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ITO, Tadashi
Gakushuin University

TANAKA, Ayumu
RIETI

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Inward Foreign Direct Investment, Transactions, and Domestic Firms' Performance: Evidence from firm-to-firm transaction linkage[1]

Tadashi ITO
Gakushuin University
Ayumu TANAKA
Aoyama Gakuin University, Kyoto University, and Research Institute of Economy, Trade and Industry

Abstract

Many studies have attempted to use industry-level variations in the presence of foreign firms to estimate the impact of foreign firms on domestic firms. However, owing to the limitations of industry-level data, the channels through which foreign firms influence domestic firms are unclear. Our study used a large set of Japanese firm-to-firm transaction data to test whether domestic firms' performance improves through firm-to-firm transactions with foreign-affiliated firms. Our empirical analyses using the state-of-the-art technique of causal inference, such as event study design and staggered difference-in-differences estimator, show no evidence of positive spillover effects of MNEs on domestic firms through business transactions.

Keywords: Inward Foreign Direct Investment (FDI), Firm-to-firm transactions
JEL classification: F21, F23

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This study utilizes the micro data of the questionnaire information based on "the Basic Survey of Japanese Business Structure and Activities" which is conducted by the Ministry of Economy, Trade and Industry (METI), and the Kikatsu Oyako converter, which is provided by RIETI.

1. INTRODUCTION

Governments are working to attract inward foreign direct investment (FDI) in anticipation of the potential positive impact that foreign firms can have on domestic firms in a host country. The impact of foreign firms on a host country has multiple dimensions. On the negative side, inward FDI may crowd out some domestic firms. On the positive side, green field inward FDI creates jobs. Inward FDI may bring superior technology or knowledge to the host country, which may trickle down to domestic firms. They may also supply better intermediate goods (in terms of lower prices and higher quality) to domestic firms.

This study focuses on the aforementioned positive effects of inward FDI on domestic firms through transactions. Foreign firms are in contact with the local economy by purchasing goods from domestic firms and selling goods to domestic firms. Thus, we can identify the impact of foreign firms on the host country's economy by analyzing their transaction links with domestic firms. However, the vast amount of existing research on inward FDI has analyzed the impact of the variation in the presence of foreign firms at the industry level on domestic firms due to data limitations.

To address and overcome the limitations of existing studies, our study attempts to directly investigate the relationship between foreign and domestic firms by matching exhaustive firm-to-firm transaction data with firm-level micro data. As a result of the international division of labor in the production process, an increasing number of firms are involved in the global value chain. Nevertheless, a large number of Japanese firms – more than a quarter of the firms in 2007– do not do business with foreign firms. When foreign firms are defined with a 10 percent foreign ownership ratio, the number of transactions with foreign firms is less than 20 percent of the total transactions during the 2007–2018 period in our data. However, the percentage of firms doing business with foreign firms steadily increased from 2007 to 2018. Using this data, we analyze the relationship between the performance of domestic firms and their transactions with foreign firms. We employ local firms' sales, employment, and sales per employee as performance measures. Our results indicate no statistically significant relationship between local firms' performance and their transactions with foreign firms.

A distinctive feature of our study is the use of recent causal inference techniques, such as event study design and staggered difference-in-differences estimators. Using these new econometric techniques, we estimate the effect of domestic firms initiating

transactions with foreign firms more rigorously than in previous studies. Our study is the first to analyze the impact of foreign firms on domestic firms using new quantitative methods, such as the Callaway and Sant'Anna (2020) estimator. Using these new econometric techniques, we find no persistent effects of starting a business with foreign firms on domestic firm sales, employment, or sales per employee.

Our study relates to the vast literature on the effects of inward FDI. Numerous studies have examined how foreign firm entry affects the host country's local economy (e.g., Aitken and Harrison, 1999; Javorcik, 2004). The entry of foreign firms can have both positive and negative effects. On the positive side, foreign firms can bring new technology, knowledge, and management practices to the local economy, which can increase productivity and improve the overall business climate. On the negative side, foreign firms can harm local businesses by competing with them and potentially driving them out of business. They can also lead to job loss, as domestic firms may be forced to lay off workers in the face of increased competition. These two types of effects on domestic firms have long been studied and are referred to as negative competitive effects and positive agglomeration effects; however, no conclusion has been reached on whether the overall effects on domestic firms are positive or negative. The reason for the mixed results may be that the impact of foreign firms on the local economy depends on several factors, including specific industry and market conditions, the level of competition, and the ability of domestic firms to adapt and compete. The time horizon may also be important. Merlevede et al. (2014) point out that competitive effects, such as market share grabbing, are likely to appear in the short term, whereas agglomeration effects, which have a positive impact on domestic firms' productivity, may gradually appear.

Developing countries are likely to expect positive externalities from accepting foreign firms from developed countries, owing to the influx of advanced technology and management practices. As a result, many studies have focused on developing countries, including pioneering work on Venezuela by Aitken and Harrison (1999). For China, which has been an active recipient of inward FDI, there are many empirical studies, including Lu et al. (2017) and Ito et al. (2012). Ito et al. (2012) find inter-industry spillovers related to TFP (Total Factor Productivity) as well as substantial intra-industry spillovers promoting invention patent applications. Lu et al. (2017) exploit cross-industry differences in FDI deregulation following China's accession to the World Trade Organization (WTO) at the end of 2001. Using a difference-in-differences (DiD)-based instrumental variable (IV) strategy, they attempt to identify FDI spillover effects. They find a negative spillover effect of FDI on the total factor productivity (TFP) of domestic

firms. They also find that the presence of foreign firms has no significant effect on domestic firms' export performance or R&D investment in the same industry. Although they found that the presence of foreign firms leads to a large increase in the wage rate paid by domestic firms and reduces the exit probability by domestic firms in the same industry, they argued that there is limited evidence that domestic firms benefit from the presence of foreign firms.

Understanding the pathways through which spillover effects occur will lead to a deeper understanding. Due to data limitations, previous studies have employed industry-level variation in foreign firms to study the effects of inward FDI; thus, the pathways of FDI effects have not been fully elucidated. Using firm-level data from Lithuania, Javorcik (2004) finds that positive productivity spillovers from FDI occur through contacts between foreign firms and local suppliers in their upstream sectors. However, Javorcik (2004) uses variations in the presence of foreign firms at the industry level and does not identify any business relationships between foreign and domestic firms. Our study uses transaction relationship data to directly analyze the impact of inward FDI on domestic firms. A similar attempt was made for Costa Rica by Alfaro-Urena et al. (2022), but our study is the first to examine a large developed economy.[1]

Starting a business with a foreign firm can accelerate the growth of a local firm by providing access to new markets and resources. Alfaro-Urena et al. (2022) analyze the firm-to-firm transaction data of Costa Rica firms to estimate the effects of inward FDI directly. Their event study estimates revealed that domestic firms experience strong and sustained performance gains after supplying their first multinational buyer. After four years, domestic firms increased employment by 26% and TFP from 4% to 9%. Understandably, domestic firms in developing countries that begin supplying multinational enterprises (MNEs) will expand their sales channels and improve their productivity by learning from them.

However, it is unclear whether domestic firms can improve productivity or increase sales by starting a business with foreign firms in developed countries, such as Japan. Our study attempts to answer this question by using large firm-to-firm transaction data as well as firm-level information. Our study is unique in that we analyze the impact of foreign suppliers and buyers on domestic firms. Our study relates to the newly emerged literature

[1] Newman, et al. (2015) examine spillover effects using the information on whether domestic firms purchase inputs from foreign firms in Vietnam. However, their data does not identify individual foreign firms with which domestic firms can do business.

using firm-to-firm transaction data. Bernard et al. (2019) use the same data as used in our study and examine the importance of buyer-supplier relationships for firm performance. In their model, better suppliers can reduce marginal costs. Their empirical analysis of the dataset on firms' buyer-seller linkages supports their model by establishing that the creation of buyer-seller links contributes to significant improvements in firm performance.

The remainder of this paper is organized as follows. Section 2 describes the data used in this study. Section 3 presents a descriptive analysis, while Section 4 reports the empirical findings based on a regression analysis and a series of sensitivity analyses. Section 5 provides event study estimates of the causal effects of initiating transactions with foreign firms on local firms based on recently developed techniques. The final section concludes this paper.

2. DATA

We use two datasets. One is firm-level data from the Basic Survey of Japanese Business Structure and Activities (BSJBSA or *Kigyo Katsudo Kihon Chosa* in Japanese) administered by the Ministry of Economy, Trade, and Industry (METI). The survey covers enterprises with 50 or more employees and with a paid-up capital or investment fund of over 30 million yen. These enterprises operate in mining, manufacturing, wholesale and retail trade, and food and beverage businesses (excluding "other eating and drinking places"), and others.[2] This survey has been conducted annually since 1991. The data include information, such as the number of employees, sales values, paid-up capital, firm location, years of establishment, etc., and especially for the purpose of this study, the foreign ownership ratio.

The other data we use are firm-level transaction data for firms compiled by Tokyo Shoko Research (TSR) Limited, a private credit rating company. It records both listed and nonlisted companies in Japan. The main information in the dataset includes transaction data for both sales and purchases between firms, and several facts about each firm, including the year of establishment, paid-up capital, total sales value, and number of employees. The dataset covers approximately 1.4 million firms and 8 million transactions between them each year. The data were updated when the survey was conducted on firms. As the survey for each firm is not done at the same time, an update is made throughout the years. We used data for all available years from 2007 to 2018. For

[2] Directly sourced from METI website.

each firm, a maximum of 24 transaction partner names were recorded. Some firms, especially large firms, must have more than 24 transaction partners. We capture these cases by combining reporters' transaction reports with those of partners, that is, cross-referencing. For example, those firms which are reported as partner firms by many reporting firms, typically Toyota, have more than 24 transaction partners.[3]

As the firm-level transaction data of TSR do not include information on ownership shares, we combine the data with BSJBSA to identify MNEs. The TSR dataset includes a far larger number of firms than the BSJBSA dataset, as it includes firms even with a few employees. We merge the two datasets using firm names, phone numbers, and paid-up capital. Approximately 65 percent of the firms in the BSJBSA dataset matched the TSR dataset.

3. DESCRIPTIVE ANALYSES

This section provides an overview of inward FDI in Japan and analyzes the impact of transactions with inward FDI firms on domestic firm performance.

3.1. *Presence of inward FDI in Japan*

Table 1 shows the numbers of all firms and inward FDI or multinational firms (MNEs) (hereinafter, we use the term MNEs to refer to inward FDI firms). There are several definitions for foreign direct investment. A foreign ownership share of over 10 percent or over 33 percent is usually used to define a firm as a foreign direct investment. As a benchmark case, we show analyses based on foreign ownership shares of more than 33 percent. The ratio of MNEs is relatively low in Japan compared to other major countries. It is around two percent throughout the period, but has gradually increased from 1.94 percent in 2007 to 2.85 percent in 2018.[4]

========== Table 1 ==========

3.2. *Productivity difference between domestic firms and MNEs*

As in the knowledge-capital model of MNEs (Markusen (2002)), MNEs have a competitive edge over domestic firms and thus have higher productivity. Figure 1 shows the cumulative distribution function of productivity, measured in sales per employee, for

[3] The information on transaction values are unavailable.

[4] The case for MNEs defined as more than 10 percent ownership share is in the appendix.

domestic firms and MNEs. Domestic firms are defined as those that are not MNEs. Namely, any firm is classified as either an MNE or a domestic firm. MNEs tend to have higher productivity levels. The Kolmogorov-Smirnov test in Table 2 indicates that MNEs are more productive than domestic firms are. Our research question is whether this superior productivity spillovers to domestic firms.

========== Figure 1 ==========

========== Table 2==========

3.3. *Transactions with MNEs*

3.3.1. Number of MNE transaction partners

Table 3 lists the number of transactional partner firms. As the number of transaction partners increased from 2007 to 2018, the number of MNE transaction partners also increased. The percentage of transactions with MNEs is around 6%, but slightly increased over time.

========== Table 3 ==========

Figure 2 shows the Box and Whisker plot of firm size measured by the log of the number of employees (upper panel) and log of sales values (middle panel), and of firm productivity (lower panel) measured in sales per employee. “0” represents firms that do not have transactions with MNEs, whereas “1” represents firms that have transactions with MNEs. There seems to be a correlation between firm size/productivity and transactions with MNEs. Firms that have transactions with MNEs are likely to be larger in terms of the number of employees and sales values, and also more productive in terms of labor productivity (sales value per employee).

========== Figure 2 ==========

To determine whether the above is not simply a correlation but a causation from transactions with MNEs to firms’ larger size and higher productivity, we divide domestic firms into two groups: those that increased their number of MNE transaction partners in the first half of the whole period (i.e., 2007–2012) and those that did not. We compare the employment growth of these two groups of firms in the second half of the entire period, namely 2013 – 2018. Figure 3 shows the cumulative density functions of employment

growth of these two groups of firms. There seems to be no difference between the two, suggesting that transactions with MNEs have little to do with firm growth in terms of employment, sales values, and labor productivity. The Kolmogorov-Smirnov test in Table 4 indicates that there was no difference.

========== Figure 3 ==========

========== Table 4 ==========

3.3.2. Start transactions with MNEs

While the last subsection describes the number of MNE transaction partners, Table 5 shows how many domestic firms started to have transactions with MNEs. In the case of procurement from MNEs (the upper panel), 1850 firms had no transactions with MNEs in 2015 but started to have transactions with MNEs by 2018, whereas 1508 firms had transactions with MNEs in 2007 but stopped having transactions by 2018. The total number of firms with transactions with MNEs increased from 4032 in 2007 to 4374 in 2018. The case of sales to MNEs (lower panel) shows a similar trend.

========== Table 5 ==========

4. ESTIMATION ANALYSES ON THE NUMBER OF MNE TRANSACTION PARTNERS

We tested the association between transactions with MNEs and firm performance using OLS. The estimation equation is as follows:

$$Firm\ performance_{it} = \beta_0 + \beta_1 Log\ of\ number\ of\ MNE\ transaction\ partners_{it} + \beta_2 Log\ of\ number\ of\ nonMNE\ transaction\ partners_{it} + u_i + u_t + u_{kt} + \varepsilon_{it},$$

where $Firm\ performance_{it}$ is the log of the number of employees, log of sales values, and log of sales per employee. u_i and u_t represent the firm- and year-fixed effects, respectively. u_{kt} is a 2-digit industry*year fixed effect. ε_{it} is i.i.d. error. To rule out potential reverse causality, the same equation is estimated using lagged covariates. We estimate the equation for procurement from MNEs (forward linkage) and sales to MNEs

(backward linkage), separately.

Tables 6, 7, and 8 present the estimation results for procurement from MNEs. Table 6 shows the association between the log of the number of MNE transaction partners and number of employees. Column (1) does not include fixed effects. Column (2) includes year fixed effects only. As it controls for year-specific effects, the statistically significant coefficient estimate with a positive sign essentially captures the across-firm difference. Column (3) includes firm fixed effects only. Thus, it captures changes over time. The much larger coefficient estimates of column (2) than those in column (3) indicate that the positive association mainly comes from the across-firm difference. Column (4) includes year and firm fixed effects, whereas column (5) includes firm and industry*year fixed effects. With these fixed effects, the estimation still yields statistically significant coefficient estimates with positive signs. In Columns (6) and (7), lagged covariates are used instead of contemporaneous covariates. Qualitatively the results remained the same. However, the magnitude of the coefficient estimates for the log of the number of MNE transaction partners is consistently smaller than those for domestic transaction partners. Transactions with MNEs did not have a strong positive impact. Table 7 shows the estimation results for firms' sales values as the dependent variable, and Table 8 shows the estimation results for firms' sales values per employee as the dependent variable.

========== Table 6 ==========

========== Table 7 ==========

========== Table 8 ==========

Tables 9, 10, and 11 show cases of sales to MNE firms. The results are qualitatively similar to those for procurement from MNEs.

========== Table 9 ==========

========== Table 10 ==========

========== Table 11 ==========

Instead of the log of the number of transaction partners, we estimate the same equation, with the ratio of the number of MNE transaction partners to all transaction partners. Tables 12 and 13 present the estimation results. The coefficient estimates are positive and significant for the log of the number of employees, insignificant for the log

of sales values, and negative and significant for the log of sales per employee.[5]

========== Table 12 ==========
========== Table 13 ==========

For a sensitivity analysis, we define MNEs as firms with headquarters in foreign countries. Table 14 presents the number of MNEs with headquarters in foreign countries. The percentage was small, around 1.3 to 1.5 percent, but the number and ratio slightly increased over time. Table 15 shows the top ten headquarters' locations in 2007 and 2018. The largest number is in the USA, followed by some European countries, such as Germany, the Netherlands, and Switzerland. From 2007 to 2018, MNEs with headquarters in China increased significantly. Although the share of developed countries increased from 2007 to 2018, it was still a predominantly large proportion. Using this alternative definition of MNEs, the estimation results are listed in Tables 16 and 17. The results are qualitatively similar to those of the benchmark case.

========== Table 14 ==========
========== Table 15 ==========
========== Table 16 ==========
========== Table 17 ==========

5. ESTIMATION OF THE IMPACTS OF STARTING TRANSACTIONS WITH FOREIGN FIRMS

5.1. *Event study design*

In this section, we examine whether the initiation of transactions with foreign firms affects sales, number of employees, and sales per employee of domestic firms. In our data for the period 2007-2018, there were new entrants and exiting firms. To eliminate these entry and exit effects, we created a balanced panel dataset. In other words, our balanced panel data cover only firms that have existed for the entire span of 12 years. Some of these surviving firms had been doing business with foreign firms for the entire

[5] The estimation results with MNEs definition of more than 10 percent ownership share yielded the qualitatively same results.

12-year period from 2007 (the first year) to 2018 (the last year). We removed these "always-treated firms" from our data. We also exclude from our data swing firms that did business with foreign firms but subsequently ceased doing so during this period.

We use as a treated group the switching firms that initially did not do business with foreign firms but started and have been doing business with foreign firms ever since the sample period. Some firms have not engaged in any business with foreign firms for 12 years. We use these "never-treated firms" as the control group.

The year a firm began business with foreign firms varied from firm to firm. The nature of our data makes it difficult to apply the canonical difference-in-difference (DiD) method, as discussed below. Instead, we first used an event-study design[6]. We employed the following event study specifications:

$$\ln y_{it} = \alpha_i + \lambda_{st} + \sum_{k=-5}^{5} \theta_k D_{it}^k + \varepsilon_{it},$$

where y_{it} denotes the outcome variables of domestic firm *i* in year *t*, that is, sales, the number of employees, and sales per employee. As described above, *t* covers the period from 2007 to 2018. We include firm fixed effects, α_i, and industry-time fixed effects, λ_{st} to control for firm-specific time-invariant factors and time-variant industry-level shocks for firm growth. The last term, ε_{it}, is the error term. Of interest to us is θ_k, the coefficient of the event study dummy D_{it}^k. We define *k* as the number of years elapsed since the first year, *f*, when firm *i* began transactions with foreign firms. That is, $k = t - f$. Following Alfaro-Urena et al. (2022), we used the conventional time window *k*= [-5, 5] and set $\theta_{-1} = 0$ and D_{it}^{-1}as the base category.

There may be significant differences between firms that initiate transactions with foreign firms and those that do not. To control for such differences, we implemented a propensity score matching method to match the treated firms with the control firm with the closest propensity score. We estimate the propensity score to start transacting with foreign firms, using the following logit model:

$$Pr\left(treated\ group = 1 \middle| x_{i,2007}\right)$$

[6] For event study design, see Freyaldenhoven et al. (2019).

$$= \frac{exp(x_{i,2007}\beta)}{1 + exp(x_{i,2007}\beta)}$$
$$= \mathrm{F}(\mathrm{lnSales}_{\mathrm{i},2007} + \mathrm{lnBuyers}_{\mathrm{i},2007}$$
$$+\mathrm{lnSellers}_{\mathrm{i},2007} + \mathrm{lnEstyear}_{\mathrm{i},2007}$$
$$+\mathrm{Industy\_FE}_{\mathrm{i},2007})$$

where $Sales_{i,2007}$ is domestic firms' sales at the starting year of our data, 2007, and $Buyers_{i,2007}$ and $Sellers_{i,2007}$ represent the number of buyers and sellers in the year 2007, respectively. To control for firm age, we include year of establishment, $\mathrm{Estyear}_{\mathrm{i},2007}$. $\mathrm{Industy\_FE}_{\mathrm{i},2007}$ controls for industry-specific factors. Based on the estimated propensity score, nearest neighbor matching without replacement was conducted to create a matched sample for the event study regressions.

Figures 4 and 5 show the event study plots based on the regression results using the method developed by Clarke and Tapia-Schythe (2021). Figure 4 presents the impact of starting to buy inputs from foreign firms on the performance of domestic firms, while Figure 5 presents the impact of starting to sell goods to foreign firms. The squares represent the estimated coefficients for the event study dummies $\widehat{\theta_k}$, and the surrounding lines indicate their 95% confidence intervals. We set D_{it}^{-1} as the base category; therefore, the squares corresponding to *k=-1* are located at zero.

First, in Figure 4, we examine the impact of starting to buy inputs from foreign firms. The first row of Figure 4 presents the results using unmatched samples, whereas the second row presents the results using matched treated and control firms. The unmatched results indicate that firms that began a transaction with foreign firms tended to be larger and more productive than those that did not, even before the treatment. This tendency persisted even after the treatment. The matched results in the second row of Figure 4 suggest that there are no significant impacts of starting to buy inputs from foreign firms on domestic firms' sales, employment, and sales per employee.

Similarly, we find no significant impact from starting to sell goods to foreign firms (see Figure 5). The first row of results supports the self-selection hypothesis that superior-performing firms begin to sell goods to foreign firms. This is because firms that began selling goods to foreign firms had greater sales, employment, and sales per worker both before and after they began than firms that did not sell goods to foreign firms. The results in the second row using the control and treatment groups matched by propensity score also indicate that starting to sell goods to foreign firms has no causal effect on domestic firms.

Overall, the results of the event study design indicate that initiating a business with a foreign firm does not significantly influence the subsequent performance of domestic firms. Rather, it strongly supports the self-selection hypothesis that firms with larger sales and employment and larger sales per employee begin doing business with foreign firms.

========== Figure 4 =========

========== Figure 5 =========

5.2. *Staggered DiD estimator*

Until recently, the effects of globalization on firms have often been analyzed using the canonical DiD model, sometimes in conjunction with matching methods. Table 18 shows the results of estimating the impact of starting a business with foreign firms on domestic firms in a canonical DiD model called the two-way fixed-effect model. In this estimation, the treatment dummies take the value of one after the year in which a firm began doing business with the foreign firm, and zero otherwise. We control for industry and year factors by adding industry-fixed effects, year-fixed effects, and a cross term between the two. Columns (1)--(3) show the effect of starting procurement from foreign firms and columns (4)--(6) show the effect of starting sales to foreign countries. The effect of procurement shows a positive coefficient for domestic firm employment and a negative coefficient for sales per employee, whereas the effect of sales is negative for domestic firm sales and sales per employee. These results differ significantly from those of the event study estimation described in the previous section.

========= Table 18 =========

Recent econometric developments have revealed that the canonical DiD estimates shown in Table 18 are unreliable. Several studies have shown that treatment timing heterogeneity induces bias in conventional two-way fixed-effects models (de Chaisemartin and d'Haultfoeuille, 2020; Goodman-Bacon, 2021; Sun and Abraham, 2021). Several solutions can now be used to address this problem (Callaway and Sant'Anna, 2020; Sun and Abraham, 2021; Wooldridge, 2021). The new development has revolutionized the DiD literature over the past few years, and new estimators are often called staggered DiD estimators. Among the proposed solutions, we employ the Callaway and Sant'Anna (2020) estimator (CS estimator) because the CS estimator can be

conducted using an accessible and reliable package (Rios-Avila et al., 2020) and has been widely used (e.g., Cunningham, 2022). Using the CS estimator, we explicitly address the staggered timing of starting transactions with foreign firms during our sample period.

We continue to use balanced panel data of surviving firms for the CS estimator, as in the previous section. However, in this section, we exclude "never-treated firms" that never traded with foreign firms during the analysis period. While the previous section used "never-treated firms" as the control group, this section uses "not-yet-treated firms" as the control group. This is because the "never-treated firms" may differ in important unobservable ways compared to treated firms. The CS estimator enables us to use "not-yet treated firms" as the control firms and "earlier treated firms" as the treated firms. Therefore, we use firms that started doing business with foreign firms earlier as the treated firms and firms that started doing business with foreign firms later as the control group. Our CS estimator is based on a doubly robust inverse probability weighting (IPW) estimation method, as described by Sant'Anna and Zhao (2020). As covariates, we include the log of the number of sellers and buyers, as well as the year of establishment of a firm to control for firm age in the estimation.

Figure 6 presents the impact of starting transactions with foreign firms. The circles indicate the estimated ATTs (the average treatment effect on the treated) based on the CS estimation method and the surrounding bars represent 95% confidence intervals. We find that initiating transactions with foreign firms has a slightly significant impact. Purchasing inputs from foreign firms temporarily increases employment and sales for domestic firms, but this effect is not persistent. Selling goods to foreign firms does not influence sales, employment, or sales per employee in domestic firms.

========== Figure 6 ==========

6. CONCLUDING REMARKS AND DISCUSSION

The vast literature has attempted to use industry-level variations in the presence of foreign firms to estimate the impact of foreign firms on domestic firms. However, owing to the limitations of industry-level data, the channels through which foreign firms influence domestic firms are unclear. Our study used a large set of Japanese firm-to-firm transaction data to test whether domestic firms' performance improves through firm-to-firm transactions with foreign-affiliated firms. Our empirical analyses using the state-of-

the-art technique of causal inference, such as event study design and staggered difference-in-differences estimator, show no evidence of positive spillover effects of MNEs on domestic firms through business transactions. This may be because our analyses were conducted in Japan, a developed country. As there is no large difference in technology or knowledge between domestic firms and MNEs in developed countries, we might not expect positive spillovers.

We highlight directions for future research. Our study reveals that domestic firms do not significantly increase their sales or employment when they commence transactions with foreign-owned MNEs. This result might be partly because domestic firms can open sales channels to foreign markets or purchase superior inputs by starting transactions with Japanese-owned MNEs, even if they do not do business with foreign-owned MNEs. Unlike our study, Alfaro-Urena et al. (2022) find that domestic firms improve their performance by starting transactions with foreign-owned MNEs in Costa Rica. Compared to developing countries, such as Costa Rica, Japan has more domestically owned MNEs. The difference in the prevalence of domestically owned MNEs may account for the difference between the results of our study and that of Alfaro-Urena et al. (2022). If future research can compare the effects of initiating a transaction with domestically owned MNEs with those initiating a transaction with foreign-owned MNEs, we will have a better understanding of the impact of transactions on domestic firms.

This study investigates only one aspect of inward FDI's many impacts on the host country's economy. Our future research agenda is a comprehensive analysis of the impacts of inward FDI in Japan, including an improvement in average industry productivity through competition effects, employment creation effects, or the Marshallian positive externality effects of productivity.

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Table 1: Number of MNEs: 2007-2018

Year	Number of MNEs	Number of all firms	MNEs ratio
2007	563	29080	1.94%
2008	629	29355	2.14%
2009	655	29096	2.25%
2010	698	29566	2.36%
2011	734	30645	2.40%
2012	743	30569	2.43%
2013	777	30203	2.57%
2014	799	30166	2.65%
2015	832	30209	2.75%
2016	919	30143	3.05%
2017	872	29530	2.95%
2018	850	29780	2.85%

Source: Authors' computation from BSJBSA by METI

Table 2: Kolmogorov-Smirnov test

Smaller group	D	P-value
Domestic firms	0.2317	0.000
MNEs	-0.0022	0.996
Combined K-S	0.2318	0.000

Table 3: Number of MNE transaction partners

year	Number of all transactions	Number of transactions with MNEs	Share of transactions with MNEs
2007	256251	15562	6.1%
2008	278523	13806	5.0%
2009	283113	16714	5.9%
2010	295821	17584	5.9%
2011	313719	14946	4.8%
2012	319768	15549	4.9%
2013	316950	19708	6.2%
2014	314971	21389	6.8%
2015	316550	21091	6.7%
2016	309437	21915	7.1%
2017	302801	23433	7.7%
2018	305754	20400	6.7%

Table 4: Kolmogorov-Smirnov test, Employment growth

Smaller group	D	P-value
Domestic firms	0.0156	0.467
MNEs	-0.0162	0.443
Combined K-S	0.0162	0.811

Table 5: Start transactions with MNEs

Procurement		2018 transaction with MNE		
		No	Yes	Total
2007 transaction with MNE	No	8215	1850	10065
	Yes	1508	2524	4032
	Total	9723	4374	

Sales		2018 transaction with MNE		
		No	Yes	Total
2007 transaction with MNE	No	6523	2069	8592
	Yes	1149	2891	4040
	Total	7672	4960	

Table 6: Procurement from MNEs (Ownership share more than 33 percent) and firms' number of employees

Firm number of employees - Procurement from MNEs

VARIABLES	(1) Log of number of employees	(2) Log of number of employees	(3) Log of number of employees	(4) Log of number of employees	(5) Log of number of employees	(6) Log of number of employees	(7) Log of number of employees
Log of number of MNE transaction partners (Procurement)	0.321***	0.321***	0.0478***	0.0463***	0.0391***		
	(0.00404)	(0.00405)	(0.00195)	(0.00197)	(0.00197)		
Log of number of domestic transaction partners (Procurement)	0.480***	0.482***	0.0867***	0.0905***	0.0773***		
	(0.00180)	(0.00180)	(0.00140)	(0.00144)	(0.00143)		
Log of number of MNE transaction partners (Procurement) - one year lagged						0.0322***	
						(0.00199)	
Log of number of domestic transaction partners (Procurement) - one year lagged						0.0550***	
						(0.00147)	
Log of number of MNE transaction partners (Procurement) - two years lagged							0.0229***
							(0.00205)
Log of number of domestic transaction partners (Procurement) - two years lagged							0.0375***
							(0.00152)
Year fixed effects		✔		✔	✔	✔	✔
Firm fixed effects			✔	✔	✔	✔	✔
Industry(2digit)*Year fixed effects					✔	✔	✔
Observations	274,223	274,223	270,746	270,746	262,623	228,986	200,936
R-squared	0.277	0.278	0.957	0.957	0.960	0.965	0.970

Standard errors in parentheses

*** p<0.001, ** p<0.01, * p<0.05, + p<0.1

Table 7: Procurement from MNEs (Ownership share more than 33 percent) and firms' sales values

Firm sales - Procurement from MNEs

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	Log of sales values	Log of sales values	Log of sales values	Log of sales values	Log of sales values	Log of sales values	Log of sales values
Log of number of MNE transaction partners (Procurement)	0.464***	0.464***	0.0624***	0.0581***	0.0509***		
	(0.00513)	(0.00513)	(0.00250)	(0.00249)	(0.00248)		
Log of number of domestic transaction partners (Procurement)	0.850***	0.854***	0.109***	0.122***	0.108***		
	(0.00229)	(0.00229)	(0.00181)	(0.00182)	(0.00181)		
Log of number of MNE transaction partners (Procurement) - one year lagged						0.0433***	
						(0.00231)	
Log of number of domestic transaction partners (Procurement) - one year lagged						0.0805***	
						(0.00171)	
Log of number of MNE transaction partners (Procurement) - two years lagged							0.0291***
							(0.00235)
Log of number of domestic transaction partners (Procurement) - two years lagged							0.0507***
							(0.00175)
Year fixed effects		✔		✔	✔	✔	✔
Firm fixed effects			✔	✔	✔	✔	✔
Industry(2digit)*Year fixed effects					✔	✔	✔
Observations	269,584	269,584	266,129	266,129	258,213	225,139	197,347
R-squared	0.417	0.421	0.964	0.966	0.968	0.976	0.980

Standard errors in parentheses

*** p<0.001, ** p<0.01, * p<0.05, + p<0.1

Table 8: Procurement from MNEs (Ownership share more than 33 percent) and firms' sales per employee

Firm sales per employees - Procurement from MNEs

VARIABLES	(1) Log of sales per employee	(2) Log of sales per employee	(3) Log of sales per employee	(4) Log of sales per employee	(5) Log of sales per employee	(6) Log of sales per employee	(7) Log of sales per employee
Log of number of MNE transaction partners (Procurement)	0.142***	0.141***	0.0133***	0.0104***	0.0110***		
	(0.00412)	(0.00412)	(0.00236)	(0.00235)	(0.00239)		
Log of number of domestic transaction partners (Procurement)	0.361***	0.363***	0.0193***	0.0277***	0.0278***		
	(0.00184)	(0.00184)	(0.00170)	(0.00172)	(0.00174)		
Log of number of MNE transaction partners (Procurement) - one year lagged						0.0109***	
						(0.00234)	
Log of number of domestic transaction partners (Procurement) - one year lagged						0.0259***	
						(0.00174)	
Log of number of MNE transaction partners (Procurement) - two years lagged							0.00574*
							(0.00245)
Log of number of domestic transaction partners (Procurement) - two years lagged							0.0152***
							(0.00182)
Year fixed effects		✔		✔	✔	✔	✔
Firm fixed effects			✔	✔	✔	✔	✔
Industry(2digit)*Year fixed effects					✔	✔	✔
Observations	269,175	269,175	265,720	265,720	257,819	224,848	197,105
R-squared	0.159	0.162	0.930	0.931	0.934	0.945	0.950

Standard errors in parentheses

*** p<0.001, ** p<0.01, * p<0.05, + p<0.1

Table 9: Sales to MNEs (Ownership share more than 33 percent) and firms' number of employees

Firm number of employees - Sales to MNEs

VARIABLES	(1) Log of number of employees	(2) Log of number of employees	(3) Log of number of employees	(4) Log of number of employees	(5) Log of number of employees	(6) Log of number of employees	(7) Log of number of employees
Log of number of MNE transaction partners (Sales)	0.206***	0.209***	0.0342***	0.0333***	0.0257***		
	(0.00418)	(0.00420)	(0.00183)	(0.00187)	(0.00184)		
Log of number of domestic transaction partners (Sales)	0.314***	0.314***	0.0638***	0.0664***	0.0562***		
	(0.00209)	(0.00209)	(0.00149)	(0.00151)	(0.00148)		
Log of number of MNE transaction partners (Sales) - one year lagged						0.0155***	
						(0.00189)	
Log of number of domestic transaction partners (Sales) - one year lagged						0.0380***	
						(0.00153)	
Log of number of MNE transaction partners (Sales) - two years lagged							0.00700***
							(0.00194)
Log of number of domestic transaction partners (Sales) - two years lagged							0.0222***
							(0.00158)
Year fixed effects		✔		✔	✔	✔	✔
Firm fixed effects			✔	✔	✔	✔	✔
Industry(2digit)*Year fixed effects					✔	✔	✔
Observations	240,237	240,237	237,173	237,173	237,124	199,574	173,804
R-squared	0.119	0.120	0.959	0.959	0.962	0.968	0.972

Standard errors in parentheses

*** p<0.001, ** p<0.01, * p<0.05, + p<0.1

Table 10: Sales to MNEs (Ownership share more than 33 percent) and firms' sales values

Firm sales - Sales to MNEs

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	Log of sales values	Log of sales values	Log of sales values	Log of sales values	Log of sales values	Log of sales values	Log of sales values
Log of number of MNE transaction partners (Sales)	0.0192***	0.0223***	0.0309***	0.0282***	0.0240***		
	(0.00582)	(0.00583)	(0.00239)	(0.00239)	(0.00236)		
Log of number of domestic transaction partners (Sales)	0.641***	0.643***	0.0840***	0.0970***	0.0853***		
	(0.00290)	(0.00290)	(0.00194)	(0.00194)	(0.00190)		
Log of number of MNE transaction partners (Sales) - one year lagged						0.0204***	
						(0.00224)	
Log of number of domestic transaction partners (Sales) - one year lagged						0.0684***	
						(0.00182)	
Log of number of MNE transaction partners (Sales) - two years lagged							0.0153***
							(0.00226)
Log of number of domestic transaction partners (Sales) - two years lagged							0.0456***
							(0.00184)
Year fixed effects		✔		✔	✔	✔	✔
Firm fixed effects			✔	✔	✔	✔	✔
Industry(2digit)*Year fixed effects					✔	✔	✔
Observations	236,513	236,513	233,434	233,434	233,384	196,608	170,988
R-squared	0.186	0.189	0.966	0.968	0.970	0.978	0.982

Standard errors in parentheses

*** p<0.001, ** p<0.01, * p<0.05, + p<0.1

Table 11: Sales to MNEs (Ownership share more than 33 percent) and firms' sales per employee

Firm sales per employees - Sales to MNEs

VARIABLES	(1) Log of sales per employee	(2) Log of sales per employee	(3) Log of sales per employee	(4) Log of sales per employee	(5) Log of sales per employee	(6) Log of sales per employee	(7) Log of sales per employee
Log of number of MNE transaction partners (Sales)	-0.189***	-0.189***	-0.00504*	-0.00738***	-0.00333		
	(0.00414)	(0.00416)	(0.00223)	(0.00224)	(0.00224)		
Log of number of domestic transaction partners (Sales)	0.318***	0.319***	0.0166***	0.0265***	0.0257***		
	(0.00207)	(0.00207)	(0.00181)	(0.00182)	(0.00181)		
Log of number of MNE transaction partners (Sales) - one year lagged						0.00473*	
						(0.00225)	
Log of number of domestic transaction partners (Sales) - one year lagged						0.0298***	
						(0.00183)	
Log of number of MNE transaction partners (Sales) - two years lagged							0.00795***
							(0.00235)
Log of number of domestic transaction partners (Sales) - two years lagged							0.0236***
							(0.00192)
Year fixed effects		✔		✔	✔	✔	✔
Firm fixed effects			✔	✔	✔	✔	✔
Industry(2digit)*Year fixed effects					✔	✔	✔
Observations	236,212	236,212	233,131	233,131	233,080	196,414	170,828
R-squared	0.091	0.094	0.936	0.938	0.940	0.951	0.955

Standard errors in parentheses

*** p<0.001, ** p<0.01, * p<0.05, + p<0.1

Table 12: Procurement ratio from MNEs (Ownership share more than 33 percent) and firm performance

Firm performance and MNE transaction(procurement ratio)

VARIABLES	(1) Log of number of employees	(2) Log of number of employees	(3) Log of number of employees	(4) Log of sales values	(5) Log of sales values	(6) Log of sales values	(7) Log of sales per employee	(8) Log of sales per employee	(9) Log of sales per employee
Ratio of MNE transaction partners over all partners (procure)	0.0138**			0.00561			-0.0102+		
	(0.00433)			(0.00553)			(0.00528)		
Ratio of MNE transaction partners over all partners (procure) - 1 year lag		0.0236***			0.00293			-0.0199***	
		(0.00440)			(0.00516)			(0.00522)	
Ratio of MNE transaction partners over all partners (procure) - 2 years lag			0.0223***			0.00776			-0.0145**
			(0.00456)			(0.00530)			(0.00551)
Year fixed effects	✔	✔	✔	✔	✔	✔	✔	✔	✔
Firm fixed effects	✔	✔	✔	✔	✔	✔	✔	✔	✔
Industry(2digit)*Year fixed effects	✔	✔	✔	✔	✔	✔	✔	✔	✔
Observations	267,241	232,952	204,352	262,635	228,925	200,589	262,228	228,626	200,342
R-squared	0.959	0.965	0.969	0.967	0.976	0.980	0.933	0.945	0.950

Standard errors in parentheses

*** p<0.001, ** p<0.01, * p<0.05, + p<0.1

Table 13: Sales ratio from MNEs (Ownership share more than 33 percent) and firm performance

Firm performance and MNE transaction (sales ratios)

VARIABLES	(1) Log of number of employees	(2) Log of number of employees	(3) Log of number of employees	(4) Log of sales values	(5) Log of sales values	(6) Log of sales values	(7) Log of sales per employee	(8) Log of sales per employee	(9) Log of sales per employee
Ratio of MNE transaction partners over all partners (sales)	0.0116*			-0.0162**			-0.0284***		
	(0.00469)			(0.00612)			(0.00580)		
Ratio of MNE transaction partners over all partners (sales) - 1 year lag		0.00351			-0.0116*			-0.0130*	
		(0.00486)			(0.00587)			(0.00588)	
Ratio of MNE transaction partners over all partners (sales) - 2 years lag			-0.00716			-0.0137*			-0.00573
			(0.00505)			(0.00601)			(0.00623)
Year fixed effects	✔	✔	✔	✔	✔	✔	✔	✔	✔
Firm fixed effects	✔	✔	✔	✔	✔	✔	✔	✔	✔
Industry(2digit)*Year fixed effects	✔	✔	✔	✔	✔	✔	✔	✔	✔
Observations	240,384	202,217	175,980	236,382	199,056	172,979	236,075	198,853	172,814
R-squared	0.961	0.967	0.972	0.969	0.978	0.981	0.939	0.950	0.955

Standard errors in parentheses

*** p<0.001, ** p<0.01, * p<0.05, + p<0.1

Table 14: Number of MNEs (Headquarters in foreign countries)

Year	Number of MNEs	Number of all firms	MNEs ratio
2007	358	29080	1.23%
2008	430	29356	1.46%
2009	427	29097	1.47%
2010	447	29571	1.51%
2011	473	30648	1.54%
2012	460	30585	1.50%
2013	436	30218	1.44%
2014	444	30181	1.47%
2015	463	30232	1.53%
2016	484	30152	1.61%
2017	454	29531	1.54%
2018	457	29781	1.53%

Table 15: Number of MNEs by Headquarter country

Year	Headquarters Country	Number of MNEs
2007	USA	126
2007	Germany	47
2007	Netherlands	43
2007	Switzerland	29
2007	France	16
2007	United Kingdom	12
2007	Denmark	10
2007	Korea	10
2007	Singapore	8
2007	Hong Kong	7

Year	Headquarters Country	Number of MNEs
2018	USA	98
2018	Netherlands	53
2018	Germany	40
2018	Switzerland	32
2018	Hong Kong	30
2018	Singapore	29
2018	China	24
2018	France	21
2018	United Kingdom	21
2018	Korea	17

Table 16: Procurement from MNEs (Foreign headquarters) and firm performance

Procurement from MNEs

VARIABLES	(1) Log of number of employees	(2) Log of number of employees	(3) Log of number of employees	(4) Log of sales values	(5) Log of sales values	(6) Log of sales values	(7) Log of sales per employee	(8) Log of sales per employee	(9) Log of sales per employee
Log of number of MNE transaction partners (Procurement)	0.0238***			0.0308***			0.00606		
	(0.00340)			(0.00432)			(0.00414)		
Log of number of domestic transaction partners (Procurement)	0.0827***			0.116***			0.0305***		
	(0.00145)			(0.00185)			(0.00178)		
Log of number of MNE transaction partners (Procurement) - one year lagged		0.0155***			0.0249***			0.00847*	
		(0.00346)			(0.00400)			(0.00407)	
Log of number of domestic transaction partners (Procurement) - one year lagged		0.0595***			0.0874***			0.0282***	
		(0.00150)			(0.00174)			(0.00177)	
Log of number of MNE transaction partners (Procurement) - two years lagged			0.00610+			0.0112***			0.00477
			(0.00356)			(0.00406)			(0.00424)
Log of number of domestic transaction partners (Procurement) - two years lagged			0.0407***			0.0561***			0.0171***
			(0.00155)			(0.00178)			(0.00185)
Year fixed effects	✔	✔	✔	✔	✔	✔	✔	✔	✔
Firm fixed effects	✔	✔	✔	✔	✔	✔	✔	✔	✔
Industry(2digit)*Year fixed effects	✔	✔	✔	✔	✔	✔	✔	✔	✔
Observations	269,349	235,069	206,416	264,688	230,981	202,597	264,270	230,669	202,340
R-squared	0.961	0.966	0.970	0.968	0.977	0.980	0.933	0.944	0.949

Standard errors in parentheses

*** p<0.01, ** p<0.01, * p<0.05, + p<0.1

Table 17: Sales to MNEs (Foreign headquarters) and firm performance

Sales to MNEs

VARIABLES	(1) Log of number of employees	(2) Log of number of employees	(3) Log of number of employees	(4) Log of sales values	(5) Log of sales values	(6) Log of sales values	(7) Log of sales per employee	(8) Log of sales per employee	(9) Log of sales per employee
Log of number of MNE transaction partners (Sales)	0.0231***			0.0198***			-0.00525		
	(0.00346)			(0.00447)			(0.00424)		
Log of number of domestic transaction partners (Sales)	0.0623***			0.0934***			0.0274***		
	(0.00152)			(0.00197)			(0.00187)		
Log of number of MNE transaction partners (Sales) - one year lagged		0.0137***			0.0119***			-0.00194	
		(0.00359)			(0.00425)			(0.00427)	
Log of number of domestic transaction partners (Sales) - one year lagged		0.0424***			0.0754***			0.0324***	
		(0.00158)			(0.00188)			(0.00189)	
Log of number of MNE transaction partners (Sales) - two years lagged			0.00547			0.0110*			0.00586
			(0.00369)			(0.00429)			(0.00446)
Log of number of domestic transaction partners (Sales) - two years lagged			0.0247***			0.0506***			0.0260***
			(0.00163)			(0.00190)			(0.00197)
Year fixed effects	✔	✔	✔	✔	✔	✔	✔	✔	✔
Firm fixed effects	✔	✔	✔	✔	✔	✔	✔	✔	✔
Industry(2digit)*Year fixed effects	✔	✔	✔	✔	✔	✔	✔	✔	✔
Observations	242,962	204,732	178,365	238,890	201,509	175,308	238,571	201,296	175,132
R-squared	0.963	0.969	0.973	0.970	0.979	0.982	0.939	0.950	0.955

Standard errors in parentheses

*** p<0.01, ** p<0.01, * p<0.05, + p<0.1

Table 18: Impacts of starting a transaction with foreign firms: two-way fixed effect model

TWFE model: unmatched results						
	Sourcing from foreign firms			Sales to foreign firms		
	(1)	(2)	(3)	(4)	(5)	(6)
	L	Sales	Sales/L	L	Sales	Sales/L
treated	0.017***	0.003	-0.014***	0.003	-0.009**	-0.012***
	[0.004]	[0.005]	[0.005]	[0.004]	[0.005]	[0.005]
Observations	68716	67799	67743	58236	57495	57463
Industry FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Industry*Year FE	YES	YES	YES	YES	YES	YES

Robust standard errors are clustered by industry-year level.

* p<0.10; ** p<0.05; *** p<0.01

Figure 1: Cumulative distribution function of sales per employee

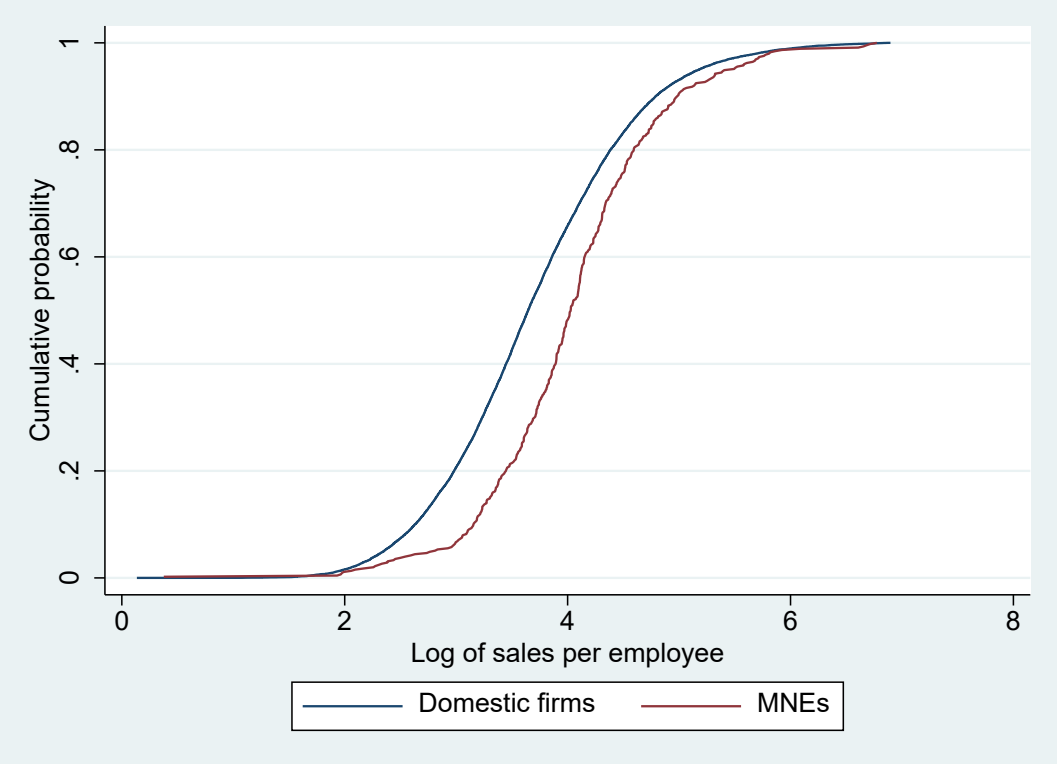
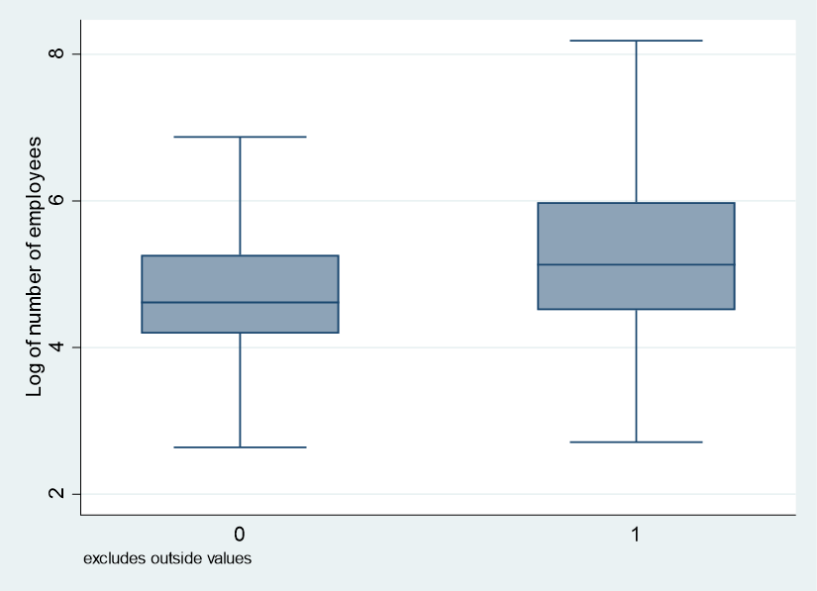
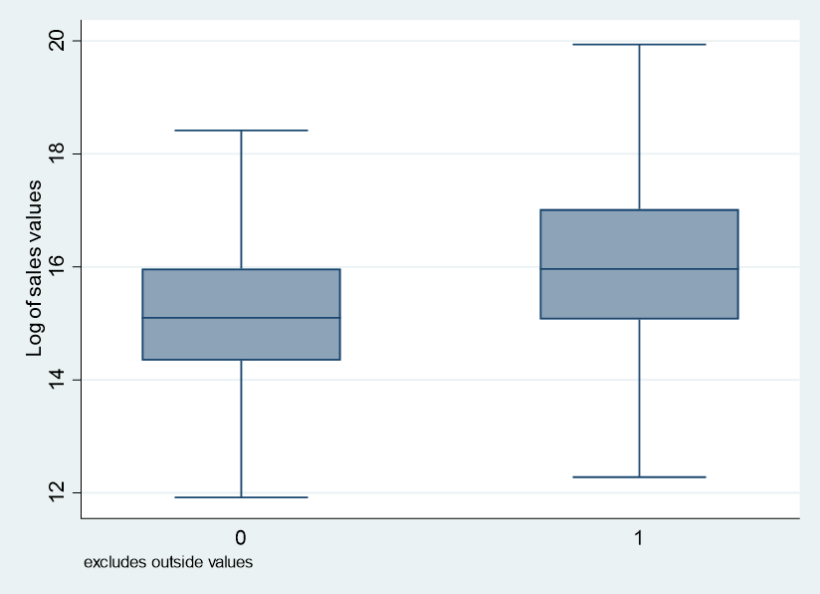


Figure 2: Box and Whisker plot





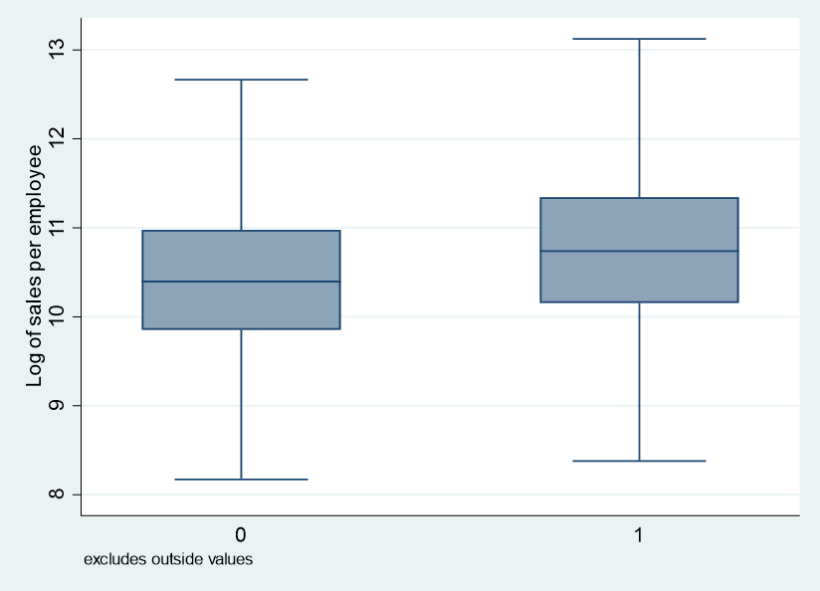


Figure 3: Cumulative Density Function – Employment growth of firms with increased transactions with MNEs and not

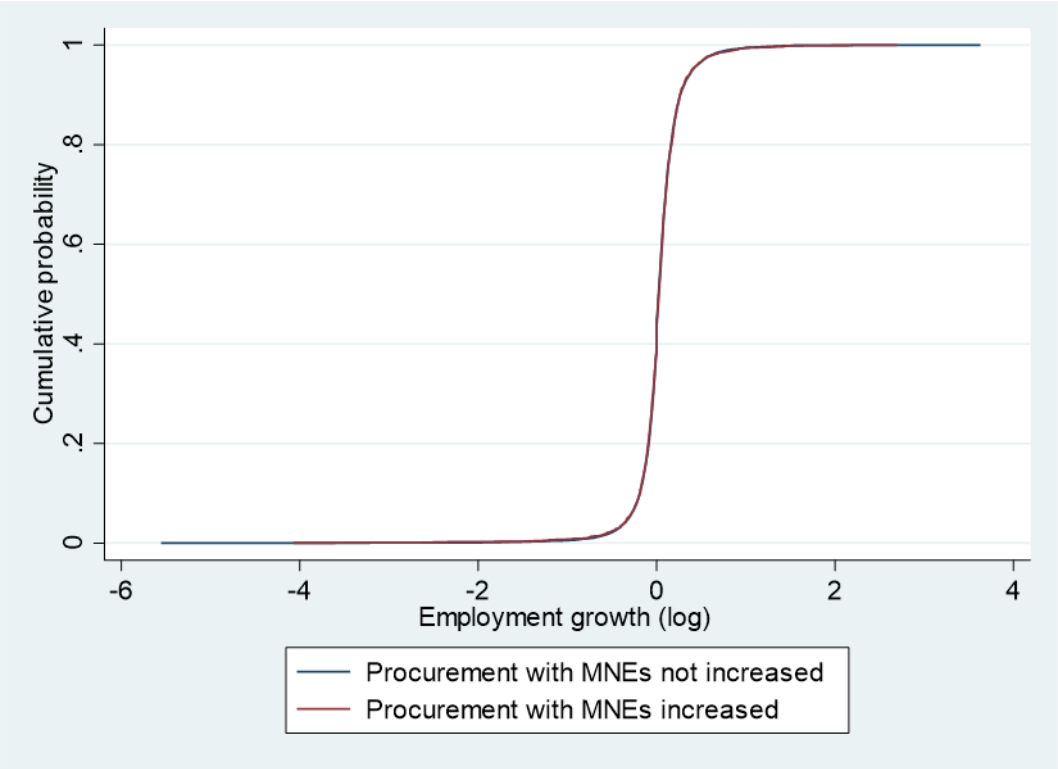


Figure 4: Impact on domestic firms that are starting to source inputs from foreign firms

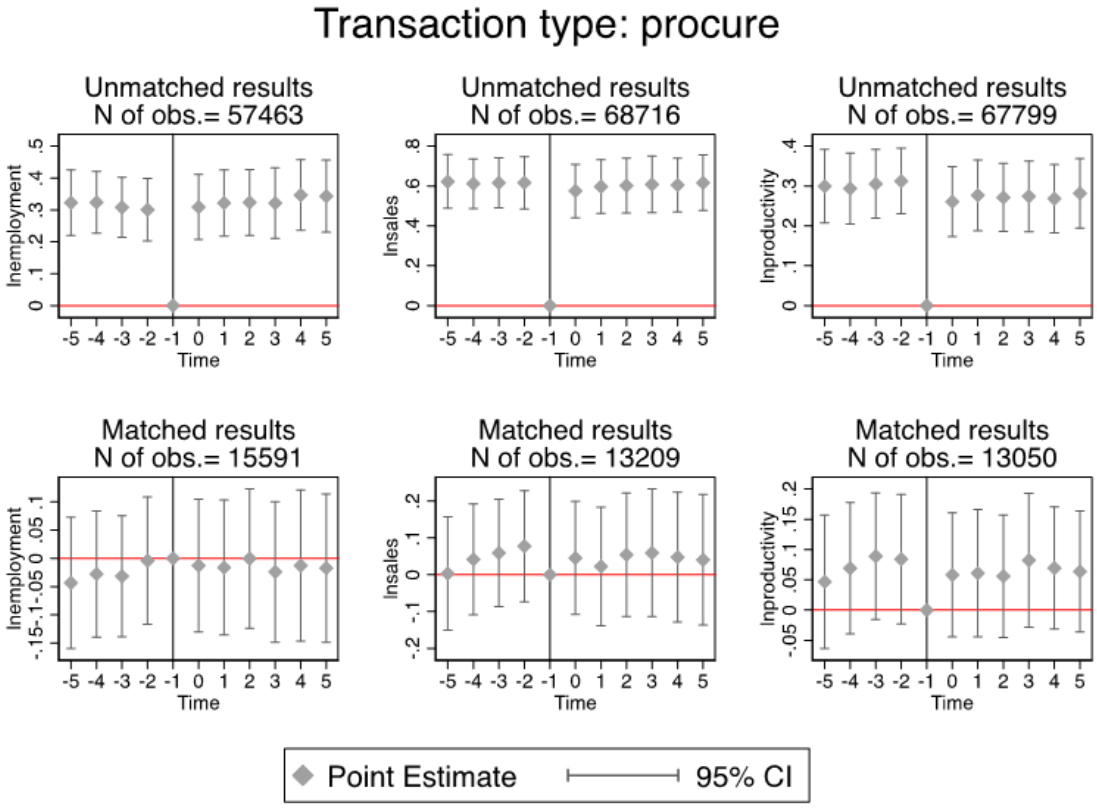


Figure 5: Impact on domestic firms that are starting to sell their products to foreign firms

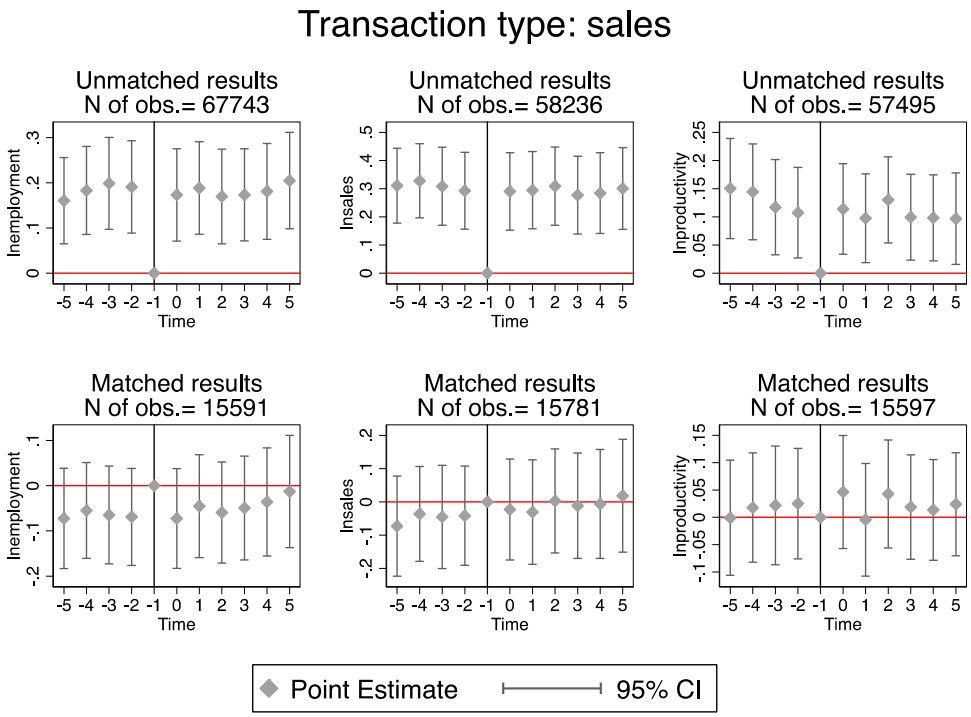
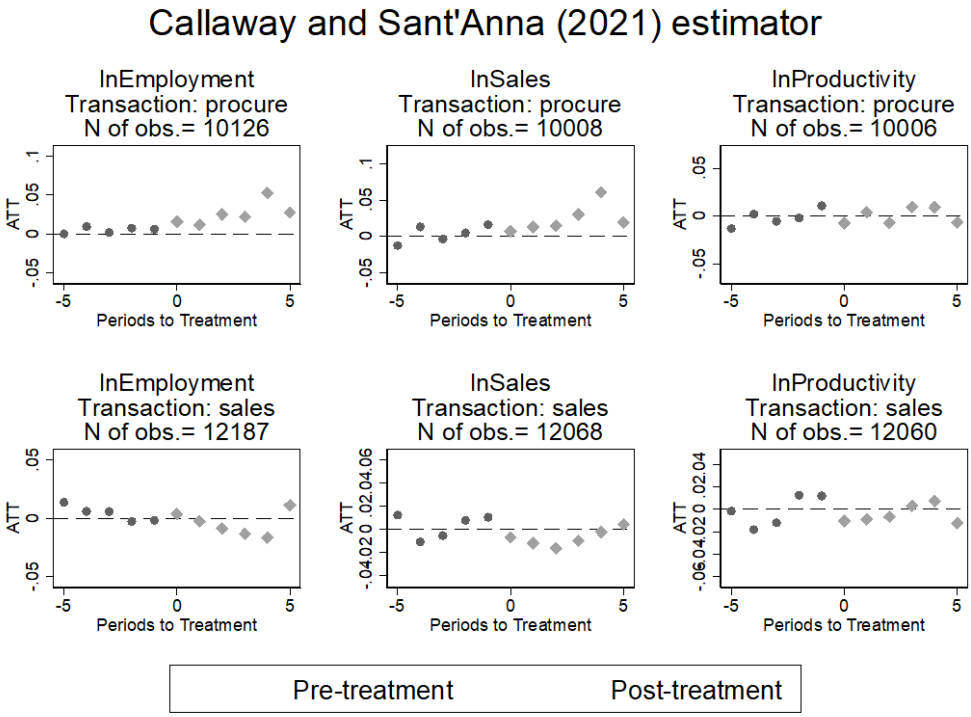


Figure 6: Impact on domestic firms that are starting a transaction with foreign firms



Notes: ATTs are estimated based on Callaway and Sant'Anna (2021) method. Point estimates of ATTs are indicated by circle markers for the pretreatment period and square markers for the posttreatment period. Surrounding bars around markers indicate the 95% confidence intervals.