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Abstract

This study investigates the effect of foreign direct investment (FDI) on markups using parent-foreign subsidiary matched data on Japan from 1997 to 2018. Using the cost of goods sold (COGS) as a measure of expenditure on variable inputs, we find that for manufacturing firms, the parent firm increases markups as the ratio of sales of foreign subsidiaries to those of the parent firm (i.e., the intensive margin of FDI) increases, while the parent firm does not significantly change markups in response to the FDI status (i.e., the extensive margin). We also find that the average markup of the corporate group, i.e., the weighted average of the markups charged by the parent firm and foreign subsidiaries, increases with both the extensive and intensive margins of FDI for manufacturing firms. Finally, we find that if we divide the host countries into developed and developing economies, a positive effect on markups is mainly observed for FDI to developing economies. Overall, our results suggest that firms increase markups by increasing vertical FDI.

Keywords: Export, Foreign Direct Investment, Markup
JEL classification: D24, F23, L11

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Foreign Direct Investment and Markups

1. Introduction

As multinational sales have grown rapidly over the last several decades in many advanced and some developing economies, the motives of foreign direct investment (FDI) and its effects on firm activities have drawn attention of both economists and policymakers. Helpman et al. (2004) show theoretically that high-productivity firms choose FDI to serve foreign customers while middle-productivity firms choose exports to do so and low-productivity firms serve only domestic markets. Many empirical studies also focus on the relationship between the productivity and export and/or FDI statuses and find that multinationals have higher productivity than exporting or domestic firms (e.g., Doms and Jensen, 1998; Mayer and Ottaviano, 2008; Fons-Rosen et al., 2021).[4][5] Although most of these studies examine the static relationship between FDI and productivity, Kimura and Kiyota (2006), using longitudinal panel data on Japanese firms, investigate the dynamic aspect of FDI and find that FDI improves productivity once the productivity convergence effect is controlled for.

FDI potentially changes firm performance besides productivity in various ways. For example, FDI may either increase or decrease domestic employment depending on the host country (e.g., Kambayashi and Kiyota, 2015; Ni, Kato, and Liu, 2021). Furthermore, while evidence is scarce, FDI may change parent firms' markups through various channels. For example, if firms move labor-intensive production process to foreign countries where labor costs are low, parent firms can decrease their marginal costs, charge high markups, and earn higher profits in home country. On the other hand, if firms can obtain higher productivity due to FDI, they may occupy a higher market share and exert a market power, leading to a higher markup. An increase in FDI may also change foreign affiliates' markups. As foreign affiliates learn local customers' tastes, adopt local regulations, and build local production and sales networks, they may be able to set higher markups as well as to improve productivity and quality of their products. In addition, as parent firms accumulate intangible capital such as brand and innovative properties, foreign affiliates can use them to improve productivity and increase markups.[6]

We therefore aim to answer the following questions. Does FDI increase or decrease the parent firm's markups? Does FDI increase or decrease the average markup of the corporate group that consists of the parent firm and its foreign affiliates? Does the effect of FDI on the parent firm's markup depend on the host countries? To reveal the effects of FDI on markups has important implications for several reasons. First, higher markups are likely to result in higher profits, higher concentration, and lower labor share. Second, a larger dispersion in markups means less efficient resource allocation (Hsieh and Klenow, 2009; Peters, 2020). Finally, the seemingly positive relationship between FDI and revenue productivity might be explained by the rise in markup and physical productivity might not be affected by FDI.

[4] An exception is Globerman et al. (1994) who show that foreign affiliates in Canada do not have higher value added per worker after controlling for size and capital intensity.
[5] Similarly, there are many studies on the productivity of Japanese multinationals (e.g., Head and Ries, 2003; Kimura and Kiyota, 2006; Tomiura, 2007; Todo and Shimizutani, 2008; Hayakawa et al., 2013).
[6] Hosono et al. (2017) use a panel dataset from Japan to show that parent firms' intangible capital contribute to foreign affiliates' production.

Some studies investigate the effects of FDI on markups of the acquired firms or foreign affiliates.[7] Keller and Yeaple (2020) use data on US-owned firms operating across 50 countries and find that the markups of foreign affiliates are higher as parent firms' sales are larger. Stiebale and Vencappa (2018) use data on Indian manufacturing firms and find that firms that are acquired by foreign firms located in technologically advanced countries increases output and markups and decrease marginal costs. Their results indicate knowledge spillovers from foreign acquirers to domestic firms. Bircan (2019) uses data on Turkish plants and finds that multinationals target plants with high prices and markups and raise physical productivity but lower prices, leaving markups unchanged, upon acquisition.

Few studies focus on the markups of the parent firms, except for Kato (2014) and Dobbelaere and Kiyota (2018). Kato (2014) examine the effects of exports and FDI on markups using a panel dataset of Japanese manufacturing firms and find that firms that conduct FDI and exports exhibit higher markups than those that conduct only exporting or serving only domestic markets. Dobbelaere and Kiyota (2018) found that while being an exporter increases the likelihood of being characterized by imperfect competition in the product market, the opposite holds for multinationals. They also found that exporters are dominantly characterized by efficient bargaining in the labor market, whereas the multinationals are less likely to operate in the labor market with the efficient bargaining. While these studies are closest to the present study, their main points are not the effects of FDI on the markups and therefore the relationship of FDI and markups is not closely explored.

We contribute to the literature in three ways. First, we investigate the effects of FDI on markups of parent firms and the average markups of corporate groups, i.e., the weighted average of parent firms and foreign affiliates. The average markups of corporate groups are interesting especially when FDI has opposing effects on the markups of parent firms and those of foreign affiliates. Suppose, for example, that parent firms increase overhead costs for managing foreign affiliates or invest in intangible capital such as building brand. Then, parent firms' costs such as selling, general, and administrative expenses (SGA) increase. If we (mis)use SGA or operating expenses (OPEX) as a variable cost, the measured markups of parent firms decrease. On the other hand, such expenses contribute to expanding foreign affiliates' markets. Thus, the markup of foreign affiliates, and possibly the average markup of the corporate group increase. The average markups of corporate groups also matter from the view of corporate management.

Second, we carefully measure the variation in markups across firms and over time by acknowledging that we have data on revenue rather than output quantities while the above-mentioned preceding studies on the relationship between FDI and markups use revenue data to estimate markups, suffering from a serious identification problem (Bond et al, 2021) as we detail below. Third, we analyze the effects on markups of the intensive margin of FDI in terms of the ratio of sales of foreign subsidiaries to those of the parent firm as well as the extensive margin that indicates whether firms have foreign affiliates or not. The intensive margin potentially affects the parent firm's markup if firms can save total costs by increasing the sales and production of foreign affiliates.

A difficult challenge to investigate the effects of FDI on markups is how to estimate firm-level markups.

[7] For the effects of exports on markups, see De Loecker and Warzynski (2012), among others. Ding (2021) is a great survey on firm-level markups and multinational production.

Markups are defined as the ratio of output price to marginal cost, or equivalently, the ratio of the output elasticity of a variable input to the input's cost share in revenue. Therefore, if we can estimate the production function and obtain the output elasticity of a variable input, we can estimate markups (De Loecker and Warzynski, 2012). To do so, however, we need data on output quantities. As Bond et al. (2021) show, if we replace data on output quantities with sales or value, deflated by industry-level common deflators, and use the revenue elasticity in place of the output elasticity, its ratio to the cost share contains no useful information about markups. If output data are not available, as in our case, we need some identifying assumptions. In this study, we assume that the output elasticity is constant within an industry-year and a firm as well as some observable firm characteristic. Then, we estimate the variation in the logarithm of markups as the variation in the logarithm of the inverse of the cost share after controlling for the industry-year and firm fixed effects as well as some firm characteristics variables. It is noteworthy that we do not estimate the level of markups but the variation in it within the industry-year and the firm. Then we examine whether this variation is systematically correlated with firms' FDI status. By using high-dimensional fixed effects, we can also lessen the endogeneity bias that may arise if high-markup firms tend to start or increase FDI.

We apply this method to a panel dataset from Japan that matches parent firms and foreign subsidiaries for the period of 1997-2018. Japan is suitable for analysis because FDI has been growing over the sample period, reaching 250 billion dollars in 2018 and covering both advanced and developing economies including the US, EU countries, China, and Asian countries. Using matched parent-subsidiary data, we can estimate the average markup of a corporate group as well as the markup of a parent or affiliate.

Our results can be summarized as follows. First, using cost of goods sold (COGS) as a measure of expenditure on variable inputs, we find that for manufacturing firms, the parent firm increases markups as the ratio of sales of foreign subsidiaries to those of the parent firm (i.e., the intensive margin of FDI) is higher while the parent firm does not significantly change markups in response to the FDI status (i.e., the extensive margin). On the other hand, if we use total costs that include selling, general, and administrative expenses (SGA) to measure markups, we obtain the opposite result: the estimated markup decreases with the intensive margin of FDI. We conjecture with some supporting evidence that costs for SGA include overhead costs for managing foreign subsidiaries. Second, we find that the average markup of the corporate group, i.e., the weighted average of the markups changed by foreign subsidiaries and the parent firm increases with the intensive margin of FDI regardless of whether we use COGS or total costs including SGA to estimate markups. Third, we find that if we divide the host countries into developed and developing economies, a positive effect of the intensive margin of FDI on markups is observed only for FDI to developing economies. Overall, our results suggest that firms increase markups by increasing vertical FDI.

The remainder of the study is structured as follows. Section 2 describes our methodology and data. Section 3 then provides the estimation results. Section 4 summarizes the results and concludes.

2. Methodology

2.1 Data

In this paper, we constructed a dataset connecting the parent company and overseas subsidiaries. We

combined data from the Japanese Ministry of Economy, Trade and Industry's Basic Survey of Japanese Business Structure and Activities (hereinafter the "BSJBSA") and the Basic Survey on Overseas Business Activities (hereinafter the "BSOBA"). The BSJBSA is a survey aimed at clarifying how the management strategies of Japanese enterprises and industrial structures actually evolve, and obtaining basic data to support administrative measures. The survey covers firms with 50 or more employees and 30 million yen or more in capital. The industries covered by the survey are mining, construction, manufacturing, and, with some exceptions, service industries. The sample size is over 30,000 companies per year, and the sample period for this analysis is 1997-2018. We use the BSJBSA to generate data on parent firms' markups, FDI dummies, dummies that identify whether FDI is vertical or horizontal, export dummies, import dummies, total assets, R&D, sales, and cash flow. The BSOBA is a survey designed to confirm the current status of Japanese firms' overseas business activities and the impact of their overseas business activities on Japan. The survey covers Japanese firms (excluding those in the finance/insurance and real estate industries) that have overseas subsidiaries as of the end of March each year. The term "overseas subsidiaries" here refers to both overseas subsidiaries and overseas sub-subsidiaries. Overseas subsidiaries are foreign firms in which the Japanese parent firm holds a 10% or more stake, while overseas sub-subsidiaries are foreign firms in which the Japanese parent firm holds a 50% or more stake and the overseas subsidiary holds a 50% or more stake. The sample size is less than about 8,000 companies per year.[8] The definition of the variables used in the regression analyses is shown in Appendix TableA1. Table 1 shows the descriptive statistics of those variables.

2.2 Identification strategy

In this subsection, we show the method of calculating the markup indicators. We define markups (μ) as the price (P) to marginal cost (c), $\mu = P/c$. If we multiply the numerator and the denominator by total output (Q), we obtain markups as follows:

$$\mu = \frac{PQ}{cQ} \tag{1}$$

Assuming that the marginal cost is equal to the average cost, we can calculate the markup by replacing cQ with the total cost. This approach to measure markups is called the accounting approach. This may impose strong restrictions on firm-level cost structures. As De Loecker, Eeckhout and Unger (2020) pointed out, this requires constant returns to scale in production, the absence of economies of scale, and no fixed cost.

Another approach to measure markups is the production approach developed by De Loecker and Warzynski (2012). Following the production approach, the markup is derived from the output elasticity of a variable input divided by revenue share of that input. In terms of logarithms, the markup can be expressed as

[8] The sample comprises the firms reporting the presence of the foreign subsidiaries in both BSJBSA and BSOBA, and the firms reporting no foreign subsidiaries and not included in BSOBA. In other words, the firms inconsistently reporting on their foreign subsidiaries are dropped from the sample.

$$\ln(\mu) = \ln\left(\frac{PQ}{P_M M}\right) + \ln\left(\frac{\partial Q}{\partial M}\frac{M}{Q}\right) \tag{2}$$

Here, M and P_M are the quantity and price of the variable input, respectively. This approach does not require strong assumptions about the cost structure, but it does require the estimation of the production function. It is now well known that the identification and estimation of production functions using firm data are serious challenges (Ackerberg, Caves, and Frazer, 2015; Gandhi, Navarro, and Rivers, 2020). In addition, estimating markups from data on revenue also suffers from identification and estimation problems (Bond et al., 2021).[9]

Considering these problems, we avoid estimating the level of markup but focus on the variation in the logarithm of markups using the variation in the logarithm of the share of variable costs in revenue.[10] Our maintained assumption that is necessary to estimate the variation in markup is that the elasticity of inputs in production function is constant within a firm and industry-year. By controlling for a firm- and industry-year-level fixed effects, we focus on how markup changes over time within a firm in a given industry and year in response to the start and expansion of overseas production. Specifically, we use COGS to measure the variable cost and use its ratio to total sales as a proxy of markup in the baseline specification. We further use the OPEX and wagebills as measures of variable costs and use their ratios to total sales as alternative measures of markup. These measures are used by Traina (2018) and Keller and Yeaple (2020), respectively. Traina (2018) shows that the results of De Loecker, Eeckhout and Unger (2020) do not hold if OPEX is used as a measure of markup instead of COGS. While our estimation results are not robust to these measurement methods, we also show that COGS are more appropriate as a proxy of variable input. We trimmed 1% tails of the distribution of the markup measures to lessen the effects of outliers.

Next, we slightly extend the framework to consider the effects of FDI. We first assume that a firm produces some kinds of products in the independent production lines. In this case, the equation (2) holds for each product. If we ignore the decision at the product level and calculate the markup indicators at the firm level, however, the firm-level markup must correspond to the weighted average over the markups of the products. Suppose that this firm starts foreign production by the horizontal FDI and stops producing export products in a domestic plant. In this case, the change in the markup at the firm level depends on the markups of the exported products. If the exported products are involved with higher markups, the markups of exporters are higher and they would be lowered when the export is substituted by the local production. Of course, starting foreign production may affect quality and production technology of the domestic products. Predicting the change in the markup is, therefore, difficult for the case of horizontal FDI. In the case of vertical FDI, we suppose that the products correspond to parts and components of the final products. We also assume that the final product is assembled from the parts and components with the structure of the spiders in Baldwin and Venables (2013) without any additional costs of production factors. In this setting, vertical FDI is expressed as the shifts of some production processes to the foreign subsidiaries, and the change in the markup at the firm level depends on the

[9] Nishioka and Tanaka (2019) also point out that to estimate the production function, detailed output and input data are required, and the estimated value of the markup varies depending on the estimation method of the production function. Kasahara and Sugita (2020) propose nonparametric identification of markup from revenue data.

[10] Similar method is proposed by Gandhi, Navarro, Rivers (2020) in the Online Appendix.

markups of the parts and components produced in the foreign subsidiaries.[11] If the parent firm shifts the production of the products with lower markups to the foreign subsidiaries, the firm-level markup of the parent firm would rise after vertical FDI.

2.3 Estimation method

In this subsection, we provide the explanation on the estimation method. The purpose of this paper is to explore the effects of FDI on markups. To this end, we estimate the following equation:

$$\ln \mu_{it} = \boldsymbol{FDI_{it}}\boldsymbol{\alpha} + \boldsymbol{Trade_{it}}\boldsymbol{\beta} + \boldsymbol{x_{it}}\boldsymbol{\gamma} + \delta_i + \delta_{st} + u_{it}$$

where $\ln \mu_{it}$ is one of various measures of markups for firm i and year t, and we use the logarithm of the ratio of sales to variable cost as the markup indicators. While we use COGS as the variable cost in the baseline estimation, we also show the results of estimations using OPEX and wagebills.

$\boldsymbol{FDI_{it}}$ is a vector of the main explanatory variables, including a FDI dummy and sales ratio. The FDI dummy is a variable that takes 1 if the firm owns a foreign subsidiary and 0 otherwise. The sales ratio is the ratio of sales of the foreign subsidiaries to that of the parent company in Japan. If a firm in Japan owns multiple foreign subsidiaries, the sales of all subsidiaries are summed up. These variables indicate the presence of foreign production, and the coefficients are expected to be positive if foreign expansion increases the markups. $\boldsymbol{Trade_{it}}$ is a set of variables related to international trade. We use export and import dummies and export and import values to sales. According to a series of studies from De Loecker and Warzynski (2012), exporting firms are expected to have higher markups and the coefficients of these variables are positive. In addition, we also control for the ratio of export to and import from related companies to sales because the transfer price is often manipulated and biases the effects on markups. If the parent firms in Japan lower their profits, the markups of those firms would fall when the values of export to and import from their related firms increase.

Finally, $\boldsymbol{x_{it}}$ denotes other control variables; logarithm of total assets, logarithm of firm age, R&D dummy, sales growth from the previous year, and the ratio of cashflow to total assets in the previous year. In addition, firm fixed effects and industry and year fixed effects are included in all estimations. These control variables and fixed effects control for the static input elasticity of output, and the coefficients of the variables on FDI are considered to indicate their impacts on the markups. Standard errors are clustered at the firm level.

3. Estimation results

In this section, we show the estimation results. We first report the estimation results on the effects of FDI on the markups of parent companies. We also explore the difference between the effects of horizontal FDI and vertical FDI and report the estimation results using interaction terms and subsamples. We, then, estimate the effects of overseas production on the markups of the entire multinational corporations. Finally, we show the results when the markup is measured in different ways using alternative definitions of variable cost.

[11] We need to assume that the products comparable to the parts and components produced by the foreign subsidiaries are sold in the market and manipulating the transfer price is limited.

3.1 Baseline results

Table 2 shows the results of the baseline estimation using the ratio of sales to COGS. Columns (1) and (3) cover all industries and columns (2) and (4) cover only the manufacturing industry. In (1) and (2), we include the variables of FDI and international trade into the set of explanatory variables. The coefficients of the FDI dummies for all industries and manufacturing are not statistically significant. It cannot be said that the establishment of a foreign subsidiary affects markups. For the manufacturing industry, however, the coefficient of the sales ratio of foreign subsidiaries is positive and statistically significant, suggesting that the markups are higher for the firms expanding the overseas production. The estimation results for exports are similar to FDI. The export dummy is not statistically significant, but the ratio of exports to sales is positive and statistically significant. For imports, the coefficient of the dummy variable is positive and the coefficient of the import ratio to sales is negative. The critical values are around 0.088 (= 0.0042/0.0476) for all industries and 0.056 (= 0.00238/0.0428) for the manufacturing industry. As the median ratio of imports to sales is 0.037 when conditioned on importing firms, for more than half of importing firms, the markups are positively affected by the importing activities. While the coefficient for exports to the related firms is statistically insignificant, the coefficient for imports from the related firms is negative and statistically significant. Those importing firms may source the intermediate goods from their related companies by higher prices to reduce the profit in Japan. In columns (3) and (4), we add control variables. Most of the coefficients for those control variables are consistent with the expectations, and the coefficients for FDI and international trade are not qualitatively changed. In sum, the effect of FDI on the markups is absent or weakly positive even if it is present. The effects of international trade are more clearly observed.

Next, we explore the difference in the impact of foreign production on markups, depending on the destination country. More specifically, we classify foreign investment in OECD countries like the U.S. as horizontal FDI and foreign investment in non-OECD countries like China as vertical FDI. Table 3 shows the estimation results. The horizontal FDI dummy takes the value of 1 if the sales of foreign subsidiaries located in OECD countries are larger than those in non-OECD countries. The vertical FDI dummy takes the value of 1 if the sales of foreign subsidiaries located in non-OECD countries are larger. To capture both types of FDI quantitatively, we divide the sale ratio of foreign subsidiaries into two terms; sales of foreign subsidiaries located in OECD countries to the parent company and sales of foreign subsidiaries located in non-OECD countries to the parent company. These two terms are added as explanatory variables in the regression of the parent company markups. (1) and (3) are the estimation results for all industries, and the coefficient for the horizontal FDI dummy is negative. Columns (2) and (4) are the results of the estimation for the manufacturing industry and show that the markup of the parent company rises when its subsidiaries located in a developing country increase their sales. Since the multinational firms in the manufacturing industry often place different production processes in Japan and developing countries, this result suggests that the production processes with lower markups are located in developing countries.

Similar results are obtained when the estimation is totally separated by the type of FDI. Table 4 shows the estimation results of subsamples split by the types of FDI. The FDI dummy is not included as an explanatory

variable because these regressions only include the firms that already own foreign subsidiaries. Columns (1) and (2) show the results of the estimation for the subsample of the firms owing subsidiaries in developed countries. The coefficient for the sales ratio of subsidiaries to parent company is positive, but statistically insignificant or weakly significant. Columns (3) and (4) show the results of the estimation for the subsample of the firms owing subsidiaries in developing countries. The coefficients for the sales ratio of subsidiaries to parent company sales are positive and statistically significant. These results again suggest that the markups of the parent companies in Japan rise when those firms expand the overseas production in developing countries.[12]

3.2 Markups for consolidated corporate group

In this subsection, we consolidated the foreign subsidiaries with the parent companies in Japan and estimated the impacts of FDI on markups from the perspective of the entire corporate group. To this end, sales and costs of foreign subsidiaries are added to those of their parent company, respectively, and the values of transaction by the parent with the related companies are subtracted from those values. The markup indicator of the corporate group is calculated by taking the ratio of consolidated sales to consolidated costs. While this indicator can be interpreted as the average of the markups imposed by the firms consisting of the corporate group, we need to interpret the result using this indicator carefully because the underlying production function might be different across firms.[13] Table 5 presents the estimation results. While the sample industry is not limited in columns (1) and (3), the sample in columns (2) and (4) includes the corporate group whose parent company in Japan is operating in the manufacturing sector. Similar to the results in Table 2, the coefficients for sales of foreign subsidiaries are positive only for manufacturing firms, suggesting that the increase in overseas production raises the markup of the entire corporate group in the manufacturing sector. In addition, the crucial difference from Table 2 can be seen for the coefficients for the FDI dummy, which are positive and statistically significant for both all industries and manufacturing sector. These results imply that the foreign subsidiaries charge higher markups than their parent companies, and therefore the markup of the corporate group rise after the establishment of foreign subsidiaries.

Next, we again divide the impacts on markups of the consolidated corporate group by the types of FDI. Table 6 shows the effects of horizontal and vertical FDI on the markups of the corporate group. We again show the results of all industries in columns (1) and (3), and manufacturing sector in columns (2) and (4). While the coefficients for sales ratio of affiliates to parent company are statistically insignificant in all columns, FDI dummies are positive and statistically significant, except for the horizontal FDI dummy in column (4). The main results in Table 5 hold even when the FDI is decomposed into two types. In addition, we can see that the

[12] Hayakawa et al. (2013) report the similar results for the productivity of Japanese multinationals. They estimate the effects of FDI using the propensity score matching method and found that TFP increases by 4.4% after vertical FDI only for production activity in the short run. In our sample, mean of the sales ratio of subsidiaries in developing countries to parent is 26.8% and the coefficient for the variable is 0.0078. While the impacts of our study and theirs are not comparable, a back-to-the-envelop calculation shows that the effect on the markups is much smaller than the effect on the TFP.

[13] In Appendix Table A2, we show the estimation results of regressing the markup indicators of foreign subsidiaries on the variables of the foreign subsidiaries and the parent company in Japan. The foreign subsidiaries impose higher markups if they export Japan and do not import from Japan. More interestingly, the markups of the foreign subsidiaries are positively correlated with the markups of their parent firms. The firms share the attributes of their products and production technology within the corporate group.

coefficients for vertical FDI dummy are larger than those for horizontal FDI dummy. Even though the production function and the elasticity of production with respect to the static input must be different across firms within the corporate group, in particular for the firms with vertical FDI, the results in Table 6 weakly suggest that the markup of the corporate group is higher if the parent firm own the foreign subsidiaries in developing countries, and the shifts of production processes with low markup to the developing countries can explain the difference of the markup indicators across FDI types.

3.3 Other measurement method

In this study, so far, the measurement of markup indicator is based on the assumptions that COGS is a variable cost and its elasticity of production is constant for each firm. While the method used in this study is a simplified version of De Loecker, Eeckhout, and Unger (2020), Traina (2018) insists that the findings of De Loecker, Eeckhout, and Unger (2020) do not hold if the variable cost is measured by OPEX instead of COGS. We, therefore, check the robustness of our results by using alternative measurement methods. Table 7 shows the estimation results with the markup indicators using OPEX and wagebills. In columns (1) and (2) of Table 7, we estimate the same equations as the columns (3) and (4) in Table 3, using the ratio of sales to OPEX as the markup indicator by adding SGA to COGS. Therefore, the columns (3) and (4) in Table 3 can be interpreted as the estimation results when we assume that COGS is a variable cost and SGA can be a fixed cost, while columns (1) and (2) in Table 7 is the estimation results when assuming that SGA is also a variable cost. When the markup is measured by the ratio of sales to OPEX, the coefficients for the FDI dummy are negative and statistically significant for both all industries and the manufacturing sector. In addition, the coefficients for the sales ratio of foreign subsidiaries are also negative and significant. The same results can be obtained when the markup is measured by the ratio of sales to wagebills. We report the estimation results in columns (3) and (4) in Table 7. As the case of OPEX, the coefficients for the FDI dummy and the sales ratio are all negative and statistically significant for both all industries and the manufacturing sector.

When we measure the markups by using COGS, on the one hand, we found that firms' expansion abroad weakly increases their markups. On the other hand, the markup indicators clearly decrease by the start or expansion of overseas production when they are measured by OPEX or wagebills. In order to make a consistent interpretation, we estimate the similar equations using the cost measures as the dependent variables. The results are reported in Table 8. In columns (1) and (2), log of COGS is used as the dependent variable. The results are consistent with Table 2. While FDI has negligible impacts on the cost, exporting firms pay lower cost for their sales. Note that the coefficients of the sales are approximately one, suggesting that our dependent variable in the baseline estimation of the markup is valid. Columns (3) and (4) in Table 8 show the results of the estimation using log of OPEX as the dependent variable. The coefficient for the FDI dummy is positive and statistically significant, and the coefficient for the sales ratio of the foreign subsidiary is also significant for all industries. The dependent variable in columns (5) and (6) is log of the wagebills and the coefficients for the FDI variables are qualitatively similar to columns (3) and (4). Finally, we regress log of SGA on the same explanatory variables and report the results in columns (7) and (8). Given that OPEX is the sum of COGS and SGA, these results show that more SGA is involved with the overseas production and that the parent company incurs a part of costs,

or SGA, in particular, for the foreign subsidiaries. Another interesting insight from Table 8 is that the coefficients of sales is clearly less than one for wagebills and SGA, suggesting that these costs do not dependent on sale, or somewhat fixed, in other words. If this conjecture is true, using COGS as a variable cost is a more appropriate method to measure the markups, as insisted by De Loecker, Eeckhout, and Unger (2020). The use of OPEX would lead to an underestimation of the markup for the parent company.

4. Concluding remark

Using parent-foreign subsidiary matched data on Japan from 1997 to 2018, we first find that for manufacturing firms, the parent firm increases markups with the intensive margin of FDI while the parent firm does not significantly change markups in response to the FDI status. Second, we find that the average markup of the corporate group, i.e., the weighted average of the markups changed by the parent firm and foreign subsidiaries, increases with the intensive margin of FDI for manufacturing firms. Finally, we find that if we divide the host countries into developed and developing economies, a positive effect of the intensive margin of FDI on markups is observed only for FDI to developing economies. Overall, our results suggest that firms increase markups by increasing vertical FDI.

Our estimation of markups relies on some identification assumptions. Specifically, we have assumed that the elasticity of production with respect to a variable input is constant within a specific firm and industry-year. Moreover, while we control for various firm characteristics variables to estimate the effect of FDI on markups, we do not use an exogenous shock to FDI that would more clearly estimate the causal effects. Regardless of these limitations, we believe that the results of this study have some important implications. In particular, a higher markup of the parent firm of a multinational suggests that an increase in its output would improve the efficiency of resource allocation across firms, although a larger size of a parent firm may eventually strengthen their market power and induce a further rise in their markup. It is left for future work to evaluate such a long-run effects of FDI on markups and thereby on the aggregate economy.

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Table 1. Descriptive Statistics

Variables	N	mean	min	p25	median	p75	max
All							
mu_cogs	563,903	1.468	0.940	1.139	1.242	1.419	15.719
mu_opex	565,595	1.031	0.780	1.005	1.021	1.048	1.329
mu_wagebill	567,912	9.273	1.321	4.038	6.530	11.005	83.430
mu_cogs_consolidated	563,933	1.475	0.940	1.141	1.244	1.425	16.324
mu_opex_consolidated	565,517	1.032	0.782	1.005	1.021	1.050	1.417
FDI dummy	579,772	0.100	0	0	0	0	1
Horizontal FDI dummy	579,772	0.028	0	0	0	0	1
Vertical FDI dummy	579,772	0.072	0	0	0	0	1
Exporter dummy	579,772	0.180	0	0	0	0	1
Importer dummy	579,772	0.187	0	0	0	0	1
Total assets	579,749	19,389	0	1,523	3,246	7,943	17,716,994
Firm age	579,772	40	0	26	40	53	302
R&D dummy	579,772	0.264	0	0	0	1	1
Sales growth	521,370	0.000	-5.854	-0.061	0.003	0.066	5.958
Cashflow	512,540	0.049	-108.062	0.018	0.041	0.074	121.885
Positive value							
Sales ratio (Affiliate/Parent)	52,732	0.372	0.000	0.040	0.144	0.418	200.283
Sales ratio (Affiliate in developed/Parent)	25,363	0.284	0.000	0.033	0.123	0.330	44.592
Sales ratio (Affiliate in developing/Parent)	46,318	0.268	0.000	0.029	0.101	0.290	155.691
Export/Sales	104,542	0.126	0.000	0.009	0.044	0.159	1.000
Import/Sales	108,650	0.111	0.000	0.009	0.037	0.136	3.418
Export to related/Sales	42,710	0.089	0.000	0.007	0.031	0.107	1.000
Import from related/Sales	38,886	0.107	0.000	0.006	0.030	0.128	1.541

Notes: In this table, we do not take logarithm of the variables we take logarithm of in the regression analyses. Markup indicators are trimmed 1% tails. Rows in "All" show the statistics of the variables calculated from the whole sample. Rows in "Positive value" shows the statistics of the variables for the observations with a positive value on each variable.

Source: Authors' compilation, using Basic Survey of Japanese Business Structure and Activities and Basic Survey on Overseas Business Activities (METI).

Table 2. Baseline results

Dependent variable: ln(mu_cogs)	(1)	(2)	(3)	(4)
Sample	all	manufacturing	all	manufacturing
FDI dummy	-0.000979	-0.000598	-0.00101	-0.000972
	[0.00178]	[0.00198]	[0.00178]	[0.00201]
Sales ratio (Affiliate/Parent)	0.0036	0.00534	0.00367	0.0059
	[0.00270]	[0.00211]**	[0.00271]	[0.00219]***
Export dummy	0.000723	0.00129	0.000417	0.000906
	[0.00109]	[0.00129]	[0.00112]	[0.00130]
Export/Sales	0.0211	0.024	0.0211	0.0237
	[0.00465]***	[0.00492]***	[0.00495]***	[0.00507]***
Export to related/Sales	0.0109	0.000196	0.0137	0.00169
	[0.00935]	[0.00956]	[0.00982]	[0.00970]
Import dummy	0.0042	0.00238	0.00424	0.00237
	[0.00101]***	[0.00113]**	[0.00104]***	[0.00116]**
Import/Sales	-0.0476	-0.0428	-0.0408	-0.0421
	[0.00594]***	[0.00692]***	[0.00603]***	[0.00723]***
Import from related/Sales	-0.0331	-0.0232	-0.0365	-0.0252
	[0.00948]***	[0.0104]**	[0.00976]***	[0.0108]**
Total assets			-0.00309	0.00386
			[0.00146]**	[0.00160]**
Firm age			0.00303	0.00563
			[0.00274]	[0.00280]**
R&D dummy			0.00409	0.00337
			[0.000932]***	[0.000898]***
Sales growth			0.00107	0.0221
			[0.00163]	[0.00259]***
Cashflow			0.0132	0.0708
			[0.00654]**	[0.0328]**
Firm fixed effect	yes	yes	yes	yes
Industry*year fixed effect	yes	yes	yes	yes
N	557,924	249,416	495,167	227,569
Adj R-squared	0.000747	0.00126	0.00233	0.0224

Notes: Standard errors are in brackets. * p<0.1, ** p<0.05, *** p<0.01.

Source: Authors' estimation, using Basic Survey of Japanese Business Structure and Activities and Basic Survey on Overseas Business Activities (METI).

Table 3. Markups and FDI types

Dependent variable: ln(mu_cogs)	(1)	(2)	(3)	(4)
Sample	all	manufacturing	all	manufacturing
Horizontal FDI dummy	-0.00562	-0.00307	-0.00583	-0.00417
	[0.00332]*	[0.00309]	[0.00339]*	[0.00317]
Vertical FDI dummy	0.000184	-0.000173	0.000221	-0.000387
	[0.00185]	[0.00204]	[0.00185]	[0.00206]
Sales ratio (Affiliate in developed/Parent)	0.0188	0.004	0.0202	0.00464
	[0.0128]	[0.00287]	[0.0133]	[0.00328]
Sales ratio (Affiliate in developing/Parent)	-0.00245	0.00646	-0.00293	0.00702
	[0.00349]	[0.00284]**	[0.00350]	[0.00269]***
Export dummy	0.000751	0.0013	0.000452	0.000927
	[0.00109]	[0.00129]	[0.00112]	[0.00130]
Export/Sales	0.0209	0.024	0.0208	0.0236
	[0.00465]***	[0.00492]***	[0.00495]***	[0.00507]***
Export to related/Sales	0.00932	0.000169	0.0119	0.00161
	[0.00940]	[0.00954]	[0.00988]	[0.00968]
Import dummy	0.00423	0.00239	0.00426	0.00237
	[0.00101]***	[0.00113]**	[0.00104]***	[0.00116]**
Import/Sales	-0.0475	-0.0431	-0.0407	-0.0423
	[0.00594]***	[0.00694]***	[0.00603]***	[0.00725]***
Import from related/Sales	-0.0323	-0.0241	-0.0356	-0.0262
	[0.00949]***	[0.0104]**	[0.00976]***	[0.0108]**
Total assets			-0.00309	0.00389
			[0.00146]**	[0.00160]**
Firm age			0.00309	0.00576
			[0.00274]	[0.00280]**
R&D dummy			0.00408	0.00339
			[0.000929]***	[0.000898]***
Sales growth			0.00113	0.0221
			[0.00163]	[0.00259]***
Cashflow			0.0132	0.0708
			[0.00654]**	[0.0328]**
Firm fixed effect	yes	yes	yes	yes
Industry*year fixed effect	yes	yes	yes	yes
N	557,924	249,416	495,167	227,569
Adj R-squared	0.00101	0.00128	0.00273	0.0225

Notes: Standard errors are in brackets. * p<0.1, ** p<0.05, *** p<0.01.

Source: Authors' estimation, using Basic Survey of Japanese Business Structure and Activities and Basic Survey on Overseas Business Activities (METI).

Table 4. Markups and FDI types in separate estimations

Dependent variable: ln(mu_cogs)	(1)	(2)	(3)	(4)
FDI type	Horizontal	Horizontal	Vertical	Vertical
Sample	all	manufacturing	all	manufacturing
Sales ratio (Affiliate/Parent)	0.0189	0.00176	0.00161	0.00784
	[0.0110]*	[0.00172]	[0.000492]***	[0.00308]**
Export dummy	0.00416	-0.00116	-0.00126	-0.00284
	[0.00545]	[0.00501]	[0.00221]	[0.00235]
Export/Sales	0.0412	0.0413	0.00693	0.0104
	[0.0159]***	[0.0170]**	[0.00845]	[0.00925]
Export to related/Sales	-0.0126	-0.00707	0.0129	0.00288
	[0.0221]	[0.0199]	[0.0147]	[0.0164]
Import dummy	-0.00239	-0.000343	0.00247	0.00262
	[0.00413]	[0.00422]	[0.00189]	[0.00205]
Import/Sales	-0.0249	-0.0373	-0.048	-0.0676
	[0.0191]	[0.0194]*	[0.00958]***	[0.0133]***
Import from related/Sales	-0.0367	-0.0564	-0.0278	-0.00448
	[0.0339]	[0.0426]	[0.0127]**	[0.0149]
Total assets	-0.000201	0.00435	0.00781	-0.00085
	[0.00680]	[0.00690]	[0.00462]*	[0.00464]
Firm age	0.000661	-0.0045	-0.0127	-0.0233
	[0.0160]	[0.0168]	[0.00871]	[0.00801]***
R&D dummy	0.0106	0.00336	0.000601	0.00356
	[0.00875]	[0.00426]	[0.00169]	[0.00191]*
Sales growth	0.0228	0.0125	0.0257	0.025
	[0.0101]**	[0.00899]	[0.00365]***	[0.00516]***
Cashflow	0.38	0.421	0.000149	0.224
	[0.0444]***	[0.0450]***	[0.00227]	[0.0638]***
Firm fixed effect	yes	yes	yes	yes
Industry*year fixed effect	yes	yes	yes	yes
N	14,760	10,482	38,355	24,915
Adj R-squared	0.0813	0.0861	0.00999	0.0851

Notes: Standard errors are in brackets. * p<0.1, ** p<0.05, *** p<0.01.

Source: Authors' estimation, using Basic Survey of Japanese Business Structure and Activities and Basic Survey on Overseas Business Activities (METI).

Table 5. Markups for consolidated corporate group

Dependent variable	(1) ln(mu_cogs_consolidated)	(2) ln(mu_cogs_consolidated)	(3) ln(mu_cogs_consolidated)	(4) ln(mu_cogs_consolidated)
Sample	all	manufacturing	all	manufacturing
FDI dummy	0.0132	0.0164	0.0127	0.0155
	[0.00212]***	[0.00262]***	[0.00217]***	[0.00271]***
Sales ratio (Affiliate/Parent)	0.00179	0.0136	0.00193	0.0144
	[0.00141]	[0.00674]**	[0.00144]	[0.00681]**
Export dummy	-0.000389	0.0000901	-0.000821	-0.000547
	[0.00114]	[0.00138]	[0.00118]	[0.00141]
Export/Sales	0.0544	0.0536	0.0572	0.0558
	[0.00604]***	[0.00643]***	[0.00648]***	[0.00678]***
Import dummy	0.00399	0.00144	0.0039	0.00116
	[0.00108]***	[0.00129]	[0.00112]***	[0.00134]
Import/Sales	-0.0207	0.0108	-0.0113	0.0148
	[0.00795]***	[0.0106]	[0.00831]	[0.0113]
Total assets			-0.0031	0.00438
			[0.00149]**	[0.00172]**
Firm age			0.00288	0.00463
			[0.00283]	[0.00304]
R&D dummy			0.00376	0.00301
			[0.000945]***	[0.000950]***
Sales growth			0.00122	0.0223
			[0.00168]	[0.00271]***
Cashflow			0.0127	0.0708
			[0.00665]*	[0.0328]**
Firm fixed effect	yes	yes	yes	yes
Industry*year fixed effect	yes	yes	yes	yes
N	557,944	249,373	495,174	227,523
Adj R-squared	0.00104	0.00406	0.00248	0.02

Notes: Standard errors are in brackets. * p<0.1, ** p<0.05, *** p<0.01.

Source: Authors' estimation, using Basic Survey of Japanese Business Structure and Activities and Basic Survey on Overseas Business Activities (METI).

Table 6. Markups for consolidated corporate group by FDI types

Dependent variable	(1) ln(mu_cogs_consolidated)	(2) ln(mu_cogs_consolidated)	(3) ln(mu_cogs_consolidated)	(4) ln(mu_cogs_consolidated)
Sample	all	manufacturing	all	manufacturing
Horizontal FDI dummy	0.0096	0.0103	0.00855	0.00783
	[0.00404]**	[0.00571]*	[0.00416]**	[0.00585]
Vertical FDI dummy	0.0139	0.018	0.0135	0.0175
	[0.00215]***	[0.00259]***	[0.00219]***	[0.00266]***
Sales ratio (Affiliate in developed/Parent)	0.00162	0.0308	0.00272	0.0333
	[0.00879]	[0.0214]	[0.00896]	[0.0214]
Sales ratio (Affiliate in developing/Parent)	0.00186	0.00753	0.00167	0.00773
	[0.00284]	[0.00771]	[0.00289]	[0.00778]
Export dummy	-0.000373	0.000155	-0.000798	-0.000457
	[0.00114]	[0.00138]	[0.00118]	[0.00141]
Export/Sales	0.0544	0.0529	0.0571	0.055
	[0.00602]***	[0.00645]***	[0.00646]***	[0.00681]***
Import dummy	0.004	0.00144	0.0039	0.00116
	[0.00108]***	[0.00129]	[0.00112]***	[0.00134]
Import/Sales	-0.0209	0.0111	-0.0116	0.0152
	[0.00795]***	[0.0107]	[0.00832]	[0.0113]
Total assets			-0.00308	0.0043
			[0.00149]**	[0.00172]**
Firm age			0.00295	0.0049
			[0.00283]	[0.00304]
R&D dummy			0.00377	0.00302
			[0.000945]***	[0.000949]***
Sales growth			0.00122	0.0223
			[0.00168]	[0.00271]***
Cashflow			0.0127	0.0708
			[0.00665]*	[0.0327]**
Firm fixed effect	yes	yes	yes	yes
Industry*year fixed effect	yes	yes	yes	yes
N	557,944	249,373	495,174	227,523
Adj R-squared	0.00105	0.00432	0.00249	0.0204

Notes: Standard errors are in brackets. * p<0.1, ** p<0.05, *** p<0.01.

Source: Authors' estimation, using Basic Survey of Japanese Business Structure and Activities and Basic Survey on Overseas Business Activities (METI).

Table 7. Alternative measures of markups

	(1)	(2)	(3)	(4)
Dependent variable	ln(mu_opex)	ln(mu_opex)	ln(mu_wagebill)	ln(mu_wagebill)
Sample	all	manufacturing	all	manufacturing
FDI dummy	-0.00485	-0.00427	-0.0216	-0.0216
	[0.000726]***	[0.00108]***	[0.00569]***	[0.00726]***
Sales ratio (Affiliate/Parent)	-0.00253	-0.00374	-0.0351	-0.0319
	[0.00104]**	[0.00136]***	[0.00895]***	[0.0102]***
Export dummy	-0.000692	-0.0011	-0.0115	-0.0163
	[0.000451]	[0.000615]*	[0.00343]***	[0.00436]***
Export/Sales	0.0125	0.0136	0.0895	0.0768
	[0.00234]***	[0.00289]***	[0.0169]***	[0.0199]***
Export to related/Sales	-0.00381	-0.00509	-0.0168	-0.00354
	[0.00478]	[0.00533]	[0.0303]	[0.0320]
Import dummy	0.000964	0.00103	-0.0146	-0.00783
	[0.000411]**	[0.000577]*	[0.00316]***	[0.00405]*
Import/Sales	-0.0129	-0.0168	0.159	0.191
	[0.00244]***	[0.00390]***	[0.0219]***	[0.0316]***
Import from related/Sales	-0.0115	-0.0158	0.0797	0.0772
	[0.00357]***	[0.00528]***	[0.0317]**	[0.0445]*
Total assets	0.00907	0.0102	0.145	0.178
	[0.000395]***	[0.000804]***	[0.00380]***	[0.00586]***
Firm age	0.00239	0.00379	-0.0678	-0.076
	[0.000711]***	[0.00123]***	[0.00668]***	[0.0100]***
R&D dummy	-0.000475	-0.000836	-0.0223	-0.023
	[0.000320]	[0.000416]**	[0.00253]***	[0.00311]***
Sales growth	0.0367	0.0475	0.256	0.28
	[0.000730]***	[0.00240]***	[0.00365]***	[0.00534]***
Cashflow	0.0133	0.0701	0.0142	0.0687
	[0.00667]**	[0.0327]**	[0.00741]*	[0.0334]**
Firm fixed effect	yes	yes	yes	yes
Industry*year fixed effect	yes	yes	yes	yes
N	496,346	227,004	498,689	230,600
Adj R-squared	0.055	0.109	0.0646	0.084

Notes: Standard errors are in brackets. * p<0.1, ** p<0.05, *** p<0.01.

Source: Authors' estimation, using Basic Survey of Japanese Business Structure and Activities and Basic Survey on Overseas Business Activities (METI).

Table 8. Cost and FDI

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable	ln(cogs)	ln(cogs)	ln(opex)	ln(opex)	ln(wagebill)	ln(wagebill)	ln(sga)	ln(sga)
Sample	all	manufacturing	all	manufacturing	all	manufacturing	all	manufacturing
Sales	1.057	1	0.963	0.947	0.547	0.497	0.589	0.542
	[0.00507]***	[0.00347]***	[0.00207]***	[0.00252]***	[0.00639]***	[0.00786]***	[0.00741]***	[0.0109]***
FDI dummy	-0.00161	-0.000562	0.00538	0.00367	0.0303	0.0281	0.0434	0.039
	[0.00225]	[0.00212]	[0.000958]***	[0.00134]***	[0.00548]***	[0.00671]***	[0.00558]***	[0.00774]***
Sales ratio (Affiliate/Parent)	-0.00389	-0.00373	0.0105	0.00466	0.00416	-0.00571	0.0178	0.0348
	[0.00342]	[0.00235]	[0.00203]***	[0.00305]	[0.00140]***	[0.00494]	[0.00281]***	[0.0108]***
Export dummy	-0.000364	-0.001	0.00147	0.00209	0.0171	0.0237	0.0199	0.0317
	[0.00147]	[0.00136]	[0.000574]**	[0.000767]***	[0.00329]***	[0.00402]***	[0.00398]***	[0.00548]***
Export/Sales	-0.0269	-0.022	-0.0161	-0.0151	-0.0534	-0.0585	0.0754	0.0845
	[0.00626]***	[0.00560]***	[0.00366]***	[0.00395]***	[0.0166]***	[0.0183]***	[0.0177]***	[0.0210]***
Export to related/Sales	-0.0349	-0.00952	-0.00654	-0.000224	0.0298	0.0239	0.09	0.0596
	[0.0153]**	[0.0107]	[0.00699]	[0.00767]	[0.0280]	[0.0300]	[0.0363]**	[0.0400]
Import dummy	-0.00456	-0.00312	-0.00075	-0.000732	0.0199	0.0157	0.0185	0.0204
	[0.00138]***	[0.00119]***	[0.000530]	[0.000702]	[0.00306]***	[0.00378]***	[0.00336]***	[0.00477]***
Import/Sales	0.0656	0.0486	0.0264	0.0322	-0.134	-0.167	-0.0601	-0.0596
	[0.0122]***	[0.00809]***	[0.00484]***	[0.00604]***	[0.0216]***	[0.0302]***	[0.0215]***	[0.0358]*
Import from related/Sales	0.0795	0.0196	0.0112	0.0143	-0.0783	-0.0593	-0.0332	-0.0283
	[0.0278]***	[0.0109]*	[0.00529]**	[0.00708]**	[0.0296]***	[0.0434]	[0.0330]	[0.0527]
Total assets	-0.0301	-0.0057	0.0123	0.0223	0.135	0.149	0.169	0.208
	[0.00356]***	[0.00276]**	[0.00147]***	[0.00178]***	[0.00491]***	[0.00675]***	[0.00589]***	[0.00942]***
Firm age	-0.0111	-0.00643	-0.00303	-0.00331	0.0969	0.109	0.0345	0.0476
	[0.00433]**	[0.00296]**	[0.00117]***	[0.00178]*	[0.00658]***	[0.00970]***	[0.00838]***	[0.0145]***
R&D dummy	-0.00389	-0.00289	0.0015	0.00235	0.0298	0.0297	0.0466	0.0552
	[0.00140]***	[0.00104]***	[0.000467]***	[0.000601]***	[0.00245]***	[0.00300]***	[0.00326]***	[0.00440]***
Sales growth	-0.0312	-0.0349	-0.0459	-0.0515	-0.111	-0.114	-0.0958	-0.102
	[0.00363]***	[0.00323]***	[0.00263]***	[0.00375]***	[0.00398]***	[0.00516]***	[0.00467]***	[0.00730]***
Cashflow	-0.0171	-0.0839	-0.0166	-0.0835	-0.00791	-0.0242	-0.0178	-0.083
	[0.00867]**	[0.0363]**	[0.00869]*	[0.0364]**	[0.00391]**	[0.0150]	[0.0101]*	[0.0385]**
Firm fixed effect	yes	yes	yes	yes	yes	yes	yes	yes
Industry*year fixed effect	yes	yes	yes	yes	yes	yes	yes	yes
N	504,874	232,143	505,698	231,826	507,760	232,363	506,660	231,508
Adj R-squared	0.745	0.905	0.97	0.966	0.337	0.312	0.386	0.337

Notes: Standard errors are in brackets. * p<0.1, ** p<0.05, *** p<0.01.

Source: Authors' estimation, using Basic Survey of Japanese Business Structure and Activities and Basic Survey on Overseas Business Activities (METI).

Appendix

Table A1. Definition of variables

Variables	Description	Source
mu_cogs	Sales/Cost of goods sold, 1% tails trimmed	BSJBSA
mu_opex	Sales/Operating expenses, 1% tails trimmed	BSJBSA
mu_wagebill	Sales/Wagebill, 1% tails trimmed	BSJBSA
mu_cogs_consolidated	(Sales of parent+Sales of subsidiaries-Transaction of parent with related companies)/(Cost of goods sold of parent+Cost of goods sold of subsidiaries-Transaction of parent with related companies), 1% tails trimmed	BSJBSA and BSOBA
mu_opex_consolidated	(Sales of parent+Sales of subsidiaries-Transaction of parent with related companies)/(Operating expenses of parent+Operating expenses of subsidiaries-Transaction of parent with related companies), 1% tails trimmed	BSJBSA and BSOBA
FDI dummy	Dummy that takes value one if there is an overseas subsidiary	BSJBSA
Horizontal FDI dummy	Dummy that takes value one if the firm has a subsidiary in OECD countries	BSJBSA and BSOBA
Vertical FDI dummy	Dummy that takes value one if the firm has a subsidiary in non-OECD countries	BSJBSA and BSOBA
Exporter dummy	Dummy that takes value one if firms export, and zero otherwise	BSJBSA
Importer dummy	Dummy that takes value one if firms import, and zero otherwise	BSJBSA
Total assets	ln(Total assets)	BSJBSA
Firm age	ln(Survey year - Established year)	BSJBSA
R&D dummy	Dummy that takes value one 1 if firms perform R&D	BSJBSA
Sales growth	ln(sales(t)/sales(t-1))	BSJBSA
Cashflow	(Operating profits+depreciation)/Total assets(t-1)	BSJBSA
Sales ratio (Affiliate/Parent)	Ratio of sales of subsidiaries to sales of the parent firm	BSJBSA and BSOBA
Sales ratio (Affiliate in developed/Parent)	Ratio of sales of subsidiaries located in developed countries (OECD countries) to parent firm's sales	BSJBSA and BSOBA
Sales ratio (Affiliate in developing/Parent)	Ratio of sales of subsidiaries located in developing countries (non-OECD countries) to parent firm's sales	BSJBSA and BSOBA
Export/Sales	Ratio of export to sales	BSJBSA
Import/Sales	Ratio of import to sales	BSJBSA
Export to related/Sales	Ratio of export of parent to related companies to sales	BSJBSA
Import from related/Sales	Ratio of import of parent from related companies to sales	BSJBSA

Notes: BSJBSA and BSOBA are abbreviations of Basic Survey of Japanese Business Structure and Activities and Basic Survey on Overseas Business Activities (METI), respectively.

Table A2. Markups of foreign affiliates

Dependent variable: ln(mu_cogs)	(1)	(2)	(3)	(4)
Sample	all	manufacturing	all	manufacturing
Variables of foreign affiliates				
Export to Japan dummy	0.00565	0.00478	0.00569	0.00448
	[0.00238]**	[0.00262]*	[0.00242]**	[0.00265]*
Import from Japan dummy	-0.0101	-0.00928	-0.00957	-0.00823
	[0.00258]***	[0.00293]***	[0.00263]***	[0.00300]***
Employment	-0.0000129	0.00267	0.000376	0.00324
	[0.00189]	[0.00233]	[0.00192]	[0.00237]
R&D dummy	-0.000401	0.000593	0.000352	0.000825
	[0.00305]	[0.00337]	[0.00308]	[0.00340]
Variables of parent company				
ln(mu_cogs)	0.0512	0.0496	0.0563	0.0516
	[0.0144]***	[0.0164]***	[0.0150]***	[0.0164]***
Export dummy			0.000657	0.0039
			[0.00459]	[0.00518]
Export/Sales			-0.0225	-0.0251
			[0.00872]***	[0.00949]***
Import dummy			0.000916	0.000295
			[0.00320]	[0.00361]
Import/Sales			-0.00773	-0.00872
			[0.0122]	[0.0128]
Total assets			-0.0131	-0.014
			[0.00455]***	[0.00578]**
Firm age			-0.0093	-0.00708
			[0.00558]*	[0.00706]
R&D dummy			0.00339	-0.000353
			[0.00380]	[0.00484]
Sales growth			0.0043	0.00717
			[0.00410]	[0.00515]
Cashflow			-0.00891	0.0198
			[0.0109]	[0.0188]
Foreign affiliates fixed effect	yes	yes	yes	yes
Industry*year fixed effect	yes	yes	yes	yes
N	207,698	141,738	202,318	138,161
Adj R-squared	0.000356	0.000327	0.000574	0.000548

Notes: Standard errors are in brackets. * p<0.1, ** p<0.05, *** p<0.01.

Source: Authors' estimation, using Basic Survey of Japanese Business Structure and Activities and Basic Survey on Overseas Business Activities (METI).