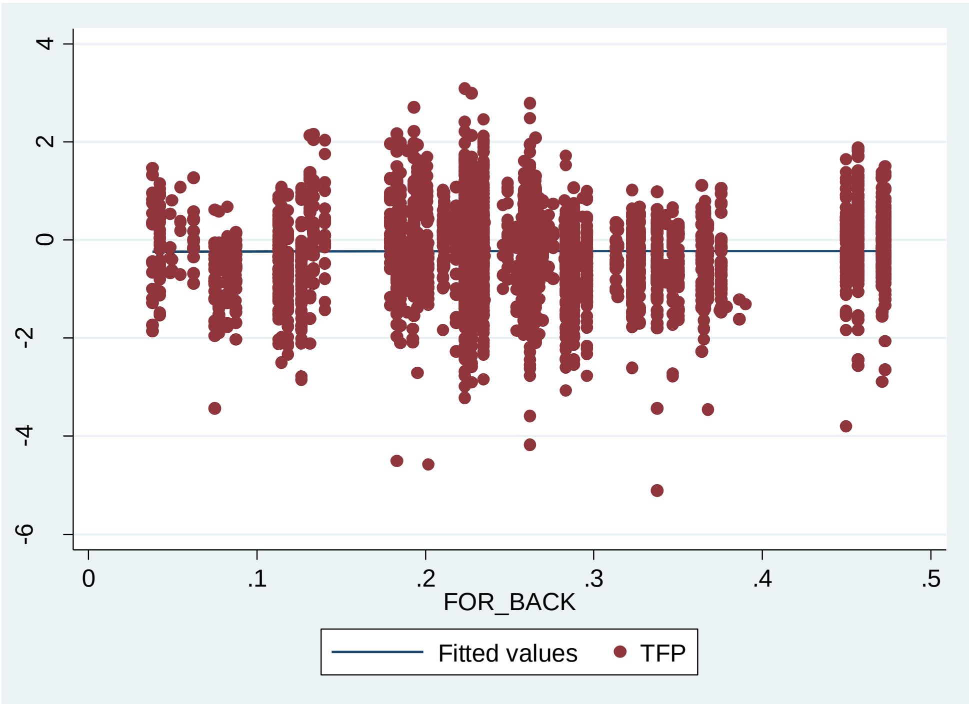


Figure 5: A Fitted Plot between TFP of Domestic Firms and the SOE Horizontal Linkage

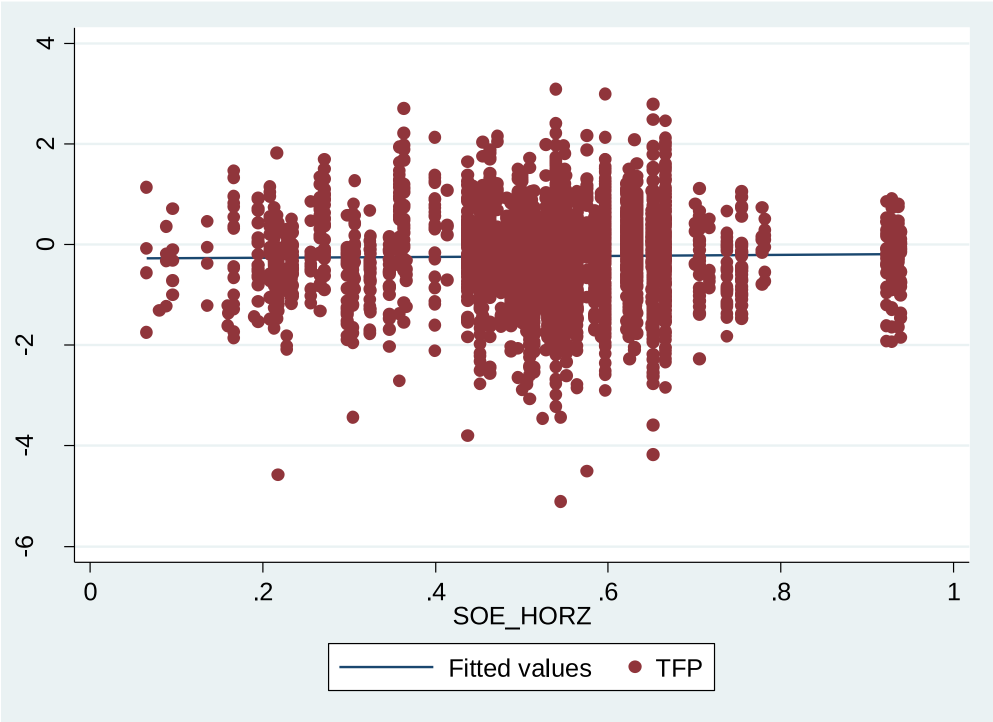
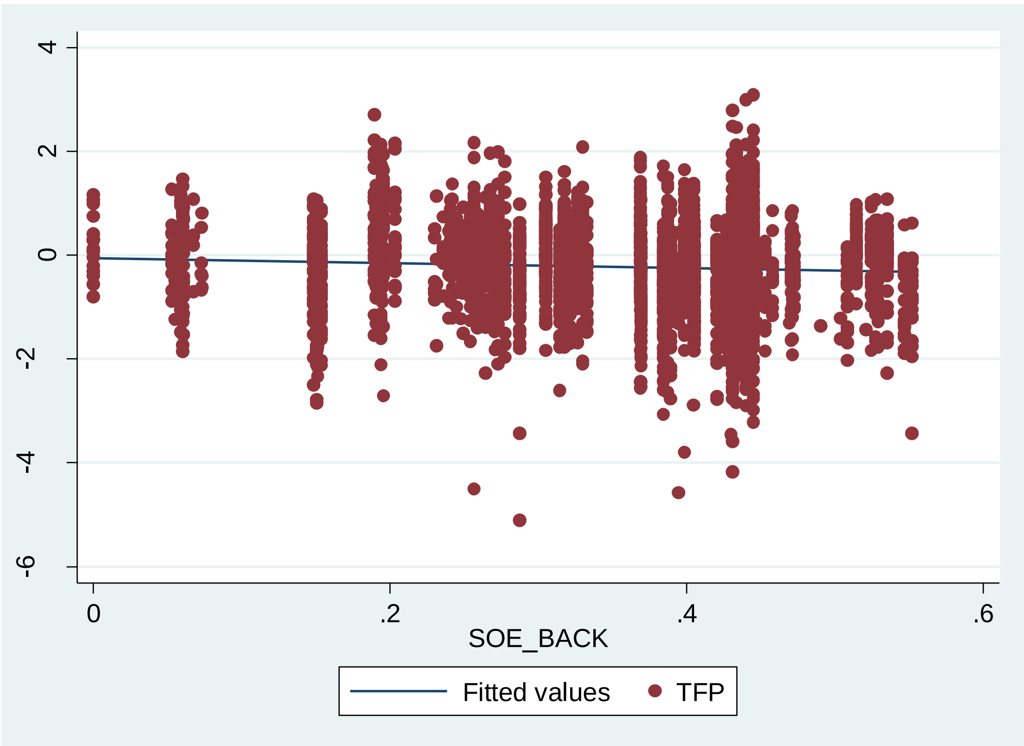


Figure 6: A Fitted Plot between TFP of Domestic Firms and the SOE Backward Linkage



CHAPTER 11

Firm Productivity, Globalization and Global Product Sharing: Lesson from Thai Manufacturing*

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This paper examines productivity determinants across firms in Thai manufacturing, using the 2006 industrial census. The main focus is to gain better understanding two-industry-specific variables highly policy relevant, trade policy and global production networks. Our key finding is that while firm-specific variables such as years of operation, R&D activities, a number of skill workers employed have positive effect on productivity, modes in which firms are integrated into the global economy like market orientation and foreign partnership positively attribute to their productivity. Firms operating in more restrictive trade policy register lower productivity than those in more liberal environment. The negative effect much higher for large firms perhaps due to presence of water-in-tariff occurring among small and medium firms. Different types of production network might have different effect. It is producer-driven network that have positive effect on productivity only the small firm sample. When firm size exceeds 110 and 125 workers, the effect on productivity is not different from zero. By contrast, firms participating in buyer-driven networks tend to have lower productivity, regardless their size.

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1. Issue

While persistence of productivity difference across firms is well recognized in the literature[1], the reasons for the persistent pattern remains largely unknown. Some studies and Fox and Smeets (2011) in particular point to the role of unobserved firm-specific fixed effects but they seem unsatisfactory. Importantly, the policy inference from them is rather weak. This becomes increasingly important in the context of developing countries where policy reforms remain unfinished business.

There are at least two challenges in trade and development policy reform. The first is unfinished business in trade liberalization and its escalation structure (Michalopoulos, 2000; IMF 2002; Nicita et al. 2013). Policy reluctance to move forward is often found, driven by the concern that there are yet productive firms that could be out of business because of trade liberalization. This reluctance is even more when there are a large number of indigenous small enterprises involved. Since the new millennium a format of trade policy reform in many developing countries including Thailand has shifted toward preferential trade arrangement (often referred to as free trade agreements or FTAs), the policy reluctance remains. Sectors that are still under the heavily cross-border protection are likely to be sensitive in FTA negotiation where trade liberalization takes place with long transition.

The second challenge is how to materialize potential benefits from the growing importance of global production network of multinational enterprises (MNEs). Global production network (GPN) refers to a circumstance where a whole production process is broken up into geographically separated stages. The network's leading firms, which can be either buyers or manufacturers, specify the characteristics of the goods to be produced, qualified inputs to be used, and the processes to be followed (Gereffi, 1999; Bair and Gereffi, 2001; Bair, 2005; Humphrey and Schmitz, 2002; Ponte, 2002).

While participating into GPN provides ample business opportunity for firms to grow and be internationally competitive, the opportunity seems uneven available. There is general belief that some enterprises often large in size and/or multinational can

[1] For example, Baily et al. (1992), Fukao and Kwon (2006), Fox and Smeets (2011), Holzner and Peci (2011) and Katsuya (2011)

benefit from the globalization and grow more than the others and small and indigenous ones in particular. In many cases, expansion of the former comes at the latter's expense. Hence, productivity difference can be observed in both between small and large firms. Whether such belief is true is a subject to be empirically tested.

While trade policy and global production networks are the key globalization drivers and highly policy relevant, they are yet included in productivity difference analysis in the previous studies. Most of potential industry-specific factors in previous studies are captured by industry-dummies. Introducing policy-relevant industry-specific factors like trade policy and global production network seems beneficial to policymakers in managing ongoing economic globalization. Against this backdrop, this paper is to examine productivity determinants across firms with emphasis on the effect of these two industry-specific factors over and above firm-specific ones. Thailand is chosen for this issue. First, Thailand's industrialization is most broad-based developed in Southeast Asia, ranging from processed foods, garment to automotives, electronics and electrical appliances. This allows us to examine the core hypothesis set above. Second, trade policy reform remains challenge to policymakers as there are sizable tariff lines whose tariff exceeds 20 per cent (the unweighted and weighted average tariff rates are 2 and 9 per cent by 2010). Policymakers are reluctant to further liberalize with concern on its adverse effect on yet productive firm.

2. Analytical Framework

A number of empirical studies point to the persistence of productivity difference across firms such as Baily et al., 1992: Fukao and Kwon, 2006; Fox and Smeets, 2011; Katsuya, 2011). Unobserved firm-specifics could be an explanation for the observed persistence in productivity difference but clearly unsatisfactory (Fox and Smeets, 2011). More importantly, the firm specific provides little clues for policy reform in economic development. This becomes increasingly important in the context of developing countries where policy reforms remain unfinished business.

As mentioned earlier, there are at least two challenges in trade and development policy, how to continue trade policy reform and how to materialize potential gains from global production network (GPN), one facet of ongoing economic globalization.

Trade policy reform deserves special attention. From Tokyo round in General Agreement of Trade and Tariff (GATT), the average tariff in developing countries successively and significantly declined from 7.2 to 4.9 per cent observed between pre and post Tokyo round thought tariff reduction mainly occurred in raw materials (GATT, 1979: 120).[2] This links developing countries to globe through expansion of international trade and direct investment.

Nonetheless, it has been undertaken unevenly, as reflected in the observed widen gap between the declining average tariff and tariff peak. In some sector, tariff and other forms of cross-border protection remain restrictive. Policymakers are reluctance to move forward on the ground that there are yet productive firms that could be out of business because of trade liberalization. This is especially true when the industry contains lots of indigenous and small enterprises. An implicit assumption used here is that some capable entrepreneurs are in the middle of upgrading. Maintaining cross-border protection a little while could buy them more time to gain dynamic efficiency and become productive later.

The restrictive trade policy entices enterprises to produce for local markets regardless sizes and nationality. Given the limited size of domestic market, competition between firms within an industry tends to be intense. SMEs might not want to have direct competition with large and/or multinational ones. The observed difference in productivity at the firm level could be observed as a result of two groups of firms within a same sector produce products that do not directly compete to each other and use different production technology. This is in line with findings in the FDI spillover literature where MNEs operate in an enclave and are not directly interacting with indigenous local firms (e.g. Kokko, 1994; Kohpaiboon, 2006).

Another challenge is the increasing importance of global production network (GPN), the breakup of the production process into geographically separated stages. While participating into GPN provides ample business opportunity for firms to grow

[2] Figures were the weighted average tariff of total industrial products.

and be internationally competitive, the opportunity could be uneven available and usually in favor of large and/or multinational enterprises. In many cases, growth opportunity to these enterprises comes at expense of small and medium enterprises. Hence, participating in GPN could result even more productivity difference across firms.

In fact, co-operation among firms in the network is information-intensive manner. The network's leading firms specify the characteristics of the goods to be produced, qualified inputs to be used, and the processes to be followed. All of them are essential for business success. Note that obtaining all the needed information incurs fixed costs so that smaller and/or indigenous firms would be at disadvantageous comparing with large and/or multinational affiliates.

In recent years, works in a global value chain literature re-highlight noticeable different behavior of MNEs in governing their production network across industries. For complex product industries like automotives and hard disk drives, MNEs in these industries prefer direct investment modes of involvement to govern their production network both offshoring and outsourcing activities. These MNE affiliates tend to deal with larger firms as a result of the increasing importance of modular production network, an emergent American model of industrial organization where lead firms in the network concentrate on the creation, penetration and defense of markets for end products—and increasingly the provision of services to go with them—while manufacturing capacity is shifted out-of-house to globally operating *turn-key suppliers*. The modular production network relies on codified inter-firm links and the *generic manufacturing capacity* residing in turn-key suppliers to reduce transaction costs, build large external economies of scale and reduce risk for network actors (Strugen 2014). Therefore, disadvantage of being small firm size against the larger one is even larger. What remains to be empirically examined is whether business opportunity for small firms is shut down completely.

Interestingly, when traditional labor intensive products and/or processed foods are concerned, MNEs prefer other form of involvement to direct investment (Richardson 1972; Oman, 1984; Kohpaiboon,2006). In these industries, production technology *per se* is mature and there is long supply chain taking place locally. While MNEs can have a full control on branding and product design, they might not be in better position run production facilities themselves. This is especially true in these industries where it involves numerous local workers and the production cost competitiveness is sensitive to principal-agent problem. Hence, MNEs usually present in a form of buyers. Even though their presence is assemble to arm's length transaction, their involvement as indicated in the previous studies is intense, including detailed product characteristics to be produced, qualified inputs to be used, and the processes to be followed. This is referred as the buyer-driven production network.

Nonetheless, the effect of firm size on productivity for those participating in this network is unclear. In these circumstances, advantage of being small enterprises tends to compensate and sometimes outweigh its disadvantage of being small. Small firms have higher degree of flexibility so that they can respond quickly to any changes in customer demand. Perhaps this is an area where smaller/indigenous firms are in a better position to compete internationally.

3. Global Integration of Thai Firms and Their Productivity

Over the past 50 years, Thai economy is increasingly integrated to the global economy. It began since the early 1960s that Thailand has always pursued a 'market-friendly' approach towards foreign investors in manufacturing. There have not been major discriminatory policies and foreign investors have been able to be involved in almost any business (Kohpaiboon, 2006). Similarly, the investment promotion regime in Thailand generally treats domestic and foreign investors equally. Investment promotion privileges, except import surcharges and input tariffs exemption, are used in order to influence decisions to allocate resources to promoted targets though effectiveness is still unclear.

It is trade policy playing a critical role in resource allocation across industries. Historically, there has been greater reliance on tariffs rather than QRs (World Bank, 1988; Kohpaiboon, 2006). This is especially true for the manufacturing sector where tariffs were the main trade policy instrument to influence the country's resource allocation, with a few exceptions.[3] An escalating tariff structure is the key theme in designing trade policy.

The most important tariff restructuring in Thailand took place in the mid-1990s as part of its commitments under the WTO. Nonetheless, it was done as an essential part of overall economic reforms aimed at strengthening efficiency and competitiveness (see Warr 2000; WTO, 1999 with the ultimate target of 3 tariff rates (0, 5 and 10 per cent, respectively, covering raw materials, intermediates, and final goods). Nonetheless, there were sizable exemptions whose tariff rates are still above 30 per cent.

From 2000, there has not been any major unilateral tariff liberalization. All of tariff liberalization took place through free trade agreements (WTO, 2011).[4] Nonetheless, the net effect of FTA-led tariff liberalization seems highly concentrated in few product items. In addition, there was a high proportion of sensitive items which Thailand are yet ready to undertake tariff cuts for major trading partners like China and Japan (Jongwanich and Kohpaiboon, 2014). All in all, trade policy reform remains unfinished business in Thailand.

In theory, presence of cascading tariff structure means that nominal protection tends to be underestimated the effective one. This discourages firms operating domestically to export as they would be in disadvantageous to global competition because of tariff on inputs and intermediates. This would constraint their global integration. Nonetheless, Thailand like other Southeast Asia economies introduced various tariff rebates/exemption schemes. There are at least three options available; tariff exemptions/drawbacks (Section 19 of the Custom Laws) given by the Department of Customs, and tax rebate schemes given by Fiscal Policy Offices (FPO) and tariff exemptions by the BOI on imported raw materials. These schemes especially BOI tariff exemption one are highly utilized, reflected by a huge difference between incident tariff

[3] One exception was the automotive industry where the government has used both tariff and non-tariff measures i.e. LCRs, to encourage auto parts localization

[4] There was a tariff reduction plan implemented between 2004 and 2008 but it was minor and covered only 900 items most of which are intermediates such as rubber and articles thereof (HS40), glass and glassware (HS70), knitted fabrics (HS60), other base metals (HS81), woven fabrics (HS58), articles of stone (HS68), man-made staple fiber (HS55), wadding yarns (HS56), cotton (HS52), and miscellaneous vegetable preparations (HS21). The magnitude of tariff reduction is moderate within the range of 0 to 8.9 per cent (Jongwanich & Kohpaiboon, 2007: Table 1).

(the ratio between tariff revenue to total imports) and the average MFN tariff rate. For instance the 2008 incident tariff was less than 2 per cent as opposed to 10.7 and 4.5 per cent for the unweight and weighted average MFN rates.

In this setting, domestic firms have two choices; first to operate under the cascading tariff structure by producing goods for the highly protected domestic market or, second, to export, by making use of the country's comparative advantage. Hence, for a given industry as well as these schemes highly utilized, it is possible to observe the co-existence of two firm types, i.e. one for highly protected domestic market and another highly export oriented. This would result in firm heterogeneity in terms of productivity.

This is what has observed in Thai manufacturing. Even though a progress of tariff restructuring and reform was limited and the average tariff in Thailand is relative high as opposed to other upper middle income countries, the country is one of the important export hubs in the region. Thailand is at the top-10 global exporters in several manufacturing products including processed foods (canned tuna, canned pineapple, processed chicken and processed shrimp), garment, footwear, electronics, and electrical appliances (Table 1).

Table 1: Manufacturing Export of Thailand 2000-2011

	(%) Share of total export				World Market Share
	2000-7	2008-9	2010	2011	2009-11
Manufacturing Products	77,4	77,1	61,9	69,4	
- Processed Shrimp (HS 160520)	0,9	0,8	0,7	0,8	35.1 (1)
- Canned Tuna(HS 160414)	0,8	1	0,8	1	43.5 (1)
- Hard Disk Drive (HS 847170)	13,9	14,8	5,3	4,6	17.3 (2)
- Vehicles (HS 8701-4)	5,4	8,3	9,7	10,5	n.a.
- Textiles and Clothing (HS51-62)	4,8	3,4	3,2	3,5	1,3
- Television set (HS 852812)	1,4	1	0,4	0,5	1.2 (12)
- Washing Machines (HS 845011)	0,1	0,3	0,1	0,1	2.1 (6)
- Microwaves (HS 851650)	0,3	0,2	0,2	0,2	9.5 (2)
- Air Conditioning (HS 841510)	0,6	0,8	0,8	0,9	16.4 (2)

More importantly, in a process of global integration, multinational enterprises (MNEs) play a crucial role. Their presence takes place through both buyer- and producer-driven network. It began with the buyer-driven network in the late 1970s where there were representatives of multinational trading companies seeking for reliable suppliers in developing countries including Thailand. These companies did not set up their affiliates but sent these representatives to work with these suppliers to manufacture tailor-made finished products for export. Evidence from firm interview in Thailand points the crucial role of these representatives for export success (Kohpaiboon, 2006). From the mid-1980s, process of global integration has speeded up partly due to the introduction of effective BOI tariff exemption scheme in 1983. This was more or less in line with changes in the global environment when many East Asian manufacturers started losing their international competitiveness in labor-intensive products. As a result, there have been massive FDI inflows into Thai manufacturing with the ultimate target for export to the third country. All of them attributed to Thai firms be integrated into the global economy.

Figure 1 presents kernel density estimation of labor productivity (in natural log) across firm groups in 2006. There are four groups, large, medium, small and micro enterprises. In this study, we follow the definition used in Small and Medium Enterprises Promotion Bill of Thailand. That is, large firms are defined as enterprises having more than 200 workers; medium ones are those employing between 50 and 200 workers; small ones are between 10 and 50 workers; and micro enterprises are those employing less than 10 workers. Clearly, Figure 1 shows that labor productivity is an increasing function of size. The average labor productivity is the highest in the large firm group and the lowest in the micro enterprise group. Medium and small firm groups are in the middle respectively. In the small and micro enterprise groups, labor productivity varies vastly across firms. Interestingly, these four firm groups are different from each other in these characteristics, some of which such R&D activities, a proportion of skill to total operation workers, and market orientation do matter to firm's productivity (Table 2).

Figure 1: Kernel Density Estimate of Labor Productivity Across Firm Size Group

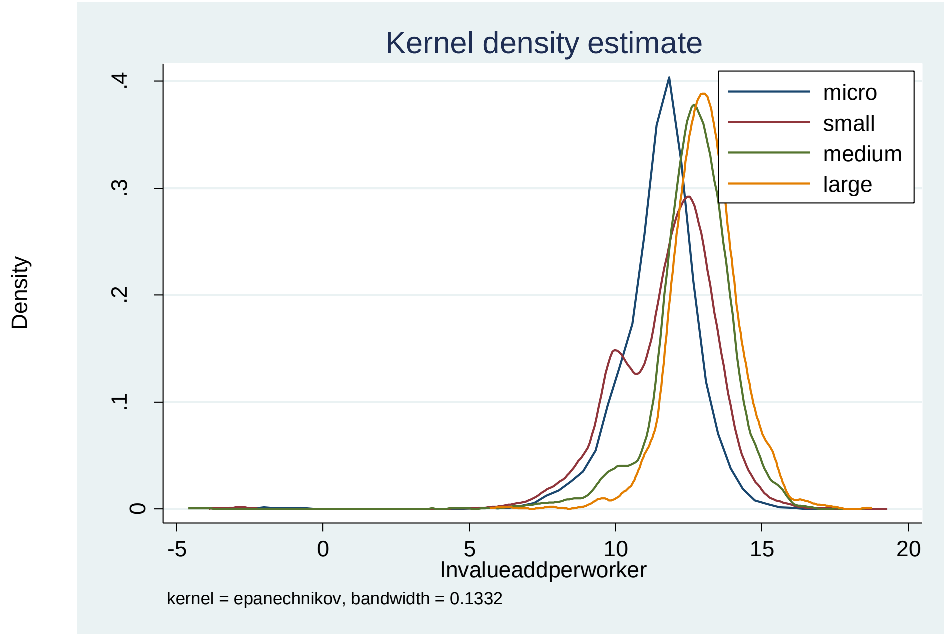


Table 2: Selected Firm Characteristics in 2006

Variables	Census 2006			
	Micro-enterprises	Small	medium	large
Registred capital	4.590.932	82.577.613	98.068.945	483.675.239
No. of irms	39.192	18.961	5.241	2.809
MNEs share (%)	0,1	1,6	8,7	19,8
Percent of exports (%)	0,1	2,8	15,6	35,5
Import materials (%)	0,3	3,7	12,5	23,5
Capacity utilization	74,8	76,4	78,4	80,8
Male (% of total pay)				
- unpaid	33,9	3,8	1	0,2
- Operative	19,3	37,1	44,3	41,2
- Skilled	16,5	28	30,9	28,3
- Unskilled	2,8	9,1	13,4	12,9
- Other employees	0,5	3,4	6,7	6,6
Female (% of total pay)				
- unpaid	32,3	8,6	1,4	0,1
- Operative	13,2	41,9	38,6	44,7
- Skilled	10,6	26,6	25,1	28,9
- Unskilled	2,6	15,4	13,5	15,8
- Other employees	0,8	5,1	8	7,2
Wage (Baht/year)				
- Operatives	88.539	1.041.578	6.281.206	47.341.036
- Other employees	7.132	264.040	2.276.928	14.725.817
Sales (Baht)	954.601	18.089.125	165.862.857	1.589.942.845
Value added (Baht)	307.375	2.579.103	64.712.365	645.478.850
R&D (% of sales)	0,01	0,1	0,38	0,6

Source: Authors' Calculation from Census 2006.

Whether firms are globally integrated as well as what modes of global integration also have a significant effect on firm's productivity. Figure 2.a, 2.b and 2.C present kernel density estimation of labor productivity (in natural log) according to how firms integrate to the globe. These kernel density estimation in Figure 2 suggest that firms integrated into the global economy either through trade (export their products or import intermediates) and/or having foreign partners exhibit higher than those that did not.

Figure 2:Kernel Density Estimate of Labor Productivity Across Modes of Global Integration

Figure 2a: Foreign Direct Investment

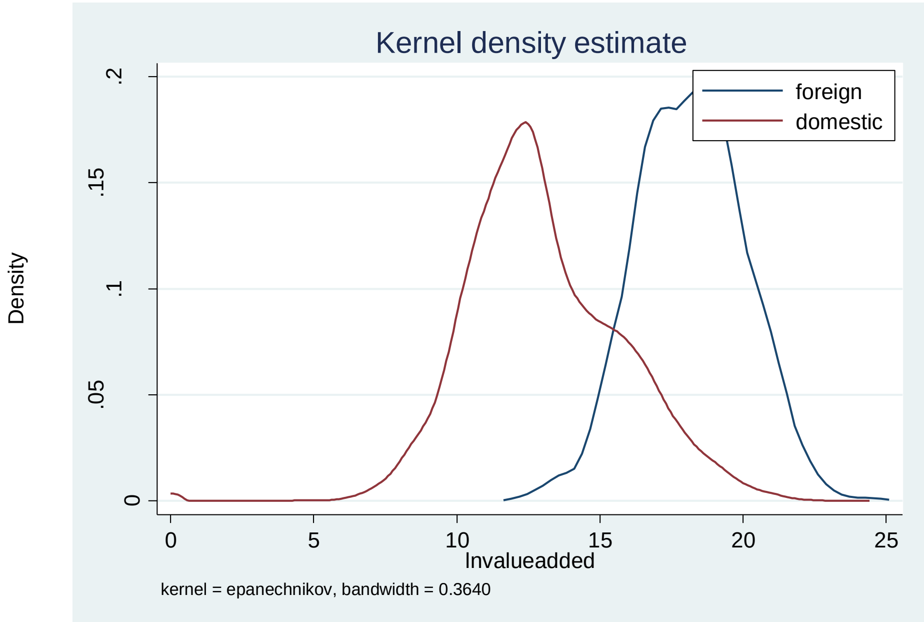


Figure 2b: Export

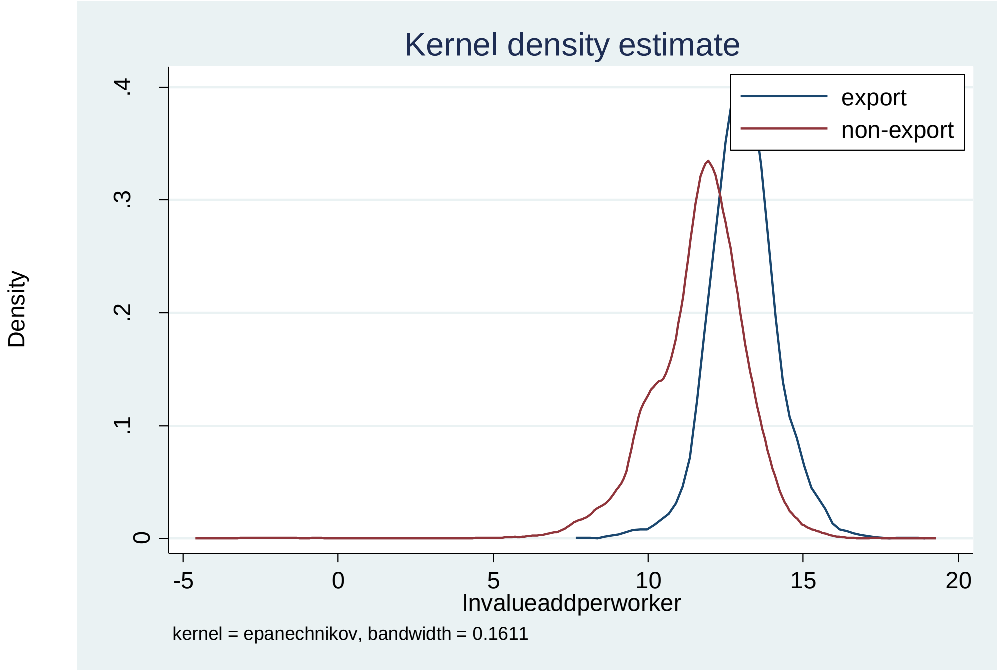
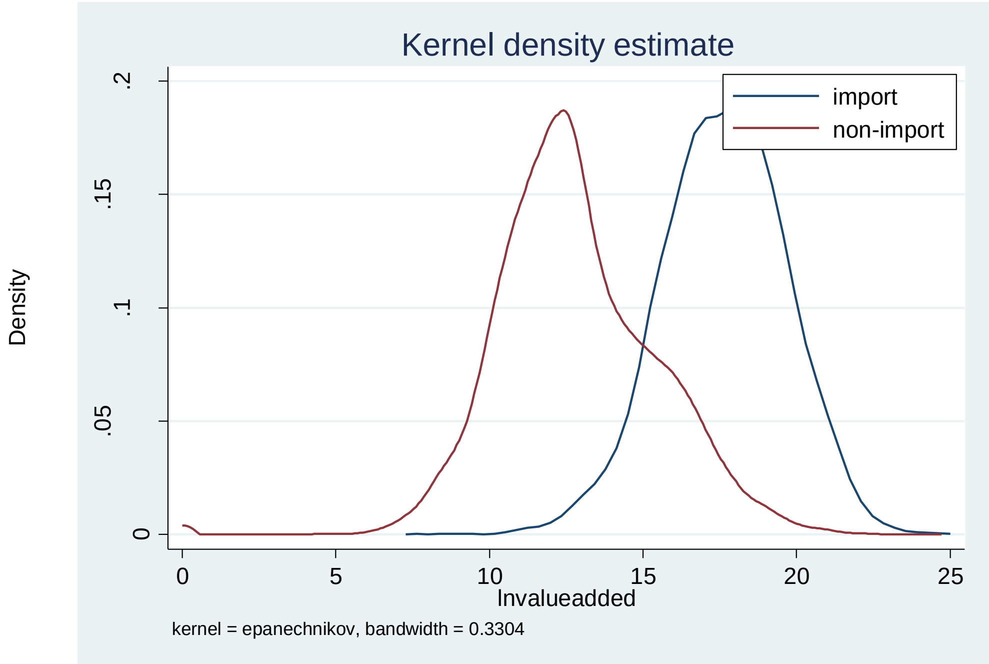


Figure 2c: Intermediate Import



Source: Authors' calculation, using 2006 industrial census.

4. Empirical Model

In line with the standard practice in the literature of productivity determinants, (Griliches, 1992; Javorcik, 2004; Crespo & Fontoura, 2007; Blalock & Gertler, 2008) The empirical model used in this study begins with a production function. A translog functional form is chosen to avoid the restriction imposed in the Cobb Douglas forms that were popular in the previous empirical studies of Thai manufacturing (e.g. Khanthachai *et al.*, 1987; Tambunlertchai & Ramstetter, 1991), i.e. unity of elasticity of substitution and log-linear relationship between inputs and outputs. The translog function form also controls for input levels and scale effects on value added. It is specified as equation (1);

$$\ln Y_{ij} = \lambda_{ij} + \alpha_1 \ln K_{ij} + \alpha_2 \ln L_{ij} + \alpha_3 \ln K_{ij}^2 + \alpha_4 \ln L_{ij}^2 + \alpha_5 \ln K_{ij} * \ln L_{ij} + \gamma_{1*n} X_{n*1} + \varepsilon_{ij} \quad (1)$$

where Y_{ij} = value added of firm ith in industry jth

K_{ij} = capital stock of firm ith in industry jth

L_{ij} = workers employed by firm ith in industry jth

X_{n*1} = column vector of controlling variables of firm ith in industry jth

In line with the endogenous growth theory, there are a set of firms-and industry-specific factors. In this study, six firm-specific factors are introduced, i.e. market orientation (mkt_{ij}), import intermeidates (imp_{ij}), ownership (own_{ij}), age (age_{ij}), a number of skill workers in operation ($skill_{ij}$) and R&D activities (RD_{ij}). mkt_{ij} is, a zero-one binary dummy which takes value '1' for firms involving export market and '0' otherwise. Alternatively, a share of export to total sales is also used as a robustness test. Similar to , imp_{ij} is measured by a zero-one binary dummy which takes value '1' for firms importing intermediates from abroad and '0' otherwise. As a robustness checking, a share of intermediate imports to total import is also used. Coefficients corresponding to these two firm-specific variables are expected to be positive. As postulated in the firm heterogeneity literature, international trade incurs sunk costs to firms so that their productivity must be adequately high to cover the cost and enter the world market.

own_{ij} is measured by a zero-one binary dummy which equals to one when firms have involved with MNEs and '0' otherwise. The share of foreign partners of firm i^{th} in industry j^{th} is also used as alternative for robust checking purpose. As also guided in the FDI literature, MNE affiliates are usually more productive than their indigenous counterparts. Nonetheless, empirical result examining the productive difference between MNE affiliates and indigenous firms is at best mixed.[5]

Another firm the model is firm age (age_{ij}), years in operations. The sign of age_{ij} is inconclusive since older firms, on the one hand, may be more traditional than younger firms and therefore less inclined to change the operating process and adopt new technologies. Hence, the older firm's productivity might be lower than that of the younger. On the other hand, older firms have more experience in production process and register higher productivity higher than the younger firms.

$skill_{ij}$, measured as a proportion of skill to total operational workers (a sum of skill and unskill operational workers) is introduced to measure how active firms improve their productivity. The higher the number of employed skill operational workers, the higher the productivity the firm. The positive sign is expected. RD_{ij} is another firm specific factor influencing on productivity. The higher the effort of R&D investment, the higher the productivity observed. Hence, the coefficient associated with RD_{ij} is expected to be positive.

Four industry-specific factors are included in the empirical model. The first industry-specific factor is producer concentration. A link between producer concentration and productivity was firstly proposed by Schumpeter (1942) with the well-known 'creative destruction' proposition. Specifically, productivity-enhancing activities typically involve large fixed and irrecoverable upon exit and are subject a large degree of risk and uncertainty, to scale and scope economies. Hence, the expectation of some forms of transient *ex post* market power is required for firms to have the incentive to invest in such activities. In a circumstance where capital markets

5 For example, studies of productivity differentials between MNEs and non-MNEs in the manufacturing industries of Malaysia (Menon, 1988; Oguchi et al 2002) and Thailand (Ramstetter 2006) suggest that differentials tended to be relatively small and were often statistically insignificant.

are imperfect, economic rents in relatively less competitive environment also provide firms with the internal financial resources for innovative activities.[6]

However, a broad consensus emerged in previous empirical studies does not support the expected positive relation between producer concentration and productivity-enhancing activities.[7] There are several sensible explanations for the statistical insignificance of the relation above. Firstly, Schumpeter's proposition had never claimed a continuous relationship between productivity and firm size. What Schumpeter focused on is said to be the qualitative differences between small, entrepreneurial enterprises and large, modern corporations in their innovative activities. Secondly, when productivity enhancing activities occur in step-by-step manner, competition between firms is needed for them to continue such activities (Aghion and Howitt, 1998, Aghion *et al.* 1999).[8] In addition, the competition could also mitigate principal-agent problems occurring in the organization (Nickel *et al.* 1997). Thirdly, productivity-enhancing activities undertaken in a large firm can be affected by presence of scale diseconomies referred to as the bureaucratization of inventive activity by Cohen & Levin (1989), in which benefits derived from these activities could be undermined through loss of managerial control. In addition, the incentives of individual scientists and entrepreneurs become weaken as their ability to capture the benefits from their effort diminishes.[9]

The second industry-level factor is growth prospect of an industry. Its rationale relates to the nature of productivity improving activities which incur considerable fixed costs, most of which are irrecoverable, i.e. sunk costs. A large volume of sales over which to spread the fixed cost of innovation are needed. Hence, in this study, the

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[6] This link between producer concentration and productivity can be related to the Structure-Conduct-Performance Paradigm in the field of industrial organization (IO) as indicated by the relation between producer concentration and firm's profitability. Despite unclear whether to interpret high accounting profits as a sign of good or bad performance of a market, to a large extent, high accounting profit is often regarded as a sign of market power and could also be a result of high efficiency of firms.

[7] See Symeonidis (1996) and Ahn (2002) and works cited therein.

[8] In a simple model of creative destruction, the incumbent firms unlike new entrants have no incentives to innovate.

[9] The effect of producer concentration on firm productivity could be conditioned by trade protection so that the interaction between producer concentration and protection variables is needed to be included in the empirical model. Nonetheless, our experiment runs point to counter-intuitive results. Therefore, our preferred empirical model excludes the interaction term.

industry's growth prospect is proxied by annual growth of gross output. The higher the annual growth the more the likelihood firms commit resources to productivity enhancing activities.

The other three industry-level factors, all of which are related to the extent to which an industry participates economic globalization, are export-output ratio, import penetration ratio and presence of multinational enterprises (MNEs), both of which would have an impact of firm productivity. Both of them are crucial in the current context. As mentioned in Section 3, Thailand introduced various tariff exemption/rebate schemes to bypass the cascading tariff structure and its impact. Even in a highly protected industry, there could be firms exporting. Similarly, in presence of tariff, tariff exemption scheme might allow firms to bypass its adverse effect. Hence, both factors work over and above the measure of cross-border protection so that they must be included in the empirical model.

Nonetheless their net impact could be either positive or negative. When export-output ratio is concerned, exporting firms could be a demonstration case of any advance technologies learning elsewhere to others to follow suit so that this could positively affect the latter's productivity. This is referred to as export spillover (Aitken et al. 1997). Hence, the positive sign is expected. On the other hand, export could adversely affect others' productivity. As postulated in the firm heterogeneity literature (e.g. Melitz (2003), Melitz and Ottaviano (2008), export could lead to the expansion of exporting firms so that demand for input especially non-traded ones like labor would increase prices. This could inflate costs and eventually negatively affect productivity of non-exporting firms.

Imports create competitive pressures to firms. This could either positively or negatively affect firms' productivity. On the one hand, imports could create market disciplinary effect on domestic prices. This could negatively affect firms' productivity. On the other hand, imports could force firms to be alert to productivity enhancing activities in order to survive in the market. Hence, the positive sign could be observed.

Theoretically it is expected that MNE affiliates should be more productive than locally non-affiliated firms (Caves, 2007).[10] Hence, an industry where there are a

[10] In empirical studies it is not always true as mentioned earlier in Footnote 5.

number of MNE affiliates, chance for firms within to benefit from them is greater. Hence, the estimated coefficient is expected to be positive.

To address two key hypotheses in this study, protection and global production network variables are introduced. Firstly, trade protection is introduced to control a possible industry's specific factor. The role of protection on productivity has been long recognized in numerous previous studies (e.g. Corden, 1974: Hart, 1983). While protection can create economic rents that potentially can be used for productivity improving activities, in practice this could run the opposite. By insulting firms from foreign competition, high protection tends to induce producers to become 'unresponsive' to improved technological capability as well as requests for improvement in the quality and price of what they offer (de Melo and Urata, 1986; Moran, 2001). This in turn results in a general deterioration of technological and management skills. Hence, the sign of trade protection is theoretically ambiguous. In this study, effective rate of protection (ERP_j) is used to measure the restrictiveness of cross-border protection granted to an industry jth.[11] Our hypothesis is the greater the protection (the higher the ERP_j), the lower the productivity

Ideally, to capture the role of global production network on productivity, firm specific information (whether output is traded in MNE global network) is needed. Such information is not available for Thai industrial census. While in the previous studies (Kohpaiboon & Jongwanich, 2014), a share of parts and component trade (or export) was used, it cannot be used here due to one main purpose of this study is to examine types of production network and its effect on firm productivity. Hence, to do so that two zero-one binary dummy variables are used; they are $PGPN_j$ = Producer-driven GPN and $BGPN_j$ = Buyer-driven GPN.

The former refers to electronics, electrical appliances, and automotives whereas the latter consists of traditional labor intensives and processed foods. See detail about industries classified as producer- and buyer-driven production network in Appendix 1.

[11] Even though, there is no consensus between *ERP* and nominal rate of protection (*NRP*) amongst economists as to choice of one over the other (Corden, 1966; Cheh, 1974), Jongwanich & Kohpaiboon (2007) argue that political bargains in Thai manufacturing are struck over *ERP* rather than *NRP*.

The coefficients corresponding to both dummy variables are expected to be different. In the former ($PGPN_j$), the positive sign is expected. That is, firms involved in the network tend to be more productive as there is increasing pressure from the leading firm in the network. As mentioned earlier, MNEs play a key role from product innovation, production and marketing. Products themselves are rather complex. Leading MNEs adopt modular production system where suppliers in the network must take a full responsibility at the product module level. This even makes scale and scope economies more essential. Hence for firms to survive in the network, extra productivity is needed. This is especially true for smaller firms which are disadvantage in covering the incurred fixed cost. Therefore, the positive sign is expected to be larger in smaller firms whereas the sign for the larger firm group could be either positive or zero.

By contrast, the coefficient corresponding to $BGPN_j$ is expected to be negative. For traditional labor intensive products and/or processed foods, production technology *per se* is mature and there is long supply chain taking place locally. Specialization in the whole production process is clear. While MNEs can have a full control on branding and product design, indigenous firms take a full control in manufacturing process under a close supervision by MNEs. In addition these products are usually the starting point for relatively newcomers to into the world economy. Pressures on value added tend to more intense in the buyer-driven network. As mentioned earlier, production process in these industries in the buyer-driven network involves numerous local workers and the production cost competitiveness is sensitive to principal-agent problem. Advantage of being large enterprises over smaller ones would be limited. Hence, the negative sign tends to be more or less the same regardless firm size.

All in all, the proposed empirical model is summarized as follows;

$$\ln Y_{ij} = \lambda_{ij} + \alpha_1 \ln K_{ij} + \alpha_2 \ln L_{ij} + \alpha_3 \ln K^2_{ij} + \alpha_4 \ln L^2_{ij} + \alpha_5 \ln K_{ij} * \ln L_{ij} + \gamma_1 mkt_{ij} + \gamma_2 own_{ij} + \gamma_3 age_{ij} + \gamma_4 skill_{ij}$$
$$+ \gamma_5 RD_{ij} + \gamma_6 CR4_j + \gamma_7 OGROWTH_j + \gamma_8 XOR + \gamma_9 MPR + \gamma_{10} ERP_j + \gamma_{11} PGPN_j + \gamma_{12} BGPN_j + \varepsilon_{ij}$$

(2)

Dependent variable

$\ln Y_{ij}$ = Value added per workers of firm *i* in industry *j* (in natural log)

Explanatory variables;

$\ln K_{ij}$ = capital stock of firm ith in industry jth

$\ln L_{ij}$ = workers employed by firm ith in industry jth

mkt_{ij} (+) = market orientation of firm *i* in industry *j* measured by two alternatives;

1. A zero-one binary dummy variable; 1 = engaging export and 0 otherwise (mkt1)
2. Export share to total sales of firm i in industry j (mkt2)

imp_{ij} (+) = intermediate imports of firm *i* in industry *j* measured by two alternatives;

1. A zero-one binary dummy variable; 1 = importing intermediates and 0 otherwise (imp1)
2. Intermediate import to total import of firm i in industry j (imp2)

own_{ij} (+) = foreign ownership of firm *i* in industry *j* measured by two alternatives;

1. Foreign ownership of firm *i* in industry *j* (own1)
2. A zero-one binary dummy variable; 1 = foreign ownership engaging export and 0 otherwise (own2)

age_{ij} (+/-) = years in operation of firm *i* in industry *j*

$skill_{ij}$ (+) = the ratio of skill to total operational workers of firm *i* in industry *j*

RD_{ij} (+) = R&D activities of firm *i* in industry *j* measured by a binary-dummy variable; it equals to 1 if a firm committed R&D regardless whether it is in-house or outsourced and 0 otherwises.

ERP_j (-) = effective rate of protection of industry *j*

$CR4_j$ (+/-) = the cumulative share of top-4 firms of industry *j*

$OGROWTH_j$(+) = the annual output growth between 2000 and 2006.

XORj (+/-) = the export-output ratio of industry *j*

MPRj (+/-) = the import-penetration ratio of industry *j,* measured as the ratio of imports to

domestic outputs (summation between import and gross output)

MNEj (+/-) = the share of multinational enterprises sales to total sale of industry j

$PGPN_j$ (+/?) = producer-driven network dummy variable; it equals to 1 if they are traditional electronics, electrical appliances, and automotives and 0 otherwises.

$BGPN_j$ (-) = buyer-driven network dummy variable; it equals to 1 if they are traditional labor intensives and processed foods and 0 otherwises.

ε_{ij} = disturbance terms

5. Data

Data for the study are compiled from unpublished returns to the Industrial Census 2006, the latest industrial census available, conducted by the National Statistics Office (NSO). A well-known limitation of the cross-sectional data set with each industry representing a single data point is that they make it difficult to control for unobserved industry specific differences. Long-term averages tend to ignore changes that may have occurred over time in the same country. These limitations can be avoided by using the panel data set compiled by pooling cross-industry and time-series data. Particularly, in the nature of technology spillover that involves a time-consuming process, panel data is more appropriate. Unfortunately, given the nature of data availability in this case, this preferred data choice is not possible. So far there are two industrial census sets, i.e. 1996 and 2006, both are establishment-level data. Even though both of them provide establishment identification number, the number is not assigned systematically. For a given ID No., an establishment in 1996 is not necessarily the same as that in 2006.

The census covers 73,931 plants, classified according to four-digit industries of International Standard of Industrial Classification (ISIC). The census was cleaned up by firstly checking duplicated samples. As occurred in the 1996 industrial census, there are some duplicated records in survey return, presumably because plants belonging to the same firm filled the questionnaire using the same records. The procedure followed in dealing with this problem was to treat the records that report the same value of the eight key variables of interest in this study, are counted as one record. The eight variables are registered capital, number of male workers, number of female workers, sale value, values of (initial and ending periods) capital stocks, value of intermediates and initial stock of raw materials. There are 8,645 such cases so that the final sample drops to 65,286 plants. In addition, we delete establishments which had not responded to one or more the key questions such as sale value, output and which had provided seemingly unrealistic information such as negative output value or the initial capital stock of less than 5,000 baht (less than $200).[12]

The 2006 census contains a large number of micro-enterprises defined as the plants with less than 10 workers. There are 37,042 samples which employ less than 10 workers (henceforth referred to micro enterprises), out of which 52 per cent of which are micro enterprises which do not hire paid workers (zero paid workers). Since our main interest here is to examine firm behavior across size, our analysis will include these micro enterprises. Nonetheless, analysis on these enterprises must be undertaken with care. 7 industries that are either to serve niches in the domestic market (e.g. processing of nuclear fuel, manufacture of weapons and ammunition), in the service sector (e.g. building and repairing of ships, manufacture of aircraft and spacecraft, and recycling) or explicitly preserved for local enterprises (e.g. manufacture of ovens, furnaces and furnace burners, manufacture of coke oven products) are excluded. All in all, these remained establishment plants accounted for 75% of the Thailand's manufacturing gross output and 62% of manufacturing value added in 2006.

Concentration ratio (*CR4*), which is used as an instrument variable for exports, is obtained from Kophaiboon and Ramstetter (2008) in which the concentration is measured at the more aggregate level (e.g. many measured at the 4-digit whereas some at the 3-digit ISIC classification) to guard against possible problems arising from the fact that two reasonably substitutable goods are treated as two different industries according to the conventional industrial classification at high level of disaggregation. Tables 3 and 4 provide a statistical summary as well as a correlation matrix of all relevant variables in this analysis. Gross output and its corresponding price deflators are from National Economics and Social Development Board (NESDB). The annual growth rate is based on gross output at constant price (1988).

[12] If we alter to 10,000 baht the number to be dropped increased to 1,289 samples (another 500 samples dropped).

Table 3: Statistical Summary of Variables used in Regression Analysis

Variable	Obs	Mean	Std. Dev.	Min	Max
lnvalueadded	62334	13,20777	2,865902	0	24,72803
lnk	66203	13,50282	2,915696	0	24,56993
lnlabor	44453	2,592941	1,580975	0	9,262174
lnage	66203	2,031822	0,871148	0	4,59512
RD	66203	0,011993	0,108857	0	1
skillshare	44198	0,75269	0,380363	0	1
foreign_fi~y	66203	1,033956	0,181118	1	2
foreign_sh~e	66203	2,035225	12,32081	0	100
export_dummy	66203	1,071764	0,258099	1	2
export_share	66203	3,626225	16,2944	0	100
import_mat~y	66203	1,077036	0,26665	1	2
import_share	66203	3,246333	14,16749	0	100
cr4	66040	0,458451	.093988 .	3220835	0,693147
outgrowth~06	65758	0,061647	.0622808 -.	1765142	0,30588
erp1	66040	0,067698	.338837 -1	0,532832	0,465767
dummypro~cer	66203	0,054106	0,226229	0	1
dummybuyer	66203	0,425751	0,49446	0	1
xor	63548	0,535286	0,369604	0	1
imp	63548	0,250397	0,302973	0	1
mnes	65692	0,176331	0,14759	0	0,8476

Source: Authors' Calculation from Census 2006

Table 4: Correlation Coefficient Matrix

	ln Y_{ij}	*ln* K_{ij}	*ln* L_{ij}	age_{ij}	RD_{ij}	$skill_{ij}$	$own1_{ij}$	$own2_{ij}$	$mkt1_{ij}$	$mkt2_{ij}$	*imp1ij*	*Imp2ij*	$CR4_j$	*OG*	ERP_j	PG	BG	*XORj*	*MPRj*	*MNEj*
ln K_{ij}	0,7	1																		
ln L_{ij}	0,79	0,56	1																	
age_{ij}	0,34	0,32	0,25	1																
RD_{ij}	0,21	0,17	0,2	0,09	1															
$skill_{ij}$	-0,08	-0,02	-0,18	0,02	-0,01	1														
$own1_{ij}$	0,35	0,29	0,34	0,08	0,1	-0,01	1													
$own2_{ij}$	0,33	0,27	0,31	0,06	0,08	-0,02	0,88	1												
$mkt1_{ij}$	0,5	0,4	0,51	0,18	0,18	-0,03	0,42	0,4	1											
$mkt2_{ij}$	0,4	0,32	0,43	0,13	0,11	-0,02	0,38	0,39	0,8	1										
imp1ij	0,47	0,38	0,45	0,18	0,17	-0,04	0,41	0,4	0,55	0,44	1									
Imp2ij	0,37	0,3	0,35	0,13	0,12	-0,03	0,37	0,39	0,43	0,4	0,79	1								
$CR4_j$	0	0,03	-0,06	0,04	0	0,03	0	-0,01	-0,03	-0,01	-0,01	0	1							
OG	0,08	0,12	-0,04	0,06	0,02	0,06	0,07	0,08	0,01	-0,02	0,04	0,03	0,12	1						
ERP_j	-0,06	-0,07	-0,03	-0,05	0	0,06	0	0	0,02	0,02	0,02	0,01	-0,11	-0,05	1					

Table 4: Correlation Coefficient Matrix (cont.)

	ln Y_{ij}	*ln K_{ij}*	*ln L_{ij}*	*age_{ij}*	*RD_{ij}*	*$skill_{ij}$*	*$own1_{ij}$*	*$own2_{ij}$*	*$mkt1_{ij}$*	*$mkt2_{ij}$*	*imp1ij*	*Imp2ij*	*$CR4_j$*	*OG*	*ERP_j*	PG	BG	*XORj*	*MPRj*	*MNEj*
ERP_j	-0,06	-0,07	-0,03	-0,05	0	0,06	0	0	0,02	0,02	0,02	0,01	-0,11	-0,05	1					
$PGPN_j$	0,18	0,12	0,16	0,04	0,04	0,03	0,21	0,22	0,16	0,16	0,18	0,18	0,16	0,18	0	1				
$BGPN_j$	-0,13	-0,14	-0,01	-0,04	-0,03	-0,06	-0,08	-0,08	-0,03	0,02	-0,1	-0,09	-0,22	-0,39	-0,08	-0,05	1			
XORj	0,07	0,03	0,07	0	0,03	0	0,09	0,1	0,11	0,09	0,11	0,1	-0,18	0,07	0,05	0,15	-0,16	1		
MPRj	0,14	0,1	0,11	0,03	0,04	0	0,12	0,13	0,1	0,05	0,16	0,15	0,04	0,09	0,07	0,2	-0,36	0,64	1	
MNEj	0,17	0,11	0,12	0,03	0,05	0,02	0,2	0,21	0,14	0,11	0,2	0,18	-0,05	0,18	0,09	0,48	-0,18	0,4	0,43	1

Source: Authors' Calculation from Census 2006.

6. Results

Table 5 reports estimations of Equation 2 using the ordinary least squares (OLS) method. T-statistics in the table are based on the robust standard error. Columns 5.1 and 5.2 in Table 5 are the samples with and without outliers detected by Cook's Distance, respectively. Regression results with and without outliers are resilient on the controlling variables in interest. The main difference is on the coefficients associated with primary inputs like capital and labor. In the regression with outliers, these coefficients in some cases turn out to be counter intuitive, e.g. negative sign on capital (in natural log). Therefore, the following discussion will emphasize that without outliers.

Table 5: Econometric Results: Productivity Determinants in 2006 (OLS estimation)

	5.1 All Samples	Samples without outliers				
		5,2	5.3	5,4	5,5	5,6
		All size	Totalworker>10	Large firm	Medium Firm	Small Firm
$\ln K_{ij}$	-0.272 (-20.28)	0.139 (8.91)	0.231 (10.11)	0.342 (2.51)	0.421 (4.06)	-0.272 (6.77)
$\ln K_{ij}^2$	0.028 (48.17)	0.009 (14.24)	0.014 (9.72)	0.01 (2.56)	0.007 (3.72)	0.028 (13.01)
$\ln L_{ij}$	1.183 (46.14)	0.886 (33.03)	1.759 (24.67)	1.135 (3.37)	2.36 (2.92)	1.183 (5.25)
$\ln L_{ij}^2$	0.003 (1.09)	0 (0.13)	0.014 (1.76)	0.049 (2.01)	-0.077 (-0.86)	0.003 (1.85)
$\ln K_{ij}$ * $\ln L_{ij}$	-0.033 (-14.54)	-0.007 (-2.87)	-0.067 (-8.94)	-0.052 (-3.26)	-0.056 (-2.72)	-0.033 (-9.04)
age_{ij}	0.179 (21.94)	0.153 (23.18)	0.178 (19.54)	0.101 (4.58)	0.171 (9.28)	0.179 (16.3)
RD_{ij}	0.202 (5.36)	0.143 (4.44)	0.149 (4.71)	0.183 (4.11)	0.108 (2)	0.202 (2.23)
$skill_{ij}$	0.086 (4.97)	0.081 (5.66)	0.095 (5.32)	0.121 (3.18)	-0.004 (-0.11)	0.086 (5.24)
$own1_{ij}$	0.08 (2.99)	0.121 (5.58)	0.135 (6.29)	0.12 (3.53)	0.175 (4.97)	0.08 (4.66)
$mkt1_{ij}$	0.232 (10.52)	0.201 (10.72)	0.2 (10.59)	0.146 (4.39)	0.179 (6.15)	0.232 (8.17)

imp1ij	0.299 (14.51)	0.259 (14.31)	0.208 (11.05)	0.03 (0.92)	0.199 (6.7)	0.299 (9.91)
$CR4_j$	-0.104 (-1.58)	-0.316 (-5.63)	-0.269 (-3.65)	0.445 (2.86)	-0.019 (-0.14)	-0.104 (-5.29)
$OGROWTH_j$	0.52 (4.79)	0.591 (6.52)	0.562 (4.98)	0.439 (2.26)	0.255 (1.33)	0.52 (4.9)
ERP_j	-0.121 (-3.67)	-0.231 (-14.06)	-0.247 (-11.02)	-0.345 (-4.13)	-0.244 (-5.97)	-0.121 (-9.87)
$PGPN_j$	0.185 (7.11)	0.192 (8.91)	0.09 (3.35)	-0.012 (-0.26)	-0.011 (-0.24)	0.185 (5.04)
$BGPN_j$	-0.222 (-14.69)	-0.224 (-17.42)	-0.258 (-14.98)	-0.129 (-3.48)	-0.111 (-3.37)	-0.222 (-14.06)
XORj	-0.099 (-4.23)	-0.113 (-5.62)	-0.161 (-5.88)	0.004 (0.07)	-0.178 (-3.28)	-0.099 (-5.69)
MPRj	0.089 (2.99)	0.128 (5.01)	0.159 (4.71)	0.206 (2.73)	0.242 (3.76)	0.089 (3.3)
MNEj	0.003 (7.08)	0.003 (7.62)	0.004 (6.58)	0.001 (0.5)	0.003 (2.63)	0.003 (6.01)
Intercept	9.547 (82.28)	7.487 (62.64)	5.096 (29.18)	5.355 (3.11)	2.312 (1.07)	9.547 (8.21)
#obs.	40034	38198	20650	2371	4485	13794
F-stat	8900,22	13016,26	5737,98	349,89	265,34	1171,56
R^2	0,7658	0,826	0,8096	0,7076	0,5748	0,6153

Note: The number in the parenthesis is the corresponding t-stat.
Source: Authors' Estimation.

As mentioned earlier, there are numerous microenterprises in the dataset, many of which seem to be self-employed. Including these samples might have impact on the estimation so that Equation 2 is re-estimated by excluding enterprises employing less than 10 workers (Column 5.3). Including these enterprises seems to have limited effect on the overall regression analysis.

Note that regression results on Columns 5.1-5.3 are under the implicit assumption that all firms share the common production function regardless their size. In reality such an assumption could be restrictive. To guard against any effect of such an assumption on regression estimates, Equation 2 is re-estimated into 3 subsamples, i.e. large firm group (equal to or more than 200 workers), medium firm group (between 50 and 200 workers), and small firm group (between 10 and 50 workers). This is done after removing the detected outliers. Their regression results are reported in Columns 5.4-5.6, respectively. Clearly, pooling all firm sizes together in regression analysis seems inappropriate as several coefficients are different across firm groups. This is especially true for one of the key interest in this study, $PGPN_j$ where statistical significance is found only in small firm group only. Hence, our preferred choice here is to run regression by sub samples.

Another important methodological note is related to possible simultaneity problem that is often raised in the cross-sectional regressions. In particular, firm productivity could have a significant effect on the observed producer concentration. To address equation 5.3-5.6 above is re-estimated using the instrumental variable estimation (IV) method. IV involves applying OLS in two stages. The first stage involves regressing each of the explanatory endogenous variables on all the pre-determined variables. In the second stage, the fitted values of the explanatory endogenous variables, obtained from the first regression, are used in place of their observed values to estimate the structural form coefficients. This two-stage procedure avoids the simple one-stage least square bias and inconsistency in the estimates by eliminating from the explanatory endogenous variables that part of the variation is due to the disturbance.

IV estimating results are reported in Table 6. Generally, results between IV and OLS estimations are rather resilient except the coefficient corresponding to producer concentration where the sign turns from negative in OLS estimation to positive in IV one. Given the methodological superiority, our results of IV estimation are discussed. Two alternative measures of market orientation (mkt_{ij}), intermediate imports (imp_{ij}) and foreign ownership (own_{ij}) do not have any impact on the regression analysis. Given the better performance in the overall fit test, $mkt1_{ij}$ $imp1_{ij}$ and $own1_{ij}$ and are used (Columns 6.1-6.3).

Table 6: Econometric Results: Productivity Determinants in 2006 (IV estimation)

	Foreign and export dummy			Foreign and export share		
	6.1 Large firm	6.2 Medium Firm	6.3 Small Firm	6.4 Large firm	6.5 Medium Firm	6.6 Small Firm
$\ln K_{ij}$	0.335 (2.48)	0.429 (4.13)	0.256 (6.74)	0.347 (2.61)	0.424 (4.04)	0.236 (6.23)
$\ln K_{ij}^2$	0.01 (2.6)	0.006 (3.53)	0.015 (12.95)	0.01 (2.6)	0.006 (3.62)	0.016 (13.26)
$\ln L_{ij}$	1.158 (3.42)	2.343 (2.89)	1.684 (5.32)	1.126 (3.35)	2.21 (2.71)	1.642 (5.18)
$\ln L_{ij}^2$	0.045 (1.83)	-0.076 (-0.85)	0.086 (1.71)	0.048 (1.96)	-0.062 (-0.69)	0.084 (1.65)
$\ln K_{ij} \ln L_{ij}$	-0.051 (-3.19)	-0.055 (-2.66)	-0.09 (-8.87)	-0.051 (-3.22)	-0.054 (-2.59)	-0.085 (-8.4)
age_{ij}	0.1 (4.51)	0.169 (9.14)	0.182 (15.86)	0.113 (5.06)	0.181 (9.75)	0.186 (16.14)
RD_{ij}	0.18 (4.04)	0.106 (1.96)	0.15 (2.2)	0.189 (4.23)	0.134 (2.49)	0.214 (3.07)
$skill_{ij}$	0.117 (3.04)	-0.003 (-0.1)	0.118 (5.16)	0.118 (3.07)	0.008 (0.23)	0.118 (5.18)
$own1_{ij}$	0.121 (3.55)	0.179 (5.05)	0.194 (4.8)			
$own2_{ij}$				0.002 (5.58)	0.003 (5.81)	0.003 (4.35)
$mkt1_{ij}$	0.151 (4.51)	0.18 (6.13)	0.271 (8.08)			
$mkt2_{ij}$				0 (1.23)	0.002 (4.85)	0.003 (6.49)
imp1ij	0.031 (0.93)	0.199 (6.64)	0.309 (10.02)			
Imp2ij				0.001 (2.25)	0.003 (6.65)	0.005 (9.46)
$CR4_j$	0.869 (2.46)	0.528 (1.65)	0.23 (0.87)	0.766 (2.19)	0.53 (1.64)	0.265 (1)
$OGROWTH_j$	0.493 (2.45)	0.33 (1.68)	0.875 (5.07)	0.511 (2.57)	0.323 (1.64)	0.864 (4.97)
ERP_j	-0.329 (-3.93)	-0.22 (-5.18)	-0.236 (-8.16)	-0.324 (-3.85)	-0.201 (-4.72)	-0.227 (-7.85)
$\frac{PGPN_j}{BGPN_j}$	-0.035 (-0.72)	-0.06 (-1.14)	0.139 (2.9)	-0.046 (-0.97)	-0.076 (-1.45)	0.132 (2.71)

	-0.11 (-2.8)	-0.09 (-2.6)	-0.283 (-11.24)	-0.111 (-2.79)	-0.082 (-2.35)	-0.283 (-11.18)
XORj	0.018 (0.28)	-0.15 (-2.62)	-0.141 (-3.61)	0.05 (0.79)	-0.133 (-2.32)	-0.138 (-3.54)
MPRj	0.224 (2.89)	0.245 (3.79)	0.104 (2.23)	0.192 (2.49)	0.248 (3.84)	0.109 (2.34)
MNEj	0 (0.26)	0.003 (2.64)	0.005 (6.48)	0 (-0.14)	0.003 (2.94)	0.005 (6.74)
Intercept	5.145 (2.96)	2.021 (0.93)	4.511 (7.31)	5.476 (3.17)	2.828 (1.29)	5.422 (8.86)
#obs.	2371	2371	4485	4485	13794	13794
F-stat	348,26	354,29	263,14	260,12	1169,06	1151,74
R^2	0,7067	0,7063	0,5731	0,5696	0,6138	0,6117

Note: The number in the parenthesis is the corresponding t-stat.

Source: Authors' Estimation.

The statistical significance of coefficients corresponding to the primary inputs (capital, and workers) and their interactions suggests that the assumption imposed in the Cobb-Douglas production function is not supported by data of Thai manufacturing.[13] Coefficients of all the controlling variables reach the theoretical expected sign at the 5 per cent or even better. The statistical significance of age_{ij} coefficient suggests that older firms tend to be more productive than the younger ones. Firms with foreign partners and engaging in international trade register higher productivity than those owned entitled by indigenous firms and fully domestic-oriented. Note that international trade includes both exporting their products abroad and importing intermediates. Firms employing higher skill operational workers register higher productivity. As expected, the coefficients associated with $skill_{ij}$ and RD_{ij} are both positive and statistically different from zero. All other things being equal, firms that hire more skill operational workers and/or committed R&D activities exhibit higher productivity.

The positive and statistical significance associated with CR4 are found in all sub samples. It suggests that some forms of transient *ex post* market power is required for firms to have the incentive to invest in such activities. In a circumstance where capital markets are imperfect, economic rents in relatively less competitive environment also provide firms with the internal financial resources for innovative activities.[14] The coefficient associated with $OGROWTH_j$ is positive and statistically significant at 1 per cent. This is in line with our hypothesis that due to the nature of productivity improving activities which incur considerable fixed costs, the higher the annual growth the more the likelihood firms commit resources to productivity enhancing activities.

The positive coefficient associated with the import penetration at the industry level in all firm groups suggests that importing raw materials enhances firms' productivity. This seems to be in line with the international R&D spillover literature (e.g. Coe and Helpman, 1995; Coe et al. 1997) that imports of intermediate products and capital

[13] Our estimation trial suggests that the overall fit of Cobb-Douglas production function estimate is far lower than that of trans-log production one. Results are available for Authors' request.

[14] This link between producer concentration and productivity can be related to the Structure-Conduct-Performance Paradigm in the field of industrial organization (IO) as indicated by the relation between producer concentration and firm's profitability. Despite unclear whether to interpret high accounting profits as a sign of good or bad performance of a market, to a large extent, high accounting profit is often regarded as a sign of market power and could also be a result of high efficiency of firms.

equipment are one crucial conducive channel for advance technology invented elsewhere to be transmitted. Experience from Thai firms suggests advance technology tends to be embodied in imported raw materials. Interestingly, the coefficient with export-output ratio is negative and statistically significant at the conventional level only in the medium and small firm groups. This seems consistent with the postulation in the firm heterogeneity literature. In a given industry, production expansion induced by export could negatively affect productivity of non-exporting firms. It is important to note that the estimated coefficient of *XOR* seems to be far lower than that of *mkt*, suggesting there is still net productivity gain for medium and small exporting firms. Finally, firms located in an industry where MNE share is larger tend to have higher productivity than those elsewhere. This can be either the fact that MNE affiliates are generally more productive than their indigenous counterparts, presence of MNE technology spillover or both. Further works are needed to provide a clear answer.

ERP reaches negative expected sign at the 1 per cent level of statistical significance. This suggests that all other things being equal, firms operating in more restrictive trade policy register lower productivity than those in more liberal environment. Interestingly, the negative coefficient is ascending according to firm size group. The negative coefficient for the small firm group is 0.236, about two third of that for the large firm group (0.329). For the medium firm group, the coefficient is 0.22. The coefficient of the large size firm group is statistically different from the other two groups, not between medium and small firm groups. While protection can create economic rents that potentially can be used for productivity improving activities, in practice insulting firms from foreign competition, high protection tends to induce producers to become 'unresponsive' to improved technological capability as well as requests for improvement in the quality and price of what they offer. Evidence of Thai manufacturing suggests the latter. This is more likely to occur in the large firm group as opposed to smaller size firm groups (under 200 workers).

The interesting and highly policy relevant question is the larger negative coefficient for large firm group as opposed to the others. Our interpretation is as follows; in an industry operating under highly restrictive trade policy, rents induced from the restrictive cross-border protection would be attractive for firms. When there are too many firms entering, it some might experience difficulty to reach optimal operational scale and exit. Two groups of firms within a same industry classification (i.e. ISIC) produce products that do not directly compete to each other and use different production technology. Productivity difference, therefore, can be observed as these two groups simply because they are in different market segment. It is more likely that smaller size firms compete to each other to steal market share from each other regardless cross-border protection granted by tariff structure. The more the number of firms, the harder the firm to collude and avoid price wars. In other words, they were experiencing water in tariff. Hence, even though they are operating in the given level of protection, water in tariff causes firms act more toward free trade.

The coefficient corresponding to $PGPN_j$ is found positive and statistically different from zero only in the small firm sample. For medium and large firm groups, their coefficients turn negative but not statistically significant at the conventional level. It implies that while firm size does matter when participating in producer-driven network, it occurs to some extent. When firms surpass certain size, it no longer matters. Generally, participating in the producer-driven production network incurs fixed costs so that larger firms are in better position to overcome the costs and reach optimal operational scale. Hence, smaller firms in the network must be more productive than elsewhere to survive. Otherwise, they are unlikely to survive and so unobserved in the dataset.

By contrast, the coefficient corresponding to $BGPN_j$ is found negative in all three firm groups. Interestingly, the negative coefficient is ascending from the large firm group (-0.11) to the small firm one (-0.28). The negative size in all firm groups suggests that operating within this network is under heavily competitive pressure so that, *certaris paribus*, value added tends to be thinner than those outside the network. This result tends to be in line findings in the global value chain literature that pressure from the buyers tremendously increased due to trade liberalization after the abolishment of Agreement of Textiles and Clothing (ATC). In addition there have been a number of newcomers especially from the former centralized economies in these traditional labor intensives operating in the buyer-driven network. It seems that small firms are more difficult to survive in the network comparing to the medium and large firms.

7. Conclusion and Policy Inferences

This paper examines productivity determinants across firms in Thai manufacturing, using the 2006 industrial census. The main focus is to gain better understanding the effect of economic globalization. Two aspects of economic globalization are discussed here, trade policy and global production networks. Our paper departs from the existing literature by distinguishing global production network into producer- and buyer-driven, which are hypothesized to have different effect on firms' productivity.

Our key finding is that while firm-specific variables such as years of operation, R&D activities, a number of skill workers employed have positive effect on productivity, modes in which firms are integrated into the global economy like market orientation, intermediate imports and foreign partnership positively attribute to their productivity. Some forms of transient *ex post* market power indicated by producer concentration is required for firms to have the incentive to invest in such activities. Firms operating in industries having brighter growth prospects are more likely to commit resources to productivity enhancing activities.

Firms operating in more restrictive trade policy register lower productivity than those in more liberal environment. Insulting firms from foreign competition through cross-border protection like tariff tends to induce producers to become 'unresponsive' to improved technological capability as well as requests for improvement in the quality and price of what they offer. Interestingly, the negative coefficient is ascending according to firm size group. The negative effect seems to be much higher for large firms perhaps due to presence of water-in-tariff occurring among small and medium firms.

Different types of production network might have different effect. It is producer-driven network that have positive effect on productivity as hypothesized. Nonetheless, it is found only the small firm sample. For firms to participate in the network, there are tremendous pressures to be productive. When firm size is greater than certain sizes, there is no difference is not so significant. By contrast, firms participating in buyer-driven networks tend to have lower productivity, regardless their size. Nevertheless, the negative coefficient tends to be absolutely bigger in small firm group comparing to medium and large firm ones.

Two policy inferences can be drawn from this study. Firstly, our study provides another evidence supporting for global integration. Global integration would force firms to stay productive and competitive. This would eventually improve resource allocation countrywide. The expected benefit in terms of productivity improvement from cross-border protection is unlikely to be materialized as productivity improvement activities are not costless. Competition pressure is crucial for firms to commit resources for these activities.

Secondly, insights into the production network suggest that both types of network are quite different. While both of them provide ample business opportunity, competition in the network is rather intense. It seems small firms tend to be in disadvantageous position to survive the ongoing globalization. Hence, social safety net is needed to go hand in hand for the ongoing economic globalization to mitigate social side-effects from the global competition. Nonetheless, opportunity for medium size firms to participate and compete into the network is fairly open.

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Appendix 1

Definition of Producer and Buyer-driven Network

ISIC	$PGPN_j$	ISIC	$BGPN_j$
3110	1	1511	1
3120	1	1512	1
3130	1	1513	1
3140	1	1514	1
3150	1	1520	1
3190	1	1531	1
3210	1	1532	1
3220	1	1533	1
3230	1	1541	1
3410	1	1542	1
3420	1	1543	1
3430	1	1544	1
3591	1	1549	1
		1711	1
		1712	1
		1721	1
		1722	1
		1723	1
		1729	1
		1810	1
		1912	1
		1920	1
		3691	1
		3694	1