The FDI-Trade Relationship: Are Developing Countries Different?*

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Abstract: This paper empirically examines the extent to which the FDI – trade relationship is affected by host-country heterogeneities associated with the development (income) and market servicing roles of Japanese FDI host countries. Using the counts and values of Japanese aggregate FDI and trade flows into more than 100 geographically and developmentally diverse countries, it is shown that Japanese FDI in the 1990s was generally trade creating. However, the extent to which FDI complemented trade varied by geographic, developmental, and market servicing status of the host countries. Our study also indicates that higher factor costs and exchange rate volatility lowered the occurrence and value of Japanese FDI. We observe that Japanese FDI during the reference period was mostly tariff jumping.

Keywords: FDI, Trade, LDCs, Japan, regional markets

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1. Introduction

This paper empirically examines the extent to which the foreign direct investment (FDI) – trade relationship is affected by host-country heterogeneity. While the earliest international trade literature suggested that factor and product movements are substitutes rather than complements (Mundel, 1957), recent theoretical and empirical investigations have failed to support this conclusion. To a large extent, the conclusions seem to differ following the nature of investment (resource-, market-or efficiency-seeking), and host-and home-country relationships (proximity, bilateral and multilateral trade and investment agreements). An important aspect that is missing from the empirical literature is that very few of the studies evaluate the FDI-trade link while simultaneously controlling the geographic, development, and markets servicing (mainly host, regional, home or non-regional markets) diversity of the host nations.

In the FDI location decision and FDI- trade interaction literature, FDI is viewed either as market seeking, resources seeking or as efficiency seeking (Sadik and Bolbol, 2001). There is also a tendency to characterize market- and resource- seeking FDI as trade diverting and efficiency seeking FDI as trade creating. Given the possibility that FDI into one host might also service other market(s), however, this may not necessarily be true. For example, while Japanese FDI into the U.S. is primarily designed to service the host (U.S.) market, Japanese FDI into the Netherlands serves both the Dutch and EU markets. It is also possible that besides the host and other nearby regional market(s), FDI in a given host might service the home market itself (e.g., in addition to the host, and other markets in the region, Japanese FDI into Hong Kong, Vietnam and Taiwan services the Japanese home market). Also, it is not uncommon to observe FDI that services a non-regional market (e.g., Japanese investment in Angola largely services markets outside Africa). Therefore, generalizing the trade FDI links based on the nature of FDI is grossly restrictive.

The previous literature on the FDI-trade link typically focuses on: 1) determining the extent to which local sales by foreign firms in the host country substitute or complement source country exports into the host, and 2) determining the

amount of imported inputs that the parent company in source country provides for the overseas affiliates (intra-or inter-industry trade). These studies essentially assume an autarky situation for the overseas affiliate(s). While this may accurately characterize the nature of FDI-trade link between the home and a given host whose local market is the main target of the FDI, the autarky assumption is, however, misleading when affiliates serve both the host and the regional market or the investing country's home market.

For example, consider a world comprising only three countries: Japan, Poland and Germany (Figure 1). Assume that Japan is the source of FDI, while Poland and Germany are FDI recipients. If trade is allowed between countries, both the Polish and German markets could be serviced either by direct merchandise shipments (exports) from Japan or by Japanese affiliates located in either host. Owing to the lower cost of production, there is also a possibility that Japanese affiliates in Poland may service the German market.[1] In an extreme case, these firms may also re-export their output back to Japan to service the home market (see Figure 1). Whether Japanese FDI into Poland or Germany complements or substitutes Japanese exports to Poland or Germany is therefore not only a function of Japanese exports (imports) into each country (autarky) but also the exports (imports) of Japanese firms located in third country (Germany and Poland) and other countries in the region (rest of the world). In fact, the presence of a network of Japanese investment in both locations and elsewhere in the region (say, in Germany, Poland and Netherlands) may complicate the dynamics.

[Insert Figure 1. Here]

What this suggests is that the FDI-trade link may be sensitive to whether the host is typically a recipient of investment mainly intend to service (1) the host market, or (2) the nearby larger regional market(s), or (3) the home and regional markets in which the home country is located, or (4) other non-regional markets or a

[1] In fact, Japanese FDI in Poland is primarily designed to service both the host and the European market as a whole "[Japanese] companies with manufacturing facilities [in Europe] are looking for lower cost areas [to produce]...Central Europe is of particular interest." Interview with Koicho Akatsu, general director of JETRO, Warsaw. *Warsaw Voice,* December 16, 2001.

combination of them. Therefore, the trade creation or trade diversion conclusions derived from previous empirical studies that focused on simple home-host bilateral trade (autarky), and not on development and market servicing structures of the hosts, may not be robust.[2]

This paper addresses the FDI-trade link by focusing on such heterogeneities arising from development differentials and the market servicing roles of Japanese FDI hosting nations. For the period 1989-1999, we analyze Japanese outward FDI into over 100 host countries. These countries differ in their development rankings, regional geography, and general market servicing characteristics. To investigate how host heterogeneity affects the FDI-trade link, first we address whether Japanese FDI-trade relationship differs according to development status of its investment hosting economies. Then, controlling for income, we evaluate if the FDI-trade link differs according to the host nation's market servicing role(s).

Econometrically our approach can be considered as an integration of the works of Wheeler and Mody (1991), Campa (1993), and Head and Ries (2000). Unlike their studies, however, for the first time, we address development and market servicing heterogeneities in the trade-FDI link. We also account for zero occurrences of FDI in our econometric approach. The dataset employed in our study combines aggregate country- and industry-level Japanese FDI data with Japanese bilateral trade flows into more than 100 countries. Thus we focus on individual host-country characteristics (in absolute and relative magnitudes) as potential FDI determinants, controlling for both

[2] Using the case above as an example, the traditional approach to evaluate the FDI trade link is to regress Japanese FDI in a particular host (e.g. Poland) on Japanese bilateral trade with that host (EXP_{JP}) and a vector of country specific other explanatory variables (X); i.e., $FDI_{JP} = EXP_{JP}$; X). As long as Japanese affiliates in Poland serve both the Polish and the German markets, the coefficient of the trade variable in the equation based on the traditional approach is biased. In order to correct for the bias, it is necessary to include the exports of Japanese affiliates in Poland to Germany and the rest of the word (EXP_{JGR}), with a positive a priori sign, and Poland's imports of goods from Japanese affiliates in Germany (IMP_{JPG}), if any, with a negative a priori sign. That is, $FDI_{JP} = (EXP_{JP}, EXP_{JPG}, IMP_{JPR}; X)$, The trade FDI link (complementarity or substitution) is therefore, to be inferred based on the result of the sum of the coefficients of the three variables.

geographic and development-specific heterogeneities (Goldberg and Klein, 1999; Martin and Velazquez, 2000).

The results from our study indicate that Japanese FDI in the 1990s has been largely trade creating, although it is more so for middle and low-income countries than for high-income countries. When considering investment counts, Japanese FDI has been less trade creating in host nations where Japanese FDI is traditionally designed to service largely the local host markets and the non-regional markets as compared to those that are designed to service Japan. It is however, more trade creating in countries where Japanese FDI is largely servicing the regional markets than in host nations that mainly service the home markets. In terms of the monetary value of the FDI, however, there is a tendency that FDI is significantly less trade creating in host markets where Japanese FDI are largely designed to service the regional markets. Our study also indicates that higher factor costs (labor and capital), as well as the higher the level and volatility of the Japan-host currency exchange rate, significantly lowers the occurrences (and values) of Japanese FDI. While countries with larger population size and better network (road) density (more infrastructure) appear to have received significantly higher inflows of new Japanese FDI, we observe that Japanese FDI has been tariff jumping.

The paper proceeds as follows. Section 2 describes the previous literature on the FDI-trade link. Section 3 describes the empirical model, while section 4 outlines descriptive characteristics of Japanese FDI performance in the 1990s and variable choice. Estimation results are presented in section 5, with section 6 concluding.

2. Previous Studies on Trade and FDI links

Our study is closest in spirit to two types of literature: in topic, to those studies that evaluate the FDI-trade interactions (Blonigen, 2001; Liu et al, 2001; Bajo-Rubio and Montero-Munoz, 2001; Head and Ries, 2001; Brainard, 1993; Egger and Pfaffermayr, 2001; Bayoumi and Lipworth, 1997), and in methodology to those studies that analysis FDI location decisions (List, 2001; Friedman, et.al, 1992; Woodward,

1992; Greenstone, 1998; Henderson, 1996; and Papke, 1991). While some of the aforementioned FDI-trade link literature shows that trade and FDI are substitutes, others maintain that trade and FDI are complementary. Especially, when competition in multiple foreign economies and under imperfect markets and uncertainty are considered, (Helpman, 1984; Markusen and Venables, 1998) the link often turns out to be complementary. As a result the available macroeconomic understanding is that trade and FDI are two most important modes of internationalization that complement one another. Based on this view FDI might induce trade (Yamawaki, 1991) or trade might induce FDI (Eaton and Tamura, 1994).[3]

When issues such as market sizes, proximity of the sources of demand and globalization processes are added, the debate on whether movements in factors create or divert trade becomes increasingly clouded as it adds an additional dimension to the problem: the competitiveness of both the investing and the host country industries. Thus, if FDI displaces trade, exports will be at least replaced by local sales in foreign markets and this is detrimental to the domestic industry of the investing country. On the contrary, if trade and FDI are complements, investing abroad might lead to greater competitiveness of the foreign market and this is beneficial to exports from the investing country and therefore to its industries. Including as many heterogeneous host nations as possible in the sample while evaluating the FDI-trade link is therefore important.

3. The Econometric Model

Following Wheeler and Mody's (1991), we specify outward Japanese FDI (Y_{it}) as a function of the classical location choice and country risk (uncertainty) variables:

$$Y_{it} = f(\Pi_{it}, \sigma^2_{it}) \qquad (1)$$

[3] For recent other studies on the complementarity of trade and FDI see for example Co, 1997; Ma et al., 2000; Morikawa, 1998; Moshirian and Pham, 2000; and Harris and Schmitt, 2001).

Where, Y_{it} is Japanese FDI in the i^{th} country at time t and Π_{it} and σ_{it}^2 are the expected return (Π_{it}) and uncertainty (σ_{it}^2) associated with exchange rate and irreversibility of fixed investment.

Our dataset provides information on the annual counts (c_{it}) and values (I_{it}) of new Japanese FDI made in each host from 1989-2000. Thus we examine the count (C_{it}) and the value (I_{it}) of FDI (Y_{it}) separately as our dependent variable and regress them on trade flows and other country specific factors that are hypothesized to affect the spatial profit function of investing overseas. [4]

3.1. Count data Model

When $Y_{it} = c_{it}$ (the number of new firms entering a given host in year t), the dependent variable is a count. We use a count data model proposed by Hausman, Hall and Griliches (1984). In the count data model, the probability that the i^{th} host attracts C_{it} new Japanese firm(s) is expressed as a function of a vector of its country-specific attributes (X_{it}):

$$\text{Prob}(Y_{it} = c_{it}) = F\left(X_{it}'\beta\right) \tag{2}$$

A common way to specify such a discrete probability function is to use a Poisson process. In the Poisson process, the integer property of the dependent variable is explicitly modeled as:

$$\Pr ob(Y = c_{ti}) = \frac{\exp(-\mu_{it})\mu_{ti}^{c_{it}}}{c_{it}!} \qquad c_{it} = 0,1,2,\ldots \text{ and } \mu_{it} = \exp(X_{it}'\beta) \tag{3}$$

Here, c_{it} is the count of Japanese firms entering a given host at time t, with X_{it} a vector of country specific explanatory variables and β a vector of unknown parameters to be estimated. The Poisson model in Eq. (3) above assumes that μ_{it} is both the mean and

[4] Obviously, c_{it} and I_{it} are not necessarily correlated. An arbitrary choice of c_{it} or I_{it} as the dependant variable may impact the FDI-trade flow interaction. Thus, we empirically test both values.

variance of c_{it}. However, this is may be too restrictive and it is often violated (due to over-or under-dispersion). In our empirical work, we test and reject the equi-dispersion assumption of the Poisson model. We then estimate a Negative Binomial (NB) model to allow the variance of the process to differ from the mean. The probability distribution of the Negative Binomial model is:

$$\Pr ob(Y = c_{ti} \mid u) = \frac{\exp((-\mu_{it} \exp(u_{it}))\mu_{ti}^{c_{it}}}{c_{it}!} \qquad (4)$$

where exp(u) has a gamma distribution with mean 1 and variance σ^2 and all other variables are as defined for the Poisson process. Unlike the Poisson, the NB model has an additional parameter α so that c_{it} is iid NB with mean μ_{it} and variance $\sigma^2 = \mu_{it} + \alpha\mu_{it}$, where α is the dispersion parameter.

3.2. Zero Inflated Count data model

While estimating the Poisson (or the NB) model, it may be that there are excessive zero counts of FDI (no entry) in the data. Excessive zero counts may arise for various reasons. For instance, consider Japanese firms contemplating to invest abroad poised with the following question: Given that they have decided to invest in a given overseas region (say, Europe, North or South America, Oceania, Middle East North or Sub-Saharan Africa), which country do they select as their investment destination? The answer(s) to such a question may involve a two-step process.

First, due to adverse host -country specific effects, many countries may not appeal to Japanese investors. This could be the result of their inherent natural or policy-based characteristics or comparative disadvantages (e.g., proximity to markets, factor abundances, infrastructure, and agglomeration economies) that affect inward FDI flows into these countries (List, 2001). Hence, some countries may always attract Zero counts of Japanese FDI.

Second, even if a country makes onto the list of preferred Japanese FDI destination, it may receive no investment in a given year (because of the Poisson process). That is, a country may be a principle recipient of FDI although in a given year it might have not received an inward investment (essentially a one-year "blip" or a

deviation from the norm). In this case, zero does not indicate a change in the country's relative comparative advantage over other potential hosts, but rather the presence of some source-country or firm-specific effects.

As a result, the data may display excess zeros (i.e., more zeros than is consistent with the Poisson or NB baseline model). Cameron and Trivedi (1998) discuss several empirical approaches that account for excess zeros. Among the models they discuss, following Lambet (1992), Pohlmeier and Ulrich (1995) and List (2001), we use Zero Inflated Poisson (ZIP) and Zero Inflated Negative Binomial (ZINB) models. Both models are natural extensions of the Poisson and the NB specifications in equations (3) and (4), respectively. In the Zero Inflated models, y_{it} takes a value 0 with a probability φ_i and a Poisson $[\mu_{it}]$ process with a probability $(1-\varphi_i)$. Therefore, the

$$\left.\begin{aligned} \text{Porb}[y_{it}=0] &= \varphi_i + (1-\varphi_i)\exp(-\mu_{it}) \\ \text{Prob}[Y=y_{it}\,|\,Y>0] &= (1-\varphi_i)\frac{\exp(-\mu_{it})\mu_{it}^{y_{it}}}{y_{it}!} \end{aligned}\right\} \quad (5)$$

Where, φ_{it} is the state probability and $\mu_{it}=\exp(X_{it}'\beta)$ as defined earlier. Following Lambert (1992), we parameterize the proportion of zeros (state probability) φ_{it} as a logistic function of observable vector of covariates Z_i (identical with the vector of explanatory variables, X) thereby ensuring its non-negativity. Thus $\varphi_{it}=\frac{\exp(Z_{it}'\gamma)}{1+\exp(Z_{it}'\gamma)}$. Finally, we follow Vuong (1989) and test for the choice between the Poisson and the ZIP; and the Negative binomial (NB) and the Zero Inflated Negative Binomial (ZINB) structures[5].

3.3 FDI measured as monetary values

We also estimate our models using the financial values of FDI as a dependent variable ($Y_{it}=I_{it}$). When the dependent variable is a financial value, it satisfies the usual

[5] We also estimate the count models in a panel data structure. The only difference is that in the panel structure we do not account for the excess zeros. Results did not differ.

continuity assumption of the linear model and estimation is a straightforward fixed- or random-effects model:

$$Y_{it} = X_{it}\beta + \alpha_i + \varepsilon_{it}$$
$$i = 1, 2,3, ..., n, \qquad t = 1,2,3, ..., T \qquad (6)$$

where X_{it} is a vector of variables hypothesized to affect outward FDI, α_i refers to the country specific (fixed or random) effects, and β_i is a vector of unknown parameters of interest to be estimated. ε_{it} is assumed to have mean 0 and variance σ_{it}^2. As usual we conduct the Hausman (1979) test for the choice between the fixed and the random-effects models for the panel.

4. Japanese and Host Country Data

4.1 Characteristics of Japanese FDI

Japan, consistently one of the world's leading FDI source countries, serves as an ideal source nation for this study. Japanese outward investment is located in every industry and geographical region, ranging from very highly stable free market countries to those nations occupying the bottom of the development, wealth, and political stability rankings. Data on Japanese outward FDI counts and values for the period 1989-1999 are obtained from the Japanese Government Ministry of Finance website. The host countries in our sample are distributed over nine major geographic regions; four market servicing (home/regional, host/regional, regional, and non-regional) areas, and three-income class (high- (developed), middle- and low- income (developing)) groups.[6] Geographically, 26 of the original 125 countries in our sample are host countries from Asia and Pacific, 22 from Latin America and Caribbean, 20 from Western Europe, 12 from East and Central Europe, 12 from Middle East and

[6] The income class categorization of the countries in the sample follows the latest (2001) World Bank country classification table. In the table, economies are divided according to 2000 GNI per capita, calculated using the World Bank Atlas method. The groups are: low income, $755 or less; middle income, $756- $9,265; and high income, $9,266 or more.

North Africa, 10 from Oceania, 4 from North America and the remaining 19 are from Sub-Saharan Africa[7].

Table 1 reveals that over the last 12 years (1989-2000) nearly 40,000 Japanese foreign affiliates with FDI valued over 69 trillion Yen were established. Some thirty-four percent of this investment, regardless of measure (count, value), went towards establishing manufacturing affiliates. Sixty-five percent of the firms are located in developed (high income) countries, where Japanese affiliates are, on average, three times larger (measured by investment value) than those located in developing economies. For developing economies, the ratio of Japanese non-manufacturing to manufacturing affiliates is 1:1. For developed economies, this ratio is about 25:1.

[Insert Table 1. Here]

Some forty-five percent of newly established Japanese foreign affiliates (and sixty-two percent of total FDI value) are located in countries that serve both the host itself and the regional markets. On the other hand, thirty-five percent of new investment (twelve percent of value) was in Asian economies that serve both the regional and Japanese markets. The remaining twenty percent of the counts of new investment (twenty-three percent of value) flows went into countries where the regional rather than the host economy is the primary target for final sale. These results indicate that Japanese firms located in developed economies are larger, both in number and capital value, than those in less-developed countries. Japanese investment in countries that service both the host and the host's region are larger both in value and number than in countries that serve the Japanese home market and the non-regional markets.

When the values of Japanese merchandise exports and imports are compared with the value of Japanese FDI received by the host nations, an interesting feature of the FDI-trade relationship emerges. While the total value of Japanese FDI and exports to developed countries is, respectively, about 4.7 and 3 times larger than those to the

[7] The list of countries by their geographic region, income class, and market servicing area is provided in the data appendix. The data appendix further provides details on variable description, data source and the units of measurement.

developing countries, the amount of Japanese merchandise trade per Yen of Japanese FDI is, however, lower in developed countries than in the developing economies. Figures in Table 1 indicate that for every Yen of Japanese investment into developed economies there were merchandise exports of only 6 cents (in U.S. dollars), as compared to 8 cents (USD) in developing countries. The value of Japanese merchandise imports per Yen of FDI made in developed and developing countries was, respectively, 3.8 and 9.3 cents (USD). This would mean that Japan realizes surplus trade balance of 3 cents per Yen of FDI committed in developed countries and a trade deficit of about 1.3 cents per Yen of FDI made in developing countries.

These results suggest potential differences in the FDI-trade link following the income (type) level of the host economy. If larger FDI flows and larger merchandise exports is to be taken as signal for the presence of a trade creating FDI (complementarity), these figures would suggest that Japanese FDI has been trade creating. The figures also indicate that Japanese FDI has been more trade creating in developing countries than the developed countries. The caveat is that these results are unconditional. Whether this withstands more rigorous statistical conditioning, following both country specific and development heterogeneities and market servicing differentials is a matter of empirical question.

4.2. Host-country characteristics

Although our main interest is to see the FDI trade link, following earlier literature we also analyze how home- and host-country variables affect the FDI decision of Japanese firms. Thus we include several country specific regressors in the vector of exogenous variables (X_{it}). Among others, these include factors hypothesized to influence expected revenues from overseas production (factor cost, infrastructure, exchange volatility, openness), and measures or proxies of variables that simultaneously affect export demand and market servicing (currency strength, market size, access, economic potential) roles. Development and regional dummies (in some of the regressions) and

bilateral trade flows to Japan and with the rest of the world are also included. A brief description of each of the variables included in our model is provided below.

Bilateral Trade flows: (EXPORT, IMPORT): Aggregated (total exports and imports) bilateral trade variables, expressed in constant USD, are included to determine if Japanese FDI is trade creating or diverting. We maintain no a priori expectation on the sign of the bilateral trade flow variables.

Indirect Imports and Exports (JFEXP, JFIMP): Two additional indirect trade variables capture the Japanese firms' output produced elsewhere and traded with the host and the rest of the world. The hypothesis is that the larger the export of Japanese firms (JFEXP) from a given host to the rest of the world, the larger would be the flow of Japanese FDI into that host. On the contrary, if a host's local market is being served largely by the imports from Japanese affiliates located elsewhere (JFIMP), the likelihood of such a country to attract large flow of Japanese FDI is low. Values for these variables are hardly available. Thus after excluding each host's trade with Japan, we took a fraction of the total exports and imports of the host, weighted by the total number of Japanese manufacturing firms located in each host, as a proxy for Japanese firms indirect trade[8] with a third country.

Factor costs: Two variables are used as a proxy for factor cost: lending rate (LEND) and labor cost (UNSKLD). The lending rate is the bank rate on short and medium-term financing needs of the private sector and is used as a proxy for capital costs. Higher lending rates require higher marginal productivity of capital for an investment location to be considered attractive for a foreign firm. We take the percentage of labor force in the primary production sector (agriculture and natural resources extraction) (UNSKLD) as a proxy for labor cost. Low labor costs often serve as a source of

[8] For example, we derive Japanese firms total export, located in a given host, to the rest of the rest of the world based on the assumption that the total export (X) of the host country is produced by a total of N (n1 host country and n2 Japanese firms located in that host). Analogous values could also be derived for imports.

comparative advantage for developing countries to attract FDI in manufacturing. The higher the percentage of the labor force engaged in the primary production sector, we assume that the lower is the labor cost. Thus, we expect the LEND variable to have a negative effect and the UNSKLD variable to have a positive effect on FDI.

Infrastructure: Wheeler and Mody (1991) find that if overseas investment is intended primarily for export (back to home or regional markets) production, the expected return (π_i) from the particular country will depend upon unit input costs. The productivity of the specific input is thus very important. To account for the general input-augmenting effects and economies arising from the availability of market information, networking externalities, and technology transfer, we use host country's network (road) density- infrastructure (INFR)[9]. We compute the variable as the total length of roads per unit square KM area of the host country.

Economic Potential and Market Size: Population size (POPLN) of the host countries together with their economic potential was used as a proxy for market size. Traditionally, bilateral trade flows are positively related to the trading partner's market size. Significant cross-border flows of goods arising from the size of the market (large number of customers) may serve as a factor to allure firms that attempt to better serve their customers by locating their production in the importing country. Additionally we account for foreign affiliate that exports their products out of their host(s), by using economic potential of the host country (ECPOT) [10] as a variable. This

[9] Good infrastructure increases the productivity of investment and therefore stimulates FDI flows. A good measure of infrastructure should take into account both its availability and reliability. However, data on infrastructure reliability is generally not available.

[10] See details of the computation in the data appendix. It is easy to notice that there is a straightforward relationship between the index of economic potential and the gravity model used in previous studies of FDI flows. A gravity model measures only local economic activity while an economic potential index also considers economic activity at other locations. Distances are measured as great-circle distances between capital cities, while real GDP (measured in 1996 US$) is from World Development Indicators.

combines the attractiveness of a country as investment location for Japanese firms in terms of the hosts' own market and geographic proximity to other national markets[11].

Currency: The strength (MYENFC) and volatility (SYENFC) of the Japan-host bilateral exchange rate are included as a FDI determinant. MYENFC refers to the average annual exchange rate (foreign currency per unit of Japanese Yen) while SYENFC refers to the variance of the foreign currency per unit of Japanese Yen. Following, MIGA (2001), we assume firms would take one-year static expectation of the exchange rate volatility prior to their entry decisions as the appropriate estimate of currency uncertainty.

Openness: A host's openness (the degree to which local producers are exposed to external competition) is a relevant determinant of the expected investment return (π_i). When markets are protected, FDI is often tariff jumping in nature (Blonigen, 2002) because closed markets are more attractive to FDI since profits of local producers will be enhanced by limitations on competitive imports. We examine openness by including TARF, a host specific un-weighted tariff rate on merchandise imports.

5. Results

5.1 The FDI-Trade Link

5.1.1 Count data Models results

We start our discussion of the Japanese overall FDI-trade link based on results from the count data models.

Coefficient estimates of the exogenous variables included the count data models are presented in Table 3a. The table provides estimates of five different variants of the Negative binomial model described in equations (4) and (5). An analogues estimate of

[11] In the traditional fixed effects model approach, variables whose values do not change over time, such as distance, cannot be used. The economic potential index variable, however, enables us to control for the impact of such factors (like distance-- most often considered in the gravity model) while estimating the fixed effects model.

Table 3a is reproduced in Table 3b with the addition of new trade variables (JFEXP and JFIMP). The negative binomial models in both tables are used because the test for eqi-dispersion hypothesis in the Poisson model rejected the null of no over dispersion. In both tables the χ^2 test, at different degree of freedom, shows that all the five variants of the NB models are significant at $p < 0.001$. However, at a high significance level of $p < 0.0001$, the Vuong test rejects all the NB models in favor of the ZINB model. Therefore, our discussion of the FDI trade link below is based on results from the different variants of Zero inflated binomial models in Table 3a. In Table 3a, the inference on the FDI trade relationship is solely based on the sign and significance of the coefficient of the export variable. In Table 3b, however, the trade FDI relationship is inferred based on the acceptance or rejection of the hypothesis that the sum of the coefficients of (EXPORT, JFEXP, and JFIMP) is not different from zero.

[Insert Tables 3a, 3b Here]

Accordingly, perusal of the coefficients of Japanese *EXPORT* in all the equations (Table 3a and 3b) indicates the existence of consistent complementary relationships between the Japanese trade and overseas investment occurrences in the 1990s. For example, results from the ZINB model 1 in Table 3a show that ceteris paribus, a dollar of Japanese export (one year lag) to the FDI hosting economies is followed, on average, by a 1.00005 factor increase in the occurrences of new FDI. Although significant in most of the cases, the sign of the *IMPORT* variable in three of the five equations was, however, not stable.

a) Differentials in development status of the host

The FDI trade complementarity that we observed from ZINB results in Model 1does not take into account the heterogeneity of host economies in terms of their development status and market servicing structure. Typically, the FDI literature view FDI into developing countries as source seeking/efficiency and FDI into developed countries as market seeking. To explore if development heterogeneity of host nations matter in the FDI trade link, we hypothesize that in areas where it is most likely market or resource seeking, FDI is trade diverting and in areas where it is efficiency

seeking, FDI is trade complementing. To evaluate our hypothesis, we run both the NB and ZINB models once each for developed and developing countries (results not reported here). Contrary to the view that FDI diverts trade when it is market seeking, in both regressions we find a significant positive coefficient for the *EXPORT* variable. This would mean that Japanese FDI occurrences have been higher in host nations that imported larger merchandize value of Japanese goods. This result was observed irrespective of the development status of host economies.

Next we turn to our main model and ask if the FDI-trade relationship is homogenous across the developing host countries at different income (development) levels. To answer this question, we create three income indicator variables based on the development (income) level of the countries and four market servicing indicator variables following the market servicing structure of the host countries.[12] The income indicator variables created are: HIGH_I_1 for developed (High income); *MIDDLE*_I_2 for developing middle-income countries; and *LOW*_I_3 for developing low-income countries. We also interact these variables with the EXPORT variable and create interaction dummies ICLASS_i*EXP, where i =1 refer to a high income-, i = 2 refer to a middle income-, and i = 3 refer to a low income-country.

Results of the ZINB model are presented in Table 3a, Column 5 (ZINB-2). The results indicate that while Japanese FDI were trade creating in both the middle and low- income countries, the trade creativity of Japanese FDI occurrences was significantly ($p < 0.001$) larger in middle and low-income countries than in high-income countries. The differences between the middle income and the low income developing host economies themselves were also significant. A test of the equality of the

[12] In all cases that involve the use of indicator variables and their interaction with the export variable, we drop the first dummies from each category to avoid the dummy variable trap. For example, our inference on income status of countries will be on whether FDI in *middle and low income developing countries* and their interaction with export is any different from those in *high income and the interaction of high income countries with export* (the omitted categories). Similarly, on market servicing roles, what we evaluate is if there are differentials between investment that largely services the *HOST (MRKT_2), REGIONAL (MRKT_3)* and *NON-REGIONAL (MRKT_4)* markets and those that largely service the *HOME (MRKT_1)- the* ignored category) market.

coefficients of MIDDLE_I_2*EXP and LOW_I_3*EXP rejects the equality at $p < 0.05$ in favor of the later being significantly larger. This suggests that among the developing host economies that hosted Japanese FDI in the 1990s, the trade creation of Japanese FDI was significantly larger in the least developed countries than in middle-income developing countries.

b) Differentials in the market servicing roles of the host nations

We suspect that the significantly larger trade creation of Japanese FDI in the middle and least developed countries than the developed countries may be because many of the low-income countries serve as strategic locations of Japanese overseas production sites to service the nearby larger national and regional markets. Thus we create additional market servicing dummies (namely *HOME, HOST, REGIONAL*, and *NONREGIONAL*) based on FDI survey reports[13] by MIGA (2001) and UNCTAD (1998). Accordingly, if Japanese FDI in a given host *largely* services the home (Japanese market) then the dummy *HOME (*takes a value of 1; and 0 otherwise); the *HOST* market *(*the dummy HOST takes a value of 1; and 0 otherwise), the *REGIONAL* market *(*the dummy REGNMKT takes a value of 1; and 0 otherwise); and when it services *largely* the *NONREGIONAL* markets *(*the dummy variable N_REGMKT takes a value of 1; and 0 otherwise). The market servicing dummies were also interacted with the EXPORT variable as *_MRKT_i*EXP* to assess the extent to which the market servicing dummies shift the slope coefficient. When $i = 1$, the interaction dummy refers to a *HOME* market servicing role. Similarly, when $i = 2$ the interaction dummy refers to a HOST market servicing role; $i = 3$ for the *REGIONAL* and $i = 4$ for the *NONREGIONAL* markets servicing structure. Table 3a, Column 6(ZINB-3) present coefficient estimates of the market-serving structures of the host economies and their interactions with the export variable in the ZINB model.

The coefficients of the MRKT*EXPORT interaction dummy variables in the column indicate two important findings. First, although Japanese FDI occurrences

[13] The reports provide a survey of the general purposes of multinational firms and their preferences of different regions (and some countries) as a destination for their investment

have been trade creating, compared to the middle and low income countries (such as Cambodia and Taiwan) that host Japanese FDI which largely to services the home and nearby Asian regional markets, it is significantly less trade creating in host nations that traditionally service their own local markets (example, USA and Germany) and in countries that largely service the non-regional markets (such as Nigeria, Angola and Kenya). Second, Japanese FDI in host economies (such as Poland, Turkey or Mexico) that service REGIONAL markets that does not include Japan, complemented trade more significantly than FDI in the Asian low- and middle- income countries (such as Cambodia and Taiwan).

In Table 3b we include the two additional proxy variables for indirect trade, the total export of Japanese affiliates from the i^{th} host to the rest of the world (Jfexp), and the total import of goods manufactured by Japanese affiliates elsewhere into the i^{th} host. (Jfimp). A priori, we hypothesized that Jfexp would have a positive coefficient and Jimp a negative coefficient. This is based on the assumption that if a host serves as a hub for the production and export of Japanese goods to the rest of the world, it would attract large volume of Japanese FDI occurrences (Value). On the contrary, if the host itself is being served largely by imports of Japanese products made elsewhere, the likelihood of the host to attract relatively large counts or value of Japanese FDI is lower. Our point here is that although indirect, these variables too represent Japanese trade (inter-or intra firms). Therefore, we make the inference on whether Japanese FDI complements or substitutes trade with its investment hosting economies based on the aggregate sum of the coefficients of Jfexp, Jfimp and the export (the direct export of merchandise items) variables. In Table 3b we present a Wald test of the hypothesis on whether the sum of the coefficients of the three variables are zero against the alternative of less than zero (substitution) or greater than zero (complementarity). In three of our empirical results the Wald test rejects (at $p < 0.001$) the null hypothesis in favor of the alternative, indicating the complementarity between Japanese FDI and trade flows irrespective of the development status of the host countries. Although the indirect trade variables maintain their a priori expected coefficients, both variables

turned significant only in the ZINB model that does not account for differentials in the income level and market servicing roles of the host nations. In the panel model, only the indirect export variable was significant.

When we account for the market servicing roles (ZINB 3, Table 3b) of the host nations, however, the complementarity between the occurrences of Japanese FDI and trade weakens and the Wald test fails to reject the null hypothesis ($p=0.21$). Nevertheless, it can be clearly observed that this is driven by the weakening of the significance of the direct export variable in ZINB 3. This might be due to the effect of including the market servicing structure of the host nations.

5.1.2 FDI measured by monetary values:

The use of counts of new FDI as a dependent variable ignores affiliate size, an important component of FDI. For example, two hosts might receive somewhat similar counts of inward FDI. In reality, however, the actual monetary value of the FDI received by these countries may significantly differ. While the differences in the values of FDI may be a function of the same factors that affect the counts of firms entering a given location, it could be that the nature of firms choosing the site as their investment destination, and the counts of the firms themselves may even be an important factor. Therefore, we also use the monetary value of completed FDI as a dependent variable. Table 4a and 4b present coefficient estimates of Eq.6 in which the monetary value of FDI is used as a dependent variable. Included in four columns of the table are OLS results, Model-1, and random effect model results (Models 2-4).

[Insert Tables 4a, 4b Here]

With only little differences in the magnitude and signs of the coefficient estimates, model results based on the monetary value of FDI also support the results we obtained by using the counts of FDI as our dependent variable. The only difference that we observe here is that, unlike results from the count data models, the trade creation of Japanese FDI appears to be less significant in host cost countries that

service nearby regional markets. Nevertheless, when we control for the influence of host nations trade with the rest of the world, the direction and strength of the complimentarity matches the results from the count data models. The fact that results from three of the four models depict the same conclusion indicate that our estimates are robust (Tables 4a and 4b, models 2, 3 and 4).

The degree to which FDI complements trade, however, varies across the development status of host economies in our sample. For instance, coefficients estimates of the export and development dummy interactions variables (in Model 3 of Table 4b), shows that every dollar of Japanese merchandise export (one year lag) would be followed by Japanese FDI inflow of 66.4 Yen in the middle-income countries. While this is about 39.20 Yen in developed countries, it is only 175.2 Yen in low-income Japanese FDI hosting nations and the differences are statistically significant at $p < 0.001$. Across the market servicing categories of the host nations in our sample (Model 4 of table 4b), we observe that host nations which service the Japanese and other nearby Asian regional markets received, on average, an FDI worth 2.24 Yen per $ of their merchandise imports from Japan. This was however, about 104.5 Yen where Japanese FDI establishments service largely the host nations' market alone. The same amounts to 104.5 Yen and 64.7 Yen in host nations where Japanese FDI mainly services the nearby regional markets and the non-regional markets, respectively. Significantly, larger amount of Japanese FDI per $ of host country merchandise imports were made in host nations where Japanese FDI largely services the regional markets.

5.4 Other FDI determinants

Based on the counts of FDI, we find that most of the variables we hypothesized to have an influence on Japanese FDI also support the findings in the previous FDI location choice literature. Only the variable on the currency strength (the average exchange rate of a Japanese Yen per unit of foreign currency) and in some cases the infrastructure variables had signs which were not a priori expected. Coefficient

estimates our model ZINB_1 (Column 3, Table 3a), for instance, show that in countries with a higher economic potential, larger population size (market size) and lower labor cost (inverse of PLBR) there were higher occurrences of Japanese FDI in the 1990s. On the contrary, countries where the cost of capital (Lend) is higher and the exchange rate against Japanese Yen is highly volatile, recorded significantly lower occurrences of Japanese FDI. The results on currency strength-that the higher the amount of Yen paid for a unit of foreign currency, the higher the counts of FDI- was, however, unexpected[14]. Our expectation was the reverse.

Based on the monetary value of FDI (Tables 4a and 4b), we find that the total value of Japanese FDI in the 1990s were higher, the larger the economic potential of the recipient country, the lower the factor costs (both labor and capital), the less open the host markets were to foreign competition (higher tariff rate), and the larger the population size. And this was more so both in the middle- and low-income (developing) countries. Middle and low-income countries in general have attracted significantly larger value of Japanese FDI than the developed countries in our sample (see Col.3 in table 4). Similarly, the total value of FDI appear to be significantly lower in countries where Japanese FDI had services largely the host market, the regional and the non-regional markets than host countries where the primary target is the Japanese or the Asian markets (Col. 4, table 4a).

6. Conclusion

This study examines the relationship between Japanese FDI (count, values) and bilateral trade flows during the 1990s in nearly 100 host nations with diverse, geographic and market servicing structures. Specifically two questions were addressed:

[14] Our result in the panel set data up (Fixed effects coefficients, following the Hausman test) shows most variables as significant and expected. The currency strength variable (MYEN) also maintains its expected negative sign. Overall, we observe that (at high significance levels) an increase in factor cost (cost of capital—lending rate, and labor --inverse of UNSKLD), in the volatility and the depreciation of Yen against foreign currency, deter new Japanese FDI occurrences. Countries with larger population size and better network (road) density (more infrastructure) received significantly higher inflows of new Japanese FDI. The higher the tariff rate on imports of the host country merchandize items, we find evidence of higher expected FDI counts. This is in line with Blonigen's (2002) findings for Japanese investment in USA. That is, Japanese FDI counts were tariff jumping

Does the Japanese FDI-trade relationship differ (a) according to the development status and (b) according to the market servicing roles of the host nations? A standard linear model is used to investigate the FDI-trade link using the value of new FDI while for the count of new FDI we adopt a non-linear approach. Both models are estimated for pooled cross sectional time series (PCTS) and panel data (PANEL) structures, accounting for how zero values could arise for a given FDI host-year pair. We also examine annual Japanese FDI flows as a function of both the relative (in terms of arbitrarily chosen numeraire countries) and absolute (in magnitude) values of the exogenous variables

Our study indicates that Japanese FDI in the 1990s has been largely trade creating irrespective of the development (income) and markets serving structure of the host nations[15].. From our study, the effects of host country income status and market serving structure on the FDI-trade relationship can be summarized as follows: (1) an increase in the flow of Japanese FDI to the host follows a rising exports levels to the host, (2) and this occurs more so in middle and low income countries than in high income countries, and (3) less so in host nations where Japanese FDI is traditionally designed to service largely the local host market and the non-regional markets. This would mean that the strength of Japanese FDI-trade relationship was sensitive to host country's income and market servicing roles.

On the FDI determinants, our study indicates that at high significance levels, in host countries with higher factor cost (labor and capital) and higher volatility of currencies against Yen there were lower occurrences of Japanese FDI. While countries with larger population size and better network (road) density (more infrastructure) appear to have received significantly higher inflows of new Japanese FDI (this result was not consistent across all specification), we also observe that Japanese FDI has been tariff jumping.

[15] Even using numeraires and transforming the FDI determinants, we were not able to find evidence in favor of the trade diversion of Japanese FDI

Our study has the following limitations. First, the classification of host countries into different market servicing category was solely based on a general description of the MIGA (2001) survey of FDI and UNCTAD (1998) report on International Investment Towards the Year 2002. The descriptions are rather general. As regional patterns may not necessarily apply to country situation, a more objective and specific indexes based on actual trade flows from each host need to be worked out[16]. Second, the indirect trade variables (Jfexp and Jfimp) are imperfect proxies. Third and more importantly, our analysis uses aggregate data. However, the trade-FDI relationship is affected by the technology embedded in the product which will spread differently according to the type of internationalization, economies of scale and transport costs (Brainard, 1997). An extension of this work is therefore to combine a three-digit ISIC trade flows with Japanese industry-level FDI data and investigate the sectoral dimension of the problem.

[16] Currently we are working on the indexes.

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Data Appendix

I. Sample: Size And Selection

List Of Japanese Fdi Host Countries In The Sample By Geographical Region, Income Class And Market Servicing Roles:

Region	Country	Income Group	Market Servicing	Region	Country	Income Group	Market Servicing
East And Central Europe	Slovenia	Low Income	Non Regional	North America	United States	High Income	Host
East And Central Europe	Ukraine	Low Income	Non Regional	North America	Canada	High Income	Regional
East And Central Europe	Uzbekistan	Low Income	Non Regional	Oceania	Australia	High Income	Host
East And Central Europe	Mongolia	Low Income	Regional	Oceania	New Zealand	High Income	Host
East And Central Europe	Czech Rep.	Middle Income	Non Regional	Oceania	Neth. Antilles	High Income	Regional
East And Central Europe	Slovak Rep.	Middle Income	Non Regional	Oceania	New Caledonia	High Income	Regional
East And Central Europe	Hungary	Middle Income	Regional	Oceania	Solomon Islands	Low Income	Regional
East And Central Europe	Kazakhstan	Middle Income	Regional	Oceania	Fiji	Middle Income	Regional
East And Central Europe	Poland	Middle Income	Regional	South Asia	Singapore	High Income	Home
East And Central Europe	Romania	Middle Income	Regional	South Asia	Brunei	High Income	Regional
East And Central Europe	Russian Fed.	Middle Income	Regional	South Asia	Bangladesh	Low Income	Home
East Asia & Pacific	Hong Kong	High Income	Home	South Asia	India	Low Income	Host
East Asia & Pacific	Korea, Rep.	High Income	Home	South Asia	Bhutan	Low Income	Regional
East Asia & Pacific	Taiwan	High Income	Home	South Asia	Nepal	Low Income	Regional
East Asia & Pacific	Cambodia	Low Income	Home	South Asia	Pakistan	Low Income	Regional
East Asia & Pacific	Indonesia	Low Income	Home	South Asia	Maldives	Middle Income	Regional
East Asia & Pacific	Vietnam	Low Income	Home	South Asia	Sri Lanka	Middle Income	Regional
East Asia & Pacific	Lao PDR	Low Income	Non Regional	Sub-Saharan Africa	Ghana	Low Income	Host
East Asia & Pacific	P.N. Guinea	Low Income	Regional	Sub-Saharan Africa	Uganda	Low Income	Host
East Asia & Pacific	China	Middle Income	Home	Sub-Saharan Africa	Angola	Low Income	Non Regional
East Asia & Pacific	Malaysia	Middle Income	Home	Sub-Saharan Africa	Côte D'ivoire	Low Income	Non Regional
East Asia & Pacific	Philippines	Middle Income	Home	Sub-Saharan Africa	Mozambique	Low Income	Non Regional
East Asia & Pacific	Thailand	Middle Income	Home	Sub-Saharan Africa	Nigeria	Low Income	Non Regional
East Asia & Pacific	Samoa	Middle Income	Regional	Sub-Saharan Africa	Cameroon	Low Income	Regional
East Asia & Pacific	Vanuatu	Middle Income	Regional	Sub-Saharan Africa	Guinea	Low Income	Regional
Latin America & Caribbean	Bahamas	High Income	Regional	Sub-Saharan Africa	Kenya	Low Income	Regional

Latin America & Caribbean	Guatemala	Low Income	Non Regional	Sub-Saharan Africa	Madagascar	Low Income	Regional
Region	Country	Income Group	Market Servicing	Region	Country	Income Group	Market Servicing
Latin America & Caribbean	Belize	Low Income	Regional	Sub-Saharan Africa	Niger	Low Income	Regional
Latin America & Caribbean	El Salvador	Middle Income	Non Regional	Sub-Saharan Africa	Senegal	Low Income	Regional
Latin America & Caribbean	Venezuela	Middle Income	Non Regional	Sub-Saharan Africa	Tanzania	Low Income	Regional
Latin America & Caribbean	Argentina	Middle Income	Regional	Sub-Saharan Africa	Zambia	Low Income	Regional
Latin America & Caribbean	Barbados	Middle Income	Regional	Sub-Saharan Africa	Zimbabwe	Low Income	Regional
Latin America & Caribbean	Brazil	Middle Income	Regional	Sub-Saharan Africa	Mauritius	Middle Income	Host
Latin America & Caribbean	Chile	Middle Income	Regional	Sub-Saharan Africa	South Africa	Middle Income	Host
Latin America & Caribbean	Colombia	Middle Income	Regional	Sub-Saharan Africa	Gabon	Middle Income	Non Regional
Latin America & Caribbean	Costa Rica	Middle Income	Regional	Western Europe	France	High Income	Host
Latin America & Caribbean	Dominican Rep.	Middle Income	Regional	Western Europe	Germany	High Income	Host
Latin America & Caribbean	Ecuador	Middle Income	Regional	Western Europe	Israel	High Income	Host
Latin America & Caribbean	Honduras	Middle Income	Regional	Western Europe	Italy	High Income	Host
Latin America & Caribbean	Jamaica	Middle Income	Regional	Western Europe	Spain	High Income	Host
Latin America & Caribbean	Mexico	Middle Income	Regional	Western Europe	United Kingdom	High Income	Host
Latin America & Caribbean	Panama	Middle Income	Regional	Western Europe	Ireland	High Income	Non Regional
Latin America & Caribbean	Paraguay	Middle Income	Regional	Western Europe	Austria	High Income	Regional
Latin America & Caribbean	Peru	Middle Income	Regional	Western Europe	Belg-Lux	High Income	Regional
Latin America & Caribbean	Tr. & Tobago	Middle Income	Regional	Western Europe	Denmark	High Income	Regional
Latin America & Caribbean	Uruguay	Middle Income	Regional	Western Europe	Finland	High Income	Regional
Middle East & North Africa	Bahrain	High Income	Non Regional	Western Europe	Greece	High Income	Regional
Middle East & North Africa	Kuwait	High Income	Non Regional	Western Europe	Iceland	High Income	Regional
Middle East & North Africa	U.A.E	High Income	Non Regional	Western Europe	Netherlands	High Income	Regional
Middle East & North Africa	Cyprus	High Income	Regional	Western Europe	Norway	High Income	Regional
Middle East & North Africa	Algeria	Low Income	Regional	Western Europe	Portugal	High Income	Regional
Middle East & North Africa	Iran	Middle Income	Non Regional	Western Europe	Sweden	High Income	Regional
Middle East & North Africa	Saudi Arabia	Middle Income	Non Regional	Western Europe	Switzerland	High Income	Regional
Middle East & North Africa	Egypt	Middle Income	Regional	Western Europe	Turkey	Middle Income	Regional
Middle East & North Africa	Jordan	Middle Income	Regional				
Middle East & North Africa	Oman	Middle Income	Regional				

II. Data Sources and Description:

- The selection of the reference years (1989-1999) is based on the availability of Japanese FDI and trade data as well as the availability of host-country specific data. Hosts were included in the sample if complete information for at least seven of the 11 years reference time was available. All currency-denominated variables with the exception of Japanese FDI values are measured in 1995 US$. Japanese FDI values are expressed in 100 million ¥).
- Data on outward Japanese FDI counts and values are from The Ministry of Finance of the Government of Japan's web page at: http://www.mof.go.jp/english/files.htm.
- Income and development status is derived from World Banks' 2001 Country Classification Table (http://www.worldbank.org/data/databytopic/class.htm) Economies are divided according to 2000 GNI per capita, calculated using the World Bank Atlas method. The groups are: low income, $755 or less; middle income, $756- $9,265; and high income, $9,266 or more.
- Japanese trade data is from OECD Commodity Trade CD ROM 2000 Version 5.2.
- Manufacturing imports/Exports are from the World Bank. Data is converted to 1995 USD (http://www1.worldbank.org/wbiep/trade/TradeandProduction)
- Exchange rate data is from the IMF's *International Financial Statistics*. Market rates, when available, are used to convert host currencies to Japanese Yen.
- Tariff rate data are based on un-weighted averages for all goods. *Ad valorem* rates, applied rates, or MFN rates whichever data are available in a longer period. Data are from WTO, IDB CD-ROM database and Trade Policy Review -- Country Report, Various issues, 1990-2000; UNCTAD, Handbook of Trade Control Measures of Developing Countries -- Supplement, 1987 and "Directory of Import Regimes, 1994; World Bank, Trade Policy Reform in Developing Countries since 1985, WB Discussion Paper #267, 1994, The Uruguay Round: Statistics on Tariffs Concessions", and "Given and Received, 1996 and World Development Indicators, 1998-00; OECD, Indicators of Tariff and Non-Tariff Trade Barriers, 1996; IDB, Statistics and Quantitative Analysis data, 1998."
- Data on labor force participation in primary production sector, land area (km^2), infrastructure (Total road network (km)), population (in 1000s), GDP (in Millions of 1995 US$) are all from World Development Indicator (2001) CD-ROM.
- Lending rate data is from the IMF's International Financial Statistics. In cases where information on lending rates is not available for a given year, the missing rate was replaced by a mean of the available lending rates prior to the year in which the data is missing.
- Economic Potential follows Harris (1954). In its simplest form a typical index of economic potential for location i can be calculated as a weighted sum of a measure of economic activity of all other locations j with the weights declining with distance:

$$P_i = \sum_{j=1}^{n} \frac{M_j}{D_{ij}},$$

with P_i – the economic potential of location i; M_j – a measure of the volume of economic activity in location j; and D_{ij} –the great circle distance between the national capitals of locations, i and j. The summation over all n locations yields an economic potential representing a given location's access to economic activity after the accounting for the cost of covering the distance to that activity.

Table1. Japanese Investment and Trade performance in sample countries (1989-2000)

Item Description	Counts	FDI		
• 125 Countries	39,481	69. 25 trillions (Yen)		
A. Host Country Distribution	Firms (% Manufacturing)	Average Investment Size (Millions, Yen)		
• 42 High Income (Developed) • 83 Developing 47 Middle Income 36 low Income	25,901(65.00) 13,580(35.00) 11,119(88.00) 2,461(12.00)	2,174.00 952.70 744.00 1,891.00		
B. Market Servicing Distribution of Hosts	Firms (% Manufacturing)	Average Investment Size (Millions, Yen)		
• 14 Home/Regional • 9 Host/Regional • 81 Regional • 21 Non-regional	13,920(35.00) 17,551(45.00) 7,452(16.00) 558(4.00)	608.90 2,446.60 2,169.10 2,993.20		
C. Geographic Distribution (No. of Countries)	Firms (% Manufacturing)	Average Investment Size (Millions, Yen)		
• East Asia and Pacific (17) • South Asia (9) • Latin America & Caribbean (22) • North America (4) • East and Central Europe (12) • Western Europe (20) • Middle East & North Africa (12) • Sub-Saharan Africa (19) • Oceania (10)	12,687(32.00) 1,422(3.60) 3,261(8.00) 12,740(32.00) 183(0.50) 6,146(16.00) 94(0.30) 500 (1.30) 2,448(6.20)	809.57 866.61 1,067.52 2,401.18 1,850.95 2,207.15 3,141.85 756.35 2,968.28		
D. Trade Flows	Proportions		Ratio: $trade Per 1¥ FDI		
	Export (Percent)	Import (Percent)	Export	Import	Balance
• High Income	76.50	64.60	0.063	0.038	+
• Middle Income	19.80	28.60	0.107	0.117	-
• Low Income	3.70	6.80	0.036	0.049	-

Source: Authors Computation

Table 2: Description of the variables

CODE [a]	Variable Name and Description [b]	Mean [c]	Standard Deviation	Expected sign
VALUE	Total Value (in 100 Million Yen) of outward Japanese FDI	561.703	2763.454	
COUNT	Total counts of new Japanese firms entering host countries	32.846	143.107	
EXPORT	Exports of Japan in millions of US Dollars	3617.661	11883.23	?
IMPORT	Imports of Japan in millions of US Dollars	2570.831	7519.424	?
MYENFC	Mean annual exchange rate (Yen per unit of a host country's currency)	46.619	89.854	-
SYENFC	Exchange rate Volatility (Standard deviations of Yen–host country's exchange rate)	2.449e+05	4.507e+06	-
ECPOT [d]	Economic potential value of a host country (GDP, in USD) per unit of own and other countries (in the same region) distance (in Km) from Japan	4811.723	5955.444	+
POPN	Host country population size in millions	466.190	151.664	+
NWRD	Net work road density (total length of road network-Km-per unit area-KM^2-of the host	0.642	0.945	+
TARF	Un-weighted tariff rate on host country's merchandise imports, in percentages; Proxy for openness)	15.617	11.467	+/-
LEND	Cost of capital (lending rate in host country, in percentages)	28.931	155.059	-
UNSKLD	Percentage of unskilled labor (labor force in primary sector, proxy for labor cost)	29.240	27.585	+

Notes:

[a] Whenever a variable is lagged (once) it will be suffixed by _i, where i is the number of lags); [b] All figures are annual and all financial values are in 1995 constant prices.

[c] The mean is based on N=1089 (99 countries and 11 years, 1989-1999).

[d] See data appendix for detail description and data source

Table 3a: Maximum Likelihood Estimates of the determinants of the counts of Japanese Outward FDI (1989-1999)

Variables [a]	Pooled Cross Sectional Times Series			
	Negative Binomial (NB)	Zero-Inflated Negative Binomial (ZINB)		
		ZINB (1)	ZINB (2)	ZINB (3)
Export_1	0.000182(7.78)****	8.99e-08(6.31***)	5.02e-07(4.94)***	4.28e-08(2.70)***
Import_1	0.000078(3.19)***	5.77e-08(3.36)***	-4.84e-06(-0.28)	2.08e-08(1.25)
Myenfc_1	0.0038(3.42)***	0.0058(5.56)***	0.0051(5.46)***	0.0046(6.38)***
Syenfc_1	2.68e-09(0.21)	1.72e-09(0.17)	3.30e-09(0.36)	2.73e-09(0.36)
Tariff	0.00626(0.0075)	-0.0106(-1.53)	-0087(-1.61)	-0.0015(-0.29)
Unskl	-0.0026(-0.72)	0.0138(3.43)***	0.0118(2.62)***	0.0049(-1.75)*
Lend	-0.00669(-3.37)***	-0.00948(-4.92)***	-0.00375(-1.78)**	-0.0037(-0.20)
Ecpot	0.000067(4.16)***	3.61e-08(2.98)***	2.61e-08(2.19)**	3.57e-06(0.33)
Nwrd	0.2316(-2.62)***	-0.065(-0.88)	0.0201(0.29)	-0.2008(-3.18)***
Popln	2.11e-06(2.78)***	1.08e-06(2.72)***	4.92e-07(1.37)	6.16e-07(1.91)**
MIDDLE_I [b]			-1.221(-5.71)***	
LOW_I			-1.989(-5.60)***	
*MIDDLE_I**Export			2.96e-07(8.84)***	
*LOW_I**Export			6.57e-07(6.93)***	
HOSTMKT				-0.476(-1.70)*
REGNMKT				-2.989(14.09)***
N_REGMKT				-3.090(-9.36)***
*HOSTMKT_2**Exp				-2.76e-08(-1.76)*
*REGNMKT_3**Exp				5.13e-07(12.94)***
*N_REGMKT_4**Exp				-3.91e-07(-1.91)**
Constant	0.9636(4.58)***	1.834(9.93***)	2.454(12.00)***	3.988(15.13)***
α	3.901(0.02054)			
Number of Observations	990	990	990	990
• Zero Observations		425	425	425
Log likelihood	-2796.39	-2403.32	-2319.143	-2183.559
LR or Wlad Chi2 (10)	469.38(10)***	417.72(10)***	586.08(14)***	857.25(16)***
	LR test Poisson Vs NegBin	Vuong test of ZINB Vs	Vuong test of ZINB Vs	Vuong test of ZINB Vs
	Chi2 (1) = 4.7E+04***	NB Model = 26.57***	NB Mode22.69***	NB Model21.89***

[a] Export, Import, MYNFC and VYNFC are lagged annual values of export, import, mean and standard deviation in Yen per unit of host's currency. All variables are in their original units. Figures in parenthesizes are asymptotic t (Z) values. Dependent Variable is the annual counts of New Japanese outward FDI (1989-1999); [b] Developed (HIGH_I_*1*), Home Market (HOME*MKT_1*) and their interactions with EXPORT are the excluded categories.

*** Significant at $p < 0.001$, ** at $p < 0.05$ and * at $p < 0.10$

Table 3b: M-L Estimates on the counts of new Japanese outward FDI (1989-1999), controlling for trade with the rest of the world

Variables [a]	Negative Binomial (NB)	Zero-Inflated Negative Binomial (ZINB)		
		ZINB (1)	ZINB (2)	ZINB (3)
Export_1	2.88e-05(9.57)***	1.525e-05(7.42)***	9.23e-06(5.26)***	3.25e-06(1.97)*
Import_1	7.88e-06(3.06)**	7.05e-06(3.88)***	2.52e-06(1.31)	1.74e-06(1.01)
Myenfc_1	0.0041(3.97)***	0.00668(6.54)***	0.0059(6.16)***	0.0046(6.40)***
Syenfc_1	2.27e-09(0.19)	1.04e-09(0.11)	1.91e-09(0.21)	2.86e-09(0.38)
Tariff	0.008(1.14)	-0.0057(-0.91)	-0.0064(-1.20)	-0.00114(-0.21)
Unskl	-0.0021(-0.63)	0.0125(3.48)***	0.014(3.13)**	-0.005(-1.99)*
Lend	-0.0052(-2.65)**	-0.00745(-3.68)***	-0.0038(-1.96)*	-0.0003(-0.17)
Ecpot	9.22e-06(6.05)***	4.64e-06(4.08)***	3.7e-06(3.12)**	3.99e-06(0.36)
Nwrd	-0.3401(-3.88)***	-0.1761(-2.41)**	-0.0403(-0.57)	0.205(-3.26)**
Popln	2.23e-06(2.95)**	7.93e-07(1.97)*	3.95e-07(1.08)	4.48e-07(1.33)
Jfexp_1	-9.94e-06(-0.16)	8.64e-06(1.91)*	4.66e-06(1.11)	2.54e-06(0.75)
Jfimp_1	-0.0011(-7.99)**	-8.18e-06(-8.43)***	-3.91e-06(-3.87)***	1.34e-06(0.12)
*MIDDLE*_I [b]			-.733(-3.34)***	
*LOW*_I			-1.574(-4.53)***	
*MIDDLE*_I*Export			2.201e-05(6.11))***	
*LOW*_I*Export			5.54e-057(5.81)***	
HOSTMKT				-0.461(-1.60)†
REGNMKT				-3.061(13.68)***
N_REGMKT				-3.172(9.34)***
*HOSTMKT_2*Exp				-3.11e-06(1.37)
*REGNMKT_3*Exp				5.17e-05(12.87)***
*N_REGMKT_4*Exp				-3.70e-05(1.80)*
Constant	0.594(2.92)**	1.452(8.08)***	1.8642(8.38)***	4.066(14.67)***
α	3.446			
Wald Test (Chi2):				
H0: Export + Jfexp +Jimp=0	29.89****	42.42***	14.04***	2.15
Number of Observations	990	990	990	990
• Zero Observations		425	425	425
Log likelihood	-2750.59	-2354.96	-2306.61	-2182.011
LR or Wlad Chi2 (10)	560.98(12)***	514.44(12)***	611.14(16)***	860.34(18)***
	LR test Poisson Vs NegBin Chi2 (1)=1.10E+06***	Vuong test of ZINB Vs NB Model 25.25***	Vuong test of ZINB Vs NB Model 22.99***	Vuong test of ZINB Vs NB Model =21.84***

[a] Export, Import, MYNFC and SYNFC, Jfexp and Jfimp are lagged by one year. SYNFC is standard deviation of Yen per unit of a host's currency. All variables are in their original units. Figures in parenthesizes are asymptotic t (Z) values. Dependent Variable is the annual counts of New Japanese outward FDI (1989-1999); [b] Developed (HIGH_I_*1*), Home Market (HOME*MKT_1*) and their interactions with EXPORT are the excluded categories. *** Significant at p<0.001, ** at p<0.01, * at p<0.05, and † at p<0.10.

Table 4a: Estimates of the determinants of Japanese outward annual value of FDI (1989-1999)

Variables [a]	Coefficient Estimates			
	OLS (1)	Random Effects (1)	Feasible GLS Panel Corrected for Group-wise heteroscedasticity (2)	Feasible GLS Panel Corrected for Group-wise heteroscedasticity) (3)
Export_1	0.184(18.51)***	0.160(10.47)***	0.0997(8.48)***	0.045(8.57)***
Import_1	-0.004(-0.28)	-0.058(-2.62)***	0.0208(2.88)***	-0.0018(0.33)
Myenfc-1	1.916(3.91)***	1.001(1.55)	-0.530(4.26)***	-0.288(3.90)***
Syenfc_1	-1.49e-06(-0.17)	1.06e-06(0.15)	7.29e-07(0.15)	7.69e-07(0.33)
Tariff	11.867(2.64)***	2.192(0.40)	0.536(1.74)*	-0.444(1.33)
Unskl	12.112(5.74)***	8.100(1.85)**	0.322(2.82)***	0.200(1.79)*
Lend	-0.174(-0.66)	-0.075(-0.33)	-0.028(0.38)	-0.025(0.76)
Ecpot	-0.004(-0.39)	0.006(0.29)	0.007(3.06)***	0.005(3.21)***
Nwrd	-1.294(-0.02)	2.375(0.02)	-9.840(0.86)	-2.167(0.28)
Popln	3.48e-07(0.10)	0.0013(2.01)**	0.002(2.66)**	9.89e-06(1.88)*
MIDDLE_I [b]			117.64(3.74)***	
LOW_I			108.229(3.21)***	
MIDDLE_I*Export			0.034(2.95)***	
LOW_I*Export			0.078(3.22)***)	
HOSTMKT				-250.81(3.67)***
REGNMKT				-203.745(5.03)***
N_REGMKT				-199.984(4.96)***
HOSTMKT_2*Exp				0.1500(8.54)***
REGNMKT_3*Exp				0.073(5.64)***
N_REGMKT_4*Exp				-0.033(2.20)*
Constant	-1721.715(-9.95)***	-1019.053(-2.93)***	-163.898(4.54)***	193.551(4.54)***
Regional Dummies	Included	Included	Not included	Not included
Number of Observations	990	990	990	990
	Adjusted R2=0.77	Wlad Chi2 (10)=	Wlad Chi2 (14)=490.81***	Wlad Chi2 (16)=569.96***
	F (18,971)=192.30***	Rho=0.401	Log Likelihood=-6432.18	Log Likelihood=-6220.01

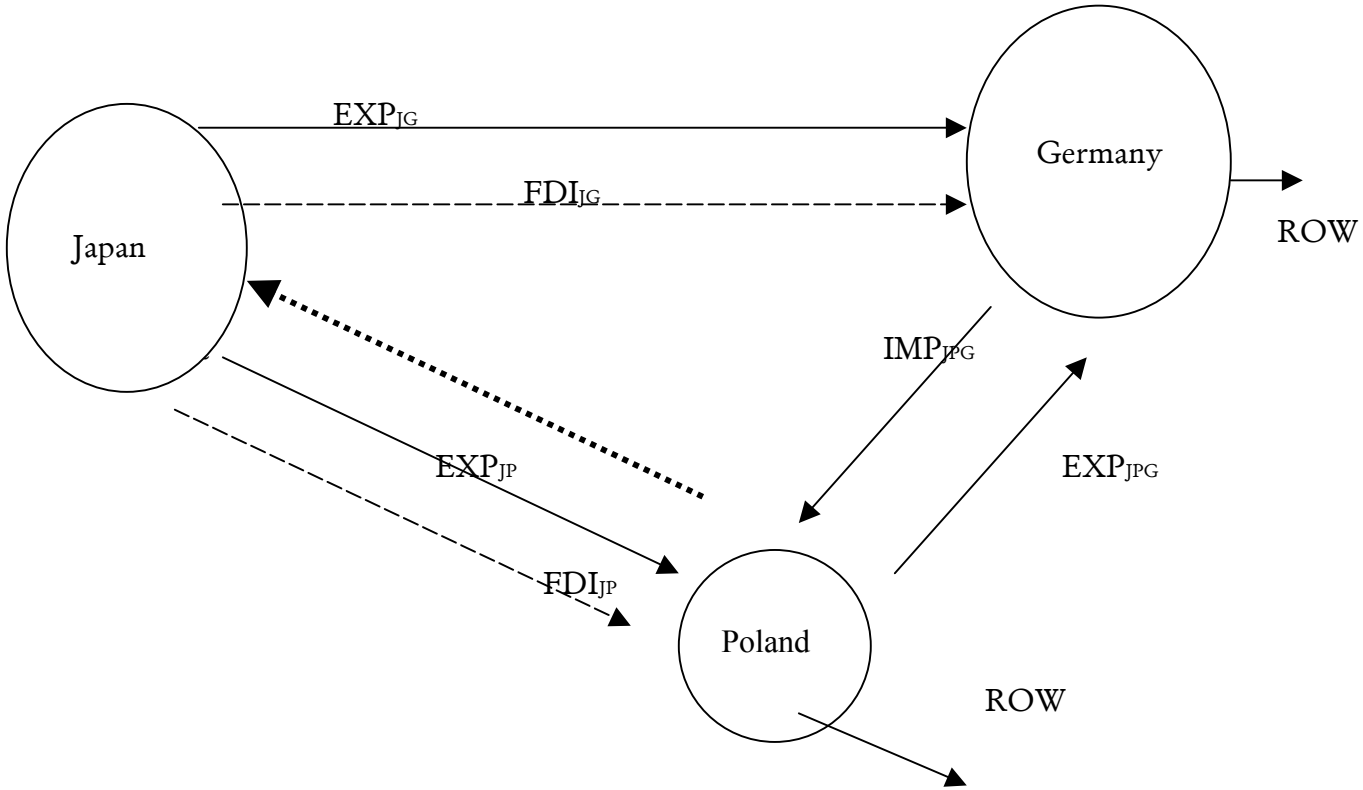
*** Significant at p<0.001, ** at p<0.05 and * at p<0.10. In all equations nine regional dummy variables were included. Results on all regional dummies are not reported here. Figures in parenthesizes are asymptotic t values. Rho in the random effects Model refers to the fraction of variance explained by u_i. Developed (HIGH_I_*1*), Home Market (HOME*MKT_1*) and their interactions with EXPORT are the excluded categories

Table 4b: The determinants of Japanese outward annual value of FDI (1989-1999), controlling the impact of trade with a third country (the rest of world)

Variables [a]	Dependent Variable: Annual Value of Japanese FDI (1995 Constant Yen) Coefficient Estimates			
	Pooled OLS (1)	Random Effects (2)	Feasible GLS (Corrected for Group-wise Heteroscedasticity (3)	Feasible GLS (Corrected for Group-wise Heteroscedasticity(4)
Export_1	0.0621(5.64)***	0.997(7.07)***	0.0342(5.95)***	0.0022(0.57)
Import_1	-0.0229(1.55)	-0.079(4.00)***	-0.017(4.38)***	-0.0204(3.67)***
Myenfc_1	1.568(0.69)	-0.938(3.67)***	-0.406(5.47)***	-0.274(4.58)***
Syenfc_1	1.38e-06(0.18)	-1.49e-06(0.22)	-9.53e-07(0.26)	1.40e-06(0.51)
Tariff	4.382(4.10)***	2.269(0.47)	0.265(1.69)*	-0.069(0.21)
Unskl	2.993(1.57)	4.093(4.25)***	0.143(2.23)**	0.125(1.69)*
Lend	-0.176(-3.77)***	-0.083(0.39)	-0.022(0.47)	-0.001(0.78)
Ecpot	0.0419(3.83)***	0.0307(2.66)**	0.008(4.16)***	0.0019(1.79))**
Nwrd	-62.953(1.24)	-53.147(0.523)	-16.044(3.25)***	-9.835(1.69)*
Popln	9.77e-06(0.29)	6.977e-05(1.38)	-0.0001(2.56)**	-2.59e-05(3.20)***
Jfexp_1	0.0315(1.28)	0.060(2.17)**	0.028(1.40)	0.136(4.70)***
Jfimp_1	-0.0744(10.45)***	-0.055(6.63)***	0.096(7.04)***	0.032(1.21)
*MIDDLE*_I [b]			28.188(3.14)***	
*LOW*_I			15.92(1.48)	
*MIDDLE*_I*Export			0.0322(4.39)***	
*LOW*_I*Export			0.141(6.03)***	
HOSTMKT				-348.05(2.88)**
REGNMKT				-433.59(9.00)***
N_REGMKT				-427.99(8.90)***
*HOSTMKT_2*Exp				0.102(2.94)***
*REGNMKT*_3*Exp				0.102(10.26)***
*N_REGMKT*_4*Exp				0.061(3.70)***
Constant	-0.393.59(2.29)*	-428.15(1.60)	-53.844(4.27)***	426.53(8.71)***
Regional dummies	Included	Included	Not Included	Not Included
Wald test (Chi2)				
H0: Export + Jfexp + Jimp=0	0.32	6.62**	1.12	3.92*
Number of Observations	990	990	990	990
	Adjusted R2=0.83	Wald Chi2(20) =1465.67***	Wald Chi2(16) =659..09***	Wald Chi2(18) =62415***
	F (20,969)=247.48***	Rho=0.249	Log Likelihood=-6044.31	Log Likelihood=-6089.81

*** Significant at p<0.001, ** at p<0.05 and * at p<0.10. In all equations nine regional dummy variables were included. Results on regional dummies are not reported here. Figures in parenthesizes are t(Z) values. Rho in the random effects Models refers to the fraction of variance explained by u_i. . Developed (HIGH_I_*1*), Home Market (HOME*MKT_1*) and their interactions with EXPORT are the excluded categories

Figure 1. FDI and Market Servicing



Terms:
FDI$_{JG}$: Japanese FDI into Germany
FDI$_{JP}$: Japanese FDI into Poland
EXP$_{JG}$: Japanese Exports into Germany
EXP$_{JP}$: Japanese Exports into Poland
EXP$_{JPG}$: Japanese Products, Produced in Poland, exported into Germany
IMP$_{JPG}$: Japanese Products, Produced in Germany, imported into Poland
ROW: Rest of World