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The Role of Multinational Firms in International Trade: The Case of Japan

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The Role of Multinational Firms in International Trade: The Case of Japan [§]

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Abstract

This paper examines the role of multinational firms in international trade using firm-level panel data for Japanese firms between 1994 and 2000. Our results indicate that multinational firms dominate Japanese trade. In 2000, only 12.4 percent of Japanese firms were multinationals but they accounted for 93.6 and 81.2 percent of Japanese exports and imports, respectively. We found that multinational firms emerged from being exporters/importers. These results imply that firms do not make the choice of either exporting or undertaking FDI, contrary to the findings of previous studies. Rather, exporters make a decision on whether or not to undertake FDI. (99 words)

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1. Introduction

This paper asks three questions: 1) Do multinationals dominate Japanese trade? If so, 2) do firms dominate international trade *before* becoming multinationals? Or rather, 3) do firms expand international trade and dominate international trade *after* becoming multinationals?

Regarding the first question, recent estimates by UNCTAD (1999, p. 232), extrapolating U.S. data to the world as a whole, indicated that multinational firms "account for two-thirds to three-quarters of world exports, and more than a third of world exports are between affiliated firms." Although such estimates give us useful information on the importance of multinational firms in world trade, they cannot be treated as definitive. This is because US exports accounted for only 17.3 percent of world exports in 1998.[1]

Related to the second and the third questions, several studies have examined the relationship between exports and FDI at the firm level and have found a positive relationship (e.g. Lipsey and Weiss, 1984, for the United States; Lipsey, Ramstetter, and Blomström, 2000, for Japan, the United States, and Sweden). However, most of the previous empirical evidence has concentrated on establishing a sign for the FDI-exports correlation rather than on explaining the correlation; something attempted by only a few

[1] World Bank (2005).

studies.[2] In light of the growing recent interest in firms' exporting and FDI behavior, an analysis to explain the correlation at the firm level would make a useful contribution to the literature.

Our analysis uses firm-level data for Japanese firms between 1994 and 2000. We found that multinational firms are a minority in terms of the number of firms, but they nevertheless dominate Japanese trade. For instance, in 2000, only 12.4 percent of Japanese firms were multinationals but they accounted for 93.6 and 81.2 percent of Japanese exports and imports, respectively. Moreover, 80.9 percent of multinational firms are either exporters or importers while 81.6 percent of domestic firms are neither exporters nor importers. Over time, multinational firms have emerged from among the ranks of exporters/importers. Multinational firms dominate international trade because, first of all, they are large exporters/importers *before* they become multinationals. Further, multinational firms expand exports *after* they become multinationals.

Our research on the links between exports and FDI goes beyond the existing literature in several important respects. First, our study is closely related to the study by

[2] According to Greenaway and Kneller (2006), attempts to explain any correlation are limited to only three studies: Head and Ries (2003), Kiyota and Urata (2005) and Girma, Kneller and Pisu (2005).

Bernard, Jensen, and Schott (2005) that presented a range of new facts about the activities of U.S. firms engaged in international trade.[3] We address this issue from a Japanese viewpoint, thus making a useful contribution to the literature by adding another national perspective to the existing evidence.

Second, in comparison with previous studies, we provide more a rigorous analysis on the causality between exports and FDI. Previous studies have confirmed the positive relationship between exports and FDI both at the industry/macro level (e.g., Lipsey and Weiss, 1981) and at the firm level (e.g., Lipsey and Weiss, 1984; Yamawaki, 1991; Clausing, 2000; Head and Ries, 2001).[4] However, a common problem of these studies is that they focused only on the effects of FDI on exports, whereas exports can also affect FDI. That is, international experience gained through exports may reduce the costs of undertaking FDI, enabling exporting firms to set up affiliates easily in foreign countries. Based on this observation, we examine the effects of international trade on FDI.

Third, we focus on a new aspect of the gains from exports. Recent firm- or plant-level studies on international trade mainly focused on the relationship between

[3] Some of their findings are discussed in section 2.2.
[4] At the highly disaggregated product level, however, a negative relationship was confirmed in some studies. See, for instance, Blonigen (2001).

exports and productivity growth. The results of the previous studies on the gains from exports are ambiguous. While some studies confirm the positive impacts of exporting activities on productivity (e.g., Baldwin and Gu, 2003, for Canada; Kimura and Kiyota, 2006, for Japan), others do not (e.g., Clerides, Lauch, and Tybout, 1998, for Colombia, Mexico, Morocco; Bernard and Jensen, 1999, for the United States). But the gains from exporting activities are not limited to productivity growth. Exporting activities contribute to the accumulation of international experience, which may help a firm to expand its international activities such as FDI.

Finally, we emphasize the high reliability and richness of the firm-level data that are collected by the Japanese Ministry of Economy, Trade and Industry (METI). This dataset covers more than 22,000 firms annually, and incorporates both manufacturing and some non-manufacturing sectors.[5]

The organization of the paper is as follows. Section 2 discusses the data used for the analysis and provides an overview of the patterns of foreign trade for Japanese firms, consisting of multinational firms and domestic firms. Sections 3 and 4 examine the dynamic relationship between exports and FDI (or the evolution of a firm into a

[5] Section 2 discusses the data used in this paper in more detail.

multinational). Section 5 summarizes the major findings and discusses some implications for the literature.

2. International trade and multinational firms: An overview

2.1. The data

We use the micro database of *Kigyou Katsudou Kihon Chousa Houkokusho* (*The Results of the Basic Survey of Japanese Business Structure and Activities*) prepared annually by the Research and Statistics Department, METI (1994-2000). This survey was first conducted in 1991, then again in 1994, and annually thereafter. The main purpose of the survey is to capture statistically a comprehensive picture of Japanese corporate firms that includes their diversification-, globalization-, R&D- and information technology-related activities.

The strength of the survey is its sample coverage and the reliability of its information. The survey is compulsory for manufacturing and non-manufacturing firms with more than 50 employees and with capital of more than 30 million yen (some non-manufacturing sectors such as finance, insurance and software services are not included). The sample firms account for about one-third of the total national workforce, 99

percent of total exports, and 69 percent of total imports for Japan in 2002.[6] The limitation of the survey is that some information on financial matters and institutional arrangements such as *keiretsu* is not available and that small firms with less than 50 workers (or with capital of less than 30 million yen) are excluded.

From these surveys, we constructed a longitudinal (panel) data set for the years from 1994 to 2000. In our study we classify Japanese firms into two groups, multinational firms and domestic firms. Multinational firms are ones that own at least one foreign affiliate with equity of more than one million yen. Firms not classified as multinational firms are classified as domestic firms. We excluded firms from our sample where the firm-age (survey year minus establishment year), total wages, the value of tangible assets, value-added (sales minus purchases), or the number of workers were not positive. The number of sample firms exceeds 22,000 annually.

2.2. Do multinational firms dominate international trade?

The positions of multinational and domestic firms in Japan from 1994 to 2000 are shown in Table 1. In 2000, multinational firms were in the minority in terms of the number of firms,

[6] In 2002, the survey covered about 10 million workers (which is about one-third of Japan's total labor force excluding the public and financial sectors, and other services that are not covered in the survey), 51.7 trillion yen of exports, and 29 trillion yen of imports.

accounting for 12.4 percent of total number of firms in Japan. However, in terms of the number of workers and sales, multinational firms represented a proportionally larger share, employing 39.2 percent of workers and transacting 52.7 percent of the sales, respectively. In terms of international trade, multinational firms accounted for 93.6 and 81.2 percent of total Japanese exports and imports, respectively.[7] These results clearly indicate that multinational firms dominated Japan's international trade.

=== Table 1 ===

Note also that these numbers are quite similar to those of U.S. firms. A recent study by Bernard, Jensen, and Schott (2005) found that employment at multinational firms accounted for 29.1 percent of the non-governmental workforce in 2000 and their exports and imports accounted for about 90 percent of the total. The results suggest that multinational firms play an important role in employment and international trade in both Japan and the United States.

Table 2 presents the relationship between multinational firms and international trade. The table is in the form of a matrix in which the columns correspond to export/import status and the rows correspond to multinational status. The top portion of the table shows the

[7] Total Japanese exports (imports) mean the total of exports (imports) covered in the panel data.

number of firms for different categories, while the middle and bottom portions show the compositional shares.

=== Table 2 ===

The figures in the middle portion of Table 2 show that most multinationals engage in exports and imports. Of multinational firms, 71.6 and 63.9 percent engage in exports and imports, respectively. Moreover, 54.1 percent of multinational firms engage in both exports and imports at the same time. Table 2 also implies that 63.9 percent of exporters and 65.4 percent of importers engage in exporting and importing at the same time.[8] The corresponding shares are significantly smaller for US firms. Bernard, Jensen, and Schott (2005, Table 10) reported that firms that were engaged in both exports and imports accounted for 6 percent of exporters and 9 percent of importers. The bottom part of Table 2 indicates the shares of multinational firms that are exporters and importers. Table 2 suggests that exporters and importers are not necessarily multinational firms. More than half of exporters and importers do not own an affiliate in a foreign country.

Table 2 also reveals that both exporters and importers are minorities in terms of the

[8] Among 4,150 exporters, 2,653 firms or 63.9 percent (=2,653/4,150) of firms engage in imports. Similarly, 65.3 percent (=2,653/4,059) of importers engage in exports.

number of firms. Out of the total number of firms, 19.5 percent are exporters, while 19.1 percent are importers.[9] More than 80 percent of domestic firms are not engaged in exporting or importing. These results imply that multinational firms dominate Japan's international trade. Most firms engaged in FDI are exporters or importers. But exporters and importers are not always multinational firms.

3. Do firms dominate international trade before becoming multinationals?

3.1. Methodology

Do firms dominate international trade before becoming multinationals? Table 3 presents a transition matrix. It indicates whether or not multinational firms in year t were exporters or importers in year $t-1$. If firms are not multinationals and if firms are neither exporters nor importers in year $t-1$, more than 99 percent of them are not multinationals in year t. However, if firms are not multinationals, but if firms are either exporters or importers in year $t-1$, 5-9 percent of firms become multinationals in year t. This implies that exporters and importers are candidates for becoming multinationals.

=== Table 3 ===

[9] Similarly, Bernard, Eaton, Jensen, and Kortum (2003) found that exporters were in the minority. They found that exporters accounted for only 21 percent of firms in the United States.

It is also interesting to note that around 10-15 percent of multinational firms lose their multinational status. Table 4 traces multinational status for firms that at some point stop being multinationals. For instance, the first column indicates that 347 multinational firms in 1994 were no longer multinationals in 1995. Of these 347 firms, 9 firms, or 2.6 percent of firms, exited in 1996; 111 firms, or 32.0 percent of firms, regained their multinational status; and 227 firms, or 65.4 percent of firms, remained domestic firms. The results indicate that more than 60 percent of firms did not regain multinational status after losing it. We investigate this relationship in more detail by applying econometric methods.

=== Table 4 ===

Suppose that firm i becomes a multinational in year t if current and expected profits of becoming a multinational are greater than costs.[10] Costs are defined as the sunk cost incurred in becoming multinational F_{it} and variable cost. Denote current profit and current profit excluding fixed cost as $\widetilde{\pi}_{it}$ and π_{it}, respectively. Assume that fixed cost is required if the firm was not a multinational in the previous year and assume that Y_{it}, a variable indicating multinational status, takes unity if firm i was a

[10] Our model is an extension of the dynamic model of the decision to export developed by Roberts and Tybout (1997).

multinational in year t and zero otherwise. For simplicity, assume that the fixed cost is the same across firms and across years ($F_{it} = F$). Thus the profit π_{it} is expressed as $\pi_{it} = \tilde{\pi}_{it} - F(1 - Y_{it-1})$.[11]

Denote the discount rate of future revenue as δ . Assume that in year t the firm chooses an infinite sequence of values $(Y_{it}, Y_{it+1}, ...)$ that maximizes the expected value of revenues. Denote the maximized revenues as

$$V_{it}(\Omega_{it}) = \max_{Y_{it}} E_t \left(\sum_{\tau=t}^{\infty} \delta^{\tau-t} \tilde{\pi}_{i\tau} \mid \Omega_{it} \right), \tag{1}$$

where Ω_{it} is the firm specific information set. Using Bellman's equation, firm i's current decision to become multinational is represented as Y_{it} that satisfies

$$V_{it}(\Omega_{it}) = \max_{Y_{it}} E_t \left(\tilde{\pi}_{it}(Y_{it}, Y_{it-1}, ...) + \delta E[V_{it+1}(\Omega_{it+1} \mid Y_{it}, Y_{it-1}, ...)] \right). \tag{2}$$

Assume that a fixed cost is required if the firm was not a multinational in the previous year. In the dynamic framework, the firm becomes a multinational if the present value of current and future revenues generated by becoming multinational is larger than the total costs (fixed cost plus variable cost). Denote the current profit and discounted value of the future value of the firm if the firm becomes a multinational in year t as

[11] New investors are required to pay the sunk fixed cost while current multinationals are not. Since multinationals cannot recoup this cost when they exit from a foreign country, the multinationals have a strong incentive to persist in remaining as multinationals. This persistency effect is sometimes referred to as the "hysteresis" effect. For more details, see Roberts and Tybout (1997).

$$\pi_{it}^{*} = \tilde{\pi}_{it} + \delta\left(E_t[V_{it+1}(\bullet) \mid Y_{it} = 1] - E_t[V_{it+1}(\bullet) \mid Y_{it} = 0]\right), \tag{3}$$

where $E[V_{it+1}(\bullet)]$ is the expected value of maximized pay-off conditioned by Y_{it}. The decision to be a multinational of firm i is represented as

$$Y_{it} = \begin{cases} 1 \text{ if } \pi_{it}^{*} > F(1 - Y_{it-1}); \\ 0 \text{ otherwise.} \end{cases} \tag{4}$$

In the empirical analysis, we specify the regression equation as follows:

$$Y_{it} = \begin{cases} 1 \text{if } \beta_0 + \sum_{k=1}^{K} \beta_k Z_{ikt-1} - F(1 - Y_{it-1}) + \mu_{it} > 0; \\ 0 \text{ otherwise,} \end{cases} \tag{5}$$

where Z_{ikt-1} indicates firm-specific variables that might affect the probability of becoming a multinational at period t, and μ_{it} represents the disturbance term.

There are several estimation strategies for this dynamic binary-choice model with unobserved heterogeneity. Following Roberts and Tybout (1997) and Bernard and Wagner (2001), we employ the probit model with random effects of the form:

$$Y_{it} = \beta_0 + \sum_{k=1}^{K} \beta_k Z_{ikt-1} + FY_{it-1} + \mu_{it}. \tag{6}$$

Additional firm characteristics Z_{it-1} include trade, capital-labor ratio, the number of workers, R&D expenditure-sales ratio, and total factor productivity (TFP) as well as year

and industry dummies.[12] In addition, we introduce two-digit industry dummies for some of the regressions to control for industry-wise characteristics such as comparative advantage and market conditions.[13] The regression therefore captures how firms undertake FDI, controlling for various factors such as initial trade status, firm characteristics, and the hysteresis effect. In order to avoid possible simultaneity problems, we lag all firm characteristics and other exogenous variables one year.[14] Summary statistics and a correlation matrix of the variables are summarized in the Appendix Table.

3.2. Estimation results

Table 5 presents the regression results of equation (6) with random effects probit estimation. Column 1 indicates that being engaged in exporting and importing is an important factor for a firm to acquire multinational status in the future. Further, column 2 suggests that potential multinational firms are large exporters and large importers. In addition, they are large in terms of employment and capital intensity. Moreover, potential multinationals have high productivity, and have previous multinational experience.

[12] We use the multilateral TFP index developed by Caves, Christensen, and Diewert (1982) and extended by Good, Nadiri, Roller, and Sickles (1983). For a detailed description of the data and their manipulation, see Nishimura, Nakajima, and Kiyota (2005).

[13] Foreign market conditions could also be important factors affecting the decision to export and/or conduct FDI. However, we do not introduce any variable for them except industry dummies due to the difficulty in obtaining detailed relevant data.

[14] For more details, see Bernard and Jensen (1999, p.12 and footnote 19).

=== Table 5 ===

Column 3 reports the marginal effects for the probability of a firm becoming a multinational firm, assuming that the random effect is zero. The marginal effects are calculated at the mean values of the independent variables. The results suggest that one percentage point (10 million yen) change in exports and imports raises the probability of becoming a multinational firm by 0.2 percent and 0.1 percent, respectively. Our results thus indicate that engagement in international trade is an important factor in a firm acquiring multinational status. Scale and capital intensity are also important factors. Firms with high productivity have a tendency to become multinational firms. This finding is consistent with the finding for U.S. multinationals (Helpman, Melitz, and Yeaple, 2004).

4. Do firms expand international trade and dominate international trade after becoming multinationals?

4.1. Methodology

Next, we examine the reverse causation: do firms expand international trade and dominate international trade after becoming a multinational? Following Bernard and Jensen (1999), we run a simple regression of the changes in growth of exports or imports, T_{it}, on initial

multinational status, Y_{it}, and other firm characteristics, Z_{ikt-1}:

$$\begin{aligned} \%\Delta T_{it} &= \ln T_{it} - \ln T_{it-1} \\ &= \alpha + \beta Y_{it-1} + \sum_{k=1}^{K} \gamma_k Z_{ikt-1} + \varepsilon_{it}. \end{aligned} \tag{7}$$

Coefficient β represents the difference in the annual average growth rates of exports or imports between multinational firms and domestic firms. If multinational firms expand international trade more rapidly than domestic firms, β will be significantly positive. Additional firm characteristics for the initial year are the number of workers, capital-labor ratio, R&D-sales ratio, firm age, TFP, and initial value of exports (imports).[15]

There are two strategies for estimating equation (7): fixed effect and random effect models. For estimating (7), however, there is a problem associated with the fixed effect model. This model identifies the effects of multinational status only when there are changes in the status during the specified period. In other words, a firm that is a multinational firm (or a domestic firm) throughout the period does not have any effect on the estimated coefficient β. In order to take into account the effects of a firm that has multinational status throughout the period, we employ the random effect model.

[15] We take the natural log for the number of workers, capital-labor ratio, firm age, and TFP.

4.2. Estimation results

Table 6 presents the estimation results of equation (7) based on the random effect model. Without controlling for firm characteristics, coefficient β does not show statistically significant signs for export growth although it shows a significant sign for import growth. Once we control for firm characteristics, however, coefficient β indicates statistically significant signs for both export and import growth estimations. This result implies that the growth of exports and imports is much faster in multinational firms than in domestic firms. The differences in annual average growth rates are 12.9 percent for exports and 10.8 percent for imports.

=== Table 6 ===

In addition to multinational status, various factors are found to contribute to the growth of exports and imports. The growth of exports and imports are faster for large, capital-intensive, efficient firms than for small, labor-intensive, inefficient firms. Firms with active R&D achieve high export growth. The growth of exports and imports are related to the scale of exports and imports. Small exporters and importers show much faster growth than large exporters and importers.

A concern may be raised about longer-term effects. It may take some years before a substitution effect between FDI and exports appears. Since the data set only covers the period from 1994 to 2000 and the degrees of freedom are limited, we test growth of exports and imports over a five-year period. Accordingly, the regression equation is rewritten as follows:

$$\begin{aligned} \%\Delta T_{it+4} &= \ln T_{it+4} - \ln T_{it-1} \\ &= \alpha + \beta Y_{it-1} + \sum_{k=1}^{K} \gamma_k Z_{ikt-1} + \varepsilon_{it}. \end{aligned} \tag{8}$$

Table 7 presents the regression results of equation (8). Note that we lose 16,028 exporting firms and 15,313 importing firms. The results indicate that multinational status still has positive and significant effects on the growth of exports and imports if we control for firm characteristics. However, the effects on 5-year trade growth are weak compared with 1-year trade growth. The results thus imply that the positive effects still exist, but substitution effects emerge in the long-run, which partially offsets the complementarity effects of FDI on exports and imports.

=== Table 7 ===

Other firm characteristics have the same effects as the effects confirmed in Table 6.

That is, the growth of exports and imports is rapid for small exporters and importers, as well as for large, efficient, capital-intensive firms. Our results are therefore robust even after we control for the mid-term effects.

4.3. Effects on overall export and import growth

Overall growth of exports and imports depends not only on the growth of exports and imports by a firm but also on the increase in the number of multinational firms. To examine how multinational firms contribute to Japanese trade, we perform a simple decomposition exercise: $dX / X = dn / n + d(X / n)/(X / n)$, where X and n represent the value of exports (or imports) and number of multinationals, respectively. The first term indicates the changes in the number of multinational firms and the second term indicates the average growth of exports (or imports).

Table 8 indicates the decomposition results. The annual average growth rates of overall exports and imports are 4.5 percent and 4.2 percent, respectively. For both exports and imports, overall growth is attributable to the increases in the number of multinational firms. The increase in the number of multinationals accounts for 3.5 percent of export growth while the increase in the average trade volume accounts for 1.0 percent. Similarly,

the increase in the number of multinational firms accounts for 3.6 percent of total import growth while the increase in average trade volume accounts for 0.6 percent. These results suggest that multinational status contributes to the growth of exports and imports but the overall growth of exports and imports is mostly driven by the shift by exporters and importers to become multinational firms.

=== Table 8 ===

5. Conclusions

This paper examined the role of multinational firms in international trade, using data for Japanese firms between 1994 and 2000. We have shown that multinational firms register faster export growth than domestic firms. Multinational firms emerge from among exporters/importers, especially large exporters/importers. In other words, potential multinational firms are large exporters/importers. Our results suggest that firms do not choose either exports or FDI. Rather, exporters choose whether or not to undertake FDI. This observation, coupled with our finding of a positive relationship between FDI and exports, indicates that FDI and exports are complements rather than substitutes. However, in the long run, some substitution effects emerge, somewhat offsetting the complementarity

effects.

Our findings also have important implications for trade theory. We showed that exporters decide whether or not to become a multinational firm by undertaking foreign direct investment (FDI), not that firms choose either to export or to become a multinational. Our results suggest the multinational firms are engaged in exporting and FDI simultaneously and this finding raises questions about the validity of many studies which assume that firms choose either exports or FDI.[16] The firm's decision on FDI should rather be modeled in such a way that a firm can engage in both exporting and FDI, simultaneously.[17]

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[16] See, for instance, Helpman, Melitze, and Yeaple (2004).
[17] Examples of such study are Rob and Vettas (2003) and Head and Ries (2004).

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Table 1. ***Multinational Firm Versus Domestic Firm: Number of Firms, Workers, Sales, Exports and Imports, 1994-2000***

	Number of firms		Employment (thousand)		Sales (billions of yen)		Exports (billions of yen)		Imports (billions of yen)	
	Multinational firm	Domestic firm	Multinational firm	Domestic firm	Multinational firm	Domestic firm	Multinational firm	Domestic firm	Multinational firm	Domestic firm
1994	2,163	18,644	3,101	4,607	222,688	197,155	26,015	1,849	14,544	1,835
1995	2,311	19,479	3,145	4,660	229,332	205,198	28,891	1,869	17,382	2,210
1996	2,458	19,249	3,138	4,657	237,180	212,796	28,067	2,116	17,628	2,575
1997	2,593	19,298	3,231	4,799	241,594	205,923	35,422	2,412	20,144	3,358
1998	2,613	19,028	3,232	4,732	223,775	192,669	33,547	2,176	17,355	2,619
1999	2,548	18,447	3,133	4,665	217,311	192,510	30,347	2,133	14,733	3,321
2000	2,628	18,608	3,186	4,948	231,779	207,846	34,103	2,336	17,107	3,969
Share (%)	Multinational firm	Domestic firm	Multinational firm	Domestic firm	Multinational firm	Domestic firm	Multinational firm	Domestic firm	Multinational firm	Domestic firm
1994	10.4	89.6	40.2	59.8	53.0	47.0	93.4	6.6	88.8	11.2
1995	10.6	89.4	40.3	59.7	52.8	47.2	93.9	6.1	88.7	11.3
1996	11.3	88.7	40.3	59.7	52.7	47.3	93.0	7.0	87.3	12.7
1997	11.8	88.2	40.2	59.8	54.0	46.0	93.6	6.4	85.7	14.3
1998	12.1	87.9	40.6	59.4	53.7	46.3	93.9	6.1	86.9	13.1
1999	12.1	87.9	40.2	59.8	53.0	47.0	93.4	6.6	81.6	18.4
2000	12.4	87.6	39.2	60.8	52.7	47.3	93.6	6.4	81.2	18.8

Source: The METI database.

Table 2. ***Multinational Firms and International Trade, 2000***

	Exporters			Importers			Both exporters and importers		
Number of firms	Yes	No	Total	Yes	No	Total	Yes	No	Total
Multinational firm	1,881	747	2,628	1,680	948	2,628	1,436	1,192	2,628
Domestic firm	2,269	16,339	18,608	2,379	16,229	18,608	1,217	17,391	18,608
Total	4,150	17,086	21,236	4,059	17,177	21,236	2,653	18,583	21,236
	Exporters			Importers			Both exporters and importers		
Share (%)	Yes	No	Total	Yes	No	Total	Yes	No	Total
Multinational firm	71.6%	28.4%	100.0%	63.9%	36.1%	100.0%	54.6%	45.4%	100.0%
Domestic firm	12.2%	87.8%	100.0%	12.8%	87.2%	100.0%	6.5%	93.5%	100.0%
Total	19.5%	80.5%	100.0%	19.1%	80.9%	100.0%	12.5%	87.5%	100.0%
	Exporters			Importers			Both exporters and importers		
Share (%)	Yes	No	Total	Yes	No	Total	Yes	No	Total
Multinational firm	45.3%	4.4%	12.4%	41.4%	5.5%	12.4%	54.1%	6.4%	12.4%
Domestic firm	54.7%	95.6%	87.6%	58.6%	94.5%	87.6%	45.9%	93.6%	87.6%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Notes: 1) Multinational firm is defined as a firm that has at least one foreign affiliate.

2) Domestic firm is a firm not classified as foreign-owned or Japanese multinational firm.

Source: The METI database.

Table 3. ***Simple Probability of Multinationals***

(Number of firms and percent)

	Multinational firm in year *t*								
	t =1995			*t* =1996			*t* =1997		
	Yes	No	Total	Yes	No	Total	Yes	No	Total
Multinational firm in year *t-1*	1,733	347	2,080	2,015	237	2,252	2,145	232	2,377
Domestic firm in year *t-1*									
Non-exporters/importers	189	13,938	14,127	141	14,509	14,650	132	14,303	14,435
Exporters/importers	269	2,904	3,173	252	3,395	3,647	249	3,351	3,600
Share (%)	Yes	No	Total	Yes	No	Total	Yes	No	Total
Multinational firm in year *t-1*	83.3	16.7	100.0	89.5	10.5	100.0	90.2	9.8	100.0
Domestic firm in year *t-1*									
Non-exporters/importers	1.3	98.7	100.0	1.0	99.0	100.0	0.9	99.1	100.0
Exporters/importers	8.5	91.5	100.0	6.9	93.1	100.0	6.9	93.1	100.0
	t =1998			*t* =1999			*t* =2000		
Number of firms	Yes	No	Total	Yes	No	Total	Yes	No	Total
Multinational firm in year *t-1*	2,258	245	2,503	2,244	243	2,487	2,139	231	2,370
Domestic firm in year *t-1*									
Non-exporters/importers	119	14,540	14,659	98	14,276	14,374	117	12,917	13,034
Exporters/importers	183	3,118	3,301	156	2,989	3,145	233	2,858	3,091
Share (%)	Yes	No	Total	Yes	No	Total	Yes	No	Total
Multinational firm in year *t-1*	90.2	9.8	100.0	90.2	9.8	100.0	90.3	9.7	100.0
Domestic firm in year *t-1*									
Non-exporters/importers	0.8	99.2	100.0	0.7	99.3	100.0	0.9	99.1	100.0
Exporters/importers	5.5	94.5	100.0	5.0	95.0	100.0	7.5	92.5	100.0

Source: The METI database.

Table 4. ***What happens If Multinational Firms Stop Being Multinational Firms?***

	Firms switch its status from multinational firm in year *t-1* to domestic firm in year *t*				
	t = 1995	*t* = 1996	*t* = 1997	*t* = 1998	*t* = 1999
Total (number of firms)	347	237	232	245	243
Exit in year *t+1*	9	11	12	17	25
Stay as domestic firms in year *t+1*	227	133	137	140	116
Become multinational firms again in year *t+1*	111	93	83	88	102
Total (share)	100.0	100.0	100.0	100.0	100.0
Exit in year *t+1*	2.6	4.6	5.2	6.9	10.3
Stay as domestic firms in year *t+1*	65.4	56.1	59.1	57.1	47.7
Become multinational firms again in year *t+1*	32.0	39.2	35.8	35.9	42.0

Source: The METI database.

Table 5. ***Do Large Exporters/Importers Become Multinational Firms?***

	Model 0	Model 1	
Dependent variable: multinational dummy (t)			
Independent variables (t-1)	Coefficient	Coefficient	Marginal effect
Export dummy	0.519**		
	[0.020]		
Import dummy	0.337***		
	[0.020]		
Exports		0.018***	0.002***
(billions of yen)		[0.002]	[0.0003]
Imports		0.005***	0.0005***
(billions of yen)		[0.001]	[0.0001]
Multinational firm dummy	2.826***	3.079***	0.829***
	[0.018]	[0.017]	[0.0148]
TFP	0.029***	0.037***	0.004***
(index)	[0.007]	[0.006]	[0.0008]
Number of workers	0.177***	0.166**	0.016***
	[0.009]	[0.010]	[0.0023]
Capital-labor ratio	2.950***	2.535***	0.247***
(billions of yen)	[0.387]	[0.394]	[0.0502]
R&D expenditure-sales ratio (%)	0.020***	0.041***	0.004***
	[0.004]	[0.004]	[0.0006]
Constant	-2.532***	-2.499***	
	[0.058]	[0.058]	
Year dummy	Yes	Yes	
Industry dummy	Yes	Yes	
N	119,305	119,305	
AIC	27625.4	29173.7	
Log-Likelihood	-13778.7	-14552.8	

Notes: 1) Random-effect probit model is used for estimation.

2) ** and * indicate level of significance at 1% and 5%, respectively. Figures in brackets indicate standard errors.

3) All independent variables are at period t-1. We take natural log for TFP, number of workers, capital-labor ratio, exports, and imports.

Source: The METI database.

Table 6. ***The Multinational Status and the Growth of Trade***

Dependent variable (from year t to t+1)	Growth of exports	imports	exports	imports
Independent variables (t)	[1]	[2]	[3]	[4]
Multinational firm dummy	0.861	2.816*	12.860**	10.833**
	[1.309]	[1.378]	[1.652]	[1.751]
Exports			-19.437**	
(natural log, millions of yen)			[0.416]	
Imports				-21.433**
(natural log, millions of yen)				[0.430]
TFP			6.696**	14.476**
(natural log)			[1.435]	[1.521]
Number of workers			18.520**	15.078**
(natural log)			[0.930]	[0.924]
Capital-labor ratio			3.476**	2.313**
(natural log, millions of yen)			[0.832]	[0.808]
R&D expenditure-sales ratio (%)			0.844**	0.327
			[0.317]	[0.343]
Constant	-2.484	20.175**	-28.471**	17.368
	[8.273]	[7.241]	[10.235]	[9.607]
Model	Random effects	Random effects	Random effects	Random effects
Year dummy	Yes	Yes	Yes	Yes
Industry dummy	Yes	Yes	Yes	Yes
Firm characteristics	No	No	Yes	Yes
N	21,483	19,951	21,483	19,951
R^2	0.025	0.048	0.283	0.308

Notes: 1) ** and * indicate level of significance at 1% and 5%, respectively. Figures in brackets indicate standard errors.
2) Estimated coefficients indicate the gaps of growth rate between multinational firms and domestic firms.

Source: The METI database.

Table 7. ***The Multinational Status and the Growth of Trade: Longer-term Effect***

Dependent variable (from year t to t+5)	Growth of exports	imports	exports	imports
Independent variables (t)	[1]	[2]	[3]	[4]
Multinational firm dummy	0.313	3.462**	3.126**	4.346**
	[0.752]	[0.865]	[0.732]	[0.819]
Exports			-8.197**	
(natural log, millions of yen)			[0.223]	
Imports				-8.862**
(natural log, millions of yen)				[0.229]
TFP			2.265**	5.480**
(natural log)			[0.665]	[0.745]
Number of workers			8.675**	6.730**
(natural log)			[0.496]	[0.517]
Capital-labor ratio			0.646	1.085*
(natural log, millions of yen)			[0.429]	[0.449]
R&D expenditure-sales ratio (%)			0.423**	0.195
			[0.159]	[0.204]
Constant	13.567*	10.975	7.75	10.415
	[5.512]	[5.658]	[5.537]	[5.648]
Model	Random effects	Random effects	Random effects	Random effects
Year dummy	Yes	Yes	Yes	Yes
Industry dummy	Yes	Yes	Yes	Yes
Firm characteristics	No	No	Yes	Yes
N	5,455	4,638	5,455	4,638
R^2	0.002	0.003	0.477	0.490

For notes and source, see Table 6.

Table 8. Decomposition of Japanese Export and Import Growths

	Exports	Imports
Overall growth (annual average)	4.5%	4.2%
Increases in the number of multinational firms	3.5%	3.6%
Increases in the average trade volume	1.0%	0.6%

Note: The number of multinationals include multinationals that export (or import).
Source: The METI database.

Appendix Table. ***Summary Statistics***

A) Summary Statistics			
Variable	*N*	Mean	Std. Dev.
Export dummy	119,305	0.20	0.40
Import dummy	119,305	0.19	0.39
Multinational firm dummy	119,305	0.12	0.32
Exports + 1 (natural log)	119,305	1.10	2.45
Imports + 1 (natural log)	119,305	0.99	2.27
TFP (natural log)	119,305	-0.02	0.59
Number of workers (natural log)	119,305	5.19	0.96
Capital-labor ratio (natural log)	119,305	1.67	1.25
R&D expenditure-sales ratio	119,305	0.52	1.62

B) Correlation Matrix										
(obs=119,305)		ExpD	ImpD	MND	Exp	Imp	TFP	L	KL	R&D
Export dummy	[ExpD]	1.00								
Import dummy	[ImpD]	0.56	1.00							
Multinational firm dummy	[MND]	0.47	0.42	1.00						
Exports + 1 (natural log)	[Exp]	0.90	0.55	0.54	1.00					
Imports + 1 (natural log)	[Imp]	0.53	0.90	0.45	0.59	1.00				
TFP (natural log)	[TFP]	0.18	0.17	0.15	0.20	0.20	1.00			
Number of workers (natural log)	[L]	0.23	0.21	0.36	0.33	0.28	0.05	1.00		
Capital-labor ratio (natural log)	[KL]	0.10	0.09	0.13	0.12	0.10	-0.09	0.10	1.00	
R&D expenditure-sales ratio	[R&D]	0.30	0.21	0.23	0.34	0.20	0.11	0.21	0.09	1.00

Source: The METI database.