RIETI Discussion Paper Series 15-E-053

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Does the presence of foreign affiliate companies matter?

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http://www.rieti.go.jp/en/

RIETI Discussion Paper Series 15-E-053

April 2015

Learning by Export:
Does the presence of foreign affiliate companies matter?*

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Abstract

This paper investigates the effect of export activities on firm performance by taking into account whether or not exporter firms' affiliated companies (i.e., their own subsidiaries and parent companies' branches) are located in the export markets. To single out a causal impact on firm performance running from starting export, we employ propensity-score matching difference-in-differences estimation. Using a unique firm-level panel dataset that allows us to identify firms starting export and firms staying in domestic markets as well as their affiliated firms' overseas activities, we find that firms exhibited better performance than their non-exporter counterparts prior to export, and that the difference in the performance, especially productivity, significantly widened after export. Such improvement in productivity originated from starting export was found to be statistically and economically significant when exporter firms did not have affiliated firms in overseas markets. On the other hand, the performance gain from export was highly heterogeneous and hence statistically insignificant in the case when these affiliated firms were present in overseas market. The former type of firm fits well to test the learning-by-exporting mechanism hypothesis since it accessed the export markets for the first time by exporting.

JEL Classification: D24, F14, L25

Key words: Export, Firm performance, Learning-by-exporting, Affiliated firms

* This research was conducted as a part of the Research Institute of Economy, Trade and Industry (RIETI) research project (Competitiveness of Japanese Firms: Causes and Effects of the Productivity Dynamics). We thank Kozo Kiyota, Toshiyuki Matsuura, Atsushi Nakajima, Masahisa Fujita, Masayuki Morikawa, and the seminar participants at Research Institute of Economy, Trade & Industry (RIETI) for helpful suggestions. We also thank RIETI for providing us the data converter connecting multiple datasets used in this paper. K. Hosono gratefully acknowledges financial support from Grant-in-Aid for Scientific Research (S) No. 22223004, JSPS and M. Takizawa acknowledges support from Grant-in-Aid for Scientific Research (B) No. 24730252, JSPS.

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1. Introduction

A number of extant literature have pointed out that firms that start export exhibit better performance than non-exporter firms prior to exports (Bernard and Jensen 1999). Such a causal linkage running from the level of firms' pre-exporting performance to export status is, however, not the whole picture of the relationship between firm performance and export. To illustrate, exporter firms may be able to achieve better performance after starting export through, for example, incorporating destination countries' local demand into their products, utilizing better resources endowed in destination countries, and/or self-training firms' internal operations. Such an additional causal linkage running from firms' export status to post-export performance is called learning-by-exporting (De Loecker, 2007).

Although the theoretical illustration of the learning-by-exporting is somewhat straightforward, empirical evidences in the extant literature, which we will review in Section 2, have been yet mixed. A number of studies have shown that the existence of learning-by-exporting effect was conditional on various firms' characteristics including pre-exporting R&D intensity or firm size as well as the characteristics of export destinations. Thus, an important empirical question in this topic is what enables firms to exploit the benefit of exporting in terms of firm performance.

Against these backgrounds, the purpose of this paper is to investigate the causal effect running from starting export to firm's various performance by using Japanese firm-level data taking into account whether exporter firms' affiliated firms (e.g., their own subsidiaries and parent companies' branches) already locate abroad or not as an important firm-level characteristics. We may expect that the performance gain from exporting can be observed more clearly in the case where affiliated firms are not present abroad, especially in the market the firm starts exports to, than in the case where they are for a number of reasons. First, in the latter case, the firm may have already gained knowledge about the local customers and regulations, among others, through the overseas

affiliated firms. Second, firms may export to parent firms' overseas subsidiaries and hence may have little chance to learn local markets by itself. Finally, on the contrary to these two reasons, if the affiliated firms may give the exporting firm detailed information on local markets, which may accelerate the firm's learning by exporting. Contrary to these, in the case where the exporter firm has no affiliated firms abroad, we may be able to pick up a pure learning effect from the first access to foreign markets. Our purpose of this study is to empirically study such conjecture by using a unique firm-level panel dataset that allows us to identify firms starting export and firms staying domestic markets as well as their affiliated companies' overseas activities.

Toward this end, we employ propensity-score matching difference-in-differences estimation. The dataset we use allows us to identify whether subsidiaries of exporter firms locate abroad or not as well as the parent companies and/or subsidiaries of exporter firms have their own branches abroad or note. We can also measure the total amounts of exports to affiliated firms by using the dataset. By using such detailed information about the overseas activities of firms' affiliated firms and trade relationship between exporter firms and their affiliated firms, we can study how affiliated firms' presence in foreign markets influence firms' post-export performance.

Our main findings can be summarized as follows. First, as reported in a number of extant studies, firms starting export showed better performance than their counterpart of non-exporter firms prior to export. Specifically, firms that started export showed higher productivity measured by Total Factor Productivity (TFP), larger size measured by the number of firms' employees, higher wages potentially representing higher skills, and higher liquidity measured by the ratio of liquid asset to total assets than their counterpart of non-exporter firms prior to export. These results are consistent with the widely reported features of exporter firms in literature. Second, the difference in the TFP and labor productivity, between exporter firms and firms staying domestic significantly widened after exporting. In the case of TFP, the difference widened by 1.3 % right after starting exports and

continued to increase up to 3.1% over the six years after starting exports. In the case of labor productivity, the difference widened by 3.2%, then increased up to around 8.3%. Third, most importantly, such an improvement in firm performance was both statistically and economically significant in the case when the parental companies of the exporter firms did not have overseas branches and when the subsidiaries of exporter firms were not located abroad or the exporter firms did not export to their affiliated firms if the subsidiaries of exporter firms were located abroad. On the other hand, the performance gain from export was not statistically significant when the parental companies of the exporter firms had overseas branches. The performance gain from starting exports is not statistically significant in the case that the subsidiaries of exporter firms were located abroad and the exporter firms exported to their affiliated firms. These results suggest that we can observe the clearer improvement of firms' performance when they newly access to export markets by themselves (i.e., not through parent firms or own overseas subsidiaries) than the case affiliated companies are present in foreign markets. In the latter case, the learning-by-exporting effect seems to differ greatly across exporter firms possibly due to different roles that their affiliated firms play in the firm's export.

The rest of the paper is structured as follows. Section 2 reviews the related literature. Section 3 describes our data. Sections 4 and 5 report our methodology and results for the impact of starting exports on firm performance in general, respectively. Section 6 summarizes the results and concludes.

2. Literature Review

A vast literature has been testing the empirical implication of the learning-by-exporting story. As a prominent paper, De Loecker (2007) reports the existence of such an effect. Following this study, a group of literature including Manjon et al. (2013) and De Loecker (2013) report refined

results based on more precisely modeled export dynamics and productivity measures. Using Japanese firm-level data, Kimura and Kiyota (2006) also report that exporter firms experienced a higher productivity growth.[1]

While these studies largely support the existence of learning-by-exporting mechanism, Keller (2004) and Wagner (2007) provide counter evidences against such a mechanism. One resolution for these conflicted results is provided by several recent studies including Yashiro and Hirano (2009), Damijan et al. (2010), Ito and Lechevalier (2010), and Ito (2011). These papers mainly aim at identifying the conditions under which the learning-by-exporting can be clearly observed and find that pre-exporting R&D intensity and firm size as well as the characteristics of export destinations matter for the effectiveness of the learning-by-exporting mechanism. The difference of our study in this paper is to shed light on new firm-level characteristics, i.e., the overseas activities of exporter firms' affiliated companies.

3. Data

We rely on two firm-level data sources. First, information on firms' export status and its financial characteristics are obtained from the *Basic Survey of Japanese Business Structure and Activities* (BSJBSA; *Kigyo Katsudou Kihon Chosa* in Japanese) compiled by the Ministry of Economy, Trade and Industry. The main purpose of this survey is to gauge quantitatively the activities of Japanese enterprises, including capital investment, exports, foreign direct investment, and investment in research and development. To this end, the survey covers the universe of enterprises in Japan with more than 50 employees and with paid-up capital of over 30 million yen. We employ the financial characteristics of firms and their export status including the years they

[1] As another study in the similar vein, Kiyota and Urata (2008) report exporter firms are more likely to implement foreign direct investment. See also Hayakawa et al. (2012) as an intensive survey covering the studies on exports and productivity.

export and the areas they export to.[2]

To investigate the differential learning-by-exporting effects between the firms whose parent firms have overseas branches and those who do not, we rely on the BSJBSA. The BSJBSA stores the information on firms' parent companies' identity. In particular, the dataset provides us the ticker code corresponding to the parent companies when they are listed. Since most of the listed companies are also covered by the BSJBSA and the BSJBSA stores the information about how many overseas branches each surveyed firm owns, we can identify whether the listed parent firms of the exporter firms own overseas branches or not.

Second, to differentiate the firms who have subsidiaries in export markets (and other foreign markets) and those who do not, we use the information on firms' own overseas subsidiaries provided by the Survey of Overseas Business Activities (SOBA; *Kaigai Jigyo Katsudou Kihon Chosa* in Japanese), another governmental survey research compiled by the Ministry of Economy, Trade and Industry. Using the SOBA, we can identify whether firms own subsidiaries abroad as well as in which areas they locate. Using this information in our dataset, we can construct subsamples of firms which own or do not own overseas subsidiaries.

These datasets allow us to construct a unique firm-level dataset, which consists of five groups of firms: A) export firms with parent firms' overseas branches and their own overseas subsidiaries in export markets[3], B) export firms with parent firms' overseas branches but without their own overseas subsidiaries, C) export firms without a parent firms' overseas branch but with their own overseas subsidiaries, D) export firms without a parent firms' overseas branch or their own overseas subsidiaries, and E) non-exporter firms, irrespectively of whether they have parent firms' overseas branches or their own overseas subsidiaries. The numbers of firms included in the group A)

[2] In this paper, we partly use the export destination information associated with Asia, North America, and Europe although several other areas are identified as export destinations such as Oceania, Africa, South America. This is simply because the number of observation becomes quite small when we use the latter group of destination for our analysis.

[3] Without explicitly mentioned, the terms "export markets" and "overseas" used in this paper refer to some areas abroad in general and do not necessarily mean the exact export destination for each exporter firm.

to D) are , 244 firms in A), 344 firms in B), 2,622 firms in C), and 3,614 firms in D) at most, respectively.[4] We conjecture that the firms in groups A) and B) at least partly export to their parent firms' overseas branches, in which case the degree of learning-by-exporting effect may vary depending on the role that their parent firms (and their overseas branches) play. In contrast to these subsamples, firms in group D) are expected to face the environment where the learning-by-exporting mechanism is expected to be observed since all the export activities including developing local customers in destination areas and modifying their products need to be done by such exporter firms themselves. Firms in group C) are considered close to the ones in the group D) if export firms do not heavily export to their overseas subsidiaries.[5] Figure 1 depicts the number of exporter and non-exporter firms over our sample periods.

Using the financial characteristics stored in the datasets, we can match a firm starting export (i.e., *treatment*) with a firm which has similar characteristics to the treated firm in terms of the likelihood of starting export but do not actually export (i.e., *control*). As we detail later, by using the propensity of starting export conditional on firm characteristics, we match exporter firms in each of groups A) to D) with non-export firms.[6] By comparing the change in the performance of exporter firms between the pre-export and post-export periods in groups A) to D) and non-export firms over the same period, we single out the effect of starting export on the performance of firms.

[4] In terms of industry distribution, firms in the group A) and B) belong to a wide range of industries including non-manufacturing sector (e.g., construction, wholesale, and information service) while the firms in the group C) and D) concentrate on manufacturing industries.

[5] As an additional dimension of firms' characteristics related to the current discussion, it might be useful to take into account whether firms starting export have their own overseas branches (not subsidiaries) or not. According to our dataset, however, the ratio of firms that do not have overseas subsidiaries but have their own overseas branches consist of around 3% of the firms not having overseas subsidiaries. Given the share of such case is small, we do not consider such an additional dimension in the present paper. From the same consideration, it might be also useful to take into account whether parent firms have their overseas subsidiaries (not branches) or not. We leave the study of this additional characteristics to future research issue.

[6] We are not matching, for example, the exporter firms in the group A) with the non-export firms with parent firms' overseas branch and with their own overseas subsidiaries in export markets, but matching the exporter firms in group A) with the non-export firms in group E). This is simply because we do not have enough number of observations for the non-export firms with parent firms' overseas branch and with their own overseas subsidiaries in export markets.

4. Empirical Strategy

4.1 Propensity-Score Matching Difference-in-Differences Estimation (PSM-DID)

In order to quantify the impact of learning-by-exporting, first, we compute the propensity score defined in Rosenbaum and Rubin (1983), which is the conditional probability of assignment to a particular treatment (export in our setting) given the pre-treatment characteristics:

$$(1)\quad P(x) \equiv \Pr\{z = 1|x\} = E\{z|x\}$$

In this formulation, $z = \{0,1\}$ is the indicator of receiving the treatment (starting export or not) and x is a vector of observed pretreatment characteristics. Rosenbaum and Rubin (1983) show that if the recipient of the treatment is randomly chosen within cells defined by x, it is also random within cells defined by the values of the single-index variable $P(x)$. Therefore, for each treatment case i, if the propensity score $P(x_i)$ is known, the Average effect of Treatment on the Treated (ATT) can be estimated as follows:

$$\begin{aligned}(2)\quad \hat{\alpha}_{ATT} &= E\{y_{1i} - y_{0i}|z_i = 1\} \\ &= E\{E\{y_{1i} - y_{0i}|z_i = 1, p(x_i)\}\} \\ &= E\{E\{y_{1i}|z_i = 1, p(x_i)\} - E\{y_{0i}|z_i = 0, p(x_i)\}|z_i = 1\}\end{aligned}$$

In this formulation, y_1 and y_0 denote the potential outcomes in the two counterfactual situations of treatment and no treatment, respectively. Therefore, according to the last line of equation (2), the ATT can be estimated as the average difference between the outcome of recipients and non-recipients of the treatment whose propensity scores $P(x_i)$ are identical.

In the case of the present study, we consider various types of treatment: (T) simply export,

(T-A) export accompanying with parent firms' overseas branch and their own overseas subsidiaries, (T-B) export accompanying with parent firms' overseas branch but without their own overseas subsidiaries, (T-C) export accompanying without parent firms' overseas branch but with their own overseas subsidiaries, and (T-D) export accompanying without parent firms' overseas branch or their own overseas subsidiaries. We focus on the difference-in-differences between *ex ante* and *ex post* performances of firms that start export and remain the domestic market. Note that x is a vector of various characteristics of a firm such as firm size, profitability, liquidity, leverage, *ex ante* performance, etc.

By focusing on the sample of firms who did not export in the previous year and estimating a probit model corresponding to a dummy variable taking value of one in the case of starting export at the first stage, we investigate important determinants of export initiation and compute the propensity score (i.e., the probabilities of a firm starting export) for each firm. Making use of this result, we conduct propensity score matching and compare the change in the performance of firms within the pairs of observations matched on the propensity score. In our matching process, firms are matched separately in each year and each industry using one-to-one nearest neighbor matching.

In the second stage, we estimate a difference-in-differences (DID) estimator to evaluate the causal effect of starting export on a set of performance variables of interest. Once we match treated and control firms, the only difference between a type of export and non-export firms is their export status. Therefore, we focus on the Average effect of Treatment on the Treated (ATT). The ATT can be estimated as equation (2) above, which, in the case of this study, is equivalent to the following equation:

$$(3)\quad \hat{\alpha}_{\mathrm{ATT}} = \frac{1}{n}\sum_{1}^{n}\left(y_{\text{EXP year+s}}^{\text{treated}} - y_{\text{EXP year+s}}^{\text{control}}\right) - \frac{1}{n}\sum_{1}^{n}\left(y_{\text{Pre EXP year}}^{\text{treated}} - y_{\text{Pre EXP year}}^{\text{control}}\right) \quad s = \{1,2,3\}$$

In this formulation, n denotes the number of observations and y denotes outcome variables. More precisely, $y^{\text{treated}}_{\text{EXP year+s}}$ and $y^{\text{control}}_{\text{EXP year+s}}$ denote the performance of exporter firms and control firms which do not export, both of which are measured as of s-year after the exporter firm started export. In a similar manner, $y^{\text{treated}}_{\text{Pre EXP year}}$ and $y^{\text{control}}_{\text{Pre EXP year}}$ denote the performance one year prior to export.

4.2 Performance Measure

The first performance variable we employ is firms' Total Factor Productivity (TFP), which is calculated using the multilateral TFP index method developed by Good et al. (1997). In the present paper, we compute the TFP of each firm as the deviation of each firm's TFP from the industry average in each year. Since we match a treated firm and a control firm within same industry by using one-to-one nearest neighbor matching criteria, such a measure of TFP is appropriate for our analysis. Details on the TFP measure are provided in the Appendix. The second performance measure used in this present paper is labor productivity, defined as a ratio of firms' sales to a number of employees. The third performance measure is return on equity defined as a ratio of firms' current profit to total equity. The last variable we use is the level of wage, a proxy for labor quality or workers' skill. We are also interested in the size of firms' assets and the number of firms' employees since they reflect the difference in investment behaviors and employment strategy of exporter and non-exporter firms, which we could use to discuss the source of performance differences between such two groups.

4.3 Explanatory variables for Propensity Score

Let us now describe the explanatory variables for our estimation in detail. Basic definition and statistics of all variables are provided in Table 1 and Table 2, respectively. Following the extant studies examining the decision of starting export, to estimate the propensity of exporting $P(x)$ in

(1), we employ pre-export TFP (*lnTFP*), firms' ROE (*ROE*), firm size measured by the natural logarithm of firms' number of employees (*ln(L)*), firms' wage (*Wage*), liquidity measured by the ratio of liquidity asset to total asset (*Liquid to Asset*), and debt dependence measured by the ratio of debt to total asset (*Debt to Asset*) as the determinants. For all these explanatory variables, we use a one-year lag to eliminate possible endogeneity problems originating from the reverse causality running from the dependent variable to the independent variables. In order to control for year-specific effect capturing, for example, the currency exchange rate, we also include the year dummy variable in the list of our explanatory variables. To control for industry-level shocks that affect the firm's export decision, we classify the firms into 70 industries and add industry dummies accordingly.

5. Empirical Results

In the following subsections, we (1) show the result of the probit estimation on the determinants of starting export (Section 5.1); and (2) examine the *ex post* performance differences between exporter firms and non-exporter firms (Section 5.2) as well as between export firms with various overseas market status associated with affiliated firms using matched samples (Section 5.3).

5.1 Propensity Score

The estimated results for the probability of starting export are shown in Table 3. First, we find that *lnTFP*, *ln(L)*, *Wage*, and *Liquid to Asset* have positive and significant coefficients. These results are largely consistent with the extant studies and provide some supports to our estimation. We use this result in our matching process where firms are matched separately for each year using one-to-one nearest neighbor matching in the same industry. Table 4 summarizes the comparison

between matched exporter firms and non-exporter firms in terms of their characteristics. All the test for the difference of mean values for treatment group and control group cannot reject the null hypothesis that there is no difference. This provides some credit to our matching procedure and criteria.

5.2 Difference-in-Differences Estimation

The results for the difference-in-differences estimation for all the firms in our sample are shown in Table 5. The table contains the results associated with seven DID estimations corresponding to different windows for measuring pre-export and post-export periods. First, we find a statistically significant positive impact of export on firms' TFP and labor productivity over all the seven windows for the comparison between $t-1$ to $t+\tau$ where $\tau = 0, \cdots, 6$. This is consistent with the results in De Loecker (2007), Manjon et al. (2013), and De Loecker (2013). The magnitude of this positive impact on TFP is 1.3% at the time of starting export, and increases up to 3.1% 6 years after starting export. Similarly, the impact on labor productivity increases from 3.2% to 8.3%. These magnitudes are economically sizable since the median level of TFP and labor productivity in our sample is -6.2 % and 2.4%, respectively. Second, in some selected windows, exporter firms also showed better performance in terms of wage and ROE. Third, contrary to these measures, firm size accounted for by the size of total assets or the number of employees does not show any statistically significant results. These results imply that there is no evidence that exporter firms increased their firm size after starting export compared to their counterpart of non-exporter firms. The improvement in TFP and labor productivity does not seem to be the result of the change in firm size.

One possible conjecture consistent with these results might be that exporter firms are exposed to higher hazard associated with the exit from business (i.e., both from export markets and domestic market). If this is the case, our result might suffer from a survivorship bias. In order to

confirm that the result above is not driven by higher exits from business in the case of starting exports, we compute the survival rates for exporter firms (in the treated group) and non-exporter firms (in the control group) separately, and find that the survival rates are actually slightly higher for exporter firms than non-exporter firms. We further compare the TFP of exporter firms and non-exporter firms that exited from business during our sample periods and confirm that there is no statistical difference between these two exiting firms. Overall, we can conclude that our results above are not suffering from the survivorship bias.

5.3 Impact of Affiliated Firms' Overseas Activities

Do the results presented in the previous section really imply the existence of learning-by-exporting mechanism? In order to clearly identify the cases where learning-by-exporting could work effectively, we implement the DID estimation for export firms with parent firms' overseas branches and their own overseas subsidiaries (type A, Table 6) and that for export firms without parent firms' overseas branch or their own overseas subsidiaries (type D, Table 7). We can see that only in the case of export firms without parent firms' overseas branch or their own overseas subsidiaries (type D), the qualitative and quantitative feature we saw in Table 5 is statistically confirmed.

In order to see the difference in the results between Table 6 and Table 7, Figure 2 depicts the series of the point estimates of DID effect on TFP over the seven windows as well as its 95% confidence band in those two tables. The bold and thin solid lines account for the point estimate of DID effect in Table 6 and its confidence band while the dashed lines account for the results in Table 7. The figure shows that the DID effect for export firms without parent firms' overseas branch or their own overseas subsidiaries (type D firms) stably increased with a relatively small confidence band over the seven windows while that for export firms with parent firms' overseas branches and

their own overseas subsidiaries (type A firms) showed a large confidence band. This result implies that exporter firms of type A was greatly heterogeneous in terms of the DID effect on TFP than those of type D.[7]

Next, we repeat the same DID estimation for export firms with parent firms' overseas branches but without their own overseas subsidiaries (type B, Table 8). Although we have a few statistically significantly positive estimates, most of the DID effects are not statistically significant. This result implies that even if exporter firms' own overseas subsidiaries are absent in export markets, the learning-by exporting effect is not clearly observed as far as parental companies are present abroad.

Table 9 reports the DID estimation for export firms without parent firms' overseas branches but with their own overseas subsidiaries (type C). Interestingly, for this type of firms, *lnTFP* exhibited a similar pattern to that of the whole sample (in Table 5) both statistically and economically. Moreover, dividing the firms of type C into those who actually exported some amounts to their own overseas subsidiaries(C-1,Table 10) and those who did not export to their own subsidiaries (C-2, Table 11), we can confirm that the result for the firms of type C (in Table 9) is driven by the firms of type C-2 .

Note that in the comparisons between exporter firms with and without overseas affiliated firms, the size of observations in each group is not necessarily well balanced. This reflects the fact that our dataset contains a smaller number of exporter firms with overseas affiliated firms than that of exporter firms without overseas affiliated firms. In order to confirm that the aforementioned results in this paper are not critically driven by such a difference in sample sizes, we construct two additional subsamples. The first subsample consists of (i) exporter firms with parent firms' overseas

[7] In terms of the level of TFP prior to starting exports, the average numbers for the firms of type A and those of type D are 0.020 and -0.046, respectively. In this sense, firms without overseas affiliated firms are less productive before starting exports. However, this does not necessarily mean that firms with lower TFP prior to starting exports exhibits higher performance improvements since the point estimate itself was, in fact, higher for firms of type A.

branch and (ii) exporter firms with their own overseas subsidiaries and positive exports to affiliated firms. That is, they are composed of firms of types A, B, and C1. Then, the second subsample consists of (i) exporter firms with their own overseas subsidiaries but no exports to affiliated firms (type C2) and (ii) exporter firms without parent firms' overseas branches or without their own overseas subsidiaries (type D). Table 12 (the first subsample) and Table 13 (the second subsample) summarize the estimated DID effects, and Figure 3 depicts the point estimates of DID effect on TFP as well as its 95% confidence band in these two tables. In Figure 3, the bold and thin solid lines account for the point estimate of DID effect obtained from the first subsample and its confidence band while the dashed lines account for the results from the second subsample. The figure shows basically the same feature as we found in Figure 2.[8] This provides some credit to the aforementioned results.

So far we have not taken into account the export destination for each firm in this paper. As we can identify the four areas (i.e., Asia, Northw America, Europe, and other areas) that firms export to over our sample periods and the same four areas where their own subsidiaries locate, we conduct the same DID analysis for (i) the exporter firms with parent firms' overseas branches and their own overseas subsidiaries locate in the export destination areas, (ii) the export firms with parent firms' overseas branches but without their own overseas subsidiaries in the exact export destination areas, and the export firms without parent firms' overseas branches but with their own overseas subsidiaries in the exact export destination areas. Again, we have a very limited number of statistically significantly positive estimates and most of the DID effects are not statistically significant for these three types of exporter firms (results omitted to save space). This result might confirm the robustness of our empirical results presented so far.

Overall, these results suggest that improvement in productivity originated from exporting is

[8] Based on the same motivation, we also estimate the DID effect of export for the subsample of firms with parent firms' overseas branches and those without them, confirming the same pattern.

more clearly observed when firms start export without overseas affiliated firms or with their own overseas subsidiaries but not for export destination.. On the other hand, the productivity gain from export is highly heterogeneous in the case that affiliated firms are present in overseas markets. This implies that the latter case includes a wide variety of experiences from starting exports. On one hand, exporter firms even with overseas affiliated firms might be able to effectively learn from exporting through modifying their product fitting in the local demand in the case that such export activities are largely oriented by the exporter firms themselves. On the other hand, however, there would be few chances for exporter firms to study from their exports, for example, when all the export activities are the direct orders from parent firms. We leave the study for understanding the sources of such a large variation in TFP improvement in the case of exporter firms with overseas affiliated firms to future studies.

Our analysis also emphasizes the importance of identifying the exact timing for firms to be newly exposed to export markets. In fact, firms with parent firms' overseas subsidiaries might have learnt through the communication with their parent firms before starting export, and have already achieved the performance improvement, but might not necessarily learn at the timing of starting export. Our analysis shows that the effect of learning-by-exporting is more clearly observed once we focus on the timing for firms to be newly exposed to export markets.

6. Conclusion

In this paper, we study the effect of export activities on firms' performance taking into account whether exporter firms' affiliated firms (i.e., their own subsidiaries and parent companies' branches) are present abroad or not. From the propensity score matching difference-in-differences estimators, we find that firms exhibited better performance than their counterpart of non-exporter

firms prior to export and the difference in the performance, especially productivity, significantly widened after export. Such improvement in productivity originated from starting export is found to be statistically and economically significant when exporter firms did not have their affiliated firms in overseas markets. On the other hand, the productivity gain from export is highly heterogeneous and not statistically significant in the case where their affiliated firms are present in overseas markets. The former type of firms fit well to test the learning-by-exporting hypothesis since they accessed to export markets for the first time by exporting.

The research presented in this paper could be expanded in a number of directions. One such direction would be to further take into account the type of overseas subsidiaries exporter firms own (e.g., retail, wholesale, or manufacturing etc.) and the types of products to narrow down the cases for the learning-by-exporting effects to be achieved. Second, another interesting analysis would be to focus on specific aggregate shocks such as a financial crisis. While the present study shows that accessing export markets for the first time could result in the improvement of productivity, it is still an open question how this channel was or was not disturbed by, for example, a sudden decline in local demand or severe shortage of financial resources.

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Appendix: The multilateral TFP index

As detailed in Fukao et al. (2011), the TFP level of firm *i* in industry *j* in year *t*, $TFP_{i,j,t}$ is defined in comparison with the TFP level of a hypothetical representative firm in industry *j* in year *t*. The firm-level TFP level is calculated as follows,

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

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

Figures and Tables

Figure 1 Number of Exporter and Non-Exporter Firms

Figure 2 DID Effect Number of Exporter and Non-Exporter Firms (Table 6 vs. Table 7.)

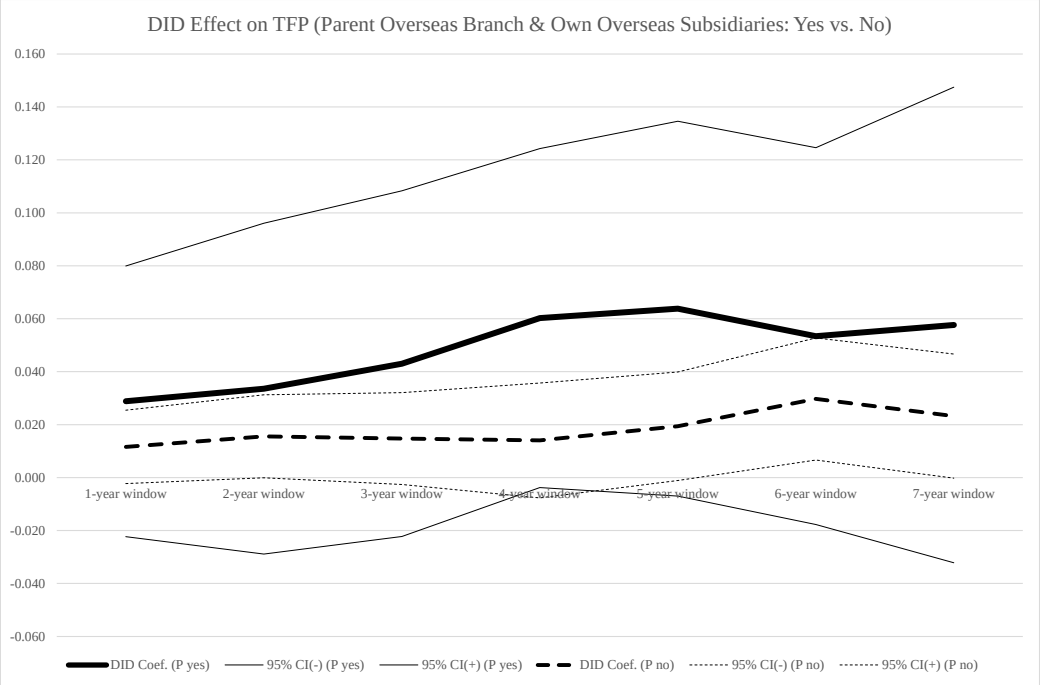

Figure 3 DID Effect Number of Exporter and Non-Exporter Firms (Robustness check)

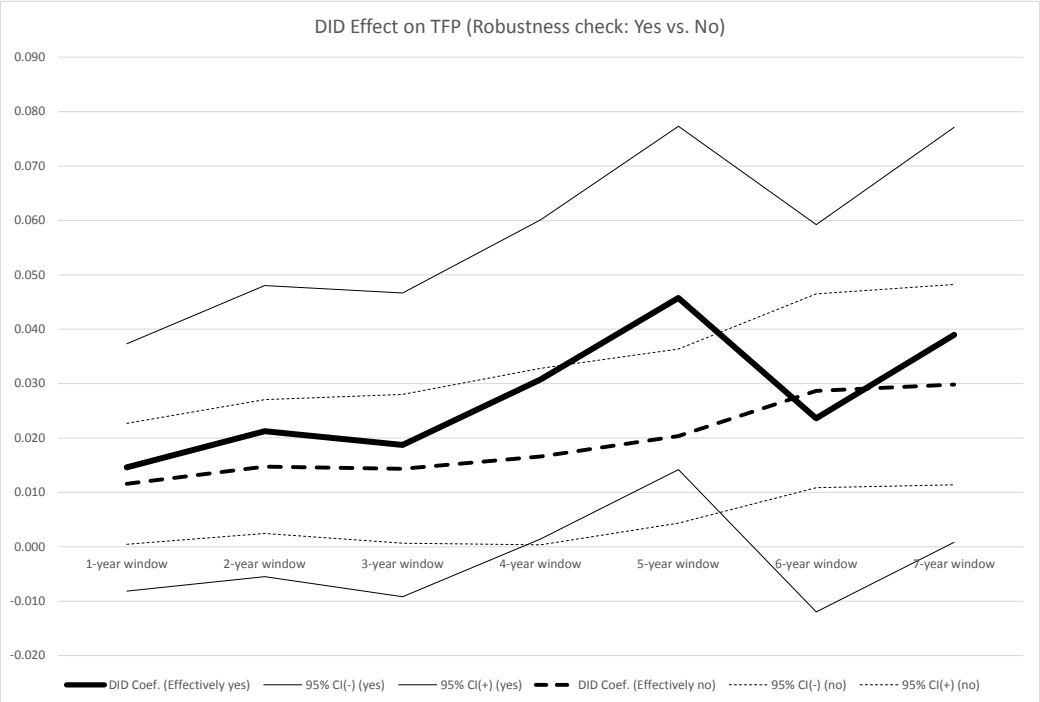

Table 1 Variable Definitions

Variables	Definitions	Sources
lnTFP	lnTFP is measured by difference from the industry average. lnTFPit=(lnYit-lnYt)-Σ1/2(Sit+St)(lnXit-lnXt) Yit, Xit and Sit show the output, input and cost share of firm i in time t. Yt, Xt and St show the industry average of those variables in time t.	Basic Survey of Japanese Business Structure and Activities (BSJBSA)
ln(LP)	LP is Labor productivity measured by difference from the industry average. lnLPit=(lnYit-lnYt)-(lnLit-lnLt) Y, L show sales and the number of employees.	BSJBSA
ROE	Return of equity. Current profit/Equity.	BSJBSA
ln(L)	log of number of employees.	BSJBSA
Wage	Wage per employee. Total wages/Number of employees	BSJBSA
Liquid to Asset	Liquid asset ratio. Liquid assets/Total assets.	BSJBSA
Debt to Asset	Debt asset ratio. Debts/Total assets.	BSJBSA

Table 2 Summary Statistics of Variables

Export dummy=0	Mean	Median	Maximum	Minimum	Number of obs
lnTFP	-0.076	-0.062	0.451	-0.648	222,075
ROE	0.034	0.024	0.824	-0.873	222,075
ln(L)	5.098	4.905	8.484	3.970	222,075
Wage	4.468	4.413	10.070	1.155	222,075
Liquid to Asset	0.572	0.577	0.975	0.095	222,075
Debt to Asset	0.722	0.760	1.460	0.124	222,075

Export dummy=1	Mean	Median	Maximum	Minimum	Number of obs
lnTFP	-0.040	-0.034	0.451	-0.625	4,297
ROE	0.038	0.026	0.457	-0.345	4,297
ln(L)	5.207	5.024	8.425	3.970	4,297
Wage	4.953	4.819	10.053	1.160	4,297
Liquid to Asset	0.619	0.618	0.974	0.102	4,297
Debt to Asset	0.706	0.743	1.438	0.124	4,297

Total	Mean	Median	Maximum	Minimum	Number of obs
lnTFP	-0.075	-0.062	0.451	-0.648	226,372
ROE	0.034	0.024	0.824	-0.873	226,372
ln(L)	5.100	4.913	8.484	3.970	226,372
Wage	4.477	4.421	10.070	1.155	226,372
Liquid to Asset	0.573	0.578	0.975	0.095	226,372
Debt to Asset	0.721	0.760	1.460	0.124	226,372

Table 3 Probit Estimation Results of Export Status

	Coefficient	Std. Err.		Marginal effect	Std. Err.	
lnTFP	0.365	0.067	***	0.012	0.002	***
ROE	0.028	0.023		0.001	0.001	
ln(L)	0.129	0.008	***	0.004	0.000	***
Wage	0.032	0.006	***	0.001	0.000	***
Liquid to Asset	0.294	0.043	***	0.010	0.001	***
Debt to Asset	-0.025	0.031		-0.001	0.001	
Const.	-2.875	0.421	***			
Industry dummies	Yes			Yes		
Year dummies	Yes			Yes		
Number of obs	226,372			226,372		
LR chi2(88)	3274.57			3274.57		
Prob > chi2	0			0		
Pseudo R2	0.0769			0.0769		

Notes:

1. The dependent variable is a dummy that takes one if the firm starts exporting in year t and zero otherwise. Firms exporting in year t-1 are excluded from this estimation.
2. All the independent variables are one-year lagged values.
3. *** indicate statistical significance at the 1% level.

Table 4 Results of Balancing Test for Matched Samples

	Mean		t-test	
Variable	Treated	Control	t	p>|t|
lnTFP	-0.040	-0.044	0.980	0.329
ROE	0.038	0.039	-0.530	0.597
ln(L)	5.207	5.194	0.690	0.492
Wage	4.953	4.930	0.720	0.470
Liquid to Asset	0.619	0.622	-0.770	0.442
Debt to Asset	0.706	0.704	0.400	0.687

Table 5 Causal Impact of Export: All Samples

DID effects

		Coef.	Std.Err.	P>|t|		Number of obs.
1-year window	lnTFP	0.013	0.005	2.450	**	6,688
(t-1)-(t)	lnLP	0.032	0.019	1.650	*	6,602
	lnAsset	0.029	0.040	0.720		6,858
	ROE	-0.047	0.037	-1.250		6,802
	ln(L)	0.013	0.030	0.450		6,858
	Wage	0.100	0.052	1.910	*	6,856
2-year window	lnTFP	0.016	0.006	2.870	***	5,272
(t-1)-(t+1)	lnLP	0.057	0.022	2.620	***	5,186
	lnAsset	0.038	0.045	0.850		5,424
	ROE	0.010	0.037	0.260		5,378
	ln(L)	0.019	0.034	0.560		5,426
	Wage	0.109	0.059	1.840	*	5,424
3-year window	lnTFP	0.015	0.006	2.410	**	4,578
(t-1)-(t+2)	lnLP	0.054	0.024	2.280	**	4,512
	lnAsset	0.046	0.048	0.960		4,734
	ROE	0.001	0.031	0.020		4,674
	ln(L)	0.026	0.036	0.710		4,738
	Wage	0.100	0.064	1.550		4,736
4-year window	lnTFP	0.019	0.007	2.570	***	3,954
(t-1)-(t+3)	lnLP	0.051	0.025	2.020	**	3,902
	lnAsset	0.045	0.052	0.860		4,098
	ROE	0.107	0.067	1.610		4,042
	ln(L)	0.027	0.040	0.670		4,098
	Wage	0.130	0.068	1.900	*	4,094
5-year window	lnTFP	0.026	0.007	3.500	***	3,448
(t-1)-(t+4)	lnLP	0.084	0.027	3.150	***	3,430
	lnAsset	0.045	0.056	0.790		3,588
	ROE	-0.061	0.055	-1.110		3,526
	ln(L)	0.020	0.043	0.480		3,588
	Wage	0.103	0.074	1.400		3,584
6-year window	lnTFP	0.028	0.008	3.420	***	2,968
(t-1)-(t+5)	lnLP	0.089	0.028	3.220	***	2,976
	lnAsset	0.045	0.060	0.760		3,126
	ROE	0.047	0.040	1.180		3,042
	ln(L)	0.017	0.045	0.380		3,126
	Wage	0.178	0.080	2.230	**	3,120
7-year window	lnTFP	0.031	0.008	3.720	***	2,594
(t-1)-(t+6)	lnLP	0.083	0.031	2.670	***	2,592
	lnAsset	0.050	0.063	0.800		2,714
	ROE	-0.103	0.062	-1.670	*	2,656
	ln(L)	0.021	0.049	0.420		2,714
	Wage	0.133	0.086	1.550		2,712

Table 6 Causal Impact of Export: With Parent Firms Overseas Branches and with Own Overseas Subsidiaries

DID effects

		Coef.	Std.Err.	P>|t|		Number of obs.
1-year window	lnTFP	0.029	0.026	1.100		242
(t-1)-(t)	lnLP	0.098	0.105	0.930		238
	lnAsset	0.029	0.212	0.140		244
	ROE	0.234	0.175	1.330		244
	ln(L)	0.001	0.188	0.010		244
	Wage	0.393	0.306	1.280		244
2-year window	lnTFP	0.034	0.032	1.050		186
(t-1)-(t+1)	lnLP	0.096	0.116	0.830		186
	lnAsset	0.026	0.246	0.110		188
	ROE	-0.135	0.112	-1.210		188
	ln(L)	0.022	0.227	0.100		188
	Wage	0.099	0.392	0.250		188
3-year window	lnTFP	0.043	0.033	1.290		152
(t-1)-(t+2)	lnLP	0.122	0.137	0.890		154
	lnAsset	0.035	0.261	0.130		156
	ROE	-0.090	0.283	-0.320		156
	ln(L)	-0.043	0.238	-0.180		158
	Wage	0.436	0.395	1.100		158
4-year window	lnTFP	0.060	0.033	1.840	*	132
(t-1)-(t+3)	lnLP	0.317	0.140	2.270	**	132
	lnAsset	-0.033	0.294	-0.110		134
	ROE	0.014	0.097	0.140		134
	ln(L)	-0.071	0.269	-0.260		134
	Wage	0.844	0.403	2.090	**	134
5-year window	lnTFP	0.064	0.036	1.770	*	110
(t-1)-(t+4)	lnLP	0.195	0.147	1.330		112
	lnAsset	0.029	0.310	0.090		116
	ROE	-0.234	0.339	-0.690		114
	ln(L)	-0.013	0.287	-0.050		116
	Wage	0.499	0.439	1.140		116
6-year window	lnTFP	0.053	0.036	1.470		92
(t-1)-(t+5)	lnLP	0.234	0.157	1.490		92
	lnAsset	-0.008	0.354	-0.020		96
	ROE	0.164	0.118	1.390		94
	ln(L)	-0.017	0.325	-0.050		96
	Wage	0.381	0.469	0.810		96
7-year window	lnTFP	0.058	0.046	1.260		82
(t-1)-(t+6)	lnLP	0.214	0.147	1.450		86
	lnAsset	-0.110	0.341	-0.320		88
	ROE	-0.014	0.081	-0.180		86
	ln(L)	-0.096	0.320	-0.300		88
	Wage	0.522	0.495	1.050		88

Table 7 Causal Impact of Export: Without Parent Firms Overseas Branches and without Own Overseas Subsidiaries

DID effects

		Coef.	Std.Err.	P>|t|		Number of obs.
1-year window	lnTFP	0.012	0.007	1.640		3,536
(t-1)-(t)	lnLP	0.036	0.027	1.320		3,464
	lnAsset	0.030	0.053	0.560		3,614
	ROE	-0.106	0.050	-2.130	**	3,576
	ln(L)	0.012	0.038	0.320		3,614
	Wage	0.117	0.070	1.660	*	3,614
2-year window	lnTFP	0.016	0.008	1.950	*	2,714
(t-1)-(t+1)	lnLP	0.063	0.030	2.080	**	2,640
	lnAsset	0.032	0.060	0.520		2,790
	ROE	-0.037	0.066	-0.560		2,770
	ln(L)	0.012	0.044	0.280		2,792
	Wage	0.160	0.080	1.990	**	2,790
3-year window	lnTFP	0.015	0.009	1.660	*	2,332
(t-1)-(t+2)	lnLP	0.054	0.034	1.590		2,266
	lnAsset	0.038	0.065	0.570		2,398
	ROE	0.014	0.046	0.310		2,368
	ln(L)	0.024	0.048	0.510		2,400
	Wage	0.150	0.088	1.700	*	2,398
4-year window	lnTFP	0.014	0.011	1.270		2,012
(t-1)-(t+3)	lnLP	0.023	0.036	0.640		1,962
	lnAsset	0.032	0.070	0.460		2,082
	ROE	0.065	0.044	1.470		2,058
	ln(L)	0.033	0.051	0.640		2,082
	Wage	0.082	0.093	0.880		2,078
5-year window	lnTFP	0.019	0.010	1.850	*	1,638
(t-1)-(t+4)	lnLP	0.072	0.038	1.900	*	1,630
	lnAsset	0.047	0.078	0.590		1,716
	ROE	0.031	0.063	0.490		1,688
	ln(L)	0.020	0.056	0.350		1,716
	Wage	0.074	0.104	0.710		1,714
6-year window	lnTFP	0.030	0.012	2.530	**	1,450
(t-1)-(t+5)	lnLP	0.100	0.039	2.540	**	1,432
	lnAsset	0.051	0.082	0.620		1,524
	ROE	0.050	0.055	0.900		1,476
	ln(L)	0.012	0.060	0.200		1,524
	Wage	0.236	0.112	2.100	**	1,520
7-year window	lnTFP	0.023	0.012	1.940	*	1,248
(t-1)-(t+6)	lnLP	0.073	0.044	1.680	*	1,234
	lnAsset	0.044	0.087	0.510		1,304
	ROE	-0.204	0.115	-1.770	*	1,280
	ln(L)	0.010	0.065	0.150		1,304
	Wage	0.113	0.119	0.950		1,304

Table 8 Causal Impact of Export: With Parent Firms Overseas Branches and without Own Overseas Subsidiaries

DID effects

		Coef.	Std.Err.	P>|t|		Number of obs.
1-year window	lnTFP	0.018	0.022	0.810		326
(t-1)-(t)	lnLP	0.013	0.081	0.160		326
	lnAsset	0.023	0.171	0.130		344
	ROE	-0.211	0.229	-0.920		342
	ln(L)	0.018	0.133	0.130		344
	Wage	0.071	0.246	0.290		342
2-year window	lnTFP	0.019	0.025	0.760		270
(t-1)-(t+1)	lnLP	0.031	0.094	0.330		272
	lnAsset	0.049	0.184	0.270		286
	ROE	0.010	0.063	0.160		278
	ln(L)	0.016	0.144	0.110		286
	Wage	-0.007	0.266	-0.030		286
3-year window	lnTFP	0.022	0.028	0.780		210
(t-1)-(t+2)	lnLP	0.073	0.096	0.760		214
	lnAsset	0.018	0.208	0.090		226
	ROE	-0.063	0.124	-0.510		222
	ln(L)	0.028	0.161	0.170		226
	Wage	0.135	0.306	0.440		226
4-year window	lnTFP	0.051	0.031	1.670	*	176
(t-1)-(t+3)	lnLP	0.149	0.106	1.400		182
	lnAsset	0.046	0.230	0.200		188
	ROE	0.006	0.082	0.070		186
	ln(L)	0.026	0.181	0.140		188
	Wage	0.350	0.323	1.080		188
5-year window	lnTFP	0.083	0.034	2.430	**	144
(t-1)-(t+4)	lnLP	0.209	0.123	1.700	*	144
	lnAsset	0.064	0.274	0.230		152
	ROE	-0.067	0.075	-0.900		150
	ln(L)	-0.016	0.212	-0.080		152
	Wage	0.398	0.339	1.180		152
6-year window	lnTFP	0.024	0.039	0.610		116
(t-1)-(t+5)	lnLP	0.137	0.148	0.920		114
	lnAsset	0.225	0.301	0.750		122
	ROE	-0.081	0.067	-1.200		120
	ln(L)	0.079	0.225	0.350		122
	Wage	-0.251	0.401	-0.630		122
7-year window	lnTFP	0.059	0.044	1.340		104
(t-1)-(t+6)	lnLP	0.195	0.163	1.200		104
	lnAsset	0.126	0.326	0.390		106
	ROE	-0.179	0.115	-1.560		102
	ln(L)	0.062	0.232	0.270		106
	Wage	-0.211	0.409	-0.520		106

Table 9 Causal Impact of Export: Without Parent Firms Overseas Branches and with Own Overseas Subsidiaries in Export Market

DID effects

		Coef.	Std.Err.	P>|t|		Number of obs.
1-year window	lnTFP	0.011	0.008	1.320		2,550
(t-1)-(t)	lnLP	0.019	0.030	0.620		2,540
	lnAsset	0.027	0.065	0.420		2,622
	ROE	0.031	0.060	0.510		2,606
	ln(L)	0.016	0.050	0.320		2,622
	Wage	0.042	0.083	0.510		2,622
2-year window	lnTFP	0.015	0.009	1.650	*	2,086
(t-1)-(t+1)	lnLP	0.050	0.034	1.480		2,070
	lnAsset	0.038	0.073	0.530		2,142
	ROE	0.084	0.033	2.550	**	2,124
	ln(L)	0.022	0.056	0.390		2,142
	Wage	0.061	0.093	0.650		2,142
3-year window	lnTFP	0.013	0.010	1.320		1,858
(t-1)-(t+2)	lnLP	0.042	0.035	1.210		1,852
	lnAsset	0.057	0.076	0.750		1,926
	ROE	-0.003	0.045	-0.060		1,904
	ln(L)	0.030	0.059	0.510		1,926
	Wage	-0.003	0.099	-0.030		1,926
4-year window	lnTFP	0.019	0.010	1.810	*	1,616
(t-1)-(t+3)	lnLP	0.054	0.038	1.410		1,608
	lnAsset	0.069	0.083	0.820		1,676
	ROE	0.180	0.153	1.170		1,648
	ln(L)	0.026	0.065	0.400		1,676
	Wage	0.112	0.108	1.040		1,676
5-year window	lnTFP	0.023	0.011	2.070	**	1,532
(t-1)-(t+4)	lnLP	0.079	0.040	1.990	**	1,520
	lnAsset	0.047	0.085	0.550		1,580
	ROE	-0.141	0.101	-1.400		1,548
	ln(L)	0.030	0.066	0.460		1,580
	Wage	0.083	0.111	0.740		1,578
6-year window	lnTFP	0.024	0.012	1.970	**	1,296
(t-1)-(t+5)	lnLP	0.066	0.042	1.590		1,324
	lnAsset	0.035	0.091	0.380		1,370
	ROE	0.048	0.067	0.710		1,336
	ln(L)	0.022	0.071	0.310		1,370
	Wage	0.129	0.122	1.060		1,368
7-year window	lnTFP	0.036	0.013	2.810	***	1,110
(t-1)-(t+6)	lnLP	0.067	0.048	1.390		1,120
	lnAsset	0.070	0.096	0.720		1,166
	ROE	0.001	0.060	0.010		1,140
	ln(L)	0.045	0.076	0.590		1,166
	Wage	0.118	0.135	0.870		1,164

Table 10 Causal Impact of Export: Without Parent Firms Overseas Branches and with Own Overseas Subsidiaries (export ratio for affiliated firms (i.e., own subsidiaries) > 0)

DID effects

		Coef.	Std.Err.	P>|t|	Number of obs.
1-year window	lnTFP	0.008	0.015	0.530	690
(t-1)-(t)	lnLP	0.019	0.058	0.320	690
	lnAsset	0.078	0.123	0.630	720
	ROE	0.133	0.186	0.710	716
	ln(L)	0.037	0.096	0.390	720
	Wage	0.024	0.160	0.150	720
2-year window	lnTFP	0.018	0.018	1.020	536
(t-1)-(t+1)	lnLP	0.069	0.066	1.050	534
	lnAsset	0.106	0.144	0.740	556
	ROE	0.101	0.063	1.600	546
	ln(L)	0.050	0.113	0.450	556
	Wage	0.057	0.185	0.310	556
3-year window	lnTFP	0.010	0.018	0.540	484
(t-1)-(t+2)	lnLP	0.011	0.071	0.160	486
	lnAsset	0.135	0.149	0.900	504
	ROE	-0.168	0.115	-1.460	496
	ln(L)	0.064	0.116	0.550	504
	Wage	-0.060	0.189	-0.320	504
4-year window	lnTFP	0.012	0.020	0.640	390
(t-1)-(t+3)	lnLP	0.036	0.080	0.450	394
	lnAsset	0.179	0.174	1.030	410
	ROE	0.711	0.599	1.190	404
	ln(L)	0.086	0.134	0.640	410
	Wage	0.064	0.205	0.310	410
5-year window	lnTFP	0.026	0.020	1.310	374
(t-1)-(t+4)	lnLP	0.114	0.083	1.370	378
	lnAsset	0.161	0.176	0.910	388
	ROE	-0.033	0.048	-0.700	380
	ln(L)	0.094	0.135	0.700	388
	Wage	0.085	0.217	0.390	386
6-year window	lnTFP	0.014	0.023	0.630	312
(t-1)-(t+5)	lnLP	0.013	0.091	0.140	318
	lnAsset	0.107	0.194	0.550	332
	ROE	-0.037	0.047	-0.790	324
	ln(L)	0.085	0.148	0.580	332
	Wage	0.139	0.239	0.580	332
7-year window	lnTFP	0.024	0.023	1.060	250
(t-1)-(t+6)	lnLP	0.018	0.113	0.160	258
	lnAsset	0.164	0.212	0.780	268
	ROE	-0.014	0.078	-0.170	260
	ln(L)	0.107	0.164	0.650	268
	Wage	0.134	0.262	0.510	266

Table 11 Causal Impact of Export: Without Parent Firms Overseas Branches and with Own Overseas Subsidiaries in Export Market (export ratio for affiliated firms (i.e., own subsidiaries) = 0)

DID effects

		Coef.	Std.Err.	P>|t|		Number of obs.
1-year window	lnTFP	0.012	0.009	1.220		1,860
(t-1)-(t)	lnLP	0.019	0.035	0.540		1,850
	lnAsset	0.008	0.077	0.110		1,902
	ROE	-0.008	0.044	-0.180		1,890
	ln(L)	0.008	0.059	0.140		1,902
	Wage	0.049	0.097	0.500		1,902
2-year window	lnTFP	0.013	0.010	1.310		1,550
(t-1)-(t+1)	lnLP	0.043	0.039	1.100		1,536
	lnAsset	0.014	0.085	0.170		1,586
	ROE	0.079	0.039	2.020	**	1,578
	ln(L)	0.012	0.065	0.180		1,586
	Wage	0.062	0.108	0.580		1,586
3-year window	lnTFP	0.014	0.011	1.210		1,374
(t-1)-(t+2)	lnLP	0.053	0.040	1.340		1,366
	lnAsset	0.029	0.089	0.330		1,422
	ROE	0.055	0.045	1.230		1,408
	ln(L)	0.018	0.068	0.270		1,422
	Wage	0.017	0.117	0.150		1,422
4-year window	lnTFP	0.021	0.012	1.710	*	1,226
(t-1)-(t+3)	lnLP	0.060	0.044	1.370		1,214
	lnAsset	0.033	0.095	0.350		1,266
	ROE	0.008	0.059	0.130		1,244
	ln(L)	0.007	0.075	0.090		1,266
	Wage	0.128	0.126	1.020		1,266
5-year window	lnTFP	0.022	0.013	1.660	*	1,158
(t-1)-(t+4)	lnLP	0.068	0.045	1.500		1,142
	lnAsset	0.010	0.097	0.100		1,192
	ROE	-0.177	0.132	-1.330		1,168
	ln(L)	0.009	0.076	0.120		1,192
	Wage	0.082	0.129	0.630		1,192
6-year window	lnTFP	0.027	0.014	1.890	*	984
(t-1)-(t+5)	lnLP	0.083	0.047	1.790	*	1,006
	lnAsset	0.012	0.103	0.120		1,038
	ROE	0.075	0.087	0.860		1,012
	ln(L)	0.001	0.081	0.020		1,038
	Wage	0.126	0.141	0.890		1,036
7-year window	lnTFP	0.039	0.015	2.600	***	860
(t-1)-(t+6)	lnLP	0.082	0.052	1.560		862
	lnAsset	0.042	0.108	0.390		898
	ROE	0.005	0.074	0.070		880
	ln(L)	0.027	0.085	0.310		898
	Wage	0.112	0.157	0.720		898

Table 12 Causal Impact of Export: Robustness Check (the first subsample)

DID effects

		Coef.	Std.Err.	P>|t|		Number of obs.
1-year window	lnTFP	0.015	0.012	1.260		1,258
(t-1)-(t)	lnLP	0.032	0.043	0.740		1,254
	lnAsset	0.054	0.092	0.590		1,308
	ROE	0.061	0.123	0.500		1,302
	ln(L)	0.025	0.074	0.340		1,308
	Wage	0.105	0.127	0.830		1,306
2-year window	lnTFP	0.021	0.014	1.560		992
(t-1)-(t+1)	lnLP	0.063	0.049	1.290		992
	lnAsset	0.077	0.105	0.730		1,030
	ROE	0.032	0.044	0.730		1,012
	ln(L)	0.036	0.085	0.420		1,030
	Wage	0.045	0.148	0.310		1,030
3-year window	lnTFP	0.019	0.014	1.310		846
(t-1)-(t+2)	lnLP	0.047	0.053	0.870		854
	lnAsset	0.089	0.113	0.790		886
	ROE	-0.128	0.088	-1.450		874
	ln(L)	0.036	0.090	0.400		888
	Wage	0.078	0.155	0.500		888
4-year window	lnTFP	0.031	0.015	2.050	**	698
(t-1)-(t+3)	lnLP	0.117	0.059	1.990	**	708
	lnAsset	0.105	0.128	0.820		732
	ROE	0.400	0.336	1.190		724
	ln(L)	0.040	0.102	0.390		732
	Wage	0.275	0.165	1.660	*	732
5-year window	lnTFP	0.046	0.016	2.840	***	628
(t-1)-(t+4)	lnLP	0.150	0.063	2.380	**	634
	lnAsset	0.117	0.136	0.860		656
	ROE	-0.077	0.068	-1.120		644
	ln(L)	0.051	0.108	0.470		656
	Wage	0.229	0.175	1.310		654
6-year window	lnTFP	0.024	0.018	1.300		520
(t-1)-(t+5)	lnLP	0.078	0.070	1.110		524
	lnAsset	0.115	0.150	0.760		550
	ROE	-0.012	0.038	-0.300		538
	ln(L)	0.067	0.118	0.570		550
	Wage	0.094	0.195	0.480		550
7-year window	lnTFP	0.039	0.019	2.000	**	436
(t-1)-(t+6)	lnLP	0.098	0.081	1.210		448
	lnAsset	0.106	0.160	0.660		462
	ROE	-0.051	0.055	-0.930		448
	ln(L)	0.058	0.127	0.460		462
	Wage	0.129	0.207	0.620		460

Table 13 Causal Impact of Export: Robustness Check (the second subsample)

DID effects

		Coef.	Std.Err.	P>|t|		Number of obs.
1-year window	lnTFP	0.012	0.006	2.040	**	5,396
(t-1)-(t)	lnLP	0.030	0.022	1.390		5,314
	lnAsset	0.022	0.044	0.510		5,516
	ROE	-0.072	0.036	-2.000	**	5,466
	ln(L)	0.011	0.033	0.330		5,516
	Wage	0.093	0.057	1.640		5,516
2-year window	lnTFP	0.015	0.006	2.350	**	4,264
(t-1)-(t+1)	lnLP	0.055	0.024	2.320	**	4,176
	lnAsset	0.026	0.050	0.520		4,376
	ROE	0.005	0.045	0.110		4,348
	ln(L)	0.012	0.037	0.340		4,378
	Wage	0.125	0.065	1.940	*	4,376
3-year window	lnTFP	0.014	0.007	2.050	**	3,706
(t-1)-(t+2)	lnLP	0.054	0.026	2.070	**	3,632
	lnAsset	0.035	0.053	0.650		3,820
	ROE	0.030	0.033	0.890		3,776
	ln(L)	0.022	0.040	0.560		3,822
	Wage	0.101	0.071	1.430		3,820
4-year window	lnTFP	0.017	0.008	2.000	**	3,238
(t-1)-(t+3)	lnLP	0.037	0.028	1.320		3,176
	lnAsset	0.032	0.057	0.560		3,348
	ROE	0.043	0.035	1.230		3,302
	ln(L)	0.023	0.043	0.530		3,348
	Wage	0.099	0.075	1.330		3,344
5-year window	lnTFP	0.020	0.008	2.490	**	2,796
(t-1)-(t+4)	lnLP	0.070	0.029	2.420	**	2,772
	lnAsset	0.032	0.062	0.510		2,908
	ROE	-0.054	0.066	-0.820		2,856
	ln(L)	0.016	0.046	0.340		2,908
	Wage	0.077	0.081	0.950		2,906
6-year window	lnTFP	0.029	0.009	3.150	***	2,434
(t-1)-(t+5)	lnLP	0.093	0.030	3.090	***	2,438
	lnAsset	0.035	0.065	0.540		2,562
	ROE	0.060	0.048	1.250		2,488
	ln(L)	0.007	0.049	0.150		2,562
	Wage	0.191	0.088	2.170	**	2,556
7-year window	lnTFP	0.030	0.009	3.170	***	2,108
(t-1)-(t+6)	lnLP	0.077	0.034	2.300	**	2,096
	lnAsset	0.045	0.068	0.660		2,202
	ROE	-0.119	0.075	-1.590		2,160
	ln(L)	0.018	0.052	0.340		2,202
	Wage	0.112	0.095	1.180		2,202