RIETI Discussion Paper Series 22-E-023

Fixed Costs in Exporting and Investing

BAEK, Youngmin
Fukuyama University

HAYAKAWA, Kazunobu
Institute of Developing Economies

RIETI
Research Institute of Economy, Trade & Industry, IAA

The Research Institute of Economy, Trade and Industry
https://www.rieti.go.jp/en/

RIETI Discussion Paper Series 22-E-023
March 2022

Fixed Costs in Exporting and Investing[1]

Youngmin BAEK (Fukuyama University)

Kazunobu HAYAKAWA (Institute of Developing Economies)

Abstract: This study quantifies the fixed costs of export and outward foreign direct investment (FDI). Specifically, we compute the ratio of fixed costs for FDI to those for exports, which is called the "fixed cost ratio" (FCR). To do so, we solve an equation derived from the theoretical model of the choice between exporting and FDI. We apply this method to exports and FDI from Japan to 68 countries during the period 2002-2018. Our findings can be summarized as follows: In terms of median values, the FCR is estimated to be approximately 10, indicating that the fixed costs for FDI are approximately 10 times higher than those for exports. Furthermore, our regression analyses on the determinants of the FCR show a significantly negative effect of regional trade agreements (RTAs) on the FCR, which indicates that RTAs contribute to reducing fixed costs of FDI more greatly than those of exporting. This result has important implications for the RTAs' trade creation effect. Finally, we conduct simulation analyses of the effect of RTAs on the ratio of exports to FDI sales.

Keywords: Regional trade agreement; Exporting; Foreign direct investment; Fixed costs
JEL classification: F15; F53

[1]. This study was conducted as part of the Project "Globalization and the Japanese Economy: Firm Adjustment and Global Trade Governance" at the Research Institute of Economy, Trade and Industry (RIETI). This study utilizes the micro data of the questionnaire information based on the "Basic Survey on Overseas Business Activities," which is conducted by the Ministry of Economy, Trade and Industry (METI). We would like to thank Eiichi Tomiura, Masayuki Morikawa, Shujiro Urata, and seminar participants at RIETI for their invaluable comments. This work was supported by JSPS KAKENHI Grant Number 17H02530. All remaining errors are ours.
[#] Corresponding author: Kazunobu Hayakawa; Address: Bangkok Research Center, Japan External Trade Organization, 16th Floor, Nantawan Building, 161 Rajadamri Road, Pathumwan, Bangkok 10330, Thailand; Tel: 66-2-253-6441; Fax: 66-2-254-1447; E-mail: kazunobu_hayakawa@ide-gsm.org

1. Introduction

Various costs for exporting and investing have become crucial obstacles for firms' business internationalization. It is costly for firms to search for and find customers in foreign countries. Exporting requires firms to acquire knowledge of international settlement and customs formalities. Firms need to establish overseas offices/factories and acquire knowledge of local laws and labor practices when conducting foreign direct investment (FDI). They must bear monetary and non-monetary internalization costs. These costs are not necessarily directly associated with the magnitude of their production or sales, and become fixed costs for exporting or FDI. Only firms for which the gains from international activities exceed these costs can internationalize their activities. Many empirical studies have found that such firms tend to be highly productive and large (e.g., Bernard and Jensen, 1999; Kimura and Kiyota, 2006).

Several studies have quantified the fixed costs for international activities, especially exports. For example, using plant-level data for Colombia, Das et al. (2007) find that the sunk costs for exporting amount to about 400 thousand USD, while the annual fixed costs for exporting are almost zero. Using firm-level export data for Chile, Morales et al. (2019) obtain similar results in that sunk costs are much larger than annual fixed costs. However, Albornoz et al. (2016) used firm-level export data of Argentina to find the opposite order. On the other hand, Kropf and Sauré (2014) computed fixed costs per export shipment using Swiss export data rather than those for annual total exports. Using the firm-level export data of Bangladesh, Cherkashin et al. (2015) estimated the market entry costs via exporting to the EU as 251 thousand USD and the U.S. as 68 thousand USD.[1]

This study quantifies the fixed costs of exporting and outward FDI from Japan. While several existing studies have estimated the magnitude of fixed costs for exporting, to the best of our knowledge, no studies quantify those for FDI. Specifically, we compute the ratio of fixed costs for FDI to those of exports, which is called the "fixed cost ratio" (FCR). To do so, we rely on the theoretical model developed by Helpman et al. (2004), which introduces firm heterogeneity into firms' choice between exporting and FDI. They demonstrate that firms with a high productivity range choose FDI, those with a medium productivity range export, and those with a low productivity range do not engage in international activities. Our approach is to solve one key equation in Helpman et al. (2004), which expresses the ratio of export sales to FDI sales as a function of wages in home and foreign countries, trade costs from home to foreign countries, the FCR, and some other parameters (i.e., the elasticity of substitution and the shape parameter of productivity distribution). As explained in the next section, we have data for all variables and parameters except FCR. Thus, by solving this equation, we can obtain the FCR.

Using this method, we compute the FCR in Japan by (export destination or FDI host)

[1] There are also several studies that compute variable trade costs. See, for example, Jacks et al. (2008, 2011).

countries (68 countries), industries (two-digit level), and years (2002-2018). This ratio will be useful to see how high the fixed costs for FDI are compared to exports. After computing this ratio, we regressed it on various possible elements to uncover the determinants of these fixed costs. Particularly, we shed light on the role of regional trade agreements (RTAs). It is important to uncover the effects of RTAs on FCR because they are associated with the trade creation effect of RTAs. If RTAs contribute to reducing fixed costs for FDI more greatly than those for exporting, RTAs may decrease exports to member countries by increasing (horizontal) the FDI in those countries. Such a reduction might be realized, especially in the long run, when tariff elimination scheduled in RTAs is completed. In addition to RTAs, we examine the effects of various elements including the bilateral investment treaty (BIT), institutional variables, and exchange rates. Finally, we also conduct simulation analyses on the effect of RTAs on the ratio of exports to FDI sales using the estimates of FCRs and those of the effect of RTAs on FCRs.

Our findings can be summarized as follows: In terms of median values, the FCR is estimated to be approximately 10, indicating that fixed costs for investing are approximately 10 times higher than those for exports. These values decline over time. We also see some variations in the FCR by industry and region. Our regression analyses on the determinants of FCR show a significantly negative effect of RTAs on FCR, which indicates that RTAs contribute to reducing fixed costs for FDI more greatly than those for exporting. The improvement of institutional quality by some FDI-related provisions in RTAs (e.g., chapters on investment and intellectual property rights) may be a critical source of such reduction. Moreover, this result implies that if the magnitude of tariff reduction through RTAs is small, RTAs may increase FDI to partner countries more than exports. This negative effect appears a year after their entry into force. Our simulation analysis shows that RTA with China dramatically decreases the ratio of exports to FDI sales in most industries. That is, it increases FDI sales to China more than exports.

The remainder of this paper is organized as follows. The next section explains the empirical framework. Section 3 reports empirical results, including the computation of FCRs, regression analyses of their determinants, and simulation analyses of RTAs' effects. Finally, section 4 concludes the study.

2. Empirical Framework

In this section, we present an empirical framework to quantify the FCR. Our approach is based on the model developed by Helpman et al. (2004), which includes two modes of serving a foreign market: export and FDI. Export requires firms to incur trade costs such as freight costs and tariffs. FDI firms toned not incur such trade costs, but pay higher fixed costs (e.g., building another production facility) than exporting firms do. Labor costs are also different in the two modes because exporting firms employ labor in their home country,

while FDI firms employ labor in the host country. Consequently, the mode with higher profit differs depending on the firm's productivity.

One of the key equations in their model (Equation 11) is:

$$\frac{S_X}{S_I} = (\omega\tau)^{1-\varepsilon}\left\{\left[\frac{f_I - f_X}{f_X}\frac{1}{(\omega\tau)^{\varepsilon-1}-1}\right]^{\frac{k-(\varepsilon-1)}{\varepsilon-1}} - 1\right\}. \quad (1)$$

For simplicity, we omit the subscripts for home and foreign countries and industries. S_X represents the total exports of the concerned industry from the home country to the foreign country. Similarly, S_I indicates total sales in the foreign country by firms in the industry that invested from the home country to the foreign country. ω is the ratio of home wage to foreign wage. τ is the trade cost of exports from the home country to foreign countries. f_I and f_X are the fixed costs for FDI and exports, respectively. Thus, we define the FCR as

$$FCR \equiv \frac{f_I}{f_X}. \quad (2)$$

k is a shape parameter of the Pareto distribution in firm productivity and ε is the elasticity of substitution.

Equation (1) demonstrates how the allocation of sales between export and FDI is associated with various elements when export and FDI firms coexist. For example, export sales relative to FDI sales increase when home wages relative to foreign wages are lower, trade costs are lower, and fixed costs for export relative to those for FDI are lower (i.e., FCR is higher). Rearranging Equation (1) yields the FCR as follows:

$$FCR = 1 + \left\{\frac{S_X}{S_I}(\omega\tau)^{\varepsilon-1} + 1\right\}^{\frac{\varepsilon-1}{k-(\varepsilon-1)}}\{(\omega\tau)^{\varepsilon-1} - 1\}. \quad (3)$$

We can compute FCR by applying observable data to each variable on the right-hand side of Equation (3). The numbers in the FCR should be interpreted as annualized values because the model is static. These costs include both sunk and nonsunk costs.

The following two conditions ensure that exporting and FDI firms coexist to serve the foreign market.

$$FCR > (\omega\tau)^{\varepsilon-1} \quad (4)$$

$$\omega\tau > 1 \quad (5)$$

Inequality (4) indicates that, for example, fixed costs for FDI are sufficiently high compared to trade costs in export. Inequality (5) ensures that home wages and trade costs, both of which are incurred in exporting, are sufficiently high. The second term on the right-hand side of Equation (1) becomes negative when inequality (4) is violated. Similarly, the second term on the right-hand side of equation (3) becomes negative if inequality (5) is violated. We check whether our estimates of the FCR and data on wages and trade costs meet these two conditions.

The data sources used to compute the FCR are as follows: We focus on Japan's exports and FDI in 68 manufacturing industries from to 2002-2018. These study countries are selected based on the existence of both exports and FDI from Japan, and are listed in

Appendix A. We chose the two-digit level in the International Standard Industrial Classification (ISIC) Revision 3 as our industry classification. All data below are aggregated at the industry level. The export data were obtained from CEPII.[2] It is called "BACI" database and is an updated version of the data provided in Gaulier and Zignago (2010). Data on sales in Japanese multinational enterprises (i.e., FDI sales) are obtained from the Basic Survey on Overseas Business Activities conducted by the Ministry of Economy, Trade, and Industry (METI), Japan.[3] Specifically, consistent with the theoretical model above, we use their local sales, that is, sales from the host market.[4] We also draw data on foreign wages from the survey. These (i.e., wages in Japan) were obtained from the Census of Manufacture by the METI. We use the elasticity of substitution and shape parameter of the productivity distribution estimated using data on manufacturing firms in France (Crozet and Koenig, 2010)[5].

The remaining variable is trade cost. The specifications of trade costs have not been explained so far. We use two types of trade cost measures. The first is the application of tariffs in foreign countries against products imported from Japan. The data were obtained from the World Integrated Trade Solutions. We take the simple average of the tariffs applied in each industry. The other measure considers freight costs. Data on freight costs from Japan to each country are unavailable. Thus, we estimate ad valorem freight costs by employing import data in the Philippines, which is geographically close to Japan and an island country like Japan. The details of this estimation are presented in Appendix B. Then, we use the product of tariffs and freight costs as trade costs. For example, when tariffs and freight costs are 10% and 5%, respectively, trade costs are 1.10 multiplied by 1.05. One drawback of this second measure is that we can only estimate freight costs during 2005-2018 due of data availability in the Philippines. Thus, we use both types of trade cost measure in our FCR computation. The measure using only the tariffs is called the "FCR-I," and the measure taking the freight costs into account is "FCR-II."

Before moving to the computation of FCRs, we provide an overview of the share of FDI sales out of total foreign sales (i.e., the sum of exports and FDI sales) to see the main mode of selling in the foreign market. The changes in these shares over time are shown in Figure 1. Share is computed by country, industry, and year. In the computation, we restrict the observations to those with positive FDI sales.[6] In this figure, we show the mean and

[2] http://www.cepii.fr/CEPII/en/bdd_modele/presentation.asp?id=37

[3] According to the explanation of this survey, the following overseas affiliates are covered; a foreign affiliate in which a Japanese corporation has invested capital of 10% or more; a foreign affiliate in which a subsidiary, funded more than 50% by a Japanese corporation, has invested capital of more than 50%; and a foreign affiliate in which a Japanese corporation and a subsidiary funded more than 50% by a Japanese corporation have invested capital of more than 50%.

[4] Namely, we do not include the sales to Japan and the third countries.

[5] One drawback is that their estimates do not include those in food manufacturing and several other industries.

[6] The trend is unchanged even if we use the balanced panel data where we restrict country-industry pairs

median values of these shares. Both values experienced a gradual rise, indicating that Japanese firms increase FDI sales more than exports to serve the foreign market. In 2018, both the values were approximately 30%.

=== Figure 1 ===

3. Empirical Results

We compute FCR in this section. After reporting variations in FCR by region, industry, and year, we examined the determinants of FCR by conducting regression analyses. Finally, we conducted a simulation analysis using our FCR estimates.

3.1. Computation of the FCR

We report the FCR computed using methods described in the previous section. It is worth noting that we were unable to compute the FCR for some observations in highly developed countries because of the violation of either or both inequalities (4) and (5). 31% of country-industry-year level observations that have positive values in both exports and FDI sales are dropped because of this violation.[7] The key reasons are that these countries have higher wages than Japan and lower tariffs against goods imported from Japan. These facts imply that firms have few incentives to invest in these countries compared to exports from Japan. Thus, inequality (5) is likely to be violated in highly developed countries. Nevertheless, we can retain around 70% of the observations, which is high enough to examine the whole picture of FCRs in Japan. As outliers, we drop observations with the top or bottom 1% of the FCRs.

The basic statistics for FCR-I are reported in Table 1. Huge mean values owing to the large maximum values were immediately observed. These values are particularly observed in countries where exports are much larger than FDI sales. In terms of median, the FCR is around 10, indicating that fixed costs for investing are approximately 10 times higher than those for exporting. The 25th and 75th percentiles of FCR were approximately 3 and 80, respectively. That is, there is a huge variation in the magnitude of the FCR across the observations. As shown in Table 2, these values do not change much in FCR-II, although we can compute FCR-II only after 2004 owing to data availability in freight costs. Time-series changes in the median values are shown in Figure 2. Although these values seem to decline over time, they experienced considerable increases during the global financial crisis. The

only to those with positive FDI sales in 2002.

[7] Out of observations with positive values in either or both exports and FDI sales, 95% have positive values in both of them. Thus, restricting to observations with positive values in both exports and FDI sales does not decrease our observations.

decline over time implies that fixed costs for investing decrease more significantly than those for exports.

=== Tables 1 & 2, Figure 2 ===

Next, we depict the basic statistics according to the two dimensions by restricting country-industry pairs in the latest year where FCRs can be computed. One dimension is by industries. This table shows the statistics for more aggregated industries (see Appendix C). The results for FCR-I and FCR-II are presented in Table 3. In terms of the median values, relatively large values can be found in the chemical, general machinery, and transport equipment industries. They require relatively large land areas and industrial machines in the factories. The construction and setup costs of these fixed assets may result in large FCRs. Other industries have median values of less than five.

=== Table 3 ===

Region is the other dimension to be observed. The results are presented in Table 4. African countries have the highest median values, followed by Asian countries. The median values in the other regions (i.e., the Americas, Europe, and Oceania) were relatively low. This result may indicate that more developed countries have lower fixed costs for investment than export countries. This finding suggests that institutional quality is related to the fixed costs of investing. In summary, we can see some variations in the FCR by industry and region.

=== Table 4 ===

3.2. Determinants of the FCR

Next, we empirically investigate the determinants of the FCR to determine how various elements affect its magnitude. Specifically, we estimate the following equation:

$$\ln FCR_{cit} = \beta_1 RTA_{ct} + \beta_2 BIT_{ct} + \mathbf{X}'_{ct}\boldsymbol{\gamma} + \mathrm{u}_{ci} + \mathrm{u}_{it} + \epsilon_{cit}. \quad (6)$$

FCR_{cit} is the FCR for country c in industry i in year t. RTA_{ct} (BIT_{ct}) is a dummy variable taking a value of one if country c has RTAs (BITs) with Japan in year t. $\mathbf{X}$ is a vector of control variables, including exchange rates (*exchange rates*), a share of domestic credit to private sector out of GDP (*domestic credit*)[8], the logistics performance index (*LPI*) as an indicator on

[8] According to the metadata in the World Development Indicators, domestic credit to private sector refers to financial resources provided to the private sector by financial corporations through loans, purchases of nonequity securities, and trade credits and other accounts receivable, that establish a claim

the logistics "friendliness" (the higher, the better), and human capital index (*human capital*) as an index on education, skills, and health conditions (the higher, the better). We also introduce institutional variables that indicate government effectiveness (*government*), political stability (*stability*), regulatory quality (*regulation*), and rule of law (*law*). These indices range from approximately -2.5 to 2.5, with higher values indicating better institutional quality.[9] We control for country-industry fixed effects (u_{ci}) and industry-year fixed effects (u_{it}). For example, the industry component in these fixed effects controls for differences in the size of the production facilities across industries. ϵ_{cit} is an error term.

We estimate Equation (6) by applying the ordinary least squares (OLS) method for the 64 countries during 2007-2018 (see Appendix A).[10] Our data sources are as follows: Data on exchange rates, domestic credit, and the LPI are drawn from the World Development Indicators. The four institutional variables are available in the Worldwide Government Indicators, while data on the human capital index are obtained from the UNCTADstat. The RTA dummy variable is constructed using the database updated by Egger and Larch (2008). The first RTA partner in Japan was Singapore, which entered into force in 2002. Subsequently, Japan increased its number of RTA partners. As of 2018, they have included 17 countries, mostly Southeast Asian countries. The existence of BITs was identified using information from the METI, Japan.[11] The first BIT for Japan was in Egypt and it entered into force in 1978. As of 2018, BITs with 28 countries, mostly developing countries, have been ratified.

These RTAs and BITs are expected to enhance institutional quality, rather than reduce monetary costs. RTAs by Japan generally include most chapters that are covered by modern RTAs worldwide.[12] Although these chapters may affect either or both the fixed costs for exporting and investing through various channels, the following chapters will have more direct effects on those costs.[13] First, the trade facilitation chapter directly reduces the fixed

---

for repayment.

[9] According to the metadata in the World Government Indicators, the political stability index measures perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism. Government effectiveness captures perceptions of the quality of public services and the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. The regulatory quality captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. The rule of law captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular, the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.

[10] Due to the availability of data for LPI, we focus on the period from 2007.

[11] https://www.meti.go.jp/policy/trade_policy/epa/investment/investment_list.html

[12] Those include tariff elimination and reduction, rules of origin, anti-dumping and countervailing measures, safeguard measures, mutual recognition and standards, trade in services, movement of natural persons, intellectual property rights, investments, competition, government procurement, trade facilitation, dispute avoidance and settlement, and improvement on business environment.

[13] Regarding the effects of RTAs on FDI, see, for example, Medvedev (2012), Gounder et al. (2019), and

costs for exporting due to the improvement in customs clearance procedures. Second, the provisions on the movement of natural persons, intellectual property rights, investments, and improvements in the business environment will reduce fixed costs, especially for FDI, as these provisions encourage the movement of business persons, minimize investment risk, and alleviate uncertainty for investment. On the other hand, BITs by Japan cover a variety of articles to promote and protect investment, including national treatment, fair and equitable treatment, full protection and security, expropriation and compensation, the most favored nation of protection from strife, transfers of funds, and state-to-state dispute settlements. These articles are expected to reduce the fixed costs of FDI, as they improve the investment climate and alleviate the uncertainty of FDI.[14]

The results for the FCR-I are reported in Table 5. In column (I), we do not include control variables and focus on dummy variables for RTAs and BITs. While the coefficient of the RTA dummy is estimated to be negative but insignificant, the BIT dummy has a significantly positive coefficient. Control variables are introduced from columns (II) to (V). Institutional variables are introduced separately because of their high correlation with one another. Columns with control variables show significantly negative coefficients for the RTA dummy, which indicates that the entry of RTAs with Japan into force significantly decreases the fixed costs for investing more than those for export. As a result, the FCR decreases by approximately 36% (=exp(−0.45)−1).

=== Table 5 ===

The coefficients of the BIT dummy are again estimated to be significantly positive. This positive coefficient is inconsistent with our expectations. Almost all BIT partners are developing countries, including the least developed ones. Japan has small FDI and export values with such countries. In short, BIT partners are relatively minor in Japanese firms' businesses. Therefore, the conclusion of BITs may have the effect of advertising partner countries in Japan as business partners, which may contribute to reducing fixed costs for exporting more than those for investing. Among control variables, only the domestic credit ratio has significantly negative coefficients. This result indicates that the availability of financial resources is important for investors. None of the other control variables showed a significant association with the FCR. These results were qualitatively unchanged when we examined FCR-II, as shown in Table 6. A notable difference is that the coefficient for the rule of law is significantly negative, indicating that increased quality of contract enforcement reduces fixed costs for investing relative to those for export.[15]

Osnago et al. (2019).

[14] For more details about the effects of BITs on FDI, see, for example, Egger and Pfaffermayr (2004), Neumayer and Spess (2005), Berger et al. (2011), Colen et al. (2016), Falvey and Foster-McGregor (2017), and Brada et al. (2021).

[15] We also estimate this model by aggregated industries. The results are shown in Tables D1 and D2 in

=== Table 6 ===

Next, we introduce lagged variables for up to four years to investigate the lagged effects of RTAs and BITs. The results are presented in Tables 7 and 8, respectively. The coefficients for the one-year lagged RTA variables tend to be significantly negative, indicating that the significant effect of RTAs on FCR appears one year after their entry into force. Subsequently, the magnitude of this effect did not change. However, the results for the BIT variables are likely insignificant. Although we find significantly positive coefficients for the BIT dummy in Tables 5 and 6, the significance is not robust. In short, contrary to RTAs, BITs do not have significant effects on FCR.

=== Tables 7 & 8 ===

3.3. Simulation

In this last subsection, we simulate the effect of RTAs on the ratio of exports to FDI sales (hereafter, the export-FDI ratio) using our estimates of FCR. Specifically, as an example, we focus on RTA with China. No RTAs existed between China and Japan during the study period. Our simulation procedure is as follows: First, based on our results in Table 5, we decreased the FCR to China by approximately 36%. Second, we set tariff rates for all industries in China to zero. Third, we drop industry-year pairs if either or both inequalities (4) and (5) are violated under the revised FCR and tariff rates. Fourth, by introducing these revised values to the right-hand side of Equation (1), we compute the export-FDI ratio, which is the ratio realized when concluding the RTA with China under the condition that it does not change wages and freight costs in both China and Japan. Finally, we take the difference between this simulated ratio and the original ratio, which is the change in the export-FDI ratio by the RTA with China.

The results are presented in Table 9. We show the statistics by aggregated industries in the latest year when we can compute the simulated export-FDI ratios (*simulated*). The original ratio (*original*) might differ between FCR-I and FCR-II if the latest year is different. The magnitude of the change in the ratios (*change*) is not so different between the cases of FCR-I and FCR-II. Except for rubber and plastic products and other transport equipment, the changes show negative values, indicating that RTA with China is expected to increase FDI from Japan more than exports. Although it remains unclear how FDI sales and exports change in absolute terms[16], RTA may decrease Japan's exports to China by substituting exports with FDI sales. The absolute magnitude of the changes is especially large for leather,

Appendix D. Significantly negative results in the RTA dummy are found in the chemical industry, the non-metallic mineral industry, and the electrical machinery industry.

[16] We cannot compute these absolute changes because they include the level of respective fixed costs.

office machinery, and precision machinery products.

=== Table 9 ===

4. Concluding Remarks

This study quantifies the fixed costs for FDI relative to those for exports, called the FCR. By solving an equation derived from the theoretical model on the choice between exports and FDI, we computed the FCR from Japan for 68 countries during 2002-2018. Consequently, in terms of median values, the FCR is estimated to be approximately 10, indicating that fixed costs for FDI are approximately 10 times higher than those for exports. We also found a significantly negative effect of RTAs on FCR, which indicates that RTAs contribute to reducing fixed costs for FDI more than exports. This result implies that if the magnitude of tariff reduction through RTAs is small, RTAs may increase FDI to partner countries more than exports. This implies that the trade creation effect of RTAs may be negative.

Indeed, Yamanouchi (2019) shows that the average effects of RTAs on Japan's exports are insignificant by estimating gravity equations with a reasonable set of fixed effects. Furthermore, the effect of the Japan-Singapore RTA on Japan's exports to Singapore was found to be negatively significant. This result is consistent with our argument above because MFN tariffs in Singapore are zero for almost all products. In short, our results on the negative effect of RTAs on the FCR may be one of the reasons why we sometimes find insignificant or small trade creation effects of RTAs in gravity analyses.[17] Our simulation analysis also showed that RTA with China is expected to increase FDI sales more than exports to China. Although the regional comprehensive economic partnership agreement, which came into force in January 2022, became the first RTA between China and Japan, it may not have increased Japan's exports to China.

Finally, we point out that there is room to improve our method of computing FCRs. As mentioned in Section 3.1, we failed to compute FCRs for 31% of the total observations, where firms theoretically have few incentives to invest compared to exports due to the high wages and low tariffs in host countries. This failure may be due to the underestimation of trade costs in exports from Japan. Although we take applied tariffs and freight costs into account in the trade cost measure, cultural factors and non-tariff measures (NTMs) also account for some part of the trade costs.[18] Taking more elements into account in the trade

[17] Another channel is that RTAs may induce countries to introduce new non-tariff barriers instead of reducing tariffs (e.g., Niu et al., 2020; Beverelli et al., 2019). Trade will decrease if the negative effect of those barriers overweighs the positive effect of tariff reduction.

[18] It is not easy to take these elements into account in our context. For example, since there are no countries that share a language with Japan, we cannot use the gravity result for language commonality

cost measure will not only lower the failure rate, but also raise the estimates of FCRs. Another source is that we did not consider that FDI firms may sell their products not only to host countries but also to neighboring countries (and the home country). These additional sales will expand profits from investing and enhance firms' incentives to invest abroad. The inclusion of these sales will result in a decrease in FCR estimates.[19]

dummy. Also, it is technically difficult to differentiate between NTMs for exporting and those for investing.

[19] We need to modify the theoretical model used in the measurement of FCR to take these sales into account, which is beyond our scope. The example of such models may be Grossman et al. (2006). Nevertheless, we also use total sales in FDI firms in Equation (3) rather than their sales only in the host market. The results are shown in Tables D3 and D4 in Appendix D. As expected, the magnitude of FCRs decreases when compared to the one in Tables 1 and 2.

References

Albornoz, F., Fanelli, S., and Hallak, J. C., 2016, Survival in Export Markets, *Journal of International Economics*, 102: 262-281.

Berger, A., Busse, M., Nunnenkamp, P., and Roy, M., 2011, More Stringent BITs, Less Ambiguous Effects on FDI? Not a Bit!, *Economics Letters*, 112(3): 270-272.

Bernard, A., and Jensen, B., 1999, Exceptional Exporter Performance: Cause, Effect, or Both?, *Journal of International Economics*, 47(1): 1–25.

Beverelli, C., Boffa, M., and Keck, A., 2019, Trade Policy Substitution: Theory and Evidence, *Review of World Economics*, 155: 755–783.

Brada, J., Drabek, Z., and Iwasaki, I., 2021, Does Investor Protection Increase Foreign Direct Investment? A Meta‐Analysis, *Journal of Economic Surveys*, 35(1): 34-70.

Cherkashin, I., Demidova, S., Kee, H., and Krishna, K., 2015, Firm Heterogeneity and Costly Trade: A New Estimation Strategy and Policy Experiments, *Journal of International Economics*, 96(1): 18–36.

Colen, L., Persyn, D., and Guariso, A., 2016, Bilateral Investment Treaties and FDI: Does the Sector Matter?, *World Development*, 83(C): 193-206.

Crozet, M., and Koenig, P., 2010, Structural Gravity Equations with Intensive and Extensive Margins, *Canadian Journal of Economics*, 43(1): 41–62.

Das, S., Roberts, M.J., and Tybout, J.R., 2007, Market Entry Costs, Producer Heterogeneity, and Export Dynamics, *Econometrica*, 75(3): 837–873.

Egger, P., and Larch, M., 2008, Interdependent Preferential Trade Agreement Memberships: An Empirical Analysis, *Journal of International Economics*, 76(2): 384-399.

Egger, P. and Pfaffermayr, M., 2004, The Impact of Bilateral Investment Treaties on Foreign Direct Investment, *Journal of Comparative Economics*, 32(4): 788-804.

Falvey, R. and Foster-McGregor, N., 2017, Heterogeneous Effects of Bilateral Investment Treaties, *Review of World Economics*, 153(4): 631-656.

Gaulier, G., and Zignago, S., 2010, BACI: International Trade Database at the Product-level. The 1994–2007 Version, CEPII Working Paper 2010-23.

Gounder, A., Falvey, R., and Rajaguru, G., 2019, The Effects of Preferential Trade Agreements on Foreign Direct Investment: Evidence from the African Caribbean Pacific Region, *Open Economies, Review*, 30(4): 696-717.

Grossman, G., Helpman, E., Szeidl, A., 2006, Optimal Integration Strategies for the Multinational Firm, *Journal of International Economics*, 70: 216–238.

Helpman, E., Melitz, M., and Yeaple, S., 2004, Export Versus FDI with Heterogeneous Firms, *American Economic Review*, 94(1): 300–316.

Jacks, D.S., Meissner, C., and Novy, D., 2008, Trade Costs, 1870-2000, *American Economic Review*, 98 (2): 529-534.

Jacks, D.S., Meissner, C., and Novy, D., 2011, Trade Booms, Trade Busts, and Trade Costs,

Journal of International Economics, 83(2): 185-201.

Kimura, F., and Kiyota, K., 2006, Exports, FDI, and Productivity: Dynamic Evidence from Japanese Firms, *Review of World Economics*, 142(4): 695–719.

Kropf, A., and Sauré, P., 2014, Fixed Costs per Shipment, *Journal of International Economics*, 92: 166–184.

Medvedev, D., 2012, Beyond Trade: The Impact of Preferential Trade Agreements on FDI Inflows, *World Development*, 40(1): 49-61.

Morales, E., Sheu, G., and Zahler, A., 2019, Extended Gravity, *The Review of economic studies*, 86(6): 2668-2712.

Neumayer, E. and Spess, L., 2005, Do Bilateral Investment Treaties Increase Foreign Direct Investment to Developing Countries?, *World Development*, 33(10): 1567-1585.

Niu, Z., Milner, C., Gunessee, S., and Liu, C., 2020, Are Nontariff Measures and Tariffs Substitutes? Some Panel Data Evidence, *Review of International Economics*, 28(2): 408–428.

Osnago, A., Rocha, N., and Ruta, M., 2019, Deep Trade Agreements and Vertical FDI: The Devil is in the Details, *Canadian Journal of Economics*, 52(4): 1558-1599.

Yamanouchi, K., 2019, Heterogeneous Impacts of Free Trade Agreements: The Case of Japan, *Asian Economic Papers*, 18(2): 1-20.

Table 1. Basic Statistics of FCR-I

	N	Mean	Min	p25	p50	p75	p90	Max
2002	251	2.0.E+13	1.0	2.8	11.2	117.5	3,283	2.6.E+15
2003	245	4.1.E+16	1.0	2.9	10.5	95.6	2,568	8.0.E+18
2004	259	3.6.E+15	1.0	2.5	11.5	90.5	5,899	9.4.E+17
2005	252	3.7.E+15	1.0	2.8	10.2	77.7	3,236	2.7.E+17
2006	235	3.8.E+14	1.0	2.5	10.2	68.4	2,185	5.0.E+16
2007	237	2.8.E+16	1.1	2.5	10.0	71.7	5,366	4.9.E+18
2008	230	1.9.E+13	1.1	3.0	10.4	135.6	16,756	2.6.E+15
2009	256	3.5.E+14	1.1	2.8	8.8	61.7	9,630	6.4.E+16
2010	261	3.6.E+15	1.1	2.7	10.1	109.5	15,057	7.9.E+17
2011	276	1.2.E+15	1.1	2.3	9.0	67.1	4,061	2.3.E+17
2012	287	1.5.E+16	1.0	2.4	9.6	90.3	3,832	4.1.E+18
2013	275	4.0.E+16	1.0	2.7	9.4	84.0	4,940	5.0.E+18
2014	256	2.5.E+16	1.1	3.0	9.9	64.0	41,397	6.5.E+18
2015	263	2.5.E+16	1.1	2.8	8.9	73.4	12,162	6.5.E+18
2016	245	1.9.E+14	1.0	3.0	8.7	72.0	41,863	2.9.E+16
2017	224	3.4.E+16	1.0	2.7	8.9	41.3	3,554	4.7.E+18
2018	227	3.3.E+10	1.1	2.7	8.5	46.8	6,226	5.3.E+12
Total	4,279	1.3.E+16	1.0	2.7	9.7	81.2	5,527	8.0.E+18

Source: Authors' compilation, using the Basic Survey on Overseas Business Activities (METI).

Table 2. Basic Statistics of FCR-II

	N	Mean	Min	p25	p50	p75	p90	Max
2005	262	8.0.E+15	1.0	2.7	10.2	81.39	3,085	5.9.E+17
2006	241	7.9.E+14	1.1	2.5	10.6	70.67	2,392	1.1.E+17
2007	242	5.6.E+13	1.0	2.5	10.4	72.05	4,875	1.1.E+16
2008	237	5.1.E+13	1.0	3.1	10.6	145.89	18,329	7.1.E+15
2009	267	8.6.E+14	1.1	2.9	9.1	63.74	10,342	1.7.E+17
2010	273	8.9.E+15	1.0	2.8	10.1	115.60	22,421	2.1.E+18
2011	287	3.0.E+15	1.0	2.5	8.6	81.51	3,693	5.7.E+17
2012	301	2.2.E+14	1.0	2.4	8.5	96.31	4,136	5.1.E+16
2013	286	1.1.E+16	1.1	2.5	10.6	70.41	7,732	3.2.E+18
2014	268	1.5.E+14	1.0	2.9	8.2	69.33	5,251	3.8.E+16
2015	272	4.3.E+14	1.0	2.5	8.9	70.40	5,873	9.3.E+16
2016	256	4.7.E+14	1.0	3.0	9.4	81.99	50,342	6.9.E+16
2017	234	3.1.E+14	1.0	2.5	8.6	42.95	1,566	7.2.E+16
2018	233	7.2.E+10	1.1	2.9	9.4	50.18	6,962	1.2.E+13
Total	3,659	2.6.E+15	1.0	2.7	9.4	77.64	6,342	3.2.E+18

Source: Authors' compilation, using the Basic Survey on Overseas Business Activities (METI).

Table 3. Basic Statistics of FCR by Industry

Type	Industry	N	Mean	Min	p25	p50	p75	p90	Max
FCR-I									
	Apparel	51	5	1.1	1.4	2.1	4.1	9.9	53.2
	Paper	42	14,627	1.0	1.3	3.2	90	3,364	443,148
	Chemical	68	7.3.E+16	1.0	5.2	15.7	1,532	2.2.E+08	5.0.E+18
	Mineral	27	8	1.1	1.3	2.8	7.2	21.3	81.4
	Metals	55	16	1.0	2.2	3.7	10.8	31.8	293.1
	General machinery	44	1,467	1.0	4.3	26.6	109.4	437	50,175
	Electrical machinery	79	10	1.1	1.7	3.4	8.0	30.4	157.4
	Transport equipment	57	3.2.E+14	1.2	12.3	54.5	14,257	2.1.E+09	1.8.E+16
	Total	423	1.2.E+16	1.0	1.9	5.8	33.3	1.8.E+03	5.0.E+18
FCR-II									
	Apparel	31	7	1.1	1.8	2.6	8.53	16.3	55.9
	Paper	39	5,976	1.0	1.3	3.0	107.47	4,000	171,213
	Chemical	66	2.4.E+11	1.1	4.7	18.5	1,405	3.3.E+08	1.2.E+13
	Mineral	26	6	1.1	1.2	2.8	6.7	18.3	29.5
	Metals	54	16	1.1	2.1	3.6	9.5	22.2	310.8
	General machinery	42	1,640	1.0	3.4	21.9	119.3	224.0	57,880
	Electrical machinery	72	11	1.0	1.5	4.0	8.4	32.3	168.9
	Transport equipment	57	8.8.E+14	1.2	14.7	65.1	17,227	2.8.E+09	5.0.E+16
	Total	387	1.3.E+14	1.0	2.0	6.6	39.63	1.9.E+03	5.0.E+16

Source: Authors' compilation, using the Basic Survey on Overseas Business Activities (METI).

Note: We restrict country-industry pairs to the latest year when we can compute FCRs.

Table 4. Basic Statistics of FCR by Region

Type	Region	N	Mean	Min	p25	p50	p75	p90	Max
FCR-I									
	Africa	19	4.2.E+17	1.4	4.1	13.7	868.2	388,441	8.0.E+18
	Americas	94	2.7.E+10	1.0	1.6	3.2	9.7	849	2.5.E+12
	Asia	228	3.3.E+16	1.0	2.5	8.5	71.0	33,150	4.7.E+18
	Europe	168	3.0.E+16	1.0	1.3	2.2	17.4	435	5.0.E+18
	Oceania	25	57,706	1.0	1.3	1.9	4.3	38	1.4.E+06
	Total	534	3.9.E+16	1.0	1.6	4.2	30.4	3,364	8.0.E+18
FCR-II									
	Africa	11	2,517	1.5	3.2	19.9	1,031	8,396	17,227
	Americas	82	9.2.E+10	1.0	1.4	4.1	22.2	1,020	7.5.E+12
	Asia	216	2.3.E+14	1.0	2.7	9.2	66.3	4,000	5.0.E+16
	Europe	137	2.2.E+07	1.0	1.3	2.7	22.6	515	2.6.E+09
	Oceania	20	169,236	1.0	1.1	1.7	4.3	25	3.4.E+06
	Total	466	1.1.E+14	1.0	1.6	5.5	35.6	1,574	5.0.E+16

Source: Authors' compilation, using the Basic Survey on Overseas Business Activities (METI).

Note: We restrict country-industry pairs to the latest year when we can compute FCRs.

Table 5. OLS Estimation Results for FCR-I

	(I)	(II)	(III)	(IV)	(V)
RTA	-0.402	-0.444*	-0.457**	-0.438*	-0.483**
	[0.244]	[0.230]	[0.215]	[0.230]	[0.228]
BIT	0.816*	0.913*	0.890*	0.863*	0.853*
	[0.483]	[0.503]	[0.483]	[0.489]	[0.504]
LPI		-0.518	-0.360	-0.517	-0.505
		[0.452]	[0.465]	[0.453]	[0.467]
Domestic credit		-1.526***	-1.422***	-1.597***	-1.313***
		[0.366]	[0.358]	[0.378]	[0.381]
Exchange rates		0.023	0.048	-0.022	0.051
		[0.137]	[0.134]	[0.156]	[0.137]
Human capital		1.124	0.496	0.105	1.261
		[4.323]	[3.895]	[4.553]	[4.225]
Stability		-0.083			
		[0.260]			
Government			-0.772		
			[0.506]		
Regulation				0.452	
				[0.469]	
Law					-0.636
					[0.391]
Number of obs.	2,477	2,477	2,477	2,477	2,477
Adjusted R-sq.	0.935	0.936	0.936	0.936	0.936

Source: Authors' estimation, using the Basic Survey on Overseas Business Activities (METI).

Notes: This table reports the estimation results obtained using the OLS method. ***, **, and * indicate 1%, 5%, and 10% levels of statistical significance, respectively. Standard errors clustered by country are reported in parentheses. In all specifications, we control for country-industry fixed effects and industry-year fixed effects.

Table 6. OLS Estimation Results for FCR-II

	(I)	(II)	(III)	(IV)	(V)
RTA	-0.456*	-0.495**	-0.509**	-0.488**	-0.542**
	[0.231]	[0.213]	[0.198]	[0.214]	[0.210]
BIT	0.809*	0.894*	0.872*	0.833*	0.816
	[0.479]	[0.496]	[0.474]	[0.483]	[0.498]
LPI		-0.539	-0.377	-0.535	-0.525
		[0.425]	[0.433]	[0.412]	[0.433]
Domestic credit		-1.440***	-1.339***	-1.532***	-1.176***
		[0.308]	[0.289]	[0.310]	[0.332]
Exchange rates		0.027	0.053	-0.031	0.062
		[0.140]	[0.136]	[0.159]	[0.138]
Human capital		-0.656	-1.302	-1.988	-0.396
		[3.840]	[3.348]	[3.915]	[3.634]
Stability		-0.100			
		[0.218]			
Government			-0.800		
			[0.504]		
Regulation				0.584	
				[0.456]	
Law					-0.812**
					[0.362]
Number of obs.	2,581	2,581	2,581	2,581	2,581
Adjusted R-sq.	0.937	0.938	0.938	0.938	0.938

Source: Authors' estimation, using the Basic Survey on Overseas Business Activities (METI).

Notes: This table reports the estimation results obtained using the OLS method. ***, **, and * indicate 1%, 5%, and 10% levels of statistical significance, respectively. Standard errors clustered by country are reported in parentheses. In all specifications, we control for country-industry fixed effects and industry-year fixed effects.

Table 7. OLS Estimation Results for FCR-I: Lagged Variables

	(I)	(II)	(III)	(IV)	(V)
RTA	0.134	0.017	0.011	0.032	-0.014
	[0.315]	[0.321]	[0.318]	[0.330]	[0.317]
L1.RTA	-0.498**	-0.447**	-0.485**	-0.448**	-0.474**
	[0.214]	[0.208]	[0.220]	[0.209]	[0.204]
L2.RTA	-0.085	-0.107	-0.106	-0.073	-0.134
	[0.223]	[0.211]	[0.211]	[0.213]	[0.205]
L3.RTA	0.235	0.203	0.186	0.205	0.214
	[0.337]	[0.348]	[0.360]	[0.342]	[0.348]
L4.RTA	-0.322	-0.281	-0.219	-0.361	-0.241
	[0.209]	[0.222]	[0.225]	[0.232]	[0.210]
BIT	0.374	0.418	0.402	0.425	0.362
	[0.534]	[0.555]	[0.555]	[0.544]	[0.575]
L1.BIT	0.501	0.484	0.491	0.415	0.468
	[0.416]	[0.381]	[0.373]	[0.380]	[0.390]
L2.BIT	1.049	1.043	1.090	0.973	1.106
	[1.161]	[1.157]	[1.163]	[1.138]	[1.158]
L3.BIT	-1.125	-1.056	-1.132	-1.064	-1.103
	[0.925]	[0.908]	[0.911]	[0.920]	[0.917]
L4.BIT	-0.391	-0.270	-0.195	-0.268	-0.202
	[0.271]	[0.261]	[0.252]	[0.260]	[0.250]
Number of obs.	2,477	2,477	2,477	2,477	2,477
Adjusted R-sq.	0.935	0.936	0.936	0.936	0.936

Source: Authors' estimation, using the Basic Survey on Overseas Business Activities (METI).

Notes: This table reports the estimation results obtained using the OLS method. ***, **, and * indicate 1%, 5%, and 10% levels of statistical significance, respectively. Standard errors clustered by country are reported in parentheses. In all specifications, we control for country-industry fixed effects and industry-year fixed effects. To save space, we do not report the results for the control variables.

Table 8. OLS Estimation Results for FCR-II: Lagged Variables

	(I)	(II)	(III)	(IV)	(V)
RTA	-0.012	-0.117	-0.127	-0.104	-0.16
	[0.294]	[0.297]	[0.293]	[0.305]	[0.287]
L1.RTA	-0.429*	-0.383	-0.423*	-0.386*	-0.418*
	[0.233]	[0.230]	[0.236]	[0.220]	[0.223]
L2.RTA	-0.063	-0.087	-0.087	-0.047	-0.123
	[0.207]	[0.192]	[0.193]	[0.195]	[0.182]
L3.RTA	0.347	0.323	0.301	0.321	0.335
	[0.270]	[0.275]	[0.287]	[0.269]	[0.269]
L4.RTA	-0.323	-0.26	-0.203	-0.358	-0.216
	[0.200]	[0.221]	[0.216]	[0.221]	[0.198]
BIT	0.351	0.399	0.38	0.406	0.317
	[0.532]	[0.562]	[0.554]	[0.542]	[0.580]
L1.BIT	0.528	0.522	0.532	0.451	0.503
	[0.439]	[0.403]	[0.392]	[0.400]	[0.412]
L2.BIT	1.048	1.053	1.093	0.959	1.129
	[1.157]	[1.152]	[1.163]	[1.135]	[1.160]
L3.BIT	-1.108	-1.034	-1.125	-1.051	-1.104
	[0.919]	[0.901]	[0.902]	[0.914]	[0.909]
L4.BIT	-0.428*	-0.324	-0.23	-0.309	-0.222
	[0.243]	[0.240]	[0.232]	[0.240]	[0.233]
Number of obs.	2,581	2,581	2,581	2,581	2,581
Adjusted R-sq.	0.938	0.938	0.938	0.938	0.938

Source: Authors' estimation, using the Basic Survey on Overseas Business Activities (METI).

Notes: This table reports the estimation results obtained using the OLS method. ***, **, and * indicate 1%, 5%, and 10% levels of statistical significance, respectively. Standard errors clustered by country are reported in parentheses. In all specifications, we control for country-industry fixed effects and industry-year fixed effects. To save space, we do not report the results for the control variables.

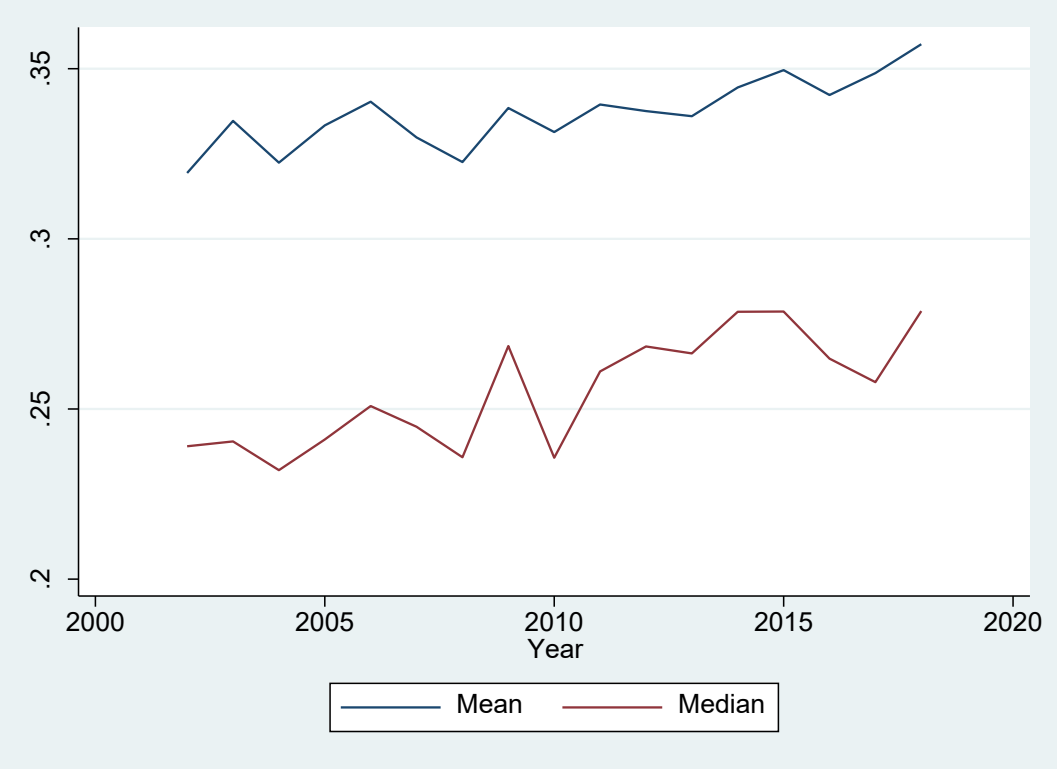
Table 9. Changes of the Ratio of Exports to FDI Sales in the RTA with China

	FCR-I			FCR-II		
ISIC 2-digit	Original	Simulated	Change	Original	Simulated	Change
17 Textiles	3.91	0.14	-3.77	3.91	0.20	-3.71
19 Leathers	60.30	41.51	-18.79	60.30	41.31	-18.99
21 Papers	1.53	1.27	-0.26	1.53	1.27	-0.25
22 Publishing	0.59	0.13	-0.46	0.59	0.17	-0.42
23 Coke, refined petroleum	2.25	0.68	-1.57	2.25	0.75	-1.50
24 Chemicals	3.11	1.52	-1.59	3.11	1.56	-1.55
25 Rubber and plastics	1.30	1.96	0.66	1.30	1.96	0.66
26 Non-metalic minerals	1.93	0.08	-1.85	1.93	0.13	-1.80
27 Basic metals	0.95	0.09	-0.86	0.90	0.02	-0.88
28 Fabricated metals	0.92	0.23	-0.69	0.92	0.26	-0.67
29 General machinery	2.53	1.56	-0.97	2.53	1.57	-0.96
30 Office machinery	43.40	0.04	-43.37			
31 Electrical machinery	1.76	0.24	-1.52	1.99	0.03	-1.96
32 ICT products	1.60	0.14	-1.46	1.60	0.17	-1.43
33 Precision machinery	25.36	10.26	-15.10	25.36	10.35	-15.01
34 Motor vehicles	0.38	0.26	-0.12	0.38	0.26	-0.11
35 Other transport	0.37	0.50	0.12	0.37	0.50	0.12

Source: Authors' estimation, using the Basic Survey on Overseas Business Activities (METI).

Notes: "Original" indicates the ratio of exports to FDI sales in the raw data, while "Simulated" shows the ratio when Japan concludes on the RTA with China. In the latter case, we decrease the FCR to China by approximately 36% and set tariff rates for all industries in China to zero. The difference between these two ratios is reported in "Change."

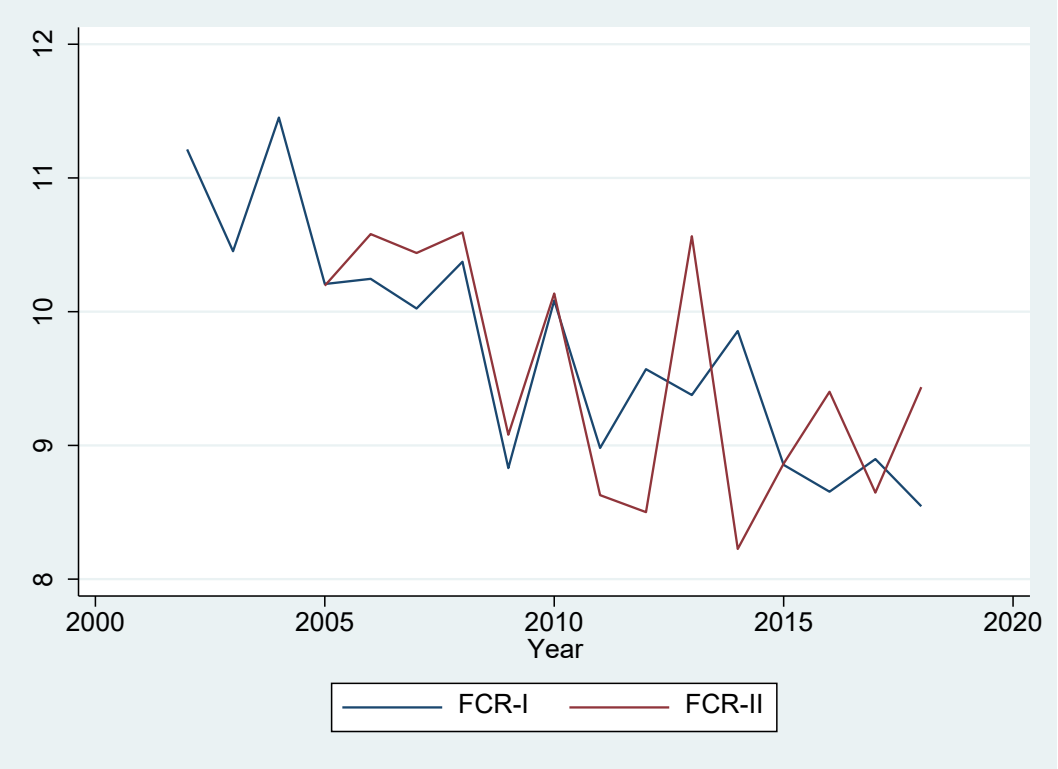
Figure 1. The Mean and Median of FDI Sales Shares



Source: Authors' compilation, using the Basic Survey on Overseas Business Activities (METI).

Note: This figure shows statistics for the share of FDI sales from FDI sales plus exports.

Figure 2. Time-series Changes of Median FCRs



Source: Authors' compilation, using the Basic Survey on Overseas Business Activities (METI).

Appendix A. Study Countries

Argentina*, Australia*, Bangladesh*, Belgium*, Bolivia*, Brazil*, Bulgaria*, Cambodia*, Canada*, Chile*, China*, Colombia*, Costa Rica, Czechia, Denmark*, Egypt*, El Salvador*, Finland*, France*, Germany*, Greece*, Hong Kong*, Hungary*, India*, Indonesia*, Iran, Ireland*, Israel*, Italy*, Korea*, Kuwait*, Laos*, Lithuania*, Luxembourg*, Malaysia*, Mexico*, Mongolia*, Morocco*, Myanmar*, Netherlands*, New Zealand*, Pakistan*, Panama, Paraguay*, Peru*, Philippines*, Poland*, Portugal*, Russian Federation*, Saudi Arabia*, Singapore*, Slovakia*, South Africa*, Spain*, Sri Lanka*, Sweden*, Switzerland*, Tanzania*, Thailand*, Tunisia*, Turkey*, Ukraine*, United Arab Emirates*, United Kingdom*, United States*, Uruguay*, Venezuela*, Viet Nam*

Note: Countries marked with asterisks (*) indicate those examined in our regression analyses.

Appendix B. Freight Costs

In this appendix, we explain how to estimate freight costs from Japan to other countries. To do so, we use import data from the Philippines during 2005-2020, of which the data are obtained from the Global Trade Atlas. One advantage of using this data is that import values can be decomposed into free-on-board export values (*FOB*), freight charges (*freight*), and insurance charges (*insurance*). We aggregate the import data on FOB and freight at the ISIC two-digit level (i) from each country (c) in each year (t). We then estimate the following equation using the ordinary least squares (OLS) method:

$$\frac{Freight_{cit} + Insurance_{cit}}{FOB_{cit} + Freight_{cit} + Insurance_{cit}} = \beta \times \ln Distance_{PHL,c} + \mathrm{u}_i + \mathrm{u}_t + \epsilon_{cit}. \quad \text{(B1)}$$

The dependent variable is the share of freight and insurance charges in the total imports, which is taken as the freight cost. As an independent variable, we introduced a log of geographical distance between the Philippines and each country, for which data were drawn from the CEPII database. We also add industry-fixed effects (u_i) and year-fixed effects (u_t). ϵ_{cit} is an error term.

An estimation was conducted for 25,432 observations. We excluded observations with the top 10% of the dependent variables as outliers. The coefficient for distance was estimated to be 0.007. The adjusted R-squared value is 0.1025. Using these estimates, we predicted freight costs from Japan for each country, which are given as follows:

$$Freight\ costs\ from\ Japan_{cit} = \hat{\beta} \times \ln Distance_{JPN,c} + \hat{\mathrm{u}}_i + \hat{\mathrm{u}}_t. \quad \text{(B2)}$$

The distance variable is replaced by the geographical distance from Japan. Applying the estimates of the distance and fixed effects obtained in estimating Equation (B1) to the right-hand side of Equation (B2), we obtain freight costs from Japan to each country at the industry level for each year. These freight cost estimates were used to compute the FCR in the main text.

Appendix C. Industry Classification

Industries in Table 3	ISIC3	Name
Apparel	17	Manufacture of textiles
	18	Manufacture of wearing apparel
	19	Tanning and dressing of leather
Paper	20	Manufacture of wood and of products of wood and cork
	21	Manufacture of paper and paper products
	22	Publishing, printing and reproduction of recorded media
Chemical	23	Manufacture of coke, refined petroleum products
	24	Manufacture of chemicals and chemical products
	25	Manufacture of rubber and plastics products
Mineral	26	Manufacture of other non-metallic mineral products
Metals	27	Manufacture of basic metals
	28	Manufacture of fabricated metal products
General machinery	29	Manufacture of machinery and equipment n.e.c.
Electrical machinery	30	Manufacture of office, accounting and computing machinery
	31	Manufacture of electrical machinery and apparatus n.e.c.
	32	Manufacture of radio, television and communication equipment
	33	Manufacture of medical, precision and optical instruments
Transport equipment	34	Manufacture of motor vehicles, trailers and semi-trailers
	35	Manufacture of other transport equipment

Note: The aggregated industry classification is also used in Tables 9 and D1. and D2.

Appendix D. Other Tables

Table D1. OLS Estimation Results for FCR-I by Industries

	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)
RTA	0.025	-1.393	-1.221*	-0.685**	-0.292	0.323	-0.513***	-0.037
	[0.678]	[1.137]	[0.606]	[0.263]	[0.207]	[0.633]	[0.145]	[0.698]
BIT	-1.159**		0.422		0.593**	-0.828***	0.343**	1.799**
	[0.491]		[0.787]		[0.228]	[0.266]	[0.160]	[0.719]
LPI	-1.013	0.641	-1.213	0.710	-0.316	-0.148	-0.607***	-0.085
	[0.812]	[1.304]	[1.059]	[0.650]	[0.272]	[0.558]	[0.163]	[1.524]
Domestic credit	1.181	-2.147	-0.731	0.282	-0.888**	-1.448*	-0.631***	-3.661***
	[1.213]	[1.276]	[1.772]	[0.849]	[0.353]	[0.841]	[0.227]	[0.998]
Exchange rates	1.312	1.195	0.238	-0.244	-0.317***	0.837	0.273	-0.062
	[1.703]	[1.814]	[0.242]	[1.049]	[0.094]	[1.258]	[0.561]	[0.171]
Human capital	1.816	-3.240	14.303	1.154	0.909	-2.412	0.909	0.637
	[22.817]	[9.679]	[10.150]	[3.745]	[4.400]	[8.524]	[2.240]	[11.961]
Law	-0.730	-1.289	-2.554	0.313	-0.592**	0.691	-0.033	-0.953
	[0.708]	[1.609]	[2.099]	[0.302]	[0.279]	[1.299]	[0.198]	[1.206]
Number of obs.	194	235	416	97	357	174	588	416
Adjusted R-sq.	0.556	0.876	0.921	0.761	0.805	0.823	0.83	0.932

Source: Authors' estimation, using the Basic Survey on Overseas Business Activities (METI).

Notes: This table reports the estimation results obtained using the OLS method. ***, **, and * indicate 1%, 5%, and 10% levels of statistical significance, respectively. Standard errors clustered by country are reported in parentheses. In all specifications, we control for country-industry fixed effects and industry-year fixed effects. Each column shows the results for (I) apparel, (II) paper, (III) chemical, (IV) mineral, (V) metals, (VI) general machinery, (VII) electrical machinery, and (VIII) transport equipment.

Table D2. OLS Estimation Results for FCR-II by Industries

	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)
RTA	0.018	-1.398	-1.432**	-0.686**	-0.292	0.273	-0.495***	-0.121
	[0.643]	[1.148]	[0.618]	[0.252]	[0.189]	[0.575]	[0.144]	[0.681]
BIT	-1.079**		0.793		0.537**	-0.683**	0.371**	1.684**
	[0.451]		[0.821]		[0.235]	[0.283]	[0.166]	[0.706]
LPI	-0.823	0.429	-1.497	0.673	-0.358	-0.132	-0.576***	-0.084
	[0.719]	[1.196]	[0.996]	[0.679]	[0.270]	[0.557]	[0.166]	[1.425]
Domestic credit	0.822	-1.963	-1.117	0.190	-0.661*	-1.658*	-0.577**	-3.053***
	[1.112]	[1.202]	[2.007]	[0.623]	[0.327]	[0.880]	[0.241]	[0.904]
Exchange rates	1.093	1.124	0.229	-0.264	-0.302***	1.256	0.208	-0.011
	[1.586]	[1.793]	[0.226]	[0.973]	[0.103]	[1.214]	[0.549]	[0.171]
Human capital	-0.931	-7.910	12.353	0.605	0.551	6.196	0.728	-7.372
	[21.899]	[8.607]	[10.530]	[2.432]	[4.251]	[10.157]	[2.304]	[9.859]
Law	-0.438	-1.229	-3.122	0.348	-0.604**	0.874	-0.067	-1.451
	[0.722]	[1.526]	[2.083]	[0.305]	[0.261]	[1.186]	[0.197]	[1.162]
Number of obs.	200	239	432	101	372	186	620	431
Adjusted R-sq.	0.584	0.884	0.926	0.79	0.822	0.807	0.84	0.935

Source: Authors' estimation, using the Basic Survey on Overseas Business Activities (METI).

Notes: This table reports the estimation results obtained using the OLS method. ***, **, and * indicate 1%, 5%, and 10% levels of statistical significance, respectively. Standard errors clustered by country are reported in parentheses. In all specifications, we control for country-industry fixed effects and industry-year fixed effects. Each column shows the results for (I) apparel, (II) paper, (III) chemical, (IV) mineral, (V) metals, (VI) general machinery, (VII) electrical machinery, and (VIII) transport equipment.

Table D3. Basic Statistics of FCR-I: Total Sales in FDI Firms

	N	Mean	Min	p25	p50	p75	p90	Max
2002	277	4.6.E+13	1.0	2.1	7.3	56.0	1,599	1.2.E+16
2003	267	1.8.E+14	1.0	2.4	8.2	69.7	1,425	3.8.E+16
2004	278	1.8.E+12	1.0	2.1	8.2	47.7	1,171	2.6.E+14
2005	275	1.0.E+15	1.0	2.5	7.1	45.0	1,875	9.1.E+16
2006	255	2.4.E+13	1.0	2.3	7.4	33.0	1,243	5.7.E+15
2007	253	1.7.E+14	1.0	2.1	6.2	37.8	1,531	4.1.E+16
2008	251	9.7.E+12	1.0	2.6	6.9	56.0	5,259	2.0.E+15
2009	272	1.3.E+13	1.0	2.5	6.4	38.7	1,556	3.4.E+15
2010	281	7.7.E+13	1.0	2.2	5.9	52.1	5,681	1.4.E+16
2011	300	8.2.E+13	1.0	2.0	5.4	34.7	1,556	1.2.E+16
2012	315	4.1.E+13	1.0	1.9	5.4	46.2	852	9.6.E+15
2013	296	1.7.E+14	1.0	2.2	6.4	33.9	1,409	5.1.E+16
2014	281	7.5.E+13	1.0	2.6	6.5	37.0	1,811	1.7.E+16
2015	293	3.9.E+13	1.1	2.4	6.4	38.3	1,018	1.1.E+16
2016	279	1.5.E+14	1.0	2.5	6.5	42.1	1,590	2.9.E+16
2017	252	1.8.E+14	1.0	2.4	5.8	34.0	2,212	3.1.E+16
2018	258	9.2.E+12	1.0	2.2	6.1	27.7	1,357	2.3.E+15
Total	4,683	1.4.E+14	1.0	2.2	6.6	42.0	1,649	9.1.E+16

Source: Authors' compilation, using the Basic Survey on Overseas Business Activities (METI).

Table D4. Basic Statistics of FCR-II: Total Sales in FDI Firms

	N	Mean	Min	p25	p50	p75	p90	Max
2005	283	8.4.E+12	1.0	2.4	7.1	41.2	1,485	2.4.E+15
2006	261	5.0.E+13	1.0	2.3	7.8	37.9	1,365	1.2.E+16
2007	259	4.2.E+12	1.0	2.2	6.4	38.7	1,681	1.0.E+15
2008	260	2.6.E+13	1.0	2.5	7.0	55.2	6,164	5.6.E+15
2009	285	2.9.E+13	1.0	2.3	6.6	41.8	1,807	8.1.E+15
2010	293	1.9.E+14	1.0	2.1	6.2	44.4	6,503	3.4.E+16
2011	314	2.0.E+14	1.0	2.0	5.6	38.5	1,490	3.3.E+16
2012	330	1.1.E+14	1.0	1.9	5.3	45.9	1,133	2.6.E+16
2013	309	2.5.E+12	1.0	2.2	6.6	34.5	1,924	5.6.E+14
2014	297	1.7.E+14	1.0	2.3	6.4	41.5	1,805	3.8.E+16
2015	307	8.0.E+13	1.0	2.3	6.3	37.3	1,106	2.4.E+16
2016	291	3.6.E+14	1.0	2.4	6.9	46.5	2,371	6.9.E+16
2017	263	4.1.E+14	1.0	2.2	6.2	39.9	941	7.2.E+16
2018	266	2.2.E+13	1.0	2.4	6.4	29.0	1,564	5.6.E+15
Total	4,018	1.2.E+14	1.0	2.2	6.4	41.1	1,885	7.2.E+16

Source: Authors' compilation, using the Basic Survey on Overseas Business Activities (METI).