Kyoto University,
Graduate School of Economics
Research Project Center Discussion Paper Series

The Impact of Multinationals' Overseas Expansion on Employment at Suppliers at Home: New Evidence from Firm-Level Transaction Relationship Data for Japan

Keiko ITO
Ayumu TANAKA

Discussion Paper No. E-13-008

Research Project Center
Graduate School of Economics
Kyoto University
Yoshida-Hommachi, Sakyo-ku
Kyoto City, 606-8501, Japan

March 2014

The Impact of Multinationals' Overseas Expansion on Employment at Suppliers at Home: New Evidence from Firm-Level Transaction Relationship Data for Japan

Keiko ITO*

Ayumu TANAKA**

February 2014

Abstract

This paper focuses on non-internationalized supplier firms and investigates how the expansion of overseas activities by their main customer firms affects their employment, utilizing a unique dataset that includes information on buyer-supplier transaction relationships for Japanese manufacturing firms for the period 1998-2007. We do not find any negative effect of top buyers' overseas expansion on domestic suppliers' employment. Instead, we find a significant *positive* effect. Our result implies that, contrary to fears of a potential hollowing out of domestic supporting industries, the expansion of overseas activities of customer firms has a positive impact on suppliers' employment. Expansion of overseas production by downstream firms may increase purchases from upstream firms in Japan and this would be the case if downstream firms can increase their world-wide sales by expanding overseas production. Therefore, our result suggests that having a transaction relationship with successful downstream multinational firms that expand their global sales through overseas production is important for non-internationalized suppliers in Japan.

Keywords: Labor demand; Supplier firms; Multinational enterprises; Transaction relationships; Japan.

JEL Classification: F23, F14, F16, F61, J23

* Faculty of Economics, Senshu University. E-mail: keiko-i@isc.senshu-u.ac.jp

**Research Fellow, Research Project Center, Graduate School of Economics, Kyoto University; Faculty of Economics, Setsunan University.

E-mail: a-tanaka@econ.setsunan.ac.jp

1. Introduction

There is a large body of literature pointing to the existence of various positive relationships between firms' overseas activities and their domestic performance. Compared to that, relatively few studies have examined the effects of such international activities on other, non-internationalized firms. In particular empirical investigations on this issue using micro data are very limited. On the other hand, studies examining the performance of firms with overseas operations show that such firms tend to perform better than firms without overseas operations in terms of productivity, wage rates, sales, employment, and various other performance measures. Based on such evidence, and given that, as shown by, e.g., Mayer and Ottaviano (2008), only a very small number of firms appear to actually engage in international activities, many researchers argue that an expansion of overseas activities is likely to have a positive impact on the domestic economy and that it is important to increase the number of internationalized firms. As a result, many governments have put in place policy schemes to promote the internationalization of domestic firms.

Such recommendations and policy steps, however, ignore the fact that our knowledge on the impact that the expansion of overseas activities by internationalized firms has on non-internationalized firms that rely on transactions with such internationalized firms is limited. Particularly in the case of assembly-type machinery industries, small parts suppliers often rely on a transaction relationship with a large final-goods manufacturer. While some suppliers may follow their main transaction partners abroad, there are a large number of suppliers which cannot follow their transaction partners, and such non-internationalized suppliers may be negatively affected by the expansion of overseas production by their main transaction partners; that is, their transaction partners may switch to foreign suppliers. This possibility has raised fears of a potential hollowing out of domestic industry in Japan, but to date this issue has not been discussed based on any rigorous empirical evidence. Moreover, the expansion of overseas production by transaction partners does not necessarily have to

have a negative effect on domestic suppliers. For example, an expansion of overseas production does not necessarily have to be accompanied by a reduction of domestic production and may even result in an increase in purchases from domestic suppliers in order to support the increased production abroad. Thus, how the expansion of overseas production affects domestic non-internationalized suppliers is a purely empirical question.

As mentioned, a relatively well established fact, supported by considerable number of empirical studies, is that internationalized firms, i.e., firms that engage in exporting or have invested in overseas operations, tend to have a superior performance to non-internationalized firms.[1] On the other hand, the results of empirical studies on the effects of MNEs' overseas operations on their home operations – looking at sales, investment, employment, employee compensation, and other performance measures at home and abroad – have produced rather mixed results. However, as shown by, e.g., Desai et al. (2009) and discussed in greater detail in the literature survey in Section 2, recent studies tend to show that overseas operations and home operations are complementary. Overall, studies on MNEs do not support the popular view that the expansion of overseas operations comes at the expense of home employment and, in fact, indicate that instead it tends to have a positive effect on the domestic performance and employment of the firms expanding their operations overseas. However, such studies do not consider the effect that the expansion of the overseas operations of MNEs has on other, non-internationalized firms, and to date, there has been hardly any rigorous empirical evidence on this effect taking firm-level transaction relationships into account.

Against this background, the purpose of the present study is to focus on non-internationalized supplier firms and investigate how such supplier firms' employment is affected when their main customers expand their overseas production, utilizing a unique dataset that includes information on buyer-supplier transaction relationships for Japanese

[1] In many countries, internationalized firms show better performance than non-internationalized firms in terms of their productivity, employment size, wage rates, skill intensity, etc. (see, e.g., Mayer and Ottaviano 2008; Wakasugi et al. 2008).

manufacturing firms.[2] We believe that a close look at the effects of the overseas expansion of internationalized firms on non-internationalized firms at home is necessary in order to devise appropriate policies to support firms' growth in a globalized economy. In fact, several empirical studies find that an increase in industry-level imports from low-wage countries (or a decline in import prices) tends to negatively affect domestic employment (e.g., Revenga 1992, Tomiura 2003, Bernard et al. 2006). While these results imply that domestic firms' employment will be reduced if low-cost imports increase as a result of the expansion of overseas production by Japanese MNEs, it is important to note that these kinds of study show the average effect of globalization on domestic plants/firms. However, the effects of the expansion of overseas activities on domestic non-internationalized supplier firms are quite complex and depend on the type and characteristics of MNEs and supplier firms involved. For example, in some cases, the expansion of overseas production by Japanese MNEs has been associated with an increase in exports from Japan (see, e.g., Nishitateno 2013 for the case of intermediate goods and Belderbos et al. 2012 for the case of capital goods). In such cases, the production and employment of domestic suppliers of such goods may in fact increase rather than decrease. Moreover, domestic suppliers whose products cannot be easily replaced by products supplied by foreign suppliers may not be affected much even though their main customers increase overseas production. On the other hand, however, MNEs may switch from domestic to foreign suppliers to some extent when they expand overseas production, resulting in a reduction in production and employment at domestic suppliers. In addition, the effects may differ between first-tier and second- or lower-tier suppliers.

Thus, the effect of customers' overseas expansion on domestic suppliers' production and employment likely vary across supplier firms, and examining the average effect only may overlook important heterogeneous effects across firms. The present study is the first attempt

[2] Another issue of interest in this context is skill-upgrading. However, due to data constraints, we will leave this issue for the future and focus on employment at the firm level instead.

to examine the impact of a firm's main customers' overseas expansion on the firm's domestic employment by using a firm-level dataset that makes it possible to link firm-level information with information on the major customers of each firm. Specifically, utilizing the firm-level information on transaction relationships, this paper tries to answer whether non-internationalized firms increase or reduce their employment when their main customers expand overseas production.

The organization of this paper is as follows. Section 2 briefly explains the expected impact of overseas expansion by MNEs based on the results obtained in previous studies. Section 3 then describes the sources and data we use for the construction of our dataset and provides an overview of the characteristics of the data. Next, Section 4 describes the empirical framework and presents the estimation results. Finally, Section 5 discusses the policy implications and concludes.

2. Related Literature

The effect of the expansion of overseas production on domestic economic activities has long been a vigorously debated issue in many developed countries. Substitutability or complementarities between overseas production and exports have been studied since the 1970s in the United States and in European countries, where many domestic firms started becoming multinationals in the 1950s or 1960s. In the case of Japan, the so-called hollowing out problem started drawing the attention of the public and policy makers in the late 1980s, when the Japanese economy was suffering from the rapid appreciation of the yen after the Plaza Accord.

Against this background, a considerable number of empirical studies have been conducted on the relationship between overseas and domestic activities, and in this section, we briefly review major studies on this issue since the late 1970s. On the relationship between overseas and domestic activities, various research questions have been raised and examined so far,

using country-, industry-, or firm-level data. Popular research topics include, for example, the effects of overseas production and/or offshoring on home production and exports, on home employment and investment, and on home productivity.[3]

Among the pioneering empirical studies, Bergsten et al. (1978), Lipsey and Weiss (1981), and Blomström et al. (1988), relying on industry-level data for the United States (the first two studies) and the United States and Sweden (the third study), found that sales of MNEs' foreign affiliates tended to be positively associated with exports from the MNEs' home country. Similarly, focusing on the United States and Japan, Eaton and Tamura (1994) found a positive relationship between FDI and home-country exports to the host country. The weight of evidence from early empirical studies including these points to either no effect or a positive effect of overseas production in a host-country market on home-country exports to that market.

With the increasing availability of firm-level data since the 1980s, there has been a growing use of such data for the analysis of the effect of MNEs' overseas activities on their home-country activities. However, firm-level data are not universally available and most studies have focused on the United States, Sweden, and Japan, which collect detailed data on multinational parents and affiliates. Employing such data for U.S. multinationals, Lipsey and Weiss (1984) found a positive relationship between MNEs' overseas production and home exports, while Swedenborg (1985), focusing on Swedish MNEs, found no significant effect overall but a positive effect of the expansion of production affiliates abroad on home exports to the overseas affiliates. For Japan, Ramstetter (1997), focusing on 20 electrical machinery MNEs, did not find evidence of substitutability between the activities of foreign affiliates and exports from parent firms. Meanwhile, Head and Ries (2001), using panel data for Japanese manufacturing firms, found that outward FDI and home exports tend to be complementary,

[3] For a comprehensive survey of early empirical studies on the effects of MNEs' overseas activities on their home country, see Lipsey (1994).

although the relationship between the two varies across firms. On the other hand, Fukao and Nakakita (1996) found that although firms which increased production at overseas subsidiaries in Asia had greater levels of exports to Asia, once reverse import were subtracted, the net export effect was negative. Moreover, the expansion of production at North American subsidiaries was associated with lower levels of exports to North America. Thus, whereas Lipsey (1994), for example, argues that the effect of production outside the United States by U.S.-based firms on exports from the United States by parent firms or all U.S. firms was more likely to be positive than negative, Fukao and Nakakita (1996) suggest that the effect of overseas expansion on home-country exports may depends on the motivation or type of FDI (i.e., whether FDI is resource- or market-seeking, or whether alternatively it aims at export substitution or reverse imports). As mentioned in the previous section, however, more recent studies such as Belderbos et al. (2012) and Nishitetano (2013) find a complementary relationship between FDI and exports from the home country.[4]

Turning to the effects of overseas expansion on home employment, Lipsey (1994) found that within MNEs, the higher the share of overseas operations in the total production of the multinational, the higher tended to be the ratio of home employment to home production. He argued that a larger share of foreign production requires a larger number of headquarters employees, such as R&D staff and supervisory personnel, whose contribution to output is not confined to the firm's domestic production. His results thus suggest that rather than the *level* of employment, overseas production affects the *composition* of employment at home. Meanwhile, Brainard and Riker (1997) and Riker and Brainard (1997), also using data for U.S. multinationals, found that jobs abroad did substitute for jobs at home, but the effect was small. As already mentioned in the introduction, however, a more recent study by Desai et al. (2009)

[4] Belderbos et al. (2012) find that foreign affiliates of Japanese MNEs tend to import capital goods from the home country, increasing home country exports. Nishitateno (2013), analyzing product-level export data for the Japanese automobile industry, finds that FDI by upstream firms leads to additional exports of intermediate goods from the home country.

finds the opposite for U.S. multinationals, and many other recent studies relying on firm-level data provide evidence of a positive relationship between outward FDI and home employment. In the case of Japanese MNEs, Yamashita and Fukao (2010) find complementarities between overseas operations and home employment.[5]

Yet, despite all the empirical evidence suggesting that, on balance, overseas operations do not have a negative effect on domestic activities and may, in fact, boost them, workers and journalists frequently express fears that MNEs are "exporting jobs" by substituting foreign production for home production. Part of the reason for this may be that, as suggested by some industry-level studies, there may be a negative relationship between industry-level globalization (overseas production or offshoring) and domestic employment. That is, while the overseas operations of MNEs may not necessarily have a negative effect on their own home employment, the increase in industry-level offshoring and reverse imports resulting from increased overseas production by MNEs may have a negative impact on domestic firms' employment. For example, using industry-level data, Revenga (1992) found a negative impact of changes in import prices on U.S. employment growth, and Katz and Murphy (1992) found that increased import competition negatively affected labor demand in the United States in the 1980s. These studies imply that the inflow of cheap imported goods negatively affected employment growth in the United States. Similarly, Bernard et al. (2006), focusing on manufacturing plants in the United States, find that there tends to be a larger reduction in plant-level employment in industries that experience greater imports from low-wage countries. For Japan, Fukao and Yuan (2001), using industry data at the three-digit level, found that Japanese FDI in East Asia was associated with a substantial decrease in employment at home,

[5] However, the evidence on complementarities may not be sufficiently robust in the case of Japan. For example, although Higuchi and Shimpo (1999) find complementarities between overseas employment and home employment for Japanese MNEs, they also find a negative impact of the expansion of overseas employment on domestic employment in the case of the manufacturing sector. Similarly, Edamura et al. (2011) suggest there may be a negative relationship in the case of Japanese FDI in Asia.

while this was not the case for FDI in other regions. On the other hand, distinguishing FDI in East Asia by motive, they found that FDI that was market-oriented was associated with an increase in home employment. These findings suggest that outward FDI of the cheap labor-seeking type is likely to increase imports from low-wage countries and thus tends to have a negative impact on domestic firms.

In sum, the effect of an expansion of overseas activities on domestic activities is not quite straightforward and depends on what exactly one focuses on. For example, overseas employment and home employment may be complementary within an MNE (the same corporate group), but this is not necessarily the case within an industry. In fact, it is quite conceivable that the effects within an MNE and within the industry in which the MNE operates may differ considerably, for example as a result of the impact that the expansion of overseas activities has on domestic suppliers transacting with such MNEs.

To the best of our knowledge, there are no rigorous empirical analyses of the effect of overseas production by MNEs on their domestic suppliers taking firm-level transaction relationships into account, and the direction of the effect cannot be determined *a priori*. If expansion of overseas production by MNEs is accompanied by supplier switching or a reduction in procurement of domestic parts and components, the supplier firms may be forced to reduce their employment as a result of the reduction in orders. But it is also possible that the expansion of overseas production by MNEs increases the procurement of parts and components from their domestic suppliers. For example, the MNEs' global sales and production may increase when they expand their overseas production. If overseas demand for the MNEs' products increases as a result of efforts to develop products for the local market or of local marketing, procurement from suppliers at home may actually increase rather than decrease. This is particularly likely if domestic suppliers have technological capabilities that are superior to those of local suppliers abroad. Several of the studies mentioned above show that MNEs' overseas production and home-country exports are complementary. Such results

indicate that expansion of overseas production by MNEs does not necessarily reduce their purchases from suppliers at home.

Thus, the direction and magnitude of the impact of MNEs' overseas expansion on domestic suppliers' employment are likely to depend on a variety of factors such as MNEs' sourcing strategies and suppliers' technological capabilities. These are important issues that need to be examined in the future, but are beyond the scope of the present study, which confines itself to simply analyzing the relationship between MNEs' overseas expansion and employment at domestic suppliers.

3. Domestic and Overseas Operations of Japanese Manufacturing Firms

3.1 Data

This study uses three databases. The first is the firm-level panel dataset underlying the *Basic Survey on Business Structure and Activities* (*BSBSA*) collected annually by the Ministry of Economy, Trade and Industry (METI). We use the data for the period 1998-2007. The survey covers all firms with at least 50 employees and 30 million yen of paid-in capital in the Japanese manufacturing, mining, and commerce sectors as well as several other service sectors. The survey contains detailed information on firm-level business activities such as the three-digit industry in which the firm operates, its number of employees, sales, purchases, exports, imports, and so on. This dataset contains information on approximately 14,000 manufacturing firms (defined as firms with manufacturing activities) each year. Out of the 14,000 manufacturing firms, about 2,500 firms own one or more manufacturing affiliates abroad, while the rest (11,000+ firms) are domestic firms that do not have a manufacturing affiliate abroad.

The second dataset is the affiliate-level panel dataset for overseas affiliates of Japanese firms underlying the *Basic Survey on Overseas Business Activities* (*BSOBA*) collected annually by METI. In 2005, approximately 3,000 parent firms with a foreign affiliate

responded to the survey, and nearly 70 percent of these parent firms fell into the manufacturing sector. The survey contains information on approximately 16,000 affiliates, half of which fall into the manufacturing sector, and provides details on affiliate-level business activities such as sales, procurements, investment, and employment. Moreover, each affiliate can be linked with the parent firm in Japan, which is included in the first dataset (*BSBSA*). Using these two datasets, we can identify which Japanese MNEs' sales and employment increased or decreased, and where (in which country, including Japan) it was that their sales and employment increased or decreased.

The third dataset is a firm-level dataset compiled by Teikoku Databank, Ltd., a private company. The dataset, called *COSMOS2*, contains the names of the top-five customer firms (in terms of sales) and top-five suppliers (in terms of procurements) for each firm. Using this information, we identify who the major transaction partners of a particular firm are. Moreover, the *COSMOS2* dataset can be linked with the METI firm-level data, the *BSBSA* and the *BSOBA*, at the firm level. By linking the *COSMOS2*, the *BSBSA*, and the *BSOBA*, we can obtain information on a firm's main customers' overseas activities such as the sales and employment of the customers' affiliates abroad. However, it should be noted that the *BSBSA* is not a complete census and covers only firms with 50 or more employees and with 30 million yen or more paid-in capital. Moreover, a substantial part of the service sector is not covered by the *BSBSA*. For example, the coverage is very small for transportation services, financial intermediation and insurance, and medical and other social services, because these service industries do not fall under the jurisdiction of METI but other ministries. Therefore, it is not possible to link information on firms' main customers in the *COSMOS2* when customers are relatively small firms or are not manufacturing firms.

In sum, combining the three datasets, the *BSBSA*, the *BSOBA*, and *COSMOS2*, at the firm level, we construct a firm-level panel dataset with information on each firm's transaction relationships and information on MNEs' overseas activities. A graphic representation of the

structure of our source data and the steps we use to construct our dataset is provided in Figure 1. We start by first identifying whether a firm owns a manufacturing affiliate abroad or not, using the information from the *BSBSA* and the *BSOBA*. Second, for each manufacturing non-MNE, we then identify which firms are the main (top five) customers, using the information from the *COSMOS2*. Third, linking the *COSMOS2* and the *BSOBA* data, we identify whether the main customers are manufacturing MNEs or not and obtain the number of workers employed by the overseas affiliates for each customer firm. Fourth, linking the *COSMOS2* and the *BSBSA* data, we obtain the number of domestic workers for each customer firm. Finally, mainly relying on the information on domestic and overseas employment for each customer firm taken from the linked dataset, we measure the extent of the expansion of overseas production of the main customers for each domestic supplier.

We should note that the response rate for the *BSOBA* is relatively low at around 60-70 percent, while the response rate for the *BSBSA*, which is a mandatory survey, is relatively high at around 80-85 percent. Due to the low response rate to the *BSOBA*, there are a lot of missing observations on MNEs' overseas activities. In order to obtain a reasonably large sample, we therefore linearly interpolated employment data for missing observations if an affiliate provided information on the number of workers for at least two years.[6]

At the end of this procedure, we have annual observations for approximately 4,500 manufacturing non-MNEs with information on their main customers, and we use these 4,500 firms in our econometric analysis below. Table 1 shows the coverage of our dataset relative to the firms included in the *BSBSA*. As shown in Table 1, the number of firms without a manufacturing affiliate abroad ranged from ca. 11,600 in 2007 to more than 13,000 in 1998, and depending on the year, they employed between 2.4 and 3 million workers in Japan.

[6] Although we could in theory measure overseas production using the amount of sales of overseas affiliates, we use employment data instead, since we need to interpolate data for missing observations and expect employment to be more stable over time than sales. That is, we think we will have smaller measurement errors using employment data rather than sales data.

Further, the table shows that the number of firms in our dataset, depending on the year, ranges from about 4,000 to close to 5,000, and these firms employed roughly 720,000 to 920,000 workers. Therefore, the coverage rate of our dataset is around 30-40 percent in terms of the number of firms and around 25-35 percent in terms of number of workers. Although this coverage rate may not be very large, we believe that the size of our sample is sufficiently large for our empirical analysis. Using the dataset, we examine the impact of the expansion of overseas production on domestic employment.[7]

INSERT Figure 1 and Table 1

3.2 Overview of the Firm-Level Dataset

Although official statistics for Japan show that domestic manufacturing activities shrank in terms of employment and number of firms along with the expansion of overseas manufacturing activities, the aggregate data do not allow us to tell whether the decline in aggregate employment was caused by the expansion of overseas activities.[8]

Let us take a closer look at the firms in our dataset. Table 2 shows that out of the approximately 14,000 manufacturing firms included in the original *BSBSA* annually, the name of the top buyer is available in the *COSMOS2* database for 10,000 firms. We can distinguish whether these 10,000 firms are MNEs or not and find that approximately 16 percent of them are MNEs. For each firm, we calculate the number of workers employed by its top five or top three customers in Japan and by those customers' overseas affiliates, and use these to calculate the overseas employment ratio of suppliers' customers. Specifically, column (6) in Table 2 shows the overseas employment ratio of the top five customers of non-MNEs, while

[7] The number of firms in our dataset and the coverage rate by industry are shown in Appendix Table 1.

[8] For a discussion of employment and the number of firms in the Japanese manufacturing sector overall, see the Appendix.

column (8) shows the equivalent ratio for MNEs. Similarly, columns (10) and (12) show customers' overseas employment ratios when focusing only on the top three customers. The figures indicate that on average the customers of MNEs tend to have a higher overseas employment ratio than the customers of non-MNEs. Moreover, for both MNEs and non-MNEs, the overseas employment ratio of their top customers is increasing over time.

In our dataset, the names of a maximum of five customers are available (in order from top one to top five customer). However, while some firms provide information on all five top customers, others provide only the name of the top customer or, say, the top three customers. Moreover, the ranking of customers often changes for a particular firm and there are often new customers in the list. In fact, buyer-supplier transaction relationships seem quite dynamic. Unfortunately, we do not have information on the importance of each transaction relationship (such as the share it accounts for in a firm's total transactions), but only have the ranking. Therefore, we use the extent of customer firms' overseas activities for each supplier, which we measure as the mean of the overseas employment ratios of the top five or the top three customers. It should be noted that when we focus on, e.g., the top five customers, but a firm has only two customers, the mean is calculated using information for these two customers. Similarly, when we focus on the top three customers, if the firm has only one customer, we use the information for that one customer. In the following empirical analysis, we mainly use the mean value for the top five customers; however, we also use the mean value for the top three customers in order to check the robustness of our estimation results.

INSERT Table 2

In this paper, we focus on the effect of overseas expansion of customer firms on the employment of non-MNEs. The reasons are as follows. First, the effect of the overseas expansion of production on domestic employment within MNEs has already been examined

in quite a number of studies. And second, MNEs take both domestic and overseas factors (market conditions, factor prices, etc.) into account when they decide their input and output, while non-MNEs take only domestic factors into account. This means that it would be problematic to treat the two in one theoretical and empirical framework, so that we would need to develop and estimate separate models. We therefore decided to focus only on non-MNEs in this paper.

In Table 3, we look at differences in the characteristics of non-MNEs that sell their products to non-MNE customers and those that sell their products to MNE customers. In terms of the number of firms, the latter group is much larger than the former. Moreover, the average employment size, average exports, and average R&D intensity tend to be larger for the latter than the former, and the difference in the mean values is statistically significant for many years during the period analyzed in this paper. Average sales also tend to be larger for the latter, although the difference is not statistically significant. These observations indicate that non-MNEs selling their products to MNE customers tend to be larger than other non-MNEs.

INSERT Table 3

4. Empirical Analysis

4.1 Empirical Specification

This section explains the empirical strategy we employ to investigate the impact of the expansion of overseas production by downstream firms on their suppliers' domestic employment. We estimate the standard labor demand function employed by Hamermesh (1993), which has been used in a number of related studies, including Harrison and McMillan (2011) and Yamashita and Fukao (2010).

Let us consider a supplier firm i using N factors of production, X_1, X_2, ….., X_N. The

production function of firm *i* producing output Y_i is:

$$Y_i = f(X_{1i}, X_{2i}, \ldots\ldots, X_{Ni}). \quad (1)$$

Then the associated cost function is given by

$$C_i = g(w_{1i}, w_{2i}, \ldots\ldots, w_{Ni}, Y_i), \quad (2)$$

where the w_i are the N input prices. Using Shepard's lemma, the factor demand for the nth input for firm i is given by

$$X_{ni} = X_{ni}^{d}(w_{1i}, w_{2i}, \ldots\ldots, w_{Ni}, Y_i) \quad (3)$$

n=1, 2, …, N.

Following Harrison and McMillan (2011), Yamashita and Fukao (2010), and others, we estimate a log-linear version of equation (3). We allow two types of factor inputs: labor and physical capital. We should note that output Y for firm i is jointly determined with employment, which possibly raises a significant simultaneity problem. As in Harrison and McMillan (2011), we assume that output Y for firm i is a function of domestic prices. Moreover, we assume that firm i's main customers' expansion of overseas production affects demand for firm i's products (i.e., orders from firm i's customers) and thereby affects its output Y. Therefore, we assume that firm i's output Y is a function of domestic prices (P) and the size of the main customers' overseas operations (FOR), and equation (3) is now written as

$$X_{ni} = X_{ni}^{d}(w_{1i}, w_{2i}, \ldots\ldots, w_{Ni}, P, FOR) \quad (4)$$

n=1, 2, …, N.

Therefore, the labor demand function to be estimated is as follows:

$$lnL_{it} = \propto + \beta lnw_{it} + \gamma lnr_{it} + \delta lnP_{jt} + \rho FOR_{ift} + \omega V'_{it} + \varphi_i + \tau_t + \varepsilon_{it}, \quad (5)$$

where subscripts i, f, and t denote the firm, the main customers, and the year. L, w, r, and P denote employment, the wage rate, the user cost of capital, and final goods prices, respectively. FOR represents the extent of the overseas operations of the main downstream customers and is a proxy for the extent to which a firm is exposed to international competition.

Variables with *ln* are in logarithm, and the log-linear specification allows us to examine the elasticity between factors. *V'* is a vector of other control variables, and we control for firm-specific and year-specific effects, φ and τ. ε is the error term. Looking at the estimated coefficient on the *FOR* variable, we examine whether the expansion of overseas activities of downstream firms affects their domestic suppliers' employment and how large the effect is.

To estimate equation (5), we need data on employment, factor prices, and final goods prices for Japanese firms. The number of regular employees and the average wage rate (calculated as total wage payments including non-wage compensation divided by the number of regular employees) for each firm are taken from the *BSBSA*. The nominal wage is deflated by the GDP deflator. The user cost of capital is calculated for each firm using the price of investment goods, the interest rate, the depreciation rate, the corporate tax rate, and so on.[9] Data on investment goods prices, interest rates, and corporate tax rates were taken from the JIP Database 2011, the Bank of Japan's website, and the *Ministry of Finance Statistics Monthly*, respectively. The depreciation rate for each sector was taken from the JIP Database 2006. As for the final goods price data, Harrison and McMillan (2011) assume that domestic final goods prices are captured by real industry sales. In this paper, we include industry-by-year dummy variables, which capture final goods prices and other industry-level characteristics.

The *FOR* variable is constructed as follows. *FOR* is the average overseas employment ratio of the top five buyers, which is calculated as the employment at overseas manufacturing affiliates divided by total employment, i.e., employment at the parent firm in Japan and at the overseas manufacturing affiliates. If a firm's top five buyers do not have any overseas

[9] The user cost of capital is estimated as follows:

$$c_k = \frac{1-z}{1-u} p_k \{\lambda r + (1-u)(1-\lambda) i + \delta_i - (\frac{\dot{p}_k}{p_k})\},$$

where $p_k, i, \delta, u, \lambda$ and z are the price of investment goods, the interest rate, the depreciation rate, the corporate tax rate, the equity ratio, and the present value of depreciation deductions on a unit of nominal investment, respectively.

manufacturing affiliates, *FOR* for this firm takes zero. Further, with regard to the top five buyers' overseas employment ratio, we also distinguish between the average ratio of employment in manufacturing affiliates in Asia to total employment and the average ratio of employment in manufacturing affiliates in non-Asian countries to the total employment. The data on employment in overseas manufacturing affiliates for each parent firm are taken from the *BSOBA*.

Regarding other control variables, we prepare two dummy variables. The first dummy variable, *MNE(t+1),* takes a value of one if a firm becomes an MNE the following year. This variable captures the possible impact of starting overseas production on their own domestic employment.[10] The second dummy variable, *Change of buyers*, takes a value of one if at least one of the top five buyers of a firm changes. More specifically, the dummy variable takes one if at least one new customer appears in the top five customer list in year *t* compared with the top five customer list in year *t-1*.

4.2 Empirical Results

The results of estimating equation (5) are reported in Table 4. In order to eliminate firm fixed effects, we take the first difference for all the variables except the dummy variables, *MNE(t+1)* and *Change of buyers.* The equation is estimated using OLS.[11] Columns (1) and (2) in Table 4 show the results using the number of all domestic workers as the dependent variable, while columns (3) and (4) show the results focusing on the number of manufacturing workers (where "manufacturing workers" are measured in terms of the number of workers in domestic manufacturing divisions).[12] As shown in columns (1) and (2), the top five buyers'

[10] However, the decision to become an MNE may be endogenously determined. For example, if a firm's main customer expands production abroad, the firm may decide to follow the main customer and become an MNE. Therefore, we also estimated the model using only firms which did not become MNEs in year *t+1* and obtained estimation results that are consistent with those reported here.

[11] Summary statistics and the correlation matrix are presented in Appendix Tables 2 and 3.

[12] In this case, the average wage rate for manufacturing workers should be included as an

overseas employment ratio takes a positive and statistically significant coefficient. Further, the top five buyers' overseas employment ratio for non-Asia also takes a positive and significant coefficient; however, the coefficient on the top five buyers' overseas employment ratio for Asia is insignificant and smaller than that for non-Asia, suggesting that the expansion of operations in Asia has a smaller positive impact on the employment of supplier firms in Japan, if any. Nevertheless, these results indicate that there is a positive relationship between an increase in customer firms' overseas employment ratio and non-multinational supplier firms' domestic employment.

Turning to the other variables, the coefficients on the wage rate are significantly negative in all cases, as expected. On the other hand, the coefficients on the user cost of capital are negative but not significant. The estimated coefficients on the *MNE(t+1)* dummy and the *Change of buyers* dummy are not significant in all cases in Table 4. This implies that neither starting production overseas nor changes in customers have a significant impact on the growth of domestic employment.

Looking at the results in columns (3) and (4), the coefficients on the growth of the top five buyers' overseas employment ratio turns out to be insignificant. The difference between the results for the number of all workers and for the number of manufacturing workers suggests that Japanese non-MNEs may have increased the number of workers in non-manufacturing divisions such as headquarters divisions, but did not increase the number of workers in manufacturing divisions when their customers expanded foreign operations.

INSERT Table 4

We conduct a number of robustness checks and confirm that there is a positive correlation

explanatory variable instead of the average wage rate for all workers. However, we use the average wage rate for all workers because information on wages for manufacturing workers is not available.

between customers' expansion abroad and changes in domestic employment at their non-MNE suppliers. We start by estimating equation (5) using the overseas employment ratio of the top three rather than the top five buyers. The results are shown in Table 5. While we obtain similar results to those in Table 4, the size of the coefficient on the overseas employment ratio of the top buyers in the first column increases from 0.018 in Table 4 to 0.031 in Table 5. This increase in the coefficient implies that expansion abroad by the top three buyers has a greater positive impact on the growth of suppliers' domestic employment.

INSERT Table 5

Next, we examine whether our results are subject to potentially important selection problems. If a supplier's main customers relocate substantial parts of their operations abroad and reduce purchases from their domestic suppliers, the supplier may be forced to close down. As our estimates are based on suppliers who survived and remained in our dataset, our estimates of the effect of customers' overseas expansion may be upwardly biased. In order to address the possible bias arising from the fact that our dataset includes only surviving supplier firms, we employ a Heckman-type selection correction approach. More specifically, we estimate equation (5) conditional on observations for the firm (supplier) for the previous period being available in our dataset. We first estimate a selection equation using a probit approach including the previous year's (t-1) TFP level of the supplier firm as the excluded determinant of survival in year t. Estimating equation (5) is then augmented by the inverse Mills ratio calculated from the first stage estimation. The results with this Heckman-type selection correction are shown in Table 6. We find the following. First, the coefficients for top buyers' overseas expansion are not statistically significant in the second stage estimation when focusing on the top five buyers, as shown in columns (1) and (2). Second, the coefficients are positive and significant when we use the overseas employment ratio of the top

three rather than the top five buyers, but the inverse Mills ratio is not significant, suggesting that the selection problem is not serious in the case of columns (3) and (4). These finds confirm our baseline result that domestic firms' employment is not negatively but positively related to top buyers' overseas expansion. We should note that, in practice, a lot of observations are dropped from our dataset not because firms actually closed down, but because it was not possible to match the information on a particular firm across the three databases used in this study. Moreover, selection in transaction relationships, i.e., whether firms find new partners, cease transacting with each other, replace partners, etc., is a further issue that should be examined more closely in the future. We will leave a more rigorous study taking these selection issues into account for the future.

INSERT Table 6

Another possible criticism of the analysis here is that the overseas employment ratio does not fully capture the extent of the expansion of buyers' overseas and domestic operations. For example, some buyers may expand their overseas operations while at the same time shrinking their domestic operations, whereas other buyers may not shrink their domestic operations. To take such possible criticism into account, we first estimate equations that instead of the overseas employment ratio include the absolute number of workers employed by the top five buyers' foreign affiliates and that of domestic workers employed by the top five buyers as separate variables. When we include both the top five buyers' domestic employment and overseas employment, the estimated coefficient on the overseas employment variable is not significant, while that on the domestic employment variable is positive and significant. However, when excluding the domestic employment variable, the estimated coefficient on the overseas employment variable is positive and significant. (The results are not shown in this paper but are available from the authors upon request.) In fact, these two variables, the top

five buyers' domestic employment and overseas employment, are highly correlated (the correlation coefficient is more than 0.6), and it seems that the variable for buyers' domestic employment captures the effect of their overseas expansion as well. However, as before, we do not find any negative impact of top buyers' expansion abroad on domestic employment.

Second, in order to control for changes in the size of domestic operations, we split our sample into two groups of firms depending on the growth rate of the top five buyers' domestic employment. We first calculate the average number of domestic workers employed by the top five buyers for each firm and year and then calculate the growth rate of the top five buyers' average domestic employment. We calculate the median of the growth rate of the top five buyers' average domestic employment by year and industry (industry of the firm, not of the buyers) and then split our sample of firms into those for which the growth rate of the domestic employment of their top five customers falls above or below the median. We then estimate equation (5) for each group firms. When focusing on the top five buyers, the coefficient on the buyers' overseas employment ratio is insignificant but positive in both cases, implying that overseas expansion by customers does not have a negative effect on non-MNEs' domestic employment (Appendix Table 4). Moreover, the results in Appendix Table 4 do not show a conspicuous difference in the estimated coefficients on the top five buyers' overseas employment ratio for each group of firms. In contrast, the estimation results based on the top three buyers, shown in Appendix Table 5, show some interesting differences between the two groups of firms. Specifically, the positive effect of the top three buyers' overseas expansion is much larger and statistically significant for domestic suppliers whose buyers' domestic employment grew by more than the median growth rate. Although the results imply that the buyers' domestic employment growth does matter, we still do not find a negative impact of buyers' overseas expansion on domestic suppliers' employment even for the group of firms whose buyers' growth rate of domestic employment falls below the median.

As another robustness checks, we estimate the same equation controlling for industry

characteristics. More specifically, we classify industries into capital-intensive and labor-intensive industries based on the median value of the industry-level capital-labor ratio. We split our sample into firms in capital-intensive and firms in labor-intensive industries, and estimate equation (5) for each subsample.[13] The estimated coefficient on the top five customers' overseas employment ratio is positive and significant in both cases, and moreover, there is no conspicuous difference in the estimated coefficients between firms in capital- and labor-intensive industries.

Moreover, we estimate the equation further controlling for other firm-level characteristics such as exporting and productivity. We add an exporter dummy variable and its interaction term with the top five buyers' overseas employment ratio to the baseline specification shown in Table 4. However, the estimated coefficients for both the exporter dummy and its interaction term are not statistically significant. Thus, although one might expect that overseas expansion by a firm's main customers has a larger impact for firms that are exporters by leading to an increase in exports to the foreign affiliates of those customers, we find that this hypothesis is not supported by the data. One possible explanation is that domestic suppliers do not necessarily export directly to their main customers' foreign affiliates, but do so indirectly through their main customers in Japan. If this is the case, we cannot capture the increase in exports resulting from the customers' overseas expansion, because our data source, the *BSBSA*, only asks firms about direct exports. Finally, when we add firm-level total factor productivity (TFP) and its interaction term with the top five buyers' overseas employment ratio to the baseline specification in Table 4, the estimated coefficients are not statistically significant for both the TFP variable and its interaction term, suggesting that TFP does not have a significant impact on employment.[14]

[13] Our classification of capital-intensive industries is shown in Appendix Table 1. The estimation results are not shown in this study but are available from the authors upon request.

[14] Firm-level TFP is calculated based on industry-level production functions estimated using the semi-parametric estimation technique proposed by Levinsohn and Petrin (2003).

Thus, we do not find a significantly negative effect of main customers' overseas expansion on non-MNEs' employment and instead in fact tend to obtain a positive impact.

5. Conclusion and Policy Implications

This paper investigated the effects of main customers' expansion of overseas operations on non-multinational firms' employment, using a unique firm-level dataset with information on buyer-supplier transaction relationships. We do not find any negative effects of top buyers' expansion of foreign activities on non-MNEs' employment. Rather, we in fact find a significantly positive effect in several cases. Contrary to fears of a potential hollowing out of domestic industry in Japan, our results imply that the expansion of overseas production by MNEs does not have a negative effect on the employment of their domestic supplier firms. Put differently, our results can be interpreted as indicating that the impact on non-MNEs' employment may actually be positive if their main customer firms are successful in foreign markets and increase foreign activities. As suggested in some previous studies (e.g., Blonigen 2001 and Nishitateno 2013), the expansion of overseas production by downstream firms may increase purchases from upstream firms in Japan, resulting in an increase in employment at the upstream firms. This would be the case if downstream firms can increase their world-wide sales by expanding overseas production. Therefore, our results suggest that selling to a firm which is successful in overseas production may be important for supplier firms in Japan. Upstream firms which have a transaction relationship with such "good" downstream MNEs may be able to benefit from their customers' overseas expansion.

However, as shown in official industry-level statistics, in practice, total manufacturing employment and the total number of manufacturing firms in Japan have been declining drastically. This macro-level observation seems to contradict our empirical result. How can we interpret the apparent contradiction? First, the biggest decline in both employment and the

number of firms can be seen for firms with less than 50 employees, which we were unable to cover in this paper due to data constraints. Therefore, the negative impact of MNEs' overseas expansion may be more serious and conspicuous for smaller firms. Smaller firms are likely to be lower down in the supply chain (i.e., more upstream), and an issue worth investigating is whether the impact of MNEs' overseas expansion on their suppliers differs depending on firms' position in the supply chain (i.e., whether they are second- or lower-tier suppliers). Second, although successful overseas expansion by downstream firms is likely to positively affect domestic suppliers' employment, the shift from domestic to overseas production by their main customers may increase the probability of death for supplier firms or the probability that transaction relationships are broken off. This risk may be particularly high for smaller supplier firms. Thus, the dynamics of transaction relationships represent another issue that deserves further scrutiny. As part of the robustness checks of our results, we estimated the labor demand function using a Heckman selection model in order to take account of the possible bias arising from the death of supplier firms. However, as mentioned, the analysis presented here is only a first step to taking the various types of selection bias into account and a more rigorous analysis is needed. The death of supplier firms, as well as changes in transaction relationships, are issues that deserve further scrutiny in the future in order to gain a better understanding of the heterogeneous impact of downstream firms' overseas expansion on supplier firms.

Closely related, the third reason why our results may appear to be in contradiction with the observed decline in manufacturing employment is that our measure of overseas expansion may not be able to fully capture the dynamic changes in the overseas and domestic production of the main buyers. For example, our current measure does not sufficiently take account of the frequency of changes in customers and the strength of transaction relationships (i.e., the length of transaction relationships and/or the transaction volume). Moreover, as mentioned in Section 2, supplier firms' technological capabilities may affect buyers' decisions in their

procurement strategies and some suppliers may put more resources into innovation activities in order to continue supplying expanding MNEs. Supplier firms may benefit more from their customers' overseas expansion if they produce highly differentiated parts and components and the customers cannot switch suppliers. While taking these factors into account is not straightforward due to data constraints, doing so would be a worthwhile exercise in a future study.

Although our result should be interpreted with some reservation, it is noteworthy that we found no evidence of a negative relationship between the overseas expansion of downstream firms and employment at domestic suppliers. In fact, our results suggest that employment has contracted more at supplier firms that do not sell to MNEs that are expanding their overseas production than at supplier firms that transact with expanding MNEs. Therefore, the macro-level decline in manufacturing employment may imply that there are a large number of domestic suppliers that cannot sell their products to expanding MNEs and therefore do not benefit from the globalization of their customer firms.

The results of this paper thus indicate that the impact of MNEs' overseas expansion on domestic supplier firms is highly heterogeneous. In terms of policy implications, the findings mean that overseas expansion itself should not be criticized and in fact instead should be promoted. Policy support for overseas expansion is appropriate and is not responsible for accelerating the hollowing out of supporting industries. Our results suggest that supplier firms that have a transaction relationship with "good" buyers that can expand their overseas operations are likely to be positively affected by the overseas expansion of their buyers. In order to establish new transaction relationships, supplier firms may have to incur some costs to collect information on potential buyers, innovate new products, change their line of business, or even invite a new manager. Government policy should support such efforts of supplier firms for establishing new transaction relationships, not discourage the expansion of overseas operations by MNEs.

Acknowledgments

We constructed our dataset at the Research Institute of Economy, Trade and Industry (RIETI) using the correspondence tables for the firm ID codes for the *BSBSA*, the *BSOBA*, and the *COSMOS2* data, which were compiled by RIETI. We would like to thank RIETI for the support we received in construction our dataset. The paper benefited from helpful comments on earlier drafts by Shujiro Urata, Chin Hee Hahn, Dionisius Narjoko, Sadayuki Takii, Ryuhei Wakasugi, Toshiyuki Matsuura, and participants of the WEAI Biennial Pacific Rim Conference, the CAED 2013 conference, and the JSIE annual conference, as well as of seminars at ERIA and GRIPS. We gratefully acknowledge financial support from the Japan Society for the Promotion of Science in the form of Grants-in-Aid for Scientific Research Nos. 23243050 and 24730234.

References

Barba Navaretti, G., D. Castellani, and A. C. Disdier (2010) "How Does Investing in Cheap Labour Countries Affect Performance at Home? Firm-Level Evidence from France and Italy," *Oxford Economic Papers* 62(2): 234-260.

Belderbos, R., R. Wakasugi, and J. Zou (2012) "Business Groups, Foreign Direct Investment, and Capital Goods Trade: The Import Behavior of Japanese Affiliates," *Journal of the Japanese and International Economies* 26: 187-200.

Bergsten, C. F., T. Horst, and T. H. Moran (1978) *American Multinationals and American Interests*, Washington D.C.: The Brookings Institution.

Bernard, A. B., J. B. Jensen, and P. Schott (2006) "Survival of the Best Fit: Exposure to Low-Wage Countries and the (Uneven) Growth of U.S. Manufacturing Plants," *Journal*

of International Economics 68(1): 219-237.

Blomström, M., R. E. Lipsey, and K. Kulchycky (1988) "U.S. and Swedish Direct Investment and Exports," in Robert E. Baldwin, ed., *Trade Policy Issues and Empirical Analysis*, Chapter 9, pp. 257-302, National Bureau of Economic Research.

Blomström, M., G. Fors, and R. E. Lipsey (1997) "Foreign Direct Investment and Employment: Home Country Experience in the United States and Sweden," *Economic Journal* 107 (445): 1787-1797.

Blonigen, B. (2001) "In Search of Substitution Between Foreign Production and Exports," *Journal of International Economics* 53(1): 81-104.

Braconier, H. and K. Ekholm (2000) "Swedish Multinationals and Competition from High and Low-Wage Locations," *Review of International Economics* 8(3): 448-461.

Brainard, L. S. and D. A. Riker (1997) "Are US Multinationals Exporting US Jobs?," *NBER Working Paper Series* 5958, National Bureau of Economic Research.

Castellani, D., I. Mariotti, and L. Piscitello (2008) "The Impact of Outward Investments on Parent Company's Employment and Skill Composition: Evidence from the Italian Case," *Structural Change and Economic Dynamics* 19(1): 81-94.

Debaere, P., H. Lee, and J. Lee (2010) "It Matters Where You Go: Outward FDI and Multinational Employment Growth at Home," *Journal of Development Economics* 91(2): 301-309.

Desai, M. A., C. F. Foley, and J. R. Hines Jr. (2009) "Domestic Effects of the Foreign Activities of US Multinationals," *American Economic Journal: Economic Policy* 1(1): 181-203.

Eaton, J. and A. Tamura (1994) "Bilateralism and Regionalism in Japanese and U.S. Trade and Direct Foreign Investment Patterns," *Journal of the Japanese and International Economies* 8(4): 478-510.

Edamura, K., L. Hering, T. Inui, and S. Poncet (2011) "The Overseas Subsidiary Activities

and Their Impact on the Performance of Japanese Parent Firms," *RIETI Discussion Paper* 11-E-069, Research Institute of Economy, Trade and Industry.

Fukao, K. and T. Nakakita (1996) "Foreign Direct Investment and Trade by Electrical Machinery Manufacturers: An Empirical Analysis Based on Panel Data," *MITI Research Review* 7: 118-140 (in Japanese).

Fukao, K. and T. Yuan (2001) "Japanese Outward FDI and Hollowing Out," *RIETI Discussion Paper Series* 01-J-003, Research Institute of Economy, Trade and Industry (in Japanese).

Hamermesh, D. S. (1993) *Labor Demand*, Princeton, N. J.: Princeton University Press.

Harrison, A. and M. S. McMillan (2011) "Outsourcing Jobs? Multinationals and US Manufacturing Employment," *The Review of Economics and Statistics* 93(3): 857-875.

Head, K. and J. Ries (2001) "Overseas Investment and Firm Exports," *Review of International Economics* 9(1): 108-122.

Higuchi, Y. and K. Shimpo (1999) "Job Creation and Job Destruction in Japanese Firms: The Effects of Firm Age, Foreign Direct Investment, and Research and Development," *Mita Business Review* 42(5): 111-133 (in Japanese).

Hijzen, A., S. Jean, and T. Mayer (2011) "The Effects at Home of Initiating Production Abroad: Evidence from Matched French Firms," *Review of World Economics* 147(3): 457-483.

Katz, L. F. and K. M. Murphy (1992) "Changes in Relative Wages, 1963-1987: Supply and Demand Factors," *Quarterly Journal of Economics* 107(1): 35-78.

Levinsohn, J. and A. Petrin (2003) "Estimating Production Functions Using Inputs to Control for Unobservables," *Review of Economic Studies* 70(2): 317-341.

Lipsey, R. E. (1994) "Outward Direct Investment and the U.S. Economy," *NBER Working Paper Series* 4691, National Bureau of Economic Research.

Lipsey, R. E. and M. Y. Weiss (1981) "Foreign Production and Exports in Manufacturing

Industries," *Review of Economics and Statistics* 63(4): 488-94.

Lipsey, R. E. and M. Y. Weiss (1984) "Foreign Production and Exports of Individual Firms," *Review of Economics and Statistics* 66(2): 304-308.

Mayer, T. and G. Ottaviano (2008), "The Happy Few: The Internationalisation of European Firms," *Intereconomics* 43(3): 135-148.

Nishitateno, S. (2013) "Global Production Sharing and the FDI-Trade Nexus: New Evidence from the Japanese Automobile Industry," *Journal of the Japanese and International Economies* 27: 64-80.

Revenga, A. L. (1992) "Exporting Jobs? The Impact of Import Competition on Employment and Wages in US Manufacturing," *Quarterly Journal of Economics*, 107(1): 255-284.

Ramstetter, E. D. (1997) "Export Performance and Foreign Affiliate Activity in Japan's Large Machinery Firms," *Transnational Corporations* 6(3): 113-133.

Riker, D. and L. S. Brainard (1997) "U.S. Multinationals and Competition from Low Wage Countries," *NBER Working Paper Series* 5959, National Bureau of Economic Research.

Swedenborg, B. (1985) "Sweden," in John Dunning, ed., *Multinational Enterprises, Economic Structure, and International Competitiveness*, pp. 217-248, London: Wiley.

Tanaka, A. (2012) "The Effects of FDI on Domestic Employment and Workforce Composition," *RIETI Discussion Paper Series* 12-E-069, Research Institute of Economy, Trade and Industry.

Tomiura, E. (2003) "The Impact of Import Competition on Japanese Manufacturing Employment," *Journal of the Japanese and International Economies* 17(2): 118-133.

Wagner, J. (2011) "Offshoring and Firm Performance: Self-Selection, Effects on Performance, or Both?" *Review of World Economics*, 147(2): 217-247.

Wakasugi, R., Y. Todo, H. Sato, S. Nishioka, T. Matsuura, B. Ito, and A. Tanaka (2008) "The Internationalization of Japanese Firms: New Findings Based on Firm-Level Data," *RIETI Discussion Paper* 08-E-036, Research Institute of Economy, Trade and Industry.

Yamashita, N. and K. Fukao (2010) "Expansion Abroad and Jobs at Home: Evidence from Japanese Multinational Enterprises," *Japan and the World Economy* 22(2): 88-97.

Appendix: Overview of the Domestic and Overseas Activities of Japanese Manufacturing Firms

This appendix provides additional information on the domestic and overseas operations of Japanese manufacturing firms based on the original *BSBSA* data (i.e., not the data linked with the *BSOBA* and *COSMOS2* data), supplemented with data from the *Census of Manufactures*. The *BSBSA* includes only firms with 50 or more employees and at least 30 million yen of paid-in capital, and firms below this threshold are not covered by the *BSBSA*, meaning that smaller firms are excluded. We therefore supplement the *BSBSA* data with information on smaller firms from the *Census of Manufactures* (also compiled by METI), which covers firms with 4 or more employees. Taken together, the firms in the two datasets cover almost the entire universe of Japanese manufacturing firms.

Using these two sets of data, Appendix Figure 1 shows the number of Japanese manufacturing firms or affiliates (panel (a)) and the domestic and overseas employment (panel (b)) of Japanese manufacturing firms for the period from 1998 to 2007. Manufacturing firms here are defined as firms with manufacturing divisions or establishments in Japan based on the information reported in the *BSBSA*. In the *BSBSA*, each firm also provides information on how many affiliates or subsidiaries the firm has in Japan and in other countries and on which industry the affiliates or subsidiaries belong to. Affiliates or subsidiaries in the *BSBSA* are defined as firms in which the parent firm has an ownership stake of 20 percent or more. In 1998, approximately 15,500 manufacturing firms responded to the *BSBSA*, out of which 2,300 firms (approximately 15 percent) had one or more manufacturing affiliates abroad. In 2007, approximately 14,600 manufacturing firms responded to the *BSBSA*, out of which 3,000 firms (20 percent) had one or more manufacturing affiliates abroad. The number of firms with 4-49 workers decreased drastically by more than 107,000 from 313,500 to 206,200 firms. On the other hand, the number of manufacturing affiliates abroad increased from 6,400 in 1998 to 8,300 in 2007, according to the official report based on the *BSOBA*.

As for domestic employment, the number of workers employed in Japanese manufacturing firms decreased from 9.6 million to 8.3 million during the period 1998-2007 (panel (b)). While the level of employment in firms with manufacturing affiliates abroad remained more or less unchanged, employment in firms without manufacturing affiliates abroad fell considerably from 6.5 million to 5.2 million between 1998 and 2007. (We assume that all firms with 4-49 workers are non-MNEs). However, looking at domestic employment per firm, firms with manufacturing affiliates abroad reduced employment from 1,300 workers on average in 1998 to 1,000 workers in 2007, while the average number of employees at firms without manufacturing affiliates abroad remained largely unchanged at around 220 workers for firms with 50 or more workers and around 12 workers for firms with 4-49 workers. On the other hand, the total number of workers employed by manufacturing affiliates abroad and the number of workers per affiliate increased from 2.2 million to 4.0 million and from 347 workers to 475 workers, respectively.

INSERT Appendix Figure 1

Figure 1. Structure of our sample data and steps to construct our data

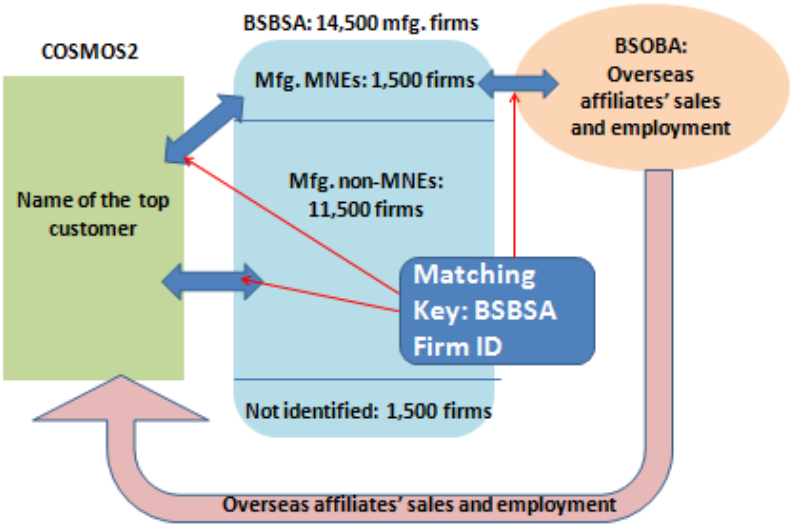


Table 1. Comparison between BSBSA and our sample: Non-MNEs

Year	Number of firms	Employment, total	Sales, total (tril. yen)	Exports, total (tril. yen)
(A) BSBSA				
1998	13,268	3,007,390	116.73	6.48
1999	13,009	2,870,212	113.48	4.08
2000	12,476	2,729,623	114.78	4.39
2001	12,251	2,609,400	108.66	4.39
2002	11,873	2,471,044	107.43	3.94
2003	11,266	2,423,932	112.65	4.71
2004	11,832	2,523,487	121.76	4.65
2005	11,452	2,442,560	122.41	4.68
2006	11,191	2,451,058	126.00	5.44
2007	11,647	2,606,213	133.00	5.81
(B) This paper				
1998	4,624	898,906	30.73	0.89
1999	4,143	721,999	24.26	0.51
2000	4,835	918,559	35.39	0.97
2001	4,068	671,739	22.97	0.50
2002	4,860	892,358	35.90	1.16
2003	4,637	859,858	36.23	1.16
2004	5,020	917,097	40.83	1.20
2005	4,856	878,537	38.79	0.91
2006	4,492	799,535	36.85	1.06
2007	4,869	896,223	46.45	1.42
Coverage of our sample, (B)/(A)				
1998	34.9%	29.9%	26.3%	13.8%
1999	31.8%	25.2%	21.4%	12.6%
2000	38.8%	33.7%	30.8%	22.0%
2001	33.2%	25.7%	21.1%	11.4%
2002	40.9%	36.1%	33.4%	29.4%
2003	41.2%	35.5%	32.2%	24.6%
2004	42.4%	36.3%	33.5%	25.8%
2005	42.4%	36.0%	31.7%	19.5%
2006	40.1%	32.6%	29.2%	19.5%
2007	41.8%	34.4%	34.9%	24.5%

Note: Figures for the wage bill, sales, and exports are in nominal terms.

Table 2. Number of firms by firm types

	Firms included in the BSBSA											
		Firms with information on the top 1 buyer										
					Firms for which data on the overseas affiliates of the top 5 buyers are available				Firms for which data on the overseas affiliates of the top 3 buyers are available			
	All	All	Non-MNEs	MNEs	Non-MNEs		MNEs		Non-MNEs		MNEs	
Year	Obs.	Obs.	Obs.	obs.	Obs.	Top 5 buyers' overseas ratio (mean)	Obs.	Top 5 buyers' overseas ratio (mean)	Obs.	Top 3 buyers' overseas ratio (mean)	Obs.	Top 3 buyers' overseas ratio (mean)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1998	15,528	11,467	9,861	1,606	4,624	16.6%	808	22.7%	3,843	17.4%	617	23.7%
1999	15,305	9,756	8,675	1,081	4,143	17.0%	543	22.7%	3,517	18.0%	440	23.9%
2000	14,774	11,478	9,808	1,670	4,835	18.7%	902	26.7%	4,038	19.8%	732	27.4%
2001	14,661	9,489	8,354	1,135	4,068	18.2%	580	25.9%	3,236	19.8%	422	27.7%
2002	14,338	11,204	9,437	1,767	4,860	18.6%	1011	26.5%	3,808	20.2%	778	28.0%
2003	13,788	10,941	9,099	1,842	4,637	18.7%	1083	27.3%	3,657	20.7%	817	29.8%
2004	14,630	11,729	9,664	2,065	5,020	18.9%	1188	26.4%	3,991	20.3%	906	28.4%
2005	14,299	11,487	9,382	2,105	4,856	20.2%	1211	28.8%	3,795	21.9%	909	30.3%
2006	13,980	10,768	8,792	1,976	4,492	20.2%	1124	27.8%	3,541	21.8%	836	30.0%
2007	14,570	11,632	9,457	2,175	4,869	19.9%	1204	28.6%	3,802	21.3%	908	30.0%

Note: Top buyers' overseas employment ratio is the ratio of workers in foreign affiliates.

Table 3. Comparison of mean level by firm type

Year	Number of firms	Employment per firm	Manufacturing workers per firm	Non-Manufacturing workers per firm	Wage bill per firm (mil. yen)	Sales per firm (mil. yen)	Exports per firm (mil. yen)	R&D/Sales per firm (mil. yen)
Non-MNEs total								
1998	4,624	194	131	63	969	6,646	193	0.008
1999	4,143	174	121	54	833	5,855	124	0.007
2000	4,835	190	129	61	989	7,319	200	0.018
2001	4,068	165	114	51	843	5,646	123	0.016
2002	4,860	184	122	62	950	7,386	238	0.016
2003	4,637	185	123	62	971	7,813	249	0.017
2004	5,020	183	121	62	958	8,134	239	0.016
2005	4,856	181	122	59	937	7,989	188	0.015
2006	4,492	178	115	63	851	8,204	236	0.016
2007	4,869	184	121	63	851	9,540	292	0.013
Non-MNEs who sell their products to non-MNEs (A)								
1998	1,821	187	119	67	891	6,571	131	0.007
1999	1,724	165	107	58	752	5,780	52	0.006
2000	1,822	174	113	61	865	6,979	88	0.016
2001	1,632	154	102	52	758	5,114	81	0.014
2002	1,935	172	108	64	857	6,533	133	0.014
2003	1,890	179	111	68	919	7,117	120	0.015
2004	2,101	175	108	67	861	7,889	197	0.015
2005	1,889	173	109	64	864	7,356	122	0.013
2006	1,658	167	102	65	769	8,467	159	0.015
2007	1,836	176	112	64	764	9,465	225	0.013
Non-MNEs who sell their products to MNEs (B)								
1998	2,803	200	139 *	60	1,019 *	6,694	233	0.009
1999	2,419	181 *	130 *	51	891 *	5,908	176	0.008 *
2000	3,013	200 *	139 *	61	1,067 *	7,525	268	0.019
2001	2,436	173 *	122 *	51	901 *	6,003	152 *	0.017 *
2002	2,925	191 *	131 *	60	1,012 *	7,951	308 *	0.017 *
2003	2,747	190	132 *	58	1,006	8,292	339 *	0.019 *
2004	2,919	188	130 *	59	1,027	8,309	269 *	0.017 *
2005	2,967	186	130 *	56	984	8,391	230 *	0.016 *
2006	2,834	185 *	122 *	62	899 *	8,050	281	0.016
2007	3,033	189	127 *	62	904 *	9,585	333 *	0.013

Notes: * indicates that the mean is significantly different from that in the middle panel at the 5% level (two tailed t-test). Figures for the wage bill, sales, and exports are in nominal terms.

Table 4. Estimation results

Changes in domestic employment: Baseline OLS specifications (1998-2007)

Dependent variable: dln # of workers	All workers	All workers	Manufacturing workers	Manufacturing workers
	(1)	(2)	(3)	(4)
dln Real wage rate	-0.151***	-0.151***	-0.191***	-0.187***
	[0.006]	[0.006]	[0.023]	[0.023]
dln User cost of capital	-0.05	-0.014	-0.445	-0.39
	[0.148]	[0.150]	[0.687]	[0.697]
MNE (t+1)	0.007	0.005	-0.021	-0.02
	[0.006]	[0.006]	[0.025]	[0.025]
Change of buyers	-0.001	-0.001	-0.001	0
	[0.002]	[0.002]	[0.009]	[0.009]
d (Top five buyers' ratio of workers in foreign affiliates)	0.018***		0.011	
	[0.007]		[0.036]	
d (Top five buyers' ratio of workers in foreign affiliates in Asia)		0.013		0.01
		[0.008]		[0.040]
d (Top five buyers' ratio of workers in foreign affiliates in non-Asia)		0.021**		0.019
		[0.010]		[0.057]
Observations	27455	26879	27455	26879
F-statistic	5.787	5.622	2.227	2.171
R-squared	0.107	0.107	0.022	0.022

Notes: Robust standard errors are shown in brackets. Constants are suppressed.

All regressions are OLS specifications that include industry-by-year fixed effects.

***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 5. Robustness checks: Top three buyers

Changes in domestic employment: OLS specifications (1998-2007)

Dependent variable: dln # of workers	All workers	All workers	Manufacturing workers	Manufacturing workers
	(1)	(2)	(3)	(4)
dln Real wage rate	-0.146***	-0.146***	-0.157***	-0.157***
	[0.007]	[0.007]	[0.025]	[0.026]
dln User cost of capital	0.021	0.057	-0.767	-0.67
	[0.174]	[0.177]	[0.774]	[0.790]
MNE (t+1)	0.011	0.008	-0.029	-0.023
	[0.007]	[0.007]	[0.030]	[0.030]
Change of buyers	-0.002	-0.001	0.000	0.000
	[0.002]	[0.002]	[0.009]	[0.009]
d (Top three buyers' ratio of workers in foreign affiliates)	0.031***		0.033	
	[0.008]		[0.043]	
d (Top three buyers' ratio of workers in foreign affiliates in Asia)		0.027***		-0.004
		[0.010]		[0.052]
d (Top three buyers' ratio of workers in foreign affiliates in non-Asia)		0.031***		0.099
		[0.011]		[0.065]
Observations	21249	20674	21249	20674
F-statistic	4.644	4.486	1.922	1.891
R-squared	0.106	0.106	0.022	0.022

Notes: Robust standard errors are shown in brackets. Constants are suppressed.

All regressions are OLS specifications that include industry-by-year fixed effects.

***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 6. Robustness checks: Testing for survivorship bias using the Heckman correction

(a) The second-stage estimates

Dependent variable: dln # of workers	All workers top five buyers	All workers top five buyers	All workers top three buyers	All workers top three buyers
	(1)	(2)	(3)	(4)
dln real wage	-0.128***	-0.128***	-0.128***	-0.128***
	[0.004]	[0.004]	[0.005]	[0.005]
dln user cost of capital	-0.091	-0.098	-0.016	-0.026
	[0.152]	[0.153]	[0.179]	[0.180]
MNE (t+1)	0.004	0.004	0.013	0.014
	[0.007]	[0.007]	[0.009]	[0.009]
Change of buyers	0.002	0.002	0.002	0.002
	[0.002]	[0.002]	[0.002]	[0.002]
d (top buyers' ratio of workers in foreign affiliates)	0.008		0.022**	
	[0.008]		[0.010]	
d (top buyers' ratio of workers in foreign affiliates in Asia)		0.007		0.021*
		[0.009]		[0.012]
d (top buyers' ratio of workers in foreign affiliates in non-Asia)		0.004		0.02
		[0.014]		[0.016]
mills lambda	0.054**	0.053*	0.048	0.048
	[0.028]	[0.028]	[0.033]	[0.033]
Observations	12438	12204	9120	8920
Censored Observations	586	582	446	440
Uncensored Observations	11852	11622	8674	8480

(b) The first-stage estimates

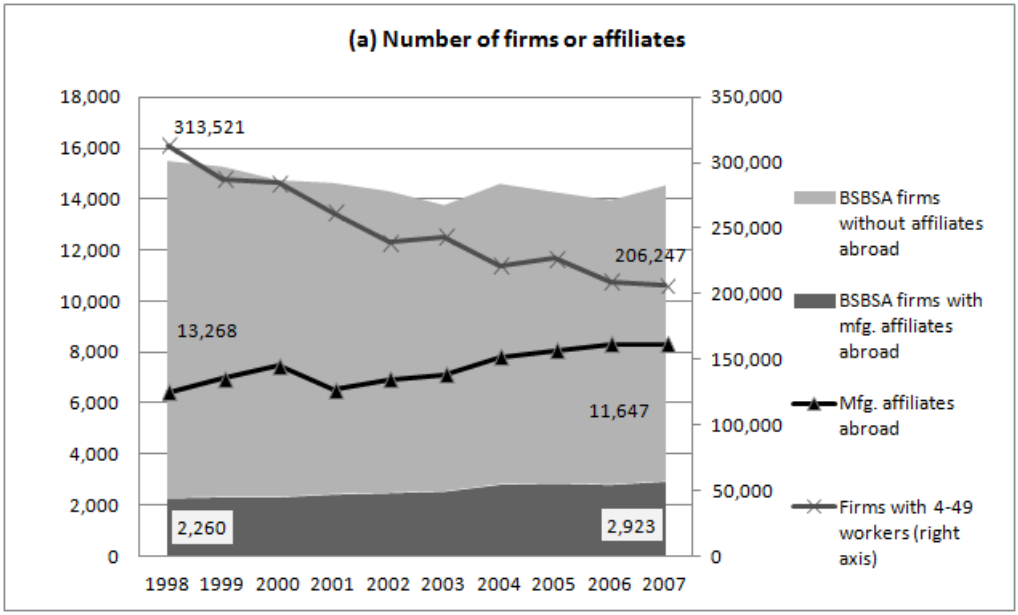
Dependent variable: survival (t)	All workers top five buyers	All workers top five buyers	All workers top three buyers	All workers top three buyers
	(1)	(2)	(3)	(4)
dln real wage	0.268***	0.276***	0.230**	0.257**
	[0.101]	[0.102]	[0.115]	[0.117]
dln user cost of capital	4.939	4.521	5.252	5.043
	[3.854]	[3.861]	[4.673]	[4.700]
Change of buyers	0.041	0.045	-0.025	-0.03
	[0.053]	[0.053]	[0.054]	[0.055]
ln TFP (t-1)	0.237***	0.234***	0.205***	0.202***
	[0.029]	[0.029]	[0.033]	[0.033]
d (top buyers' ratio of workers in foreign affiliates)	-0.129		-0.398	
	[0.197]		[0.244]	
d (top buyers' ratio of workers in foreign affiliates in Asia)		-0.041		-0.228
		[0.239]		[0.296]
d (top buyers' ratio of workers in foreign affiliates in non-Asia)		-0.21		-0.723*
		[0.349]		[0.382]
Observations	12438	12204	9120	8920

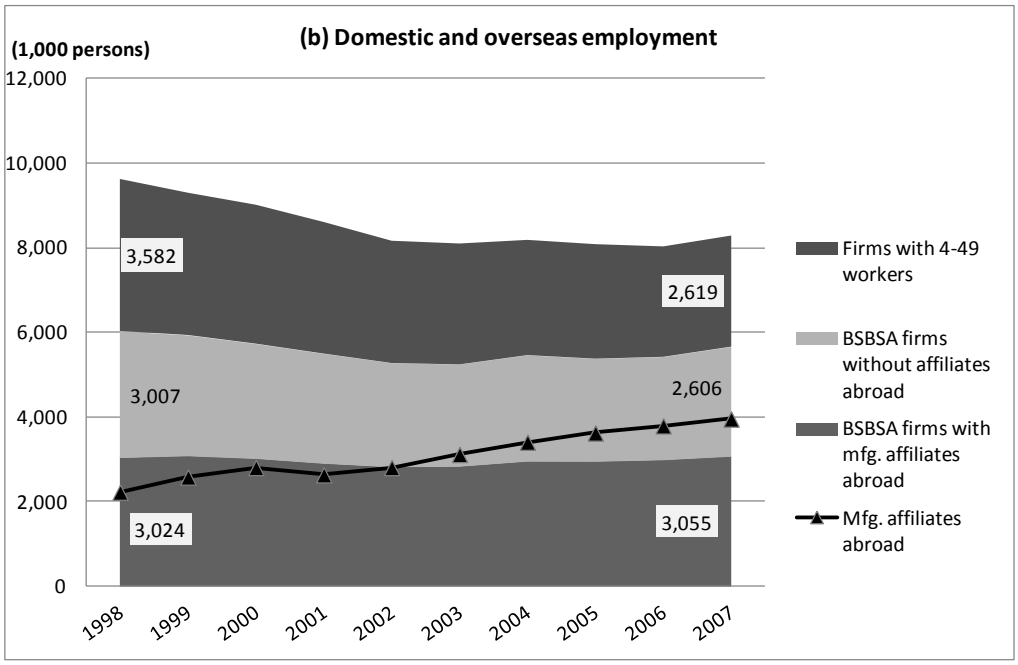
Notes: Robust standard errors are shown in brackets. Constants are suppressed.

Both the first- and the second-stage specification include industry-by-year fixed effects.

***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

Appendix Figure 1. Domestic and overseas activities of Japanese manufacturing firms





Sources: Firms with 50 or more employees and manufacturing affiliates abroad: Authors' calculation based on the micro-data underlying the *BSBSA* and the *BSOBA*.

Firms with 49 or fewer employees: Data compiled by the Ministry of Economy, Trade, and Industry based on the *Census of Manufactures*.

Appendix Table 1. Number of non-MNE observations by industry: Non-MNE firms with manufacturing divisions or establishments in Japan (2007)

	(A) BSBSA	(B) This paper	(B)/(A)	Capital-intensive industries*
1: Food products and beverages	1,551	416	26.8%	0
2: Textiles	428	126	29.4%	0
3: Lumber and wood products	230	76	33.0%	0
4: Pulp, paper, and paper products	331	176	53.2%	1
5: Printing	583	210	36.0%	1
6: Chemicals and chemical fibers	187	87	46.5%	1
7: Paint, coating, and grease	86	36	41.9%	1
8: Pharmaceutical products	199	76	38.2%	1
9: Miscellaneous chemical products	191	79	41.4%	1
10: Petroleum and coal products	47	22	46.8%	1
11: Plastic products	579	327	56.5%	1
12: Rubber products	104	50	48.1%	0
13: Ceramic, stone and clay products	416	153	36.8%	1
14: Iron and steel	358	174	48.6%	1
15: Non-ferrous metals	257	138	53.7%	1
16: Fabricated metal products	806	404	50.1%	0
17: Metal processing machinery	202	94	46.5%	0
18: Special industry machinery	523	302	57.7%	0
19: Office and service industry machines	98	33	33.7%	1
20: Miscellaneous machinery	448	211	47.1%	1
21: Electrical machinery and apparatus	337	167	49.6%	0
22: Household electric appliances	87	37	42.5%	0
23: Communication equipment	212	82	38.7%	0
24: Computer and electronic equipment	145	57	39.3%	0
25: Electronic parts and devices	562	227	40.4%	0
26: Miscellaneous electrical machinery	183	78	42.6%	0
27: Motor vehicles and parts	647	330	51.0%	1
28: Other transportation equipment	221	110	49.8%	1
29: Precision machinery	549	211	38.4%	0
30: Miscellaneous mfg. industries	29	9	31.0%	0
37: Wholesale trade	1,051	371	35.3%	0
Total	11,647	4,869	41.8%	

* Capital-intensive industries are defined as industries with an above-median industry average capital intensity.

Appendix Table 2. Summary statistics

Variable	N	Min	Mean	Max	SD
dln # of workers in parent firm	27,455	-1.36	0.00	2.55	0.12
dln # of manufacturing workers in parent firm	27,455	-7.85	-0.02	6.79	0.61
dln Real wage bill in parent firm	27,455	-3.79	0.03	5.02	0.29
dln Real wage rate in parent firm	27,455	-2.22	0.02	2.38	0.22
dln User cost of capital in parent firm	27,455	-0.14	0.00	0.08	0.01
MNE (t+1)	27,455	0.00	0.02	1.00	0.14
Change of top five buyers	27,455	0.00	0.78	1.00	0.41
d (Top five buyers' ratio of workers in foreign affiliates)	27,455	-0.95	0.01	0.94	0.12
d (Top five buyers' ratio of workers in foreign affiliates in Asia)	26,879	-0.93	0.01	0.94	0.10
d (Top five buyers' ratio of workers in foreign affiliates in non-Asia)	26,879	-1.20	0.00	1.19	0.07
dln Top five buyers' workers in foreign affiliates	27,455	-10.94	0.03	10.99	1.98
dln Top five buyers' workers in foreign affiliates in Asia	26,882	-10.18	0.06	10.41	1.88
dln Top five buyers' workers in foreign affiliates in non-Asia	26,840	-10.65	-0.03	10.31	1.86
dln Top five buyers' domestic workers	27,455	-6.07	-0.02	5.86	0.70
Change of top three buyers	21,249	0.00	0.64	1.00	0.48
d (Top three buyers' ratio of workers in foreign affiliates)	21,249	-0.88	0.01	0.95	0.11
d (Top three buyers' ratio of workers in foreign affiliates in Asia)	20,674	-0.87	0.01	0.98	0.09
d (Top three buyers' ratio of workers in foreign affiliates in non-Asia)	20,674	-1.20	0.00	1.19	0.07
dln Top three buyers' workers in foreign affiliates	21,249	-10.89	0.02	10.99	1.77
dln Top three buyers' workers in foreign affiliates in Asia	20,677	-10.18	0.05	10.41	1.68
dln Top three buyers' workers in foreign affiliates in non-Asia	20,641	-10.51	-0.04	10.38	1.66
Exporter	27,455	0.00	0.22	1.00	0.41

Appendix Table 3. Correlation matrix

Correlation matrix (Obs.=26,879)

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1)	dln # of workers in parent firm	1.000										
(2)	dln # of manufacturing workers in parent firm	0.222	1.000									
(3)	dln Real wage bill in parent firm	0.175	0.041	1.000								
(4)	dln Real wage rate in parent firm	-0.264	-0.059	0.886	1.000							
(5)	dln User cost of capital in parent firm	-0.009	0.018	0.001	0.008	1.000						
(6)	MNE (t+1)	0.009	-0.004	0.014	0.010	-0.013	1.000					
(7)	Change of buyers	0.002	0.005	-0.008	-0.008	0.029	0.017	1.000				
(8)	d (Top five buyers' ratio of workers in foreign affiliates)	0.017	0.006	0.013	0.007	-0.017	0.008	-0.010	1.000			
(9)	d (Top five buyers' ratio of workers in foreign affiliates in Asia)	0.014	0.004	0.010	0.005	-0.008	0.012	-0.007	0.817	1.000		
(10)	d (Top five buyers' ratio of workers in foreign affiliates in non-Asia)	0.007	0.003	0.007	0.005	-0.022	-0.003	-0.009	0.562	0.016	1.000	
(11)	dln Top five buyers' domestic workers	0.027	0.001	0.002	-0.010	-0.018	0.004	0.003	0.348	0.229	0.280	1.000

Appendix Table 4. Robustness checks: Estimation results for subsamples split by buyer's domestic employment growth

Changes in domestic employment: OLS specifications (1998-2007)

Dependent variable: dln # of workers	Buyers with a higher average growth rate		Buyers with a lower average growth rate	
	All workers	All workers	All workers	All workers
	(1)	(2)	(3)	(4)
dln real wage	-0.156***	-0.155***	-0.146***	-0.146***
	[0.009]	[0.009]	[0.008]	[0.008]
dln user cost of capital	-0.056	-0.035	-0.003	0.053
	[0.258]	[0.262]	[0.152]	[0.151]
MNE (t+1)	0.019**	0.016*	-0.004	-0.004
	[0.009]	[0.009]	[0.008]	[0.008]
Change of buyers	0.002	0.001	0.001	0.001
	[0.002]	[0.002]	[0.002]	[0.002]
d (top five buyers' ratio of workers in foreign affiliates)	0.015		0.014	
	[0.011]		[0.009]	
d (top five buyers' ratio of workers in foreign affiliates in Asia)		0.012		0.011
		[0.013]		[0.011]
d (top five buyers' ratio of workers in foreign affiliates in non-Asia)		0.012		0.017
		[0.016]		[0.013]
Observations	13546	13275	13909	13604
F-statistic	3.25	3.226	3.702	3.563
R-squared	0.115	0.115	0.115	0.114

Notes: Robust standard errors are shown in brackets. Constants are suppressed.

All regressions are OLS specifications that include industry-by-year fixed effects.

***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

Appendix Table 5. Robustness checks: Estimation results for subsamples split by top-three buyer's domestic employment growth

Changes in domestic employment: OLS specifications (1998-2007)

Dependent variable: dln # of workers	Buyers with a higher average growth rate		Buyers with a lower average growth rate	
	All workers	All workers	All workers	All workers
	(1)	(2)	(3)	(4)
dln Real wage rate	-0.150***	-0.149***	-0.142***	-0.142***
	[0.010]	[0.010]	[0.009]	[0.009]
dln User cost of capital	0.009	0.026	0.07	0.136
	[0.305]	[0.310]	[0.165]	[0.165]
MNE (t+1)	0.022**	0.018*	0.000	-0.001
	[0.011]	[0.011]	[0.010]	[0.010]
Change of buyers	-0.001	-0.002	-0.003	-0.002
	[0.002]	[0.002]	[0.002]	[0.002]
d (Top three buyers' ratio of workers in foreign affiliates)	0.035***		0.022**	
	[0.012]		[0.011]	
d (Top three buyers' ratio of workers in foreign affiliates in Asia)		0.033**		0.019
		[0.015]		[0.014]
d (Top three buyers' ratio of workers in foreign affiliates in non-Asia)		0.035**		0.019
		[0.016]		[0.015]
Observations	10504	10244	10745	10430
F-statistic	2.809	2.781	3.059	2.963
R-squared	0.116	0.117	0.118	0.117

Notes: Robust standard errors are shown in brackets. Constants are suppressed.

All regressions are OLS specifications that include industry-by-year fixed effects.

***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.