RIETI Discussion Paper Series 13-E-027

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RIETI Discussion Paper Series 13-E-027

April 2013

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Abstract

Distribution services play a large role in intermediating production and consumption across borders. Using firm-level data on Japanese multinationals in the wholesale and retail sectors, this paper examines foreign direct investment (FDI) decisions of distribution firms for local distribution services at the extensive and intensive margin. Consistent with the model of heterogeneous firms on multinational production, productive multinationals are more likely than less productive ones to enter a larger number of markets, penetrate less attractive markets, and generate larger sales per market. While these findings are consistent with previous evidence on manufacturing multinationals, there are some distinctive determinants of FDI in distribution services.

***Keywords*:** Foreign direct investment, Firm heterogeneity, Distribution services, Japan
***JEL Classification*:** F10, F14, F23, L81

[ζ] I would like to thank RIETI for research opportunities and the Ministry of Economy, Trade, and Industry (METI) for providing firm-level data. For useful comments, I thank Shawn Arita, Ayumu Tanaka and the participants of the RIETI project entitled "Firm-level Productivity in East Asia". The opinions expressed and arguments employed in this paper are the sole responsibility of the author and do not necessarily reflect those of RIETI, METI, or any institution with which the author is affiliated. All remaining errors are my own.
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1. Introduction

Distribution services in wholesale and retail sectors help to intermediate between production and consumption of goods and services. While advances in communication technology should reduce transaction costs over space, these sectors still play a large role in economic activity; for instance, their share of total employment in 2008 was 13.7% in Germany, 14.2% in the U.S., and 18.3% in Japan (ILO).[1] The prominence of distribution services is also apparent in international trade. Distribution explained 18% of global trade in commercial services in 2006 (Francois and Hoekman, 2010). Wholesalers and retailers accounted for 26% of Belgian exports in 2004 (Muûls and Pisu, 2009), 22% of Chinese exports in 2005 (Ahn et al., 2011), 23% of Japanese exports in 2008 (Tanaka, 2013), and 11% of U.S. exports in 2002 (Bernard et al., 2010).[2]

A growing number of studies have analyzed the role of intermediary firms in trade (Akerman, 2010; Antràs and Costinot, 2011; Rauch, 1999). Intermediary firms are found to promote domestic producers to access the export market, and thus facilitate international trade. However, there is little attention on foreign expansion of intermediary distribution firms through foreign direct investment (FDI). Distribution firms can export commercial goods, but mainly establish distribution networks abroad to facilitate distribution services for their clients across borders and within foreign markets. As foreign distribution costs of intermediary firms add up to trade costs for their client exporters, their FDI activity is also critical to understand bilateral barriers to trade in goods (Anderson and van Wincoop, 2004).

In this paper, I shed light on FDI decisions of intermediary distribution firms at the extensive and intensive margin by using the firm-level data on Japanese multinationals in wholesale and retail sectors for 1997-2009. To analyze the role of firm heterogeneity in multinational activity for distribution services, I draw on the model of heterogeneous firms on export and FDI (Helpman et al. 2004). In their settings, firms have a varying level of efficiency and serve a foreign market by export or FDI. To establish a foreign plant, they incur fixed costs but economize on transport costs associated with trade. Under these assumptions, high productive firms undertake FDI and medium productive firms choose to export. Conditional on making FDI, more productive firms are more likely than less productive firms 1) to enter a larger number of markets, 2) to penetrate less attractive markets, and 3) to generate larger sales per each market (Yeaple, 2009). I

[1] Figures come from the website: http://laborsta.ilo.org/

[2] On the import side, they explained 26% of Belgian imports in 2004 (Muûls and Pisu, 2009), 41% of Chilean imports in 2005-2007 (Blum et al., 2010), and 24% of U.S. imports in 2002 (Bernard et al., 2010).

investigate these predictions on productivity ordering by estimating the effects of firm and host-market characteristics on the extensive and intensive margins of FDI activity in wholesale and retail sectors. As considerable analysis has been conducted on manufacturing sectors, this paper addresses the question whether the firm-level evidence on FDI is consistent between distribution services and manufacturing.[3]

The main results can be summarized as follows. First, exporters and multinational firms in wholesale and retail sectors are more productive than domestic firms; the premiums range from 28-34% for exporters and 26-67% for multinationals. These results are consistent with the theoretical prediction on productivity ordering in Helpman et al. (2004). Second, more productive wholesalers and retailers have the higher probability to invest in a foreign market. While the investment probability increases with various host-market characteristics such as the market size, more productive distribution firms have the higher probability to invest in a less attractive market with, for instance, smaller market size. After controlling for self-selection effects by the Heckman selection model, the volume of sales by foreign affiliates in wholesale and retail sectors increase significantly with their parent firm's productivity. Taken together, these results lend considerable support for the model of firm heterogeneity on multinational production.

My analysis extends the prior literature in several ways. First, prior work such as Aw and Lee (2008), Chen and Moore (2010) and Yeaple (2009) has examined the location decision of heterogeneous multinationals, but their analysis is limited to manufacturing multinationals. Second, Breinlich and Criscuolo (2011), Buch et al. (2011), and Bhattacharya et al. (2012) have investigated the role of firm heterogeneity in trade and FDI in such sectors as business consulting, banking and software services, and discusses the similarities and differences between manufacturing and service sectors. Also, Bernard et al. (2011) and Tanaka (2013) examines the role of distribution firms in international trade. However, these studies do not analyze the firm-level structure of outward FDI in wholesale and retail services. Finally, the country-level determinants of trade and FDI in services were analyzed in Kimura and Lee (2006) Head et al. (2009), and Ramasamy and Yeung (2010). Among various determinants, geographic distance is found to decrease trade and FDI in their studies. By contrast, I find that it *increases* FDI in distribution services at the extensive and intensive margin. As the commercial presence is a dominant mode of trade in services, the previous work might overestimate the distance burden on providing services abroad.

[3] For surveys of the extensive literature on firm heterogeneity in export and FDI, see Bernard et al. (2007), Greenaway and Kneller (2007) and Wagner (2007).

The rest of this paper is as follows. Section 2 provides the background information on wholesale and retail sectors in Japan. Section 3 explains the empirical strategy and data sources. Section 4 discusses the estimation results on the determinants of FDI in these sectors at the extensive and intensive margin. Section 5 concludes.

2. Wholesale and Retail Sectors in Japan

This section provides some backgrounds on wholesale and retail sectors in Japan. I first describe what type of business consists of wholesale and retail sectors to highlight the nature of distribution services, followed by recent trends in these sectors.

According to the international standard industry classification (ISIC), business activity in distribution services is defined as sale without transformation (resale) of any goods and the provision of services incidental to the sale including packing, cleaning, sorting, and repairing. Wholesale is the resale of new and used goods to other wholesalers, retailers, and industrial and public users. It also includes agents and brokers in the distribution of goods, and sales branches of manufacturing and mining enterprises apart from their plants/mines. On the other hand, retail is the resale of new and used goods primarily to the end users for household consumption. The examples are department stores, supermarkets, and convenience stores. Accordingly, the major type of customers distinguishes wholesale and retail. They are also classified by the type of commodities that account for a majority of sales in, for instance, apparel, food and beverages, machinery, automobile, and chemical.

Figure 1 presents the trend in commercial sales for wholesale and retail sectors in Japan, which include both domestic and export sales. The data are taken from the *Current Survey of Commerce* by the Japanese Ministry of Economy, Trade, and Industry.[4] Retail sales have remained at around 140 trillion yen since the year 1990 whereas wholesale sales have steadily declined from around 700 trillion yen in the early 1990s. In the wake of the global financial crisis in 2008/2009, the wholesale sales decreased sharply in 2009 and remained below the pre-crisis level in 2010. By contrast, retail sales appear to be insensitive to the downward business cycle.

[Figure 1 here]

During the above period, the Japanese economy experienced a sudden collapse of bubble economy in the beginning of 1990s and thereafter a long spell of deflation

[4] The survey coverage includes wholesale and retail establishments excluding agency and brokerage businesses.

except for the year 1997 with an increase in consumption tax. As these macroeconomic trends intensified price competition in retail sectors, the number of retail establishments declined from 1.56 million in 1991 to 1.13 million in 2007 by 28.5%. Since a large number of small retailers exited, the number of workers per establishment increased from 4.4 in 1991 to 6.7 in 2007 (the *Census of Commerce* in 2007). Large-scale retailers streamlined their distribution channels by consolidating the number of wholesale suppliers and increasing a direct purchase of goods from manufacturers. Their bargaining pressure on wholesalers strengthened to reduce wholesale prices. Consequently, industry reorganization in wholesale sector occurred through business tie-ups and mergers and acquisitions. The number of wholesale establishments declined from 0.47 million in 1991 to 0.33 million in 2007 by 29.7%.

Since the 1990s, wholesale and retail sectors in Japan were also characterized by diversification and internationalization (Kato et al., 2007). Large-scale wholesalers started to diversify their business into retail services in order to ensure the stable distribution channels for their wholesale goods as well as to provide consulting services for retailers by learning directly from their own retail business. While wholesalers and retailers are distinguished by whether they mainly serve final customers, the diversification of distribution services would make it difficult to clearly draw a line between wholesale and retail businesses at the firm level. Thus, this paper analyzes both wholesalers and retailers as *distribution* firms. Additionally, it is said that foreign expansion of large retailers through FDI accelerated during the period. Especially, major convenience stores prominently increased their penetration of foreign markets in retail services. These features provide a motivation for my analysis to examine the role of firm heterogeneity in FDI activity for local distribution services.

3. Empirical Strategy and Data

This section explains the empirical strategy to investigate the role of firm heterogeneity in the extensive and intensive margin of multinational activity. Then, I describe data sources used in the analysis.

An econometric framework is designed to examine the theoretical implications on the structure of multinational activity in Yeaple (2009), which builds upon a model of firm heterogeneity in Helpman et al. (2004). In their setting, firms have a varying level of efficiency and serve a foreign market by export or FDI. They must pay fixed costs of FDI to establish a local affiliate, but can economize on transportation costs associated with export. These assumptions suggest that the high productive firms will undertake FDI and the medium productive firms will choose to export. Yeaple (2009) further

shows that firm heterogeneity affects the extensive and intensive margin of FDI activity. Specifically, the model predicts that conditional on making FDI, more productive firms are more likely than less productive firms (i) to enter a larger number of markets, (ii) to penetrate the less attractive markets, and (iii) to yield larger sales per each market. In the absence of firm-specific entry and demand shocks in host markets, firm efficiency would shape the pecking-order structure of multinational activity.[5]

In the following, I specify an econometric model for the extensive margin to examine the hypotheses (i) and (ii). Next, I describe an empirical model for the intensive margin to investigate the hypothesis (iii).

3.1. Specification for Extensive Margin

To investigate whether these hypotheses apply to FDI in distribution services, we first estimate the effects of firm and host-country characteristics on the probability that firm *i* maintains a foreign affiliate in host country *j* for year *t*. Following Chen and Moore (2010), I consider the following specification:

$$\Pr\left(FDI_{ijt}=1\right)=\Lambda\left(\alpha+\boldsymbol{X}'_{i(t-1)}\boldsymbol{\beta}+\boldsymbol{Z}'_{j(t-1)}\boldsymbol{\gamma}+\delta_j+\mu_t\right) \quad (1)$$

where $\Pr\left(FDI_{ijt}=1\right)$ indicates the probability of firm *i* investing in country *j* for year *t* and $\Lambda(\cdot)$ is the logistic cumulative distribution function. α is a constant term. $\boldsymbol{X}_{i(t-1)}$ is a vector of firm characteristics in the previous year. $\boldsymbol{Z}_{j(t-1)}$ is a vector of host-country characteristics in the previous year that affect the attractiveness of potential host markets for direct investment in distribution services. δ_j is unobserved fixed effects of host markets.[6] μ_t is the year dummy to account for the aggregate shocks that affect individual firms during the same year.

Firm characteristics include the level of productivity and the length of foreign-market experiences. The central purpose is to estimate the impact of firm-level productivity on outward direct investment. The model predicts a positive coefficient of the productivity variable in equation (1). In empirical tests, however, an estimate of firm-level productivity may contain a positive learning effect from FDI activity.[7] Thus, I control for the firm's experiences of operating a local affiliate abroad to disentangle learning effects from self-selection effects.

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[5] Eaton et al. (2011) introduce firm-specific entry and demand shocks in the trade model of firm heterogeneity to account for a deviation of the strict pecking order in French exporters.

[6] I do not include firm-level fixed effects for the two reasons. First, a large number of dummy variables for parent firms would cause the incidental parameters problem in the maximum likelihood estimator (Lancaster, 2000). Second, it was computationally infeasible to estimate the logit model with firm-level fixed effects, including the conditional logit model used to estimate a fixed-effect binary choice model.

[7] See, for instance, Hayakawa et al. (2012) for a survey on learning effects from FDI.

For host-market characteristics, I consider clusters of other foreign investors in the same host market. In the case of Japanese manufacturing multinationals, the previous studies such as Head et al. (1995) and Belderbos and Carree (2002) found that agglomeration effects promote Japanese outward FDI. Along the similar line, I conjecture that the agglomeration of Japanese manufacturing plants would generate a demand for distribution services to transport intermediate inputs and final goods. As a result, Japanese manufacturers' agglomeration should increase the host-market attractiveness for Japanese FDI in distribution services. As such demand for local distribution services is not limited to manufacturing production, agglomeration of other Japanese affiliates in service sectors is also included.

Market access should be a crucial motive for local provision of distribution services, as is the case for manufacturing multinationals (Markusen, 2002). I include the market size and population density to represent market-access motives. Following Head and Mayer (2004), I also consider market potential to account for the neighboring market size in proximity to a host country. As market-seeking FDI is encouraged by transport costs between home and host markets, I include the geographic distance as a proxy for international transport costs. However, the geographic distance represents differences in time zones to some extent, which would discourage management of foreign affiliates. Following Stein and Daude (2007), the time difference in hours between Japan and foreign markets is included. Additionally, I include educational attainment of host markets to take into account the quality of local workers used for distribution services. Finally, I consider a wide variety of other country characteristics that are likely to affect investment costs. These factors include an unemployment rate, firing cost, the depth of credit information, the length of procedures to start a business, and total tax rate.

3.2. Specification for Intensive Margin

I proceed to specify an econometric model to examine the role of firm heterogeneity in the intensive margin of foreign affiliate sales in distribution services. An estimating equation is specified to explain the sales of foreign affiliate(s) by firm *i* in host market *j* during year *t*:

$$\ln ASALE_{ijt} = \beta + \boldsymbol{X}'_{i(t-1)}\boldsymbol{\eta} + \boldsymbol{Y}'_{j(t-1)}\boldsymbol{\theta} + \delta_j + \mu_t + \varepsilon_{ijt} \qquad (2)$$

where $\ln ASALE_{ijt}$ is the log of the volume of foreign affiliate sales. As is similar to equation (1), β is a constant term. $\boldsymbol{X}_{i(t-1)}$ is a vector of firm characteristics in the previous year. $\boldsymbol{Y}_{j(t-1)}$ is a vector of host-country characteristics in the previous year. δ_j is country fixed effects. μ_t is the year dummy. Finally, ε_{ijt} is an error term.

Equation (2) is specified to examine whether more productive firms are more likely

than less productive firms to yield larger affiliate sales in a host market. Such a hypothesis is derived from the condition under which firms have already decided to establish a local affiliate because operating profits are sufficient to overcome the fixed entry cost. The sample on foreign affiliate sales should be generated in such a mechanism, and contains a significant proportion of observations with zero sales. This points to the large number of cases in which firms have decided *not* to invest in many foreign markets. Because the censored sample is not representative of the population in examination, the censoring bias must be corrected to make consistent inference.

To account for possible selection bias, I estimate the Heckman selection model in two steps (Heckman, 1979). First, I estimate a probit model for the entire sample to examine the selection of whether a foreign affiliate is established or not conditional on the similar explanatory variables as in equation (1). The inverse of the Mill's ratio for each observation is computed from the predicted values of the probit model. Second, I augment equation (2) with the inverse Mill's ratio and estimate for the selected sample by ordinary-least-squares (OLS) method.[8]

In the second step, $\boldsymbol{Y}_{j(t-1)}$ is defined as a strict subset of $\boldsymbol{Z}_{j(t-1)}$ to satisfy an exclusion restriction in the second stage regression. Valid excluded variables should affect the probability that a firm establishes a foreign affiliate, but should not directly affect the volume of foreign affiliate sales. Specifically, I use the number of days required to start a business in a host market. This measure affects a fixed entry cost to establish a local subsidiary in a foreign market, but should have little influence on variable costs of foreign operation. Helpman et al. (2008) also employ the regulation costs of firm entry as excluded variables for trade. Arguably, the regulatory barriers to entry satisfy the exclusion restrictions for FDI more reasonably than trade, which serve to identify the Heckman selection model.

3.3. Data Sources

This study exploits the confidential firm-level data collected by the Japanese Ministry of Economy, Trade, and Industry (METI). The first dataset is the *Kigyou Katsudou Kihon Chousa* (the Basic Survey of Business Structure and Activities, hereafter BSBSA). The survey covers all business firms with 50 employees or more and capital of 30 million yen or more in both manufacturing and non-manufacturing sectors. The selected firms are mandatory to respond to the survey. The first survey was conducted in 1991 and continued annually since 1994. For the analysis, I exploit the

[8] Firm-level fixed effects are not considered because it was computationally infeasible to estimate firm-level fixed effects in the Heckman selection model.

period 1997-2009 because the information on exports was reported in a consistent way since the year 1997.

The BSBSA data are used to estimate productivity of Japanese firms in wholesale and retail sectors. To construct the sample for analysis, I keep only the firms that report their main line of business as wholesale or retail. When some firms switch their industry classification between wholesale and retail sectors, I assigned the mode of their reporting sectors to estimate production function separately for these sectors. I measure firm-level efficiency with total factor productivity (TFP) as follows:

$$\ln TFP_{it} = \ln VA_{it} - \beta_L \ln L_{it} - \beta_K \ln K_{it} \quad (3)$$

where *VA* is real value added; *L* is labor hours; and *K* is real capital stock.[9] As a benchmark estimate, equation (3) is first estimated by OLS separately for each year and industry to compute TFP. To address an endogeneity problem in OLS estimation, I also estimate equation (3) by the method developed in Levinsohn and Petrin (2003). As a proxy for unobserved productivity shocks, I use the information on transportation and package costs and/or advertising costs. Finally, I address possible outliers by excluding the observations in the top and bottom 1% of the TFP estimates in each methodology.

The second dataset is the *Kaigai Jigyo Katsudo Kihon Chosa* (the Basic Survey of Overseas Business Activities, hereafter BSOBA). A survey questionnaire is sent to all the Japanese firms in both manufacturing and non-manufacturing sectors that are headquartered in Japan with foreign business enterprises; more than 10 percent of foreign affiliate's equity shares must be owned by the Japanese parent firm. Because it is not mandatory for firms to respond to the survey, the response rate is around 60-70 percent. Nevertheless, there is rich information in the survey on the scale and scope of foreign affiliate activities by Japanese firms. Specifically, I use the information of foreign affiliates in wholesale and retail sectors on entry year, location and sales. The total sales are further decomposed into sales to local, home, and third markets.

These affiliate-level sales are aggregated across parent firms, host markets, and years to match Japanese parent firms with their foreign affiliates. Using the merged dataset, I identify the establishment year of the first foreign affiliate for each parent firm and compute the years of foreign-market experiences. Additionally, the BSOBA data are used to calculate the total number of other foreign affiliates across host markets in manufacturing and service sectors, respectively.[10]

Data sources on host-country characteristics come mainly from the World

[9] The details of data construction are provided in the Appendix.

[10] The service sector includes construction, wholesale and retail, finance and insurance, real estate, transportation, public utility, and other miscellaneous industries.

Development Indicator (WDI) by the World Bank and the CEPII Gravity Dataset.[11] For market-access variables, the real GDP and population size are taken from the WDI dataset. The geographic distance, land area, and the number of hours differences are from the CEPII. The WDI also provides the information on other host-country characteristics, including an unemployment rate, firing cost, credit information, procedural days of business start-ups, and corporate tax rates. Additionally, educational attainment as measured by the average years of schooling comes from Barro and Lee (2010).

4. Estimation Results

In this section, I first describe firm characteristics of Japanese wholesalers and retailers to investigate whether the data are consistent with the model of firm heterogeneity in Helpman et al. (2004). Then, I present the estimation results on the determinants of Japanese multinational activities.

4.1. Firm Characteristics

I begin to describe the extent to which Japanese firms in wholesale and retail sectors engage in foreign markets through export and/or FDI. Table 1 tabulates the number of firms for the period 1997-2009. As is discussed in section 2, the macroeconomic trends after the 1990s have intensified market competition in wholesale and retail sectors and induced a number of distribution firms to exit from the market. Consistent with these observations, the number of domestic firms declined steadily from 8,739 to 7,024 between 1997 and 2009 whereas the number of exporters also decreased from 1,305 to 981. As a result, the total number of firms declined by 17.5%. By contrast, the number of firms with FDI increased over time, suggesting that Japanese wholesalers and retailers have increasingly served a foreign market through local commercial presence.

[Table 1 here]

Using the sample in Table 1, I conduct a simple empirical test of productivity differences between domestic, exporting, and multinational firms.[12] I regress the productivity measure on dummy variables for exporters and multinationals, controlling

[11] Gravity data are found at the website: http://www.cepii.fr/anglaisgraph/bdd/gravity.asp

[12] Tanaka (2011) compares the productivity premiums on Japanese multinationals between manufacturing and service sectors.

for industry- and year-fixed effects. Table 2 presents the estimation results. TFP variables are estimated by OLS and the Levinsohn-Petrin approach. Robust to the alternative estimations of TFP, I find that exporters and multinational firms are on average more productive than domestic firms. The productivity premiums range from 28% to 34% for exporters and from 26% to 67% for multinationals. These productivity premiums are similar in economic magnitude to the Japanese manufacturing firms (Wakasugi et al., 2008). Additionally, I compare the productivity between exporters and multinationals. The *F* tests in columns (2) and (4) show that multinational firms are significantly more productive than exporters. According to the *F* tests in columns (1) and (3), such productivity premium of multinationals does not depend on whether they engage in export or not. These results are consistent with the findings in Helpman et al. (2004).

[Table 2 here]

The previous studies focused primarily on manufacturing or entire sectors to investigate the underlying assumption of firm-heterogeneity model on productivity ordering.[13] In this respect, I extend the previous literature by showing that the model on export versus FDI is also consistent with the data on productivity ordering in wholesale and retail sectors. However, the question remains regarding the extent to which export and FDI are substitutable modes for distribution firms to provide services abroad. To shed light on the question, I plot export and foreign affiliate sales at the parent-firm level for 2007 in Figure 2. A simple regression shows that 1% increase in the affiliate sales is significantly associated with a 0.7% increase in the export sales. While more detailed data are necessary for a rigorous test, these patterns point to not a sharp substitution but complementary links between export and FDI activity for distribution firms. Thus, the model of firm heterogeneity would need to account for the fact that distribution firms can export commercial goods and engage in local distribution services not in a mutually exclusive way, but in a complementary manner.

[Table 2 here]

4.2. Determinants of Extensive Margin

I proceed to present the estimation results for determinants of the extensive margin.

[13] See for example Bernard and Jensen (1999), Arnold and Hussinger (2005), and Girma et al. (2005).

Table 3 shows a description of the variables and their data sources. Table 4 presents the summary statistics of the sample used in the analysis. The sample contains 794 parent firms, 78 host markets, and 12 years. However, the maximum number of these combinations does not match the number of observations in Table 4 because of the limited observations on some explanatory variables. Taking into account the fact that all the parent firms in the sample maintain at least one foreign affiliate in wholesale or retail sector, the mean value of 0.02 in the FDI variable indicates that most multinationals do not maintain multiple affiliates across foreign markets. Indeed, the sample shows that the average number of foreign affiliates per multinational parent is 1.42, with the standard deviation of 2.98 and the maximum number of 38.

[Tables 3 and 4 here]

Table 5 presents the benchmark results without country fixed effects. The specification in column (1) includes the standard determinants of trade and FDI in services, which are found to be important in the previous empirical work (Kimura and Lee, 2006; Ramasamy and Yeung, 2010). The result in column (1) shows that the TFP variable has a significantly positive correlation with the presence of FDI. To gauge the economic magnitude of a marginal effect, I compute a percent change in the odds of observing FDI resulting from one standard-deviation increase in the TFP variable, holding other variables at the mean. The marginal effect is 53.0%. Intuitively speaking, if a parent firm had higher productivity by one standard deviation, then his chance of establishing a foreign affiliate would increase by 53.0%. This result supports the theoretical hypothesis that more productive firms invest in a larger number of foreign markets.

[Table 5 here]

The foreign-market experience has a significantly positive association with the odds of maintaining a foreign affiliate. The marginal effect shows that one standard-deviation increase in the EXP variable would increase the probability of observing FDI by 150%. This result suggests that FDI in distribution services is encouraged not only by the inherent efficiency of individual firm, but by learning effects from directly engaging in local provision of distribution services. Moreover, I find that the learning effect from FDI is quantitatively larger than the self-selection effect approximated by firm's productivity estimates. While the previous studies such as Aw et al. (2008), Chen and

Moore (2010), and Yeaple (2009) emphasize the role of firm productivity in manufacturing FDI, my analysis implies that firm's efficiency is crucial for distribution FDI, but an experience from local distribution services plays a quantitatively larger role by almost three times. In fact, this finding is consistent with the work by Todo (2011), which shows that the past status of export and/or FDI accounts mainly for the export and FDI decisions in Japanese manufacturing firms.

Column (2) presents the result of the specification with host country's investment costs. Because these variables have significantly smaller number of observations, the sample size declines dramatically by 3.9 million observations. The results show that the TFP and EXP variables remain to have the significantly positive coefficients. Compared with the result in column (1), these variables have the smaller marginal effects; 44.2% for TFP and 85.8 for EXP. Nevertheless, the foreign-market experience has the larger impact on the probability of observing FDI, consistent with the result in column (1).

Looking at the host-country characteristics, I find that agglomeration of Japanese manufacturing affiliates has the significantly positive coefficient in column (1), but the insignificant coefficient in column (2). Also, the MFGAGG variable has the small marginal effects. These results suggest that agglomeration of manufacturing FDI does not promote FDI in distribution services. While Ramasamy and Yeung (2010) find that manufacturing FDI flows in the previous period promotes services FDI flows, my analysis shows that agglomeration of manufacturing FDI may not necessarily encourage distribution-services FDI. This result is in fact consistent with the model of international trade with intermediates in Ahn et al. (2011). In their model, firms export directly or indirectly through intermediary services. The share of intermediated exports decreases with market size, which is positively correlated with manufacturing FDI. Thus, the presence of manufacturing local affiliates would increase direct exports by manufacturers, but decrease indirect exports by intermediaries, which discourage FDI activity to provide local distribution services.

In contrast with manufacturing agglomeration, agglomeration of Japanese services affiliates has the significantly positive coefficients in both columns (1) and (2). The marginal effect in column (2) shows that one standard-deviation increase in the SRVAGG variable increases the odds of observing FDI by 65.3%. These results imply that FDI in distribution services is encouraged by other foreign affiliates in service sectors. One plausible explanation is that distribution FDI is encouraged by a network effect between firms in services. Another account is that the number of services affiliates may approximate the strength of regulations on foreign investment in service sectors because host-country investment climate is already controlled. In this case, the

larger services agglomeration represents lower restrictions on foreign investors in services sector, which result in the higher investment probability by firms in distribution sectors.

The host-market size and population density have the significantly positive association with FDI in distribution services. The marginal effects in column (2) indicate that one standard-deviation increase in the GDP and DEN variables increase the odds of FDI by 109.1% and 42.4%, respectively. By contrast with manufacturing FDI, market potential has the insignificant coefficients across specifications, suggesting that third-market size plays no role in the investment decision for firms in distribution sectors. These results support the idea that FDI in wholesale and retail sectors is targeted at the host market to supply local distribution services.

The geographic distance has a significantly positive correlation with the probability of FDI in columns (1) and (2), implying that Japanese firms in distribution sectors tend to establish distribution-related local affiliates in more distant markets away from Japan. As emphasized previously, the joint-production feature of distribution services between producers and customers significantly reduces tradability of distribution services, making FDI an alternative mode to produce distribution services in a distant market. By contrast, the differences in time zone have a significantly negative correlation with FDI in distribution services across specifications. As this result is consistent with the study by Stein and Daude (2007), the time differences would make it difficult for distribution headquarters to manage, monitor, and coordinate foreign operations.

The educational attainment of labor force in a host country has the insignificant coefficient in column (2), implying that efficiency-seeking motives do not play a role in distribution-services FDI. An unemployment rate has the significantly negative correlation with the probability of FDI, but firing costs have little correlation. Additionally, the probability of FDI in distribution services increases with the greater credit depth of information and the lower total tax rate in a host market. The length of starting business has the significantly positive association, which is not consistent with my prediction.[14] Perhaps, the START variable may capture uncertainty in business environments and provide an incentive for the local presence of distribution operations to manage cross-border transportation of commercial goods.

These discussions up to this point have highlighted that more productive firms tend to invest in a larger number of foreign markets and the probability of making FDI increases with market attractiveness such as agglomeration of services FDI, market size,

[14] The START variable has the significantly negative coefficient in the first-stage of the Heckman selection model, as explained in section 4.3.

and population density. Based on these findings, I turn to examine the second hypothesis that more productive firms would be more likely than less productive firms to penetrate the less attractive markets. To this end, I compute the predicted probability of observing FDI by changing the values of each explanatory variable on host-country characteristics for different percentiles of the TFP variable, holding the other explanatory variables at the mean. The computed probabilities enable me to examine whether the odds of observing FDI in the less attractive market increase with firm-level productivity.

The results for the services agglomeration are shown in Figure 3. As the services agglomeration decreases, the predicted probabilities of FDI decrease. However, the higher TFP variable is associated with the higher predicted odds of FDI even in the lower range of the services agglomeration. This suggests that high productive firms tend to establish FDI for distribution services even in the less attractive markets in terms of agglomeration of other Japanese affiliates in service sectors. Additionally, Figure 4 shows the results for the host-market size. While the predicted probabilities of FDI decline to almost zero in the lower range of the GDP variable, there is a higher chance of observing FDI when the TFP variable increases in the sufficiently large host markets. These results are qualitatively similar for other host-country characteristics. Therefore, my analysis provides evidence for the theoretical implications that more productive multinationals can penetrate less attractive markets.

[Figures 3 and 4 here]

Finally, I check the robustness of the estimation results in Table 5, which are not reported to save space. The similar specifications with dummy variables for each host market are estimated. These results suggest that the firm-level characteristics such as TFP and foreign-market experiences remain to exhibit the significantly positive coefficients, with the similar magnitudes of marginal effects. By contrast, the most variables for host-market characteristics lose significance except for the market size. As is consistent with the findings in Chen and Moore (2010), country-fixed effects purge away most of cross-sectional variations in the host-country variables, making the most host-country variable insignificant for the reason that host-market characteristics change little over time in the short-run. In addition, following Bernard et al. (2010), I exclude the sample firms in which more than 25% of their employees in Japan belong to manufacturing/mining sections. The restricted sample is used to re-estimate productivity and the determinants of extensive margin, which produce the quantitatively similar

results as in Tables 2 and 5. Thus, the previous results are robust to the definition of wholesalers and retailers.[15]

In sum, this section presents the formal evidence that more productive firms in distribution sectors are more likely than less productive firms to make direct investment and to penetrate less attractive markets. Thus, the firm-heterogeneity model on multinational production is consistent with FDI in distribution services in terms of the extensive margin.

4.3. Determinants of Intensive Margin

I turn to discuss the results for determinants of the intensive margin. I first examined the benchmark specification with a full set of explanatory variables including UNEMP, FIRE, CREDIT, START, and TAX. As these variables had the insignificant coefficients, I focused on the benchmark specification without these explanatory variables. Table 6 reports the estimation results with and without country fixed effects. To check whether the selection effects matter, I report the estimated coefficients for the inverse Mill's ratio. The coefficient is insignificant in column (1), but significantly positive in column (2), suggesting the importance of accounting for self-selection effects. Moreover, the excluded variable, START, has the significantly negative coefficients in the first-stage specifications of columns (1) and (2), consistent with the idea that longer procedures of starting business discourage an establishment of distribution-services subsidiaries.

[Table 6 here]

The TFP variable has the significantly positive coefficients in columns (1) and (2). This implies that conditional upon entry, more productive firms are more likely than less productive firms to generate larger affiliate sales. The result is in favor of the model of firm heterogeneity regarding the relationship between firm productivity and the intensive margin of FDI activity. According to the result in column (2), 1% increase in parent firm's productivity is associated with 1.8% increase in the volume of sales by foreign affiliates in wholesale and retail sectors. Additionally, the foreign-market experience correlates significantly and positively with the volume of affiliate sales. For instance, one standard-deviation increase in the EXP variable is predicted to increase affiliate sales up to 216.5%.[16] Finally, foreign affiliate sales in wholesale and retail

[15] The following results also do not change quantitatively for the restricted sample.
[16] The exact percentage change in ASALE is computed by $100\times(\exp(0.095\times12.13)-1)$.

sectors correlate negatively with agglomeration of Japanese affiliates in manufacturing, positively with that in services. Market potential and geographic distance also has the positive association with ASALE.

As a robustness check, I further decompose total affiliate sales into sales by destination market: a local market, export to Japan, and export to third markets. Specifically, I estimate the similar specification with these alternative definitions of the dependent variables. Table 7 reports the estimation results without country fixed effects. The inverse of Mill's ratio has the insignificant coefficients across alternative specifications in columns (1) to (3), suggesting that potential self-selection bias may not matter significantly for these specifications.[17]

[Table 7 here]

Column (1) shows that the TFP variable is associated significantly and positively with local sales of foreign affiliates in wholesale and retail sectors. Column (2) also indicates that parent firm's productivity correlates significantly and positively with exports of foreign affiliates to the Japanese market. Additionally, column (3) shows the significantly positive correlation of the TFP variable with exports of foreign affiliates to third markets. Marginal effects of these results suggest that 1% increase in the TFP level is predicted to increase the alternative measures of FDI at the intensive margin between 0.94% and 1.25%. Therefore, these results provide additional evidence of the positive contribution of parent firms' productivity to the intensive margin of their FDI in distribution services.

5. Conclusion

Distribution services by wholesalers and retailers play an important intermediary role in economic transactions both within a country and across countries. This paper uses the firm-level data on Japanese multinationals in wholesale and retail sectors for 1997-2009 and examines FDI decisions of intermediary distribution firms at the extensive and intensive margin. By focusing on firm heterogeneity, I examine whether evidence supports the model of international trade with heterogeneous firms, which has been subject to the econometric analysis mainly for manufacturing sectors. The empirical results show that more productive firms are more likely than less productive firms to engage in trade and to establish foreign subsidiaries for distribution services.

[17] While the following results on the TFP variable are robust to the inclusion of country fixed effects, the inverse Mill's ratio has the significant coefficients in the specification with country fixed effects.

Parent firms' productivity also increases the scope and scale of foreign distribution services. Thus, my analysis suggests that the model of firm heterogeneity is fairly consistent with the pattern of trade and FDI for multinationals in wholesale and retail sectors.

In addition to the prominent role of firm heterogeneity, this paper also sheds light on the country-level determinants of FDI in distribution services. Agglomeration of other Japanese affiliates in manufacturing and service sectors would increase the probability of Japanese distribution firms to establish commercial presence, as is consistent with the previous research on manufacturing FDI. However, manufacturing agglomeration could decrease the scale of foreign distribution services possibly because manufacturing multinationals would engage in trading activities by themselves. Moreover, distribution FDI may be encouraged by the geographic distance, but discouraged by the differences in time zones.

There are remaining issues left for future research to further improve our understanding on distribution FDI. As Kalirajan (2000) documented a number of restrictions on trade in distribution services, it remains to identify a crucial source of regulatory barriers to FDI decisions for wholesalers and retailers. Such research would lead to useful policy implications for liberalization in service sectors. Moreover, it raises the question whether promotion of distribution FDI would consequently affect trade. As Nordås et al. (2008) analyzed the aggregate impact of retail sectors on trade, the firm-level analysis on this issue is promising.

Appendix

This appendix describes the details of datasets used to estimate firm-level productivity. First, value added is computed from total sales minus intermediate input. The total sales include the total volume of domestic sales and export sales, which approximates the domestic production. The intermediate input is the costs of goods sold plus selling, general, and administrative expenses minus wages and depreciation. The value added as computed above is deflated with the GDP deflator in wholesale and retail trade from the *System of National Accounts (SNA) Statistics* by the Japanese government's Cabinet Office.

Second, labor input is measured by the total working hours of all workers for each firm. In particular, I use the number of regular and part-time workers multiplied by the average of their annual working hours, respectively. The information on working hours for regular and part-time workers is taken from the *Monthly Labor Survey* by the Japanese Ministry of Health, Labor, and Welfare. Third, capital input is computed from

the value of fixed tangible assets deflated by the gross fixed capital deflator from the *System of National Accounts (SNA) Statistics*. Finally, the costs of transportation, package, and advertising are deflated with the GDP deflator, as used for the value added.

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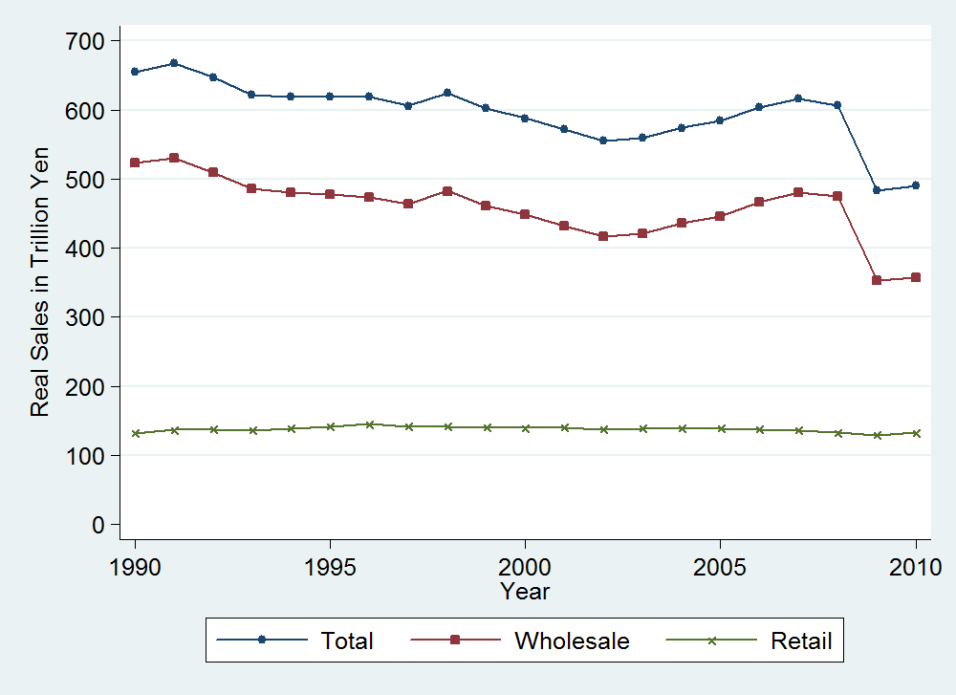
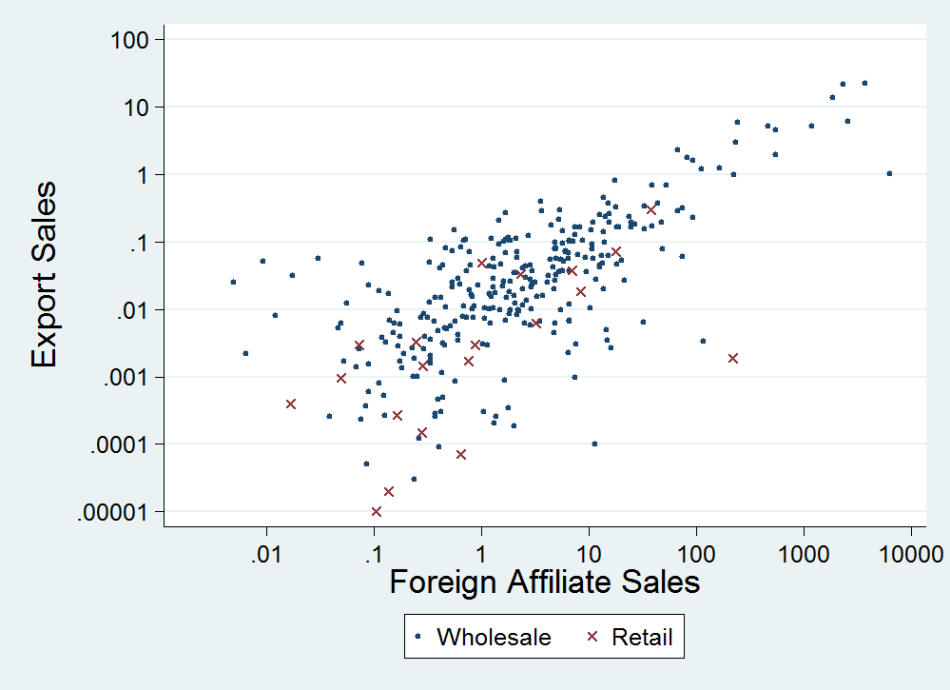
Figure 1. Trends in Commercial Sales for 1990-2009



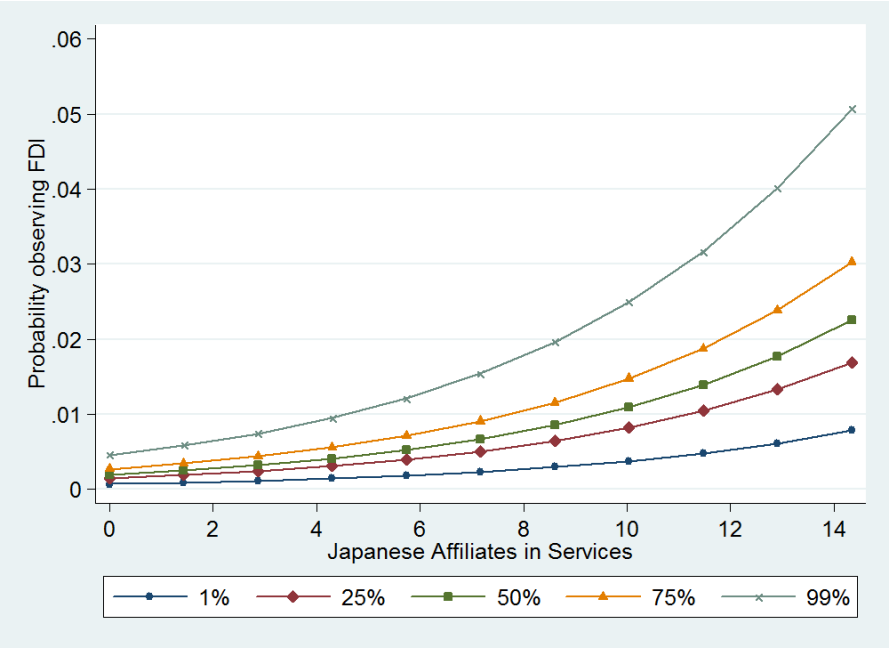
Source: The *Current Survey of Commerce*.

Figure 2. Export and Foreign Affiliate Sales in 2007



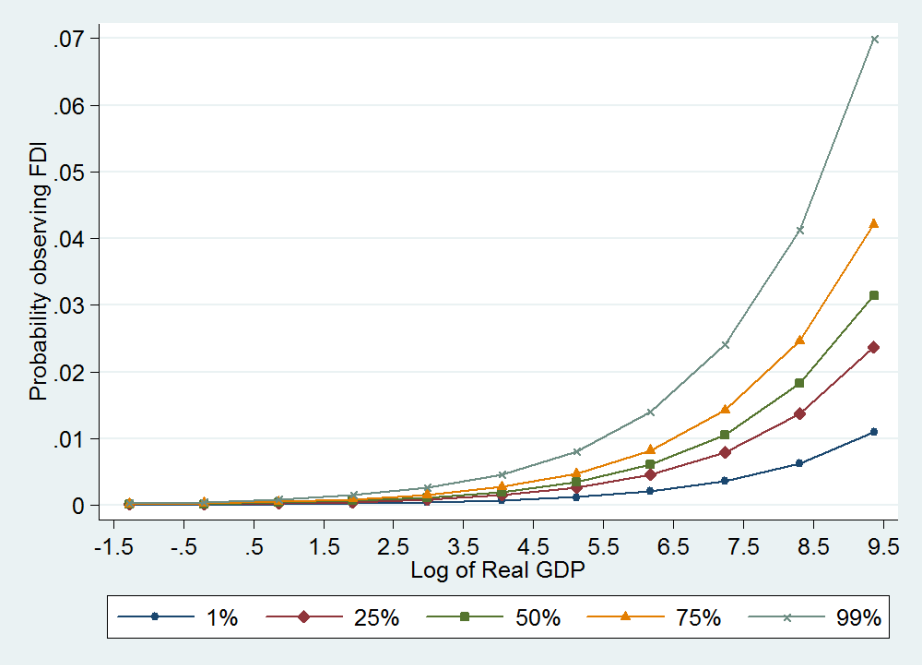
Note: Export and foreign affiliate sales are defined in billions of Japanese yen.

Figure 3. Predicted probability of FDI by TFP and Services Agglomeration



Notes: Markers indicate the percentiles of the TFP variable whose values are used to evaluate the probabilities; the horizontal axis is the number of thousands of Japanese affiliates in service sectors.

Figure 4. Predicted probability of FDI by TFP and Host Market Size



Notes: Markers indicate the percentiles of the TFP variable whose values are used to evaluate the probabilities; the horizontal axis is the log of real GDP in billions of 2000 U.S. dollars.

Table 1: Number of Firms by Export and FDI Status

Year	Domestic	Exporter	FDI without export	FDI with export	All
1997	8,739	1,305	42	158	10,244
1998	8,738	1,295	38	155	10,226
1999	8,562	1,272	41	163	10,038
2000	7,947	1,204	43	175	9,369
2001	7,969	1,226	30	163	9,388
2002	7,578	1,218	35	183	9,014
2003	7,308	1,107	46	228	8,689
2004	7,512	1,301	23	145	8,981
2005	7,328	1,097	59	286	8,770
2006	7,041	1,058	70	284	8,453
2007	7,236	1,065	67	294	8,662
2008	7,176	1,001	76	335	8,588
2009	7,024	981	70	367	8,442
Total	100,158	15,130	640	2,936	118,864

Note: FDI indicates multinational firms with at least one foreign affiliate.

Table 2. Productivity Comparisons by Exporter and Multinational Firms

	(1)	(2)	(3)	(4)
Dependent	TFP by OLS		TFP by Levinsohn and Petrin	
Exporter	0.25***	0.25***	0.29***	0.29***
	(0.0037)	(0.0037)	(0.0040)	(0.0040)
FDI without export	0.23***		0.50***	
	(0.016)		(0.018)	
FDI with export	0.36***		0.51***	
	(0.0077)		(0.0087)	
FDI		0.33***		0.51***
		(0.0070)		(0.0079)
Industry dummy	Yes	Yes	Yes	Yes
Year dummy	Yes	Yes	Yes	Yes
No. of observations	118,864	118,864	118,864	118,864
R-squared	0.057	0.057	0.15	0.15
F test for H_0: $\beta_{exp} = \beta_{FDI\&noexp}$	1.16		128.6	
	(0.2822)		(0.000)	
F test for H_0: $\beta_{exp} = \beta_{FDI\&exp}$	170.3		579.3	
	(0.000)		(0.000)	
F test for H_0: $\beta_{exp} = \beta_{FDI}$		124.8		668.4
		(0.000)		(0.000)

Notes: FDI includes both multinational firms without and with export; parentheses report robust standard errors; *** denotes significance at the 1% level; *F* tests report *F* statistics with p-values.

Table 3. Description of Variables and Data Sources

Variable	Description	Source
FDI	It takes on unity if firm i establishes a foreign affiliate in market j for year t+1, and zero otherwise.	BSOBA
ASALE	Log of affiliate total sales by firm i in market j for year t+1	BSOBA
ASLOC	Log of affiliate local sales by firm i in market j for year t+1	BSOBA
ASJPN	Log of affiliate export to Japan by firm i in market j for year t+1	BSOBA
AS3RD	Log of affiliate export to third markets by firm i in market j	BSOBA
TFP	Log of TFP estimated by Levinsohn and Petrin method	BSBSA
EXP	Foreign-market experiences as measured by years from first direct investment by firm i	BSOBA
MFGAGG	Number of other manufacturing affiliates by Japanese firms in market j (in hundreds)	BSOBA
SRVAGG	Number of other services affiliates by Japanese firms in market j (in hundreds)	BSOBA
GDP	Log of real GDP in billions of 2000 U.S. dollars in market j	WDI
DEN	Log of population size divided by land area in market j	WDI/CEPII
MKP	Log of distance-weighted real GDP of third markets in market j	WDI/CEPII
DIST	Log of population-weighted great circle distance between large cities in Japan and market j	CEPII
TDIF	Time difference in hours between Japan and market j	CEPII
EDU	Average years of schooling in market j	Barro and Lee (2010)
UNEMP	Unemployment rate in market j (% of total labor force)	WDI
FIRE	Firing cost in market j (weeks of wages)	WDI
CREDIT	Credit depth of information index in market j (0=low to 6=high)	WDI
START	Number of days required to start a business in market j	WDI
TAX	Total tax rate in market j (% of commercial profits)	WDI

Table 4. Summary Statistics

Variable	No. of Obs.	Mean	Std. Dev.	Min	Max
FDI	520,594	0.02	0.13	0	1
ASALE	4,712	6.78	1.98	0.15	14.28
ASLOC	3,867	6.26	1.98	-0.48	13.58
ASJPN	2,257	4.39	2.50	-0.79	13.20
AS3RD	1,929	5.25	2.65	-0.59	13.17
TFP	520,594	-2.94	0.44	-4.70	-2.02
EXP	520,594	16.46	12.13	1	82
MFGAGG	520,594	0.81	2.40	0	25.79
SRVAGG	520,594	0.74	1.80	0	14.34
GDP	520,594	4.25	1.91	-1.27	9.37
DEN	520,594	4.28	1.41	0.88	8.92
MKP	520,594	1.87	0.52	0.86	3.15
DIST	520,594	9.07	0.51	6.86	9.84
TDIF	520,594	6.59	3.20	0	12
EDU	520,594	8.32	2.31	2.85	13.02
UNEMP	128,146	7.20	3.80	0.5	26.7
FIRE	128,146	54.63	44.62	2	217
CREDIT	128,146	4.34	1.59	0	6
START	128,146	30.44	27.50	2	153
TAX	128,146	46.76	16.55	11.3	108.1

Table 5. Determinants of Extensive Margin of FDI in Distribution Services

Dependent variable: FDI = 1 or 0

	(1)			(2)		
	Coef.	Std. Err.	Marginal Effect (%)	Coef.	Std. Err.	Marginal Effect (%)
TFP	0.98***	(0.12)	53.0	0.78***	(0.13)	44.2
EXP	0.075***	(0.0048)	149.9	0.054***	(0.0057)	85.8
MFGAGG	0.052***	(0.014)	13.4	0.038	(0.034)	11.3
SRVAGG	0.17***	(0.027)	36.2	0.30***	(0.059)	65.3
GDP	0.52***	(0.029)	171.4	0.48***	(0.046)	109.1
DEN	0.38***	(0.024)	71.5	0.25***	(0.041)	42.4
MKP	0.13	(0.17)	7.1	-0.081	(0.23)	-4.0
DIST	0.78***	(0.12)	49.4	0.73***	(0.18)	47.4
TDIF	-0.34***	(0.037)	-65.8	-0.26***	(0.045)	-56.8
EDU	0.088***	(0.015)	22.5	0.067	(0.035)	13.5
UNEMP				-0.10***	(0.024)	-32.9
FIRE				-0.0019	(0.0019)	-8.2
CREDIT				0.26***	(0.033)	51.3
START				0.0095***	(0.0018)	30.0
TAX				-0.021***	(0.0042)	-29.4
Year dummy		Yes			Yes	
Country dummy		No			No	
No. of observations		520,594			128,146	
Log likelihood		-28344.8			-8705.5	
Pseudo R-squared		0.41			0.37	

Notes: Parentheses report standard errors corrected for clustering within each parent firm; marginal effects report a percent change in the odds of observing FDI from a standard deviation increase in each variable; ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Table 6. Determinants of Intensive Margin of FDI in Distribution Services

Dependent variable: ASALE

	(1)		(2)	
	Coef.	Std. Err.	Coef.	Std. Err.
TFP	1.11***	(0.15)	1.81***	(0.21)
EXP	0.038***	(0.011)	0.095***	(0.016)
MFGAGG	-0.067***	(0.020)	0.11	(0.073)
SRVAGG	0.17**	(0.053)	-0.046	(0.073)
GDP	0.048	(0.091)	1.14	(1.27)
DEN	0.13	(0.076)	-2.47	(1.45)
MKP	0.59***	(0.14)	4.12	(3.46)
DIST	0.47**	(0.16)		
TDIF	-0.11	(0.065)		
EDU	0.048	(0.035)	0.083	(0.49)
Inverse Mill's ratio	-0.044	(0.51)	2.35***	(0.68)
Year dummy	Yes		Yes	
Country dummy	No		Yes	
No. of observations	252,956		252,956	
No. of uncensored observations	4,712		4,712	

Notes: The first-stage regression includes the START variable as an excluded variable in the Heckman selection model; ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Table 7. Determinants of Foreign Affiliate Sales by Destination Market

	(1)		(2)		(3)	
Dependent	ASLOC		ASJPN		AS3RD	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
TFP	1.03***	(0.18)	0.94*	(0.47)	1.25*	(0.60)
EXP	0.026	(0.013)	0.085*	(0.034)	0.068	(0.044)
MFGAGG	-0.090***	(0.023)	-0.088*	(0.038)	-0.042	(0.041)
SRVAGG	0.21**	(0.078)	0.31*	(0.15)	0.17	(0.16)
GDP	-0.11	(0.12)	0.34	(0.29)	0.10	(0.34)
DEN	-0.042	(0.087)	0.18	(0.22)	0.62*	(0.32)
MKP	0.61**	(0.21)	0.44	(0.33)	0.50	(0.38)
DIST	0.068	(0.22)	-0.25	(0.38)	1.19	(0.72)
TDIF	-0.016	(0.099)	-0.16	(0.19)	-0.25	(0.26)
EDU	-0.021	(0.039)	0.12	(0.084)	0.20	(0.11)
Inverse Mill's ratio	-0.19	(0.69)	1.48	(1.51)	0.89	(1.84)
Year dummy	Yes		Yes		Yes	
Country dummy	No		No		No	
No. of observations	252,956		252,956		252,956	
No. of uncensored observations	3,867		2,257		1,929	

Notes: The first-stage regression includes the START variable as an excluded variable in the Heckman selection model; ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.