Firm Heterogeneity, Foreign Market Entry Mode and Ownership Choice: The Case of Japanese Direct Investment

Andrzej Cieślik and Michael Ryan

Abstract: We extend and generalize the model of international trade and FDI proposed by Helpman et al. (2004) that builds on the Melitz (2003) framework with heterogeneous firms by allowing for various types of horizontal FDI that may differ in terms of the degree of foreign ownership. First, we assume that a firm servicing a foreign market can choose not only between exporting and the wholly-owned FDI (Helpman et al., 2004) but may also form a joint venture with an indigenous firm in the foreign country to share the investment cost. This increases the range of productivity levels for which FDI should be observed compared to exporting. Second, we divide joint ventures into the three categories: minority, equal share and majority joint ventures. Then we test the predictions of the theory using Kolmogorov-Smirnov stochastic dominance tests and the Japanese individual dataset for firms that made horizontal FDI in 20 OECD countries during the period 1985-2001. The empirical results indicate that joint ventures are always stochastically dominated by the wholly-owned subsidiaries and joint ventures always dominate both exporters and non-exporters. The split of joint ventures into particular categories demonstrates that this result is driven by the majority joint ventures.

JEL Classification Codes: F23

Keywords: Firm heterogeneity, foreign market entry mode, Japanese direct investment, ownership choice
1. Introduction

The last two decades have seen an enormous growth of activity by multinational firms that became the major players in the process of globalization of national economies. Foreign direct investment made by these firms has grown at faster rates than both international trade and GDP. Inability of the neoclassical theory to explain contemporary trade and investment patterns led to the emergence of the so-called new trade theory that departed from the assumptions of product homogeneity, constant returns to scale and perfect competition. The first wave in the development of the new trade theory started already in the early 1980s with the rapid growth in the application of concepts borrowed from the industrial organization literature to international trade. In particular, the new trade theory literature introduced within-industry heterogeneity resulting from product differentiation and monopolistic competition assuming at the same time that firms are symmetric in terms of technology. This assumption implied similar productivity levels and similar participation in international trade for all firms within the industry.

However, recent microeconomic empirical research based on firm-level datasets has shown that there is a lot of within-industry heterogeneity with respect to productivity levels of individual firms and their participation in international trade and investment. Therefore, the assumption of symmetry across firms within the industry was regarded as not fully satisfactory and had to be relaxed. This gave rise to the second wave in the development of the new trade theory. In the beginning of the XXI century, with the seminal work of Melitz (2003), who developed a model of monopolistic competition with heterogeneous firms, the international trade and investment literature has entered a new stage of its development. Although Melitz (2003) model was originally designed to study only the intra-industry effects of international trade this model soon became the “workhorse” of modern international trade
theory and its many extensions were provided to study the whole range of different issues.\footnote{See Helpman (2006) for the excellent survey of the recent literature on trade FDI and organization of firms.} In particular, Helpman \textit{et al.} (2004) generalized Melitz (2003) model to handle the issue of the choice between exporting and horizontal foreign direct investment known as the proximity-concentration tradeoff.

In this paper we argue that, their generalization cannot be regarded as fully satisfactory because it concentrates on one type of FDI only, i.e. wholly-owned subsidiaries and completely neglects other forms of entering foreign markets such as various types of joint ventures and the ownership choice of individual firms that form joint ventures that are a common feature of contemporary investment patterns. The goal of this paper is twofold. First, we provide another extension of the Melitz (2003) model that brings the ownership dimension into the organizational choice of individual firms. Therefore, our theoretical framework can be regarded as more general than that provided by Helpman \textit{et al.} (2004) as it shows their results for the wholly-owned FDI can be treated as a special case in our generalization of the Melitz (2003) model. Second, we verify empirically the predictions of the generalized theory using the Japanese individual dataset for firms that made horizontal FDI in 20 OECD countries during the period 1985-2001.

The paper is organized as follows. In Section 2 we develop a theoretical framework that will constitute a basis for our empirical work on Japanese FDI presented further in the paper. First, we summarize the main findings of Helpman \textit{at el.} (2004) who allow for only two types of foreign market entry: exporting and wholly-owned horizontal FDI. Then we extend their framework by allowing firms to form joint-ventures with host country partners, which increases the range of productivity levels for which horizontal FDI should be observed compared to exporting. In Section 3 we describe our empirical methodology based on Kolmogorov-Smirnov stochastic dominance tests. In Section 4 we discuss the properties of
the firm-level dataset for Japanese firms. In Section 5 we present and interpret our empirical findings. Section 6 summarizes and concludes with guidelines for future research.

2. Theoretical Framework

Melitz (2003) developed a theoretical model of monopolistic competition with heterogeneous firms that differed in terms of their productivity levels to study the intra-industry effects of international trade. The main insights from the Melitz (2003) model are derived from an interaction between productivity differences across firms, the presence of variable trading costs and the similarity across firms in fixed costs of exporting. These interactions can be easily illustrated using a static version of the Melitz (2003) model with the continuum of heterogeneous firms that produce different varieties of a differentiated product using labor as a single factor of production. Like in a typical model of monopolistic competition each firm supplies only one variety of the differentiated product. The demand for a variety supplied by firm j in its domestic market is described by demand function \( x(j) = A p(j)^\varepsilon \), where \( x(j) \) is the quantity demanded of variety j, \( p(j) \) its price, \( A \) is a measure of the level of demand that is exogenous to the firms but endogenous to the industry and \( \varepsilon \) is the elasticity of demand, \( \varepsilon = (1/1-\alpha) > 1. \)

2 Firm j faces a variable production cost per unit of output \( c/\theta(j) \), where \( c \) is the wage rate and \( \theta(j) \) is the level of firm’s j productivity. In addition to the variable production cost there is also a fixed cost of production \( c_f_D \) expressed also in terms of labor. If the firm decides to enter the domestic market it sells its output at the profit maximizing price given as the markup over its marginal cost of production \( p(j) = c/\alpha\theta(j) \). In this case firm’s j profits \( \pi_D \) can be related to its productivity through the profit following function:

\[
\Pi_D(\Theta) = \Theta B - c_f_D
\]  

\[ (1) \]

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2 This demand function can be easily derived from a standard constant elasticity of substitution (CES) function with \( \alpha \) being a measure of the elasticity of substitution between particular varieties of a differentiated product.
where \( \Theta \equiv \theta^{c-1} \) and \( B \equiv (1-\alpha)A(c/\alpha)^{1-\epsilon} \).

There is a threshold value for the productivity index \( \Theta \) denoted by \( \Theta_D \) below which firms decide not to enter the domestic market as they cannot cover their fixed costs with variable profits. Hence, only those firms with the productivity index above \( \Theta_D \) will enter the domestic market.

Now assume that there is another country marked by \( l \) which can be a potential market for variety \( j \) developed by the firm located in the home country. For simplicity, assume that the demand elasticity for the variety is the same in both countries but the demand levels can differ. The demand function for variety \( j \) in country \( l \) can be respectively written as: \( x_l(j) = A_l p(j)^\epsilon \). Varieties are exported from the home country to the foreign country at standard “iceberg” transportation cost \( \tau \). Moreover, in addition to the transportation cost \( \tau \) there are also fixed costs of exporting \( cf_X \). These costs can be interpreted as costs of forming distribution and servicing networks in a foreign country. In this case the firms that enter the domestic market can make additional profits \( \Pi_X^l \) by exporting a part of their output to a foreign country:

\[
\Pi_X^l = \tau^{1-\epsilon} B^l - cf_X
\]

where \( B^l \equiv (1-\alpha)A_l(c/\alpha)^{1-\epsilon} \). There is a threshold value for the productivity index \( \Theta \) denoted by \( \Theta_X^l \) below which domestic firms decide not to export to the foreign country as their operational profits made at the foreign market are not sufficient to cover the fixed costs of exporting. Therefore, only high productivity firms with \( \Theta > \Theta_X^l \) decide to sell their varieties in both markets while the low productivity firms with \( \Theta < \Theta_X^l \) concentrate on the domestic market only.

The static version of the Melitz (2003) model has been subsequently used by Helpman at al. (2004) to study the horizontal foreign direct investment in the context of the proximity-concentration hypothesis.

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3 The firm’s index \( j \) can be dropped as the profits are independent of the identity of the firm. The only thing that matters in this case is the productivity level.
2.1. Wholly-owned subsidiary versus exporting

Helpman et al. (2004) generalization of the Melitz (2003) model assumes that firms can enter foreign markets not only by exporting but also by making horizontal foreign direct investment in the form of a wholly-owned subsidiary. In particular they assume that a home country firm can set up a production plant in a foreign country at cost $c_f$, that will allow producing its variety of differentiated product at unit variable cost $c^j/\theta(j)$. If the firm decides to make horizontal FDI in the form of a wholly-owned subsidiary in the foreign country its operating profits from FDI can be written as:

$$\Pi^I_f = \Theta B^I_f - c_f$$

(3)

where $B^I_f \equiv (1-\alpha)A^I_f(c/\alpha)^{1-\epsilon}$, and $c$ is the measure of cost of resources (e.g. wage rate) and $f_I$ is the fixed cost of forming a subsidiary in a foreign country.

Comparing (2) and (3) one can notice that when $f_I > f_X$ and $c^j < c\tau$ the firm faces a standard proximity concentration trade-off. FDI relative to exports saves transport costs but at the same time duplicates production facilities and therefore requires a higher fixed cost (Helpman et al., 2004). Following Helpman (2006) this trade-off can be shown graphically in Figure 1, assuming that the level of demand is the same in both home and foreign countries $B = B^I$ and $f_I > \tau^e f_X > f_D$. 4

<Insert Figure 1 about here>

In this case, $\Theta^I_f > \Theta^X_f > \Theta_D$ and high-productivity firms with productivity levels above $\Theta^I_f$ serve the foreign country market via horizontal FDI in the form of a wholly-owned subsidiary, middle-productivity firms with $\Theta^X_f < \Theta < \Theta^I_f$ serve the foreign market by

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4 Helpman et al. (2004, p. 302) argue that “Larger countries attract a disproportionately larger number of entrants (relative to country size) and a larger number of sellers (hence, more product variety)”. They also demonstrate that larger markets are disproportionately served by domestically-owned firms.
exporting, and the lowest productivity firms with \( \Theta_D < \Theta < \Theta_X \) operate in the home country market only.

2.2. FDI and the ownership choice: Wholly-owned subsidiary versus joint-venture

In this paper we extend the original Melitz (2003) model and generalize the Helpman et al. (2004) framework by allowing for various types of horizontal FDI that may differ in terms of the degree of foreign ownership. In the simplest possible case, unlike in Helpman et al. (2004), we assume that if the firm decides to service the foreign market it can choose not only between exporting and the wholly-owned FDI but may also form a joint venture with an indigenous firm in the foreign country to share the overhead investment cost. Forming a joint-venture with a local partner in the host country allows the firm to solve the problem of duplicating the cost of production facilities but at the same time requires the revenue sharing with the indigenous firm. For simplicity we assume that the local firm in the host country that enters into a joint venture with the home country firm equally participates in the fixed overhead costs and sales revenues in the host country market. The ownership share of the home country firm in the joint venture will be denotes by \( \gamma \) which can be interpreted as the profit retention rate. In this case the operational profit of the home country firm that forms a joint venture with a local partner from FDI is given by:

\[
\Pi_{JV} = \gamma(\Theta_B - cf) = \gamma(\Theta_B - \gamma cf)
\]

(4)

where \( \gamma \) denotes the profit retention rate with \( \gamma \leq 1 \). In the extreme case when \( \gamma = 1 \) equation (4) simplifies to (3) and we are back to the original case of a wholly-owned subsidiary discussed in the previous subsection. Allowing for joint ventures yields a modified graph shown in Figure 2 that presents the tradeoff not only between exporting and the wholly-owned FDI but also the tradeoff between the wholly-owned FDI and the joint-venture FDI.\(^5\)

\(^5\) On the one hand, forming a joint venture allows the home country firm to reduce its overhead investment cost in the foreign country, however, at the same time it also reduces its profits which now need to be shared with the
It can be noticed that the slope and the location of the profit function for joint ventures depends on the profit retention rate $\gamma$. Higher $\gamma$ means a higher slope of the profit function and at the same time a higher cost of investment in production facilities abroad. Consequently, the location of $\Theta^l_{WOS}$ and $\Theta^l_{JV}$ on the $\Theta$ line depends on the profit retention rate $\gamma$. Higher values of parameter $\gamma$ shift the location of both $\Theta^l_{WOS}$ and $\Theta^l_{JV}$ to the right and the range for which exporters are operational increases while the range for which wholly-owned affiliates are operational decreases. Moreover, if the profit retention rate is too low, i.e. for some low values of $\gamma$, horizontal FDI in the form of a joint venture might be strictly dominated by exporting.

Summing up, we can notice that compared to the original Helpman et al. (2004) model that allows for FDI in the form of a wholly-owned subsidiary only in our model the possibility of forming joint-ventures with local firms expands the range of productivities for which we can observe horizontal foreign direct investment.

2.3. Joint venture ownership choice: minority, equal share, majority

Our study of joint ventures can be further extended by separating joint ventures into the following three categories: minority ($0.1 < \gamma < 0.5$), equal share ($\gamma = 0.5$) and majority joint ventures ($0.95 > \gamma > 0.5$). The tradeoff between different types of joint-ventures that differ with respect to the ownership share is illustrated graphically in Figure 3.
In this case $\theta^l_{WOS} > \theta^l_{MAJV} > \theta^l_{ESJV} > \theta^l_{MIJV}$ and the highest productivity multinational firms with productivity levels above $\theta^l_{WOS}$ serve the foreign country market via wholly-owned subsidiaries, lower productivity multinational firms with productivity levels between $\theta^l_{WOS} > \Theta > \theta^l_{MAJV}$ form majority joint ventures, even lower productivity multinational firms with productivity levels between $\theta^l_{MAJV} > \Theta > \theta^l_{ESJV}$ form equal share joint ventures, and the lowest productivity multinational firms with productivity levels between $\Theta > \theta^l_{ESJV} > \Theta > \theta^l_{MIJV}$ form minority joint ventures with local firms. Finally, Home country firms with the productivity levels between $\theta^l_{MIJV} > \Theta > \theta^l_{X}$ serve the foreign market by exporting.\textsuperscript{6}


To test empirically the predictions of our generalized theoretical framework we follow the previous empirical literature in this area and compare and rank the productivity of our sample firms through the non-parametric first-order stochastic dominance approach. The empirical approach based on stochastic dominance tests is well established in the empirical literature on firm heterogeneity and allows robustly comparing productivity differences across firm-types at all moments of their productivity distributions, rather than at a single moment (typically the mean). For example, recent empirical studies employing Kolmogorov-Smirnov stochastic dominance tests, such as Delgado \textit{et al.} (2001), Girma \textit{et al.} (2004), Merino (2004), Girma \textit{et al.}

\textsuperscript{6} However, it must be noted that these results crucially depend on the location of the profit line $\Pi^l_X$ for exporters whose slope is determined by the transport cost $\tau$ and the location by the fixed cost of exporting $f_c$. Although theory predicts various types of joint venture FDI that differ with respect to the ownership choice, if the cost of exporting and transport costs are low then some types of joint-venture FDI, especially those formed by the least productive multinational firms such as minority- and equal share-owned joint ventures might be strictly dominated by exporting and may not be observed in practice.
al. (2005), Arnold and Hussinger (2005), and Wagner (2006) empirically confirm this structure as they find significant heterogeneity in TFP-foreign market entry relationship.\(^7\)

As stochastic dominance tests are well-established in the literature, we only briefly discuss them here. These tests are used to make comparisons between the distribution of firm productivity levels corresponding to different groups in the general population of firms. Suppose we wish to consider the cumulative productivity distribution functions of two firm-types (F, S). For F to first-order stochastically dominate S, \(F(z)-S(z) \leq 0\) for some \(z \in \mathbb{R}\), where \(\mathbb{R}\) is the set of real numbers. Note that for some \(z\), strict equality is allowed to hold. Thus we allow firms with the same productivity level to choose different foreign market entry modes and instead focus on the more robust picture of differences across the two distributions. To test for stochastic dominance, we employ both one-sided and two-sided Kolmogorov-Smirnov (KS) tests. The null-hypothesis of the two-sided test is that the comparison distributions are identical, and is written as

\[
H_0: F(z) - S(z) = 0 \quad \forall z \in \mathbb{R} \quad \text{against} \quad H_1: F(z) - S(z) \neq 0 \quad \text{for some } z \in \mathbb{R} \quad (5).
\]

In the one-sided test, we examine

\[
H_0: F(z) - S(z) \leq 0 \quad \forall z \in \mathbb{R} \quad \text{against} \quad H_1: F(z) - S(z) > 0 \quad \text{for some } z \in \mathbb{R} \quad (6).
\]

The KS test statistics for the two-sided and one-sided tests are, respectively

\[
KS_2 = \sqrt{\frac{nm}{N}} \max_{1 \leq i \leq n, 1 \leq j \leq m} \{F_n(z_i) - S_m(z_j)\} \quad (7).
\]

\[
KS_1 = \sqrt{\frac{nm}{N}} \max_{1 \leq i \leq n, 1 \leq j \leq m} |F_n(z_i) - S_m(z_j)| \quad (8).
\]

where \(n\) and \(m\) represent the sample sizes of the F and S distributions, and where \(n+m=N\). Thus for F to stochastically dominate S, we must both reject the two-sided KS test’s null-

\(^7\) For a recent survey of the full literature on firm-level heterogeneity and its role in the exporting and FDI decisions, see Greenaway and Kneller (2007). Girma, et.al. (2004) use measures of per employee sales, value added and profit to proxy for TFP.
hypothesis and fail to reject the one-sided KS test’s null hypothesis. In the results tables provided below, the reported KS coefficients are the D-statistics, or the maximum difference between the F and S distributions.  

4. Data Descriptive Statistics

We determine the foreign market entry status of the Japanese firms in our sample from two Toyo Keizai sources: the Japan Company Handbook (JCH) and the Kaigai Shinshutsu Kigyo Soran (KSKS). The JCH provides data on all companies listed on Japan’s stock exchanges, including their export sales percentages, while the KSKS provides a listing of the overseas investment activities of Japanese corporations. From these two sources, we classify as “domestic” those Japanese firms listed in the JCH with no export sales, as well as no reported wholesale/retail or manufacturing affiliates in the KSKS. Firms that have positive export sales data listed in the JCH but no foreign manufacturing affiliates in the KSKS are classified as “exporters” in our sample, while firms with at least one manufacturing affiliate listed in the KSKS are classified as MNEs. Our host country sample is 20 OECD countries (the EU-15 plus Australia, Canada, New Zealand, Switzerland, and the U.S.), countries in which minimal (if any) ownership restrictions on manufacturing investments exist.

The KSKS dataset is also the source of the affiliate foreign ownership characteristics, as it provides equity ownership data for each affiliate listed in the dataset. “Wholly owned” affiliates are firms that have a single Japanese parent holding more than 95% ownership share while “joint venture” affiliates have two or more parent firms, none of which own more than 95% of the affiliate. We can further subdivide the “joint venture” affiliates into “Majority-Owned” firms (Japanese parent owns between 50%-95%), “Equal Share” affiliates (Japanese parent owns between 50%-95%), “Minority-Owned” affiliates (Japanese parent owns between 0%-49%), “Joint Venture” affiliates (two or more parent firms, none of which own more than 95% of the affiliate), and “wholly owned” affiliates (Japanese parent owns more than 95% of the affiliate).

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8 The D-statistic is measured by $F(z) - S(z)$, so we expect non-negative coefficients when S stochastically dominates F, and negative coefficients when F stochastically dominates S.

9 Goerzen and Beamish (2005, p.15) find that “scholars have established that Toyo Keizai’s surveys account for nearly all cases of Japanese FDI for parent firms that responded to the survey…it yields an accurate picture of those firms’ foreign investments.”

10 The 95% cutoff is standard in the literature; however, changing it to 90% does not affect our empirical results.
parent owns 50%), and a “Minority-Owned” affiliate (Japanese parent owns between 10%-50%). As is standard in the literature, a minimum 10% ownership share is required for investments to be considered FDI rather than portfolio investment.

To calculate a Japanese firm’s total factor productivity (TFP), we use the data on each firm from complied in the Pacific Basin Capital Markets (PACAP) database, which extensively lists corporate information on publicly-traded Japanese corporations. We, in turn, use the Levinsohn-Petrin (2003) method to calculate TFP. For the MNE firms, TFP values are calculated at the time of investment; for firms with multiple investments, we use each investment’s corresponding TFP value. For domestic and exporter firms, we use their end-of-sample TFP values (2001).

Table 1 shows the descriptive statistics of our dataset, which includes the foreign market entry classification of 1090 Japanese manufacturing firms. Of these firms, some 44% are domestic firms, 21% are exporters, and the remaining 35% are manufacturing MNEs. Of the MNE firms, 457 investments are made, for a mean of 1.52 affiliates per firm. 57% of these affiliates are wholly owned, with 43% being joint ventures. Of these joint ventures, 53% are majority owned by the Japanese parent, with 28% minority-owned and the remaining 19% being equal share affiliates. Finally, while the mean number of affiliates per firm is greater than one, 90% of the multiple-affiliated Japanese MNEs in our sample have only wholly owned affiliates or joint venture affiliates. 11

5. Empirical Results

In this part of the paper we present and interpret two sets of empirical results that correspond to two parts of our theoretical framework. We start with describing the results for the

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11 Given the limited number of firms with both WOS and JV affiliates, we merge these firms into the WOS category. In addition, we find the TFP of both domestic firms and exporters to be stochastically dominated by these firms, further suggesting their inclusion into the WOS category.
ownership choice between wholly-owned subsidiary and joint venture and then discuss the results obtained for various types of joint ventures that differ in terms of the degree of foreign ownership.

<Insert Table 2 about here>

In Table 2, part A, we present the results of our baseline TFP comparison across the Helpman, et. al. (2003) foreign market entry classification. We find that the aforementioned TFP heterogeneity exists across classification groups: TFP of the exporter firms stochastically dominates the TFP of domestic firms, while the TFP of the MNE group stochastically dominates both the domestic and exporter firms. Thus, we have established the standard domestic-exporter-MNE ranking for Japanese-owned as well as other firms as found in the previous empirical literature on firm heterogeneity based on other datasets.

While this is not surprising, given the results by Head and Ries (2003) and Kimura and Kiyota (2006) that confirm the existence of such heterogeneity for Japanese firms, these results are not the focus of the paper. Rather, confirmation of such results provides the convenient basis for our analysis to extend to affiliate ownership characteristics. Thus, in part B of Table 2, we focus on TFP comparisons across parents of different affiliate ownership types including joint ventures and wholly-owned subsidiaries.

We find robust results for the domestic-MNE and exporter-MNE TFP relationship across affiliate ownership; that is, the domestic-MNE and exporter-MNE TFP relationship holds for MNEs that establish only joint venture affiliates and for those establishing wholly owned affiliates. In regard to the MNE firms, the TFP of joint venture-only firms is stochastically dominated by those firms with wholly owned affiliates. Thus, our empirical results confirm the predictions derived from our theoretical framework presented in subsection 2.2, postulating that only the most productive multinational firms enter foreign
markets by establishing wholly-owned subsidiaries while less productive multinational firms prefer establishing joint-ventures.

<Insert Table 3 about here>

While our empirical results clearly demonstrate that statistically significant TFP differences exist between firms that do JV investments and those that have WOS affiliates, this difference may arise from the within-JV heterogeneity that exists. For instance, ownership shares within the JV affiliates can range from as low as 10% (the minimum threshold for the affiliate to be considered FDI) up to 95% (the JV-WOS cutoff). Thus, it is important to recognize if differences in ownership structure within the JV group contribute to our result.

In particular, our theoretical framework predicts that majority joint ventures should be stochastically dominated by wholly-owned subsidiaries but that the same time they should dominate other forms of FDI as well as exporters and non-exporters. Equal share joint ventures should be stochastically dominated by both wholly-owned subsidiaries as well as majority-owned joint ventures, while at the same time they should dominate minority joint ventures as well as exporters and non-exporters. Finally, minority joint ventures should be dominated by all other types of FDI but at the same time they should dominate both exporters and non-exporters.

Table 3 provides the results of our KS tests on TFP differences, using three different JV arrangements: minority-owned JVs, Equal Share JVs, and Majority-Owned JVs. We use these categories to test the role that each JV ownership structure plays in its TFP heterogeneity relationship with Domestic firms, Exporters, as well as within the JV investments themselves. The top part of Table 3 shows that TFP from firms establishing JV affiliates stochastically dominates domestic firms, regardless of JV ownership structure. Combined with our results from Table 2, this reinforces the notion that TFP from MNEs
stochastically dominates domestic firms. In regard to JVs versus Exporters, we find that the TFP from firms involved in Equal Share and Majority-Owned JVs stochastically dominate Exporters’ TFP, but not for the firms involved in Minority-Owned JVs.\(^\text{12}\)

We next turn to intra-JV TFP comparisons, and find a relative TFP ranking that is somewhat directly related to equity ownership. While firms doing Minority-Owned JVs do not have statistically lower TFP values than those with Equal Share affiliates, they do have lower TFP values than firms with Majority-Owned JVs. The TFP values for firms with Equal Share affiliates are not stochastically dominated by the TFP of firms with Majority-Owned affiliates. However, when we compare the TFP values to those of firms doing WOS investment, we find that the TFP values from all JV ownership arrangements are stochastically dominated by the TFP from firms doing WOS investments.

Thus, our results from Table 3 suggest we can rank the TFP within the MNE category in the following way: firms doing WOS have the highest TFP value at the time of investment, with those doing Majority-Owned JVs having the next highest TFP, those doing Minority-Owned JVs having the lowest TFP which matches the predictions of our theoretical model. However, TFP from firms doing Equal Share JVs do not appear statistically different from either the Minority-Owned nor Majority-Owned TFP values, suggesting a non-linearity in the JV ownership-TFP relationship.\(^\text{13}\)

If we combine our results from Tables 2 and 3, we have an even broader classification of TFP rankings. Domestic firms clearly have the lowest TFP values, and while exporters look similar in TFP to firms doing Minority-Owned JVs, their TFP values are stochastically dominated by TFP values from all other MNEs. We find a TFP ranking within the JV firms,

\(^\text{12}\) This result is, however, not very surprising given the heterogeneity of the host countries in our sample. The predictions of our theoretical model crucially depend on the assumptions of the same trade and FDI costs for all trading and investment partners as well as on their economic size. Using simple stochastic dominance tests we are unable to control for these country specific factors.

\(^\text{13}\) This result may arise simply because of the nature of the Equal Share arrangement as compared to the other JV organizational structures where a majority owner exists (even if it is not the Japanese MNE), or perhaps because of the relatively low number of Equal Share affiliates in our dataset.
and also find that the TFP values from JV firms are stochastically dominated by the TFP of firms establishing WOS affiliates. Thus, the present results allow us extending the previous domestic/exporter/MNE ranking of TFP to: Domestic/Exporter/Minority-Owned JV/Majority-Owned JV/Wholly Owned subsidiary, a result that provides empirical support for Figure 3 above.

6. Conclusion

In this paper we extended and generalized the model of international trade and FDI developed by Helpman et al. (2004). In contrast to their model that allowed only for establishing wholly-owned subsidiaries our generalized theoretical framework has brought the ownership dimension into the organizational choice of multinational firms. Our generalization of their model that allows for establishing joint ventures with host country partners increases the range of productivity levels for which FDI should be observed compared to exporting. The main prediction of this generalized framework is that only the most productive multinational firms enter foreign markets via FDI while less productive firms prefer establishing joint ventures. This theoretical finding allowed us to extend the previous productivity ranking of individual firms. To test empirically the predictions of our theoretical framework we used firm-level data for Japanese firms that made horizontal FDI in the OECD countries. Our empirical results based on Kolmogorov-Smirnov stochastic dominance tests demonstrate that on the one hand joint ventures are always stochastically dominated by the wholly-owned subsidiaries and on the other joint ventures always dominate both exporters and non-exporters. To gain a deeper insight into what drives our empirical results we assigned joint ventures into three different categories: majority-, equal share- and minority-owned joint ventures. The split of joint-ventures into particular categories demonstrated that our results are driven by the majority-owned joint ventures. The results obtained for the minority- and equal share-owned joint ventures were not clear cut as we were not able to demonstrate that
minority-owned joint ventures stochastically dominate exporters and equal share-owned joint ventures stochastically dominate minority joint ventures. Therefore, future empirical work should complement our evidence based on simple stochastic dominance tests by more formal econometric work that would allow controlling for cross-country heterogeneity in our sample, in particular differences in host country size, as well as in costs of exporting and investment. This should yield more clear-cut results for different ownership choices.
References


Table 1
Statistics on Foreign Market Entry and Affiliate Ownership

<table>
<thead>
<tr>
<th>Number of Firms</th>
<th>871</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Domestic Firms</td>
<td>387</td>
</tr>
<tr>
<td>Number of Exporters</td>
<td>183</td>
</tr>
<tr>
<td>Number of Multinationals</td>
<td>301</td>
</tr>
<tr>
<td>Number of Affiliates</td>
<td>457</td>
</tr>
</tbody>
</table>

Affiliate Ownership Types
- Joint Ventures: 195
- Wholly Owned Subsidiaries: 262

Joint Venture Affiliate Characteristics
- Majority-Owned: 104
- Equal Share: 36
- Minority-Owned: 55

Source: authors’ calculation from *Japan Company Handbook* [Toyo Keizai, various years] and *Kaigai Shinshutsu Kigyo Soran* [Toyo Keizai, various years]
Table 2. Kolmogorov-Smirnov Tests – FDI is horizontal FDI only

<table>
<thead>
<tr>
<th>Comparison Groups (F vs. S)</th>
<th>F=S</th>
<th>S≤F</th>
<th>F≤S</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Standard Comparison Cases</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Domestic vs. Exporters</td>
<td>0.1910 (0.004)</td>
<td>0.1910 (0.002)</td>
<td>-0.0030 (0.998)</td>
</tr>
<tr>
<td>Domestic vs. Manufacturing MNEs</td>
<td>0.2043 (0.000)</td>
<td>0.2043 (0.000)</td>
<td>-0.0054 (0.987)</td>
</tr>
<tr>
<td>Exporters vs. Manufacturing MNEs</td>
<td>0.2231 (0.012)</td>
<td>0.2231 (0.009)</td>
<td>-0.0739 (0.596)</td>
</tr>
<tr>
<td><strong>B. Comparisons across FDI Ownership Types</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Domestic vs. JV FDI only</td>
<td>0.2462 (0.000)</td>
<td>0.2462 (0.000)</td>
<td>-0.0214 (0.942)</td>
</tr>
<tr>
<td>Domestic vs. WOS FDI only</td>
<td>0.2986 (0.000)</td>
<td>0.2986 (0.000)</td>
<td>-0.0029 (0.998)</td>
</tr>
<tr>
<td>Exporters vs. JV FDI only</td>
<td>0.1065 (0.098)</td>
<td>0.1065 (0.098)</td>
<td>-0.0812 (0.558)</td>
</tr>
<tr>
<td>Exporters vs. WOS FDI only</td>
<td>0.1536 (0.067)</td>
<td>0.1531 (0.071)</td>
<td>-0.0435 (0.778)</td>
</tr>
<tr>
<td>JV FDI only vs. WOS FDI only</td>
<td>0.1368 (0.007)</td>
<td>0.1368 (0.005)</td>
<td>0.0000 (1.000)</td>
</tr>
</tbody>
</table>
Table 3. Kolmogorov-Smirnov Tests for various types of FDI according to the ownership share

<table>
<thead>
<tr>
<th>Comparison Groups (F vs. S)</th>
<th>F=S</th>
<th>S≤F</th>
<th>F≤S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic vs. Minority-Owned JVs</td>
<td>0.2774 (0.014)</td>
<td>0.2774 (0.011)</td>
<td>-0.0214 (0.974)</td>
</tr>
<tr>
<td>Domestic vs. Equal-share JVs</td>
<td>0.4120 (0.007)</td>
<td>0.4120 (0.007)</td>
<td>-0.0278 (0.978)</td>
</tr>
<tr>
<td>Domestic vs. Majority-Owned JVs</td>
<td>0.2468 (0.047)</td>
<td>0.2468 (0.036)</td>
<td>-0.0342 (0.938)</td>
</tr>
<tr>
<td>Exporters vs. Minority-Owned JVs</td>
<td>0.1430 (0.630)</td>
<td>0.1430 (0.375)</td>
<td>-0.0676 (0.803)</td>
</tr>
<tr>
<td>Exporters vs. Equal-share JVs</td>
<td>0.2415 (0.091)</td>
<td>0.2415 (0.091)</td>
<td>-0.1031 (0.756)</td>
</tr>
<tr>
<td>Exporters vs. Majority-Owned JVs</td>
<td>0.1038 (0.047)</td>
<td>0.0830 (0.047)</td>
<td>-0.1038 (0.612)</td>
</tr>
<tr>
<td>Minority- vs. Equal-share JVs</td>
<td>0.2172 (0.624)</td>
<td>0.2172 (0.385)</td>
<td>-0.1570 (0.608)</td>
</tr>
<tr>
<td>Minority- vs. Majority-Owned JVs</td>
<td>0.1468 (0.068)</td>
<td>0.1468 (0.068)</td>
<td>-0.1046 (0.721)</td>
</tr>
<tr>
<td>Minority- vs. Wholly Owned</td>
<td>0.1618 (0.037)</td>
<td>0.1618 (0.037)</td>
<td>-0.0654 (0.798)</td>
</tr>
<tr>
<td>Equal-share vs. Majority-Owned JVs</td>
<td>0.1862 (0.816)</td>
<td>0.1425 (0.669)</td>
<td>-0.1862 (0.504)</td>
</tr>
<tr>
<td>Equal-share vs. Wholly Owned</td>
<td>0.1989 (0.078)</td>
<td>0.1989 (0.078)</td>
<td>-0.1718 (0.335)</td>
</tr>
<tr>
<td>Majority-Owned JVs vs. Wholly Owned</td>
<td>0.1444 (0.097)</td>
<td>0.1444 (0.097)</td>
<td>-0.0183 (0.983)</td>
</tr>
</tbody>
</table>
Figure 1. Wholly-owned subsidiary, exporting and non-exporting.
Figure 2. Joint-venture, wholly-owned subsidiary and exporting firms
Figure 3. Minority-, equal share- and majority-owned joint-ventures and wholly-owned subsidiary.