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BILATERALISM AND REGIONALISM IN JAPANESE AND U.S. TRADE AND DIRECT FOREIGN INVESTMENT PATTERNS

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ABSTRACT

We apply a modified "gravity model" incorporating measures of factor endowments to analyze Japanese and U.S. bilateral trade flows and direct foreign investment positions with a sample of around 100 countries for the period 1985-1990. Country features that our analysis takes into account are population, income, the land-labor ratio, the average level of education, and region. We find that features of a country associated with more trade with either Japan or the United States also tend to be associated with more DFI from Japan or the United States. U.S. economic relations with Japan and Western Europe provide an important exception. Despite U.S. concern about its trade deficit with Japan, we find Japan to be much more open to the United States, not only as a source of imports, but also as a destination for U.S. exports than most countries in Western Europe. Taking other factors into account, however, Western Europe is more open to U.S. direct foreign investment. We also find that a country's level of education tends to increase significantly U.S. interaction of all types with that country, even after correcting for per capita income. Education does not play a significant role in Japanese trade patterns. As factor endowments theory would predict, the United States tends to trade more with densely-populated countries, while Japan tends to import more from sparsely-populated countries. Even after taking into account population, income, factor endowments, and region, there is a substantial degree of "bilateralism" in Japanese and U.S. economic relationships in that the residual correlation among exports, imports, and outward direct foreign investment is much larger than would be the case if these magnitudes were independent across countries.

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1. Introduction

Discussions about international economic relationships are focusing increasingly on regional and bilateral issues. The North American Free Trade Agreement, the deepening of the European Union, and the potential formation of an Asia-Pacific Economic Community have raised questions about what the formation of regional "blocs," mean for the amount of trade and investment within and between these blocs. The political debate over bilateral trade balances, particularly the U.S. trade deficit with Japan, raises questions about how much the quest to maintain bilateral balances distorts international trade. Discussion has focused not only on the trade deficit, but on barriers to direct foreign investment as well.

In this paper we examine the bilateral trade and direct foreign investment (DFI) patterns of Japan and the United States with other countries, including each other, during the period 1985-1990. Our purposes are threefold: One is to identify characteristics of a country that are significant in determining the amount of bilateral trade and investment between that country, on the one hand, and Japan or the United States, on the other. A second is to examine the patterns of trade and investment of Japan and the United States across the major regions of the globe. A third is to consider how trade flows and investment stocks interact. Our approach combines explanations of trade based on relative factor endowments and on imperfect competition and increasing returns to scale. We extend this approach to model bilateral direct foreign investment stocks, both inward and outward, as well as bilateral exports and imports.[1]

The availability of data on DFI positions dictated the time period of our analysis and the choice of Japan and the United States as two fixed "poles" in the bilateral trade and DFI patterns that we examine. Their roles as the two largest national economies make their international economic relationships of interest for their own sake, however. Moreover, since both countries are major sources of DFI throughout the world, their bilateral relations with other countries provide a rich set of observations on how DFI and trade interact.

Our analysis has implications for the debate surrounding the large U.S. trade deficit with Japan. We find that the focus on the bilateral trade deficit obscures more fundamental trade and investment relationships between the two countries. We show that Japan is as open to U.S. exports as countries in many other regions of

[1]Leamer (1984) is the standard reference on the empirical implementation of factor endowments theory. Helpman (1987) applies a model of imperfect competition and scale economies to the estimation of trade flows. Our analysis here combines elements of these two approaches.

the world. In particular, during the period we consider Japan imported more U.S. goods and services per capita than most Western European countries. Moreover, taking into account size, income, and resource endowments, Japan imports more from the United States than the average Western European country. The reason that the U.S. has run bilateral trade deficits with Japan but not with most Western European countries is not an especially low propensity for Japan to import U.S. goods, but an especially high U.S. propensity to import Japanese goods. We do, however, find that Japan is more closed to U.S. DFI than is Western Europe. To look at these issues from Japan's perspective, correcting for population, income, and factor endowments, North America is much more important to Japan both as a trading partner and as a source of and destination for DFI than is Western Europe.

Figures 1 through 8 provide some evidence on these relationships. These figures relate Japanese and U.S. exports, imports, outward DFI and inward DFI, respectively, to and from major countries of Western Europe, East Asia, and North America (on the vertical axis) to that country's GNP (on the horizontal axis).[2] All variables are divided by the respective country's population and are average values for the six years of our sample.

Figures 1 through 4, which pertain to Japan, show the dominance of the United States over Europe in Japan's trade and investment relationships. Figure 1, for example, indicates that Switzerland is the only European country to buy more per capita than the United States from Japan. As Figure 2 illustrates, Japan buys more from the average American than it does from the average resident of any European country except Switzerland, Iceland, and Denmark. Figures 3 and 4 reveal similar patterns in Japan's inward and outward DFI positions: The only European countries that, on a per capita basis, dominate the United States have relatively small populations.

Figures 5 through 8 show things from the U.S. perspective. Figure 5 indicates that the average Japanese buys more from the United States than the average resident of any European country except Belgium-Luxembourg, the Netherlands, Switzerland, Ireland, Iceland, Sweden, and the United Kingdom (the last two buying only slightly more than Japan). The United States exports nearly twice as much to the average Japanese than it does to the average German or Frenchman. Figure 6 shows that Japan exports more per capita to the United States than

[2]Where indicated, we have omitted individual countries with very large per capita trade or DFI positions. Including them requires a scale that would obscure the comparison among the remaining countries.

does any European country except Iceland. Japan's dominance of U.S. trade relationships does not extend to U.S. DFI positions, however. Figure 7 shows that Japan is quite insignificant as a destination for U.S. DFI compared with Western Europe, while, as shown in Figure 8, Japan ranks well below some European countries, including the United Kingdom, as a source of DFI.

These figures do not reflect other factors, such as country size and resource endowments, that might significantly affect a country's trade and investment relationships with Japan or the United States. Our econometric analysis takes these factors into account. Some broad conclusions are the following:

1. Largeness significantly reduces a country's per capita propensity to trade with either Japan or the United States. Our estimates imply that the doubling of a country's population, holding its per capita income and relative factor endowments constant, will cause total imports and exports to rise only between 70 and 80 per cent.[3] There is less evidence that a country's size reduces its per capita propensity to attract DFI from either Japan or the United States.

2. Japanese and U.S. trade and outward DFI grow roughly in proportion to the partner country's per capita level of GNP. Not surprisingly, only quite rich countries invest very much in Japan and the United States, and the effect of their per capita GNP on their DFI position is much more than unit elastic. We find elasticities of around two or greater.

3. The partner country's factor endowments are significant in explaining aspects of Japanese and U.S. trade and investment patterns even after population, per capita income, and region are taken into account. In particular, a country's low population density significantly increases Japan's propensity to import from that country, while it significantly reduces the U.S. propensity to import from it. Low density also contributes to Japan's propensity to invest in a country. Both countries tend to export more, however, to countries with greater population densities.[4] The level of education of a country's work force consistently and significantly raises the magnitude of

[3]One explanation is that large countries are more protectionist than small countries. Optimal tariff theory does indeed imply that large countries benefit more than small countries from protection. If greater protectionsim in large countries is the explanation for our finding, an implication is that the formation of supranational trading blocs that form trade policies collectively would tend to reduce U.S. and Japanese trade.

[4]A natural explanation is that Japan's high population density leads it to import land-

all four U.S. trade and investment relationships with that country, while its effect on economic relations with Japan does not consistently differ from zero.

4. We find, as do other studies, that regionalism plays an important role in the international economic relationships of both Japan and the United States: Taking into account population, income, and factor endowments, both countries have deeper trade and investment relationships with countries in their respective regions than with the rest of the world.[5]

5. There is a strong positive association between *outward* DFI and exports for both countries.[6] There is also, however, strong positive association between outward DFI and imports. We find much less association between *inward* DFI and either imports or exports, however.[7]

Our paper proceeds as follows: We discuss our data and estimation procedures in section 2. Section 3 presents our findings on the relationship between trade and investment patterns, on the one hand, and country characteristics, on the other. In section 4 we turn to the role of regions in these relationships. Section 5 treats the interactions among the trade and investment patterns of the two countries. We offer some conclusions in section 6.

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intensive products, which tend to be produced in greater amounts in land-abundant countries. The relatively low population density of the United States implies the opposite relationship between the population density of the source and imports. Our finding that Japan tends to export more to land-scarce countries suggests that intraindustry trade considerations rather than factor endowments dominate the determination of export patterns.

[5]See, for example, Frankel and Wei (1993).

[6]Encarnation (1993) and Graham (1993) have emphasized this relationship.

[7]The factor endowments theory of international trade is consistent with either a positive or a negative relationship between trade flows and capital movements. If trade barriers inhibit trade that would have occured because of differences in relative factor endowments then investment substitutes for trade, as in the classic Mundell (1957) model. However, if trade occurs because of differences in relative productivities or tax policies across sectors then capital movements can expand total trade by creating differences in final factor endowments that augment the initial incentives for trade. Purvis (1972) and Markusen (1983) develop models with these features. This analysis applies to capital movements generally rather than to DFI per se, however. Helpman (1984) and Markusen (1984) develop factor endowments theories of multinational corporations and DFI.

2. Data and Estimation

Our procedure combines the standard gravity model that relates bilateral trade intensities to the total incomes of the trading partners and the distance between them with factor-intensity explanations for trade flows. We apply the analysis to trade flows and DFI positions of Japan and the United States with a balanced panel of countries, using annual data, for the period 1985-1990. Table 1 lists the countries in the sample.[8]

We relate Japan's and the United States's exports X_{it}, imports M_{it}, outward DFI O_{it}, and inward DFI I_{it} at time t to partner i's population POP_{it}, per capita income YPC_{it}, the ratio of population to land area DEN_{it}, and the years of schooling of the average worker HK_i. Table A1 lists our sources of data.[9] The variables POP and YPC together capture the effect of country size on trade flows and investment positions, as in the standard gravity framework.[10] The variable YPC can also serve as a proxy for the country's capital-labor ratio and for the potential for intraindustry trade.[11] The variables DEN and HK reflect relative

[8]We included all countries for which data were available throughout the period. If we exclude human capital from the analysis the Japanese sample contains 95 countries and the U.S. sample 105. Including the human capital variable reduces the Japanese sample to 83 countries and the U.S. sample to 91.

[9]As the subscripts indicate, we have annual data for the variables POP, YPC, and DEN. Our measure of human capital, taken from Kyriacou (1991), is available only at five year intervals. Hence we use the measure for 1985 for all years. Kyriacou constructs this measure from data on schooling using a perpetual inventory method. We thank Mark Speigel for making the data available to us. The DFI data for Japan, taken from the Ministry of Finance, reflect a different definition of DFI than the United States data. Specifically, they ignore the effect of reinvested earnings, repayment of principal, and decreases in equity on changes to the DFI position. Hence they reflect only accumulated gross outflows. The Japanese balance of payments data apply a definition more comparable to the U.S. definition, although reinvested earnings are ignored. These data were not available on a country-by-country basis during this period, however. For our sample individual inward DFI positions are reported for only 8 countries. The positions of all other countries are aggregated into one observation that constitutes about 10 per cent of the total. Flow data for 1991 indicate very little investment by countries outside these 8. Hence we set the level of investment for all other countries at zero. These data limitations dictate caution in interpreting our results on Japanese DFI, particularly inward DFI.

[10]Deardorff (1984) discusses the "gravity" approach to modelling trade flows econometrically. It has its origins in the work of Tinbergen (1962) and Poyhonen (1963). The framework has recently been applied to regional trade issues by Frankel and Wei (1993). Drysdale and Garnaut (1982) provide a very thorough survey of the approach. Leamer (1974), as we do here, estimates a model that encompasses the factor-endowments and gravity frameworks.

[11]Helpman (1987) relates the magnitude of intraindustry trade to this measure.

endowments of land and human capital. The magnitudes of these variables for Japan and the United States should also affect bilateral trade and investment relationships. Since these vary only over time we capture their effects through a set of 5 dummy variables which we denote by the row vector D_T.

Instead of using the distance between countries to explain the intensity of their relationships, as in the gravity model, we capture the effect of distance and other regional factors with regional fixed effects. The countries within a region do not vary that much in terms of their distance from Japan and the United States. compared with differences across regions. Moreover, we are interested in factors other than distance through which membership in a region affects trade and investment with Japan and the United States. For this purpose we divide the world into eleven regions: North America, Central America, South America, Japan, Oceania, Eastern Asia, Southern Asia, the Middle East, Africa, Western Europe, and Eastern Europe. Table 1 presents our assignment of the countries in our sample to these regions. We denote the 10 regional dummy variables by the row vector D_R.

In contrast to the standard gravity approach, we allow for nonhomogeneity in the relationship between our dependent and explanatory variables. In particular, we assume that for each dependent variable V, where $V = X, M, I, O$, the logarithm of $a_V + V_{it}$ is linear homogeneous in the logarithms of the explanatory variables, where a_V is an intercept parameter that we estimate.

Our dependent variables are bounded below by zero, and some observations of outward and inward DFI (O and I) achieve this bound. Hence we apply Tobit estimation.[12] Thus a positive value of a_V implies that the function of the explanatory variables for V must achieve a minimum threshold value before strictly positive values of V occur.

For Japan and the United States separately, then, we estimate the equations:

$$V_{it} = \max[-a_V + C_V POP_{it}^{\alpha_V} YPC_{it}^{\beta_V} DEN_{it}^{\gamma_V} HK_{it}^{\epsilon_V} \exp(D_R\delta_{RV} + D_T\delta_{TV} + u_{it}), 0]$$

for $V = X, M, O, I$. Here u_{Vit} is a normal error term associated with dependent variable V and δ_{RV} and δ_{TV} are the column vectors of coefficients of the dummy variables for region and time, respectively. For each dependent variable V we estimate the intercept a_V, the constant C_V, the population coefficient α_V, the per capita income coefficient β_V, the density coefficient γ_V, and the human capital coefficient ϵ_V.

[12]See Tobin (1958).

We estimate the equations by maximum likelihood. To derive the maximum likelihood function we define the variable V^* where:

$$V_{it}^* = -a_V + C_V POP_{it}^{\alpha_V} YPC_{it}^{\beta_V} DEN_{it}^{\gamma_V} HK_{it}^{\epsilon_V} \exp(D_R\delta_{RV} + D_T\delta_{TV} + u_{it}).$$

Hence

$$V_{it} = V_{it}^* \text{ if } V_{it}^* > 0$$
$$V_{it} = 0 \text{ otherwise}$$

We rearrange this relationship and take natural logarithms of each side to obtain:

$$\ln(a_X + V_{it}^*) =$$
$$C_V + \alpha_V \ln POP_{it} + \beta_V \ln YPC_{it} + \gamma_V \ln DEN_{it} + \epsilon_V \ln HK_i + D_{VR}\delta_{Ri} + D_{VT}\delta_{Tt} + u_{Vit} \equiv$$
$$Z'_{Vit}\theta_V + u_{it}$$

The density function for V_{it}^* is:

$$f(V_{it}^*) = f(u_{it})\left|\frac{\partial u_{it}}{\partial V_{it}^*}\right| = f(u_{it})\frac{1}{V_{it}^* + a_V}.$$

We assume that $u_{it} \sim N(0, \sigma^2)$. Hence,

$$\Pr(V_{it} = 0) = \Pr(u_{it} \geq \ln a_V - Z_{it}\theta_V) = 1 - F_{it}$$
$$\Pr(V_{it} > 0) \cdot f(V_{it}|V_{it} > 0) = F_{it}\frac{f(\cdot)}{F_{it}} = \frac{1}{a_V + V_{it}} \cdot \frac{1}{(2\pi\sigma^2)^{1/2}} \exp\left\{-\frac{[\ln(V_{it}+a_V) - Z'_{it}\theta_V]^2}{2\sigma^2}\right\}$$

where F is the normal cumulative density function. The log-likelihood function is therefore:

$$\ln L(V, Z'; \theta_V, a_V) = \sum_{V=0}(1-F_{it}) - \sum_{V>0}\{-\ln(V_{it}+a_V) - \frac{1}{2}(\ln 2\pi + \ln\sigma^2) - \frac{1}{2\sigma^2}[\ln(V_{it}+a_V) - Z'_{it}\theta_V]^2\}$$

The maximum likelihood estimates of a_V and θ_V maximize $\ln L(V, Z'; \theta_V, a_V)$.[13]

Table 2 reports the estimated equations for Japan and Table 3 for the United States. We present estimates of the system of equations with HK for the smaller sample and without it for the larger sample.[14]

[13]See Maddala (1983).

[14]The human capital measure is not available for any of the countries in Eastern Europe. Hence there is no dummy variable for this region in equations in which HK appears. To determine the extent to which differences between the coefficients of the other variables in the equations are the consequence of different samples rather than the inclusion of human capital, we also estimated the equations on the smaller sample excluding HK as an explanatory variable. We do not present the results. In most cases the principle differences are the consequence of the inclusion of human capital rather than changes in sample.

The numbers in italics below the estimated coefficients are Eicker-White standard errors.[15] Defining $\pi_V = \{\theta_V, a_V\}$ as the vector of parameters, these are the square roots of the diagonal elements of the matrix:

$$Var(\pi_V) = A^{-1}(\pi_V)B(\pi_V)A^{-1}(\pi_V)$$

where

$$A(\pi_V) = \frac{1}{NT}\sum_{t=1}^{T}\sum_{i=1}^{N}\frac{\partial^2 \ln f(V_{it}, Z'_{it}, \theta_V, a_V)}{\partial \pi_V \partial \pi'_V}$$

$$B(\pi_V) = \frac{1}{NT}\sum_{t=1}^{T}\sum_{i=1}^{N}\left[\frac{\partial \ln f(V_{it}, Z'_{it}, \theta_V, a_V)}{\partial \pi_V} \cdot \frac{\partial \ln f(V_{it}, Z'_{it}, \theta_V, a_V)}{\partial \pi'_V}\right].$$

Because of the intercepts, the coefficients $\alpha_V, \beta_V, \gamma_V$ and ϵ_V converge only asymptotically to the elasticity of the dependent variable with respect to the corresponding dependent variable as the dependent variable approaches infinity. Table 4 reports the actual elasticities calculated at the mean values of the dependent variables. Except in the case of inward DFI, the threshold parameters are so small relative to the average value of the dependent variable that the elasticities at the means differ only negligibly from the asymptotic elasticities. The threshold effects are usually not significantly different from zero in the Japanese trade equations. They are significantly positive in the Japanese investment equations and in all U.S. relationships.[16]

We discuss the effects of income, population, and factor endowments in Section 3. We turn to regional trade and investment patterns in Section 4. Section 5 concerns the interaction between trade and investment patterns.

3. Size, Income, and Factor Endowments

The roles of the partner country's income and population in the four relationships are quite similar for the two countries, while we find significant differences in the effects of the partner's density and levels of human capital. We discuss each in turn.

[15] See White (1982).

[16] To test the sensitivity of our results to outliers we restimated the equations omitting observations with exceptionally large residuals. These were Singapore and Hong Kong in the Japanese and U.S.equations, along with Iran and Panama in the United States equations. Omitting them did not significantly affect the results except to reduce the magnitude of the fixed effect for East Asia.

3.1. Population

The elasticity of each of the dependent variables with respect to population is highly significant. For imports and exports, however, the elasticities are consistently significantly less than one, in the range of .7 to .9. Whether or not the elasticities of outward DFI with respect to population are significantly short of unity is sensitive to the inclusion of human capital (in the case of Japan) and regional dummies (in the case of the United States). Hence while there is strong evidence that smaller countries are more open to trade with both Japan and the United States than are large countries, the evidence that they are more open to DFI is weaker.

3.2. Per Capita Income

For both countries the per capita income elasticity estimates in the two trade equations are either insignificantly different from one or slightly less than one, depending upon whether or not human capital is included as an explanatory variable. The results suggest, however, that DFI from the United States goes to richer countries than Japanese DFI: For Japan the estimated elasticities are less than one while for the United States they exceed one, by a significant amount when human capital is omitted. Since human capital is highly correlated with per capita GNP, the two variables reflect similar country characteristics. As we note below, a country's level of education has more effect on DFI from the United States than on DFI from Japan. An implication seems to be that U.S. DFI has a tendency, not shared with Japan, to go to countries that are richer or that have more educated labor forces. Not surprisingly, high per capita GNP in the source country contributes significantly to its amount of DFI in either Japan or in the United States.

3.3. Land

Land-scarce Japan tends to import significantly more from land-abundant countries. It also tends to invest more in these countries, although this second relationship is not always significant. Our estimates imply that a country's density contributes positively to Japan's exports to that country, although the effect is not always significant. The United States, which is relatively land-abundant, trades significantly more with denser countries, both in terms of imports and exports. Evidence on the effect of density on US outward DFI is less consistent, although

density does have a significantly positive effect in some equations. Interestingly, the source country's density is a consistently significant factor in the determination of its level of DFI into either country. An interpretation is that headquarters activities are labor rather than land-intensive, and therefore tend to be exported by labor-abundant countries.[17]

3.4. Human Capital

Human capital does not play a consistently significant role in any of Japan's bilateral relationships. For the United States, however, a higher level of education contributes consistently and significantly to all four relationships, even though per capita income is taken into account. One explanation is that U.S. firms are intensive in the use of advanced technologies, and these firms tend to be in industries that engage in a significant amount of intraindustry trade and investment.

4. Regional Patterns

Table 5 reports the natural logarithms of the coefficients of the regional dummy variables, $\exp(\delta_{VR})$ in each of the four equations for Japan and the United States. They are reported in descending order of magnitude. Since North America is the excluded region in each case, $\exp(\delta_{VNAm}) = 1$. The magnitudes of the coefficients can be interpreted as approximately the factor by which trade or investment with that region exceeds that with North America, once population, income, and factor endowments are taken into account.[18] For example, in the column for Japan's imports the value of .529 in the row for Western Europe (which rises to .572 when human capital is omitted) means that Japan imports little over half as much from Western Europe as it does from North America once country characteristics are taken into account.

The major implications are the following:

[17]Markusen's (1984) and Helpman's (1984) models of DFI have this implication.

[18]This interpretation is approximate because of the intercept terms. As discussed already, however, except in the case of inward DFI these terms are small in magnitude relative to the range of variation of the dependent variables. For exports, imports, and outward DFI, then, the approximation is close.

4.1. Regionalism

Regionalism plays an important role in that, for both countries, trade and investment relationships are strongest with nearby countries. Correcting for the effects of population, income, and factor endowments Japan's trade in both directions is several times greater with countries in East Asia than with countries elsewhere. Japan's imports are much more regionally concentrated than its exports. Oceania ranks second, although magnitudes are much closer to those for North America. Outward DFI shows the same pattern. As a source of DFI, however, North America strongly dominates, with East Asia and Western Europe far behind. For the United States, the other North American countries are the most important trade and investment partners, followed by Central America. South America ranks fourth in trade relationships and third or fourth in investment relationships.

4.2. East Asia

The East Asian economies are tightly linked, through both trade and investment, with the United States as well as with Japan. Taking into account population, income, and factor endowments, these economies are the biggest exporters to and importers from the United States outside North and Central America. Moreover, they are the most important sources of and destinations for United States DFI outside the Western Hemisphere and Oceania.

4.3. Western Europe, Japan, and the United States

Western European countries are on average much less important both to the United States and to Japan as trade partners than each country is to the other. In particular, correcting for population, per capita income, and factor endowments, Japan imports about a third more from the United States than the average Western European country. For Japan, North America overwhelms Western Europe as destination for and source of DFI. For the United States, however, Western Europe is much more important as a destination for DFI than is Japan. As sources of DFI into the United States, Japan and Western Europe are very similar.

Our finding that Japan is more open to U.S. exports than are most Western European countries may seem inconsistent with other studies of trade patterns among the OECD that find Japan to be more closed than Western Europe, even if intra-European trade is excluded.[19] One difference is that other studies have

[19]See, for example, Harrigan's (1993a, 1993b) comprehensive analysis of manufacturing trade

focused on trade in manufactures and on interindustry trade, and much of what the United States exports to Japan consists of agricultural commodities and raw materials. Another difference is that other studies examine the openness of Japan to all countries rather than to the United States alone. Even though, from the U.S. perspective, Japan is more open as a trade partner than is Western Europe, for other countries the opposite could typically be the case.

We have treated the individual countries of the European Union (EU) as separate observations. It might be more appropriate to consider the EU as a single economy. Since our estimates of the population elasticities in the trade relationships are significantly less than one, if the European Union is truly a single market then, other things equal, our model would predict that collectively its members would trade less with Japan and the United States because of the EU's overall size. For this reason we thought that aggregating the EU into a single observation might raise the fixed effect for Western Europe relative to Japan's in the estimated trade relationships. We examined the sensitivity of our results to this alternative approach by reestimating the equations aggregating the member countries of the EU into a single observation. The results were very similar. In particular, the relative fixed effects for Western Europe and Japan were unaffected.

5. Trade and Investment Interactions

Several recent studies have suggested that barriers to U.S. DFI abroad have impeded U.S. exports, arguing that outward DFI serves as a "beachhead" for U.S. exports.[20] One reason might be that DFI markets U.S. commodities abroad. Another is that U.S. firms located abroad are more likely to use U.S.-made inputs, or that a U.S.-owned retailer would have a greater tendency to sell U.S. made products. The observation that much U.S. trade is intrafirm lends some supports to this claim. For DFI to affect *net* exports positively requires the argument, however, that international vertical integration be biased toward "downstream" rather than "upstream" overseas investments. Investment abroad in upstream

at the industry level. Lawrence (1993) and Saxonhouse (1993) survey work on measuring Japan's openness.

[20]This argument has been advanced by Encarnation (1993) and Graham (1993), among others. Graham regresses exports on DFI and imports and finds the coefficient on DFI to be significantly positive. This approach presupposes that DFI and imports are exogenous with respect to exports.

activities would tend to increase imports rather than exports.

Direct foreign investment undertaken to "jump over" trade protection would, of course, create a tendency for DFI and exports to be substitutes rather than complements. Firms that are stymied by import protection in selling in foreign markets might instead choose to locate production there in order to serve the local market.

On the other hand, DFI taking advantage of relative productivity differentials might tend to expand trade, since DFI of this nature would tend to magnify initial differences in comparative advantage.[21]

5.1. Trade and Investment Interactions Suggested by Observed Characteristics

The evidence that we have presented so far provides some insight into the interaction between trade and DFI. First of all, country characteristics such as population, per capita income, and resource endowments tend to have similar, but not identical, effects on trade and investment relationships. These similarities suggest complementarity between trade and investment. Particular results suggest situations in which DFI and exports might be substituting for each other, however:

1. As already noted, Japan tends to import more from land-abundant countries, and to invest more in such countries. Density has a zero or positive effect on Japanese exports to a country, however. This finding suggests that at least some Japanese outward DFI is associated with larger Japanese imports from natural-resource abundant countries. Japanese DFI, for example, may develop these resources for eventual export to Japan. Here outward DFI is associated with greater importing rather than greater exporting.

2. The estimated population and income elasticities of U.S. exports are consistently lower than the population and income elasticities of U.S. outward DFI. These relationships suggest that U.S. firms tend to use local production more than exports to serve foreign markets as their income grows. It also suggests that the tendency of larger counties to be more closed to U.S. exports applies less strongly to U.S. DFI.

[21] Brainard (1993a,1993b) provides evidence on this issue with a comprehensive firm-level analysis of the relationship between exports of U.S. firms and the sales of their foreign affiliates. She finds areas of both complementarity and substitutability between the two.

Second, the rankings of the various regions as trade partners and as destinations for DFI are highly correlated, also suggesting that regional factors that act to raise exports and imports also tend to attract DFI. We have already noted a major exception for the United States: Japan is more important than Western Europe as a trade partner, but not as a destination for DFI. Two possible explanations are that: (i) import protection in Western Europe has led U.S. firms to rely on local production to serve European Markets; and (ii) barriers to DFI in Japan has led U.S. firms to rely more on exports to serve the Japanese market.

5.2. Residual Interaction

To what extent do country characteristics that we have not taken into account generate correlations among trade and DFI? To the extent that country characteristics, such as national policies, that we have not accounted for have effects both on trade flows and on investment positions they will generate correlations among the observed errors in our estimated equations.

Tables 6 presents the matrices of correlation coefficients among the errors in the four equations for Japan and the United States, first with and then without regional dummies included as regressors. The off-diagonal elements indicate the expected impact of a one standard-deviation shock in one of the variables corresponding to that element on the other variable corresponding to that element, in proportion to its standard deviation. The minimum possible value is minus one and the maximum possible value is one. A value of zero means no effect. Hence the value of .5 in the row for Japanese outward DFI and the column for Japanese exports means that a one-standard-deviation positive shock to outward DFI is associated with half a standard deviation increase in exports, and that a one standard deviation increase in exports is associated with half a standard deviation increase in outward DFI.

The following results stand out:

1. All four shocks are quite positively correlated with each other, although inward DFI is much less correlated with the other three variables than these three are with each other. An implication is that, even after scale, income, factor endowments and region are accounted for, there is still substantial "bilateralism" in economic relationships in that various types of economic interactions are highly correlated with each other by country and over time. More exporting means more importing and more outward investment.

2. Except in the case of inward DFI, correlations always rise when regional effects are eliminated, indicating that regional patterns add to the extent of overall bilateralism.

3. While the correlation between outward DFI and exports is highly positive, it is only slightly higher than the correlation between outward DFI and imports. Hence the analysis suggests that outward DFI is associated more with trade in general more than with a larger trade surplus. An implication is that policies that reduce investment barriers in another country will expand trade with that country, but need not have much impact on the trade balance with that country.

The asymmetry in results on the relationships between outward DFI and trade patterns, on one hand, and inward DFI and trade, on the other, reflects the membership of Japan and the United States in the small group of countries that serve as major sources of DFI throughout the world: While Japan and the United States have DFI positions in most countries, only a handful of countries have significant investment positions in Japan and the United States. Since these represent only a small fraction of the countries with which that Japan and the U.S. trade, there is much less potential for inward DFI to affect trade patterns.

5.3. Timing

The previous section discussed the contemporaneous correlations between trade and investment residuals. To gain some understanding of the timing among them, we also examine their correlations across periods. Figures 9, 10, 11, and 12 illustrate the correlations across different periods between each pair of variables. Since our sample has six periods we can consider correlations across at most 6 periods. Each panel portrays the correlation between the residuals in the estimates of the two variables indicated in the title of the panel, with the second variable listed lagging the first by the number indicated on the x-axis. Figures 9 and 10 report correlations for Japan and Figures 11 and 12 report correlations for the United States. Figures 9 and 11 report correlations from regressions that include regional effects while Figures 10 and 12 exclude them.

It should be noted that the correlations tend to change very little when one or the other variable is lagged. Thus any evidence that these figures can provide about the timing of interactions is very weak. To the extent that there are consistent patterns, of greatest interest is the correlation between outward DFI and

exports. These display the opposite patterns for Japan and the United States. Figures 11 and 12 indicate that U.S. outward DFI is more highly correlated with earlier exports, while in the case of Japan it is more correlated with later exports. This result suggests that Japanese DFI abroad may indeed have a "beachhead" effect in promoting subsequent Japanese exports, but that U.S. exports are later followed by DFI, perhaps as a means of "jumping" over actual or threatened protection.

For both countries, however, the residual correlation between imports and outward DFI tends to rise as DFI lags relative to imports. This result suggests that outward DFI leads to subsequent imports from the country where it occurred.[22]

6. Conclusion

Our analysis is limited in at least two respects. First, we have examined the bilateral trade and investment patterns of only two countries, Japan and the United States. While trade data are collected on a uniform basis across countries, data on DFI are not. We have relied on national sources of data, and definitions have not been comparable even across these two countries. A thorough examination of the determinants of global DFI patterns will require uniform data from all the major sources of DFI.

Second, We have focused on aggregates, relating trade and investment patterns to a small number of national characteristics implied by factor endowments theory and the theory of intraindustry trade. In fact, the motivations for trade and investment are likely to vary substantially across industries. More disaggregate analysis is needed to provide insight into the actual mechanisms that relate trade and direct foreign investment.

We are, however, able to draw two broad implications from our analysis. One is that a country's characteristics associated with increased trade with Japan or the United States tend also to be associated with increased DFI from Japan or

[22]To examine the significance of the residual correlations we estimated the relationship:

$$ev_{it} = \mu_0 + \mu_1 ev'_{it-L} + v_{it}$$

by OLS for each pair of variables V and V', where ev_{it} is the residual for country i in period t for variable V; $V, V' = X, M, O, I; V \neq V'; L = 0, ..., 6$. For almost all relationships except those involving inward DFI the coefficient μ_1 was significantly positive regardless of lag length. When one of the variables was inward DFI the relationship was usually insignificant or marginally significant.

from the United States. This result applies both to country characteristics that our analysis has taken into account (population, income, factor abundance, and region) and to country characteristics that we have ignored. A major exception is the reversal of U.S. trade flows and DFI positions with Western Europe and with Japan: Taking other country characteristics into account, the United States not only imports more from Japan than it does from the typical Western European country, but exports more to it as well. Western Europe, however, dominates Japan as a destination for U.S. DFI.

Another broad implication is the extent to which factors associated with increased Japanese or U.S. exports to a country are also associated with increased imports from that country. The balance of payments constraint implies correlation over time in the aggregate. However, given a country's total level of exports and imports, if these magnitudes were distributed independently across the countries of the world little correlation would remain at the country level. Certain factors, such as population, income, factor endowments, and distance would tend to affect both exports and imports similarly, leading to positive correlation, but substantial correlation remains even after these features are accounted for. This result suggests that there are strong forces leading to bilateralism in trade relationships beyond what standard trade models would imply. Here we have provided evidence that such forces exist. What these forces are remains to be established.

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TABLE 1
REGION DEFINITIONS AND SAMPLES

North America			
United States	(Japan)	Mexico	(Japan, U.S.)
Canada	(Japan, U.S.)		
Western Europe			
United Kingdom	(Japan, U.S.)	* Switzerland	(Japan, U.S.)
Austria	(Japan, U.S.)	Finland	(Japan, U.S.)
Belgium-Luxembourg	(Japan, U.S.)	Greece	(Japan, U.S.)
Denmark	(Japan, U.S.)	Iceland	(Japan, U.S.)
France	(Japan, U.S.)	Ireland	(Japan, U.S.)
Germany	(Japan, U.S.)	Malta	(U. S.)
Italy	(Japan, U.S.)	Portugal	(Japan, U.S.)
Netherlands	(Japan, U.S.)	Spain	(Japan, U.S.)
Norway	(Japan, U.S.)	Turkey	(Japan, U.S.)
Sweden	(Japan, U.S.)		
Central America			
Costa Rica	(Japan, U.S.)	Panama	(Japan, U.S.)
Dominican Republic	(U. S.)	* Bahamas, The	(Japan, U.S.)
El Salvador	(Japan, U.S.)	* Belize	(U. S.)
Guatemala	(Japan, U.S.)	Jamaica	(Japan, U.S.)
Haiti	(Japan, U.S.)	Trinidad and Tobago	(Japan, U.S.)
Honduras	(Japan, U.S.)		
South America			
Argentina	(Japan, U.S.)	Peru	(Japan, U.S.)
Bolivia	(Japan, U.S.)	Uruguay	(Japan, U.S.)
Brazil	(Japan, U.S.)	Venezuela	(Japan, U.S.)
Chile	(Japan, U.S.)	Barbados	(U. S.)
Colombia	(Japan, U.S.)	Guyana	(Japan, U.S.)
Ecuador	(Japan, U.S.)	Suriname	(Japan, U.S.)
Paraguay	(Japan, U.S.)		
Middle East			
Iran, I. R. of	(Japan, U.S.)	* Syrian Arab Republic	(Japan, U.S.)
Israel	(Japan, U.S.)	United Arab Emirates	(Japan, U.S.)
Jordan	(Japan, U.S.)	Egypt	(Japan, U.S.)
Saudi Arabia	(Japan, U.S.)		
East Asia			
Hong Kong	(Japan, U.S.)	Philippines	(Japan, U.S.)
Indonesia	(Japan, U.S.)	Singapore	(Japan, U.S.)
Korea	(Japan, U.S.)	Thailand	(Japan, U.S.)
Malaysia	(Japan, U.S.)	* China, People's Rep.	(Japan, U.S.)

TABLE 1 (Cont.)
REGION DEFINITIONS AND SAMPLES

South Asia

Bangladesh	(Japan, U.S.)	Nepal	(Japan, U.S.)
Sri Lanka	(Japan, U.S.)	Pakistan	(Japan, U.S.)
India	(Japan, U.S.)		

Africa

* South Africa	(Japan, U.S.)	Mauritius	(U. S.)
Algeria	(U. S.)	Morocco	(Japan, U.S.)
Botswana	(U. S.)	Mozambique	(Japan, U.S.)
Burundi	(U. S.)	Niger	(U. S.)
Cameroon	(Japan, U.S.)	Nigeria	(Japan, U.S.)
Central African Rep.	(U. S.)	Zimbabwe	(U. S.)
* Congo	(Japan, U.S.)	Rwanda	(Japan, U.S.)
Zaire	(Japan, U.S.)	Senegal	(Japan, U.S.)
Ethiopia	(Japan, U.S.)	Sierra Leone	(U. S.)
Gabon	(Japan, U.S.)	Swaziland	(Japan, U.S.)
Gambia, The	(Japan)	Tanzania	(Japan, U.S.)
Ghana	(Japan, U.S.)	* Togo	(U. S.)
Cote d'Ivoire	(Japan, U.S.)	Tunisia	(Japan, U.S.)
Kenya	(Japan, U.S.)	Uganda	(Japan, U.S.)
Madagascar	(Japan, U.S.)	Burkina Faso	(Japan)
Malawi	(U. S.)	Zambia	(Japan, U.S.)
Mauritania	(Japan)		

Oceania

Australia	(Japan, U.S.)	* Vanuatu	(Japan)
New Zealand	(Japan, U.S.)	Papua New Guinea	(Japan, U.S.)
* Solomon Islands	(Japan)	* Western Samoa	(U. S.)
Fiji	(Japan)		

Eastern Europe

* Yugoslavia	(Japan, U.S.)	* Hungary	(Japan, U.S.)
* Bulgaria	(Japan, U.S.)	* Poland	(Japan, U.S.)
* Czechoslovakia	(U. S.)		

Japan

Japan	(U. S.)

[NOTE]

The countries with (*) are out of the sample when human capital is including in the regression.

TABLE 2a

JAPAN: TRADE AND INVESTMENT EQUATIONS

ln (a + V) = max [Z'b + u , ln a]

With Human Capital

Maximum Likelihood, Tobit Estimates

	V	Export	Export	Import	Import	DFI out	DFI out	DFI in	DFI in
	Observation #	498	498	498	498	498	498	498	498
	Log likelihood	-3324.7	-3469.2	-3261.1	-3393.3	-3071.3	-3181.4	-349.0	-364.4
	a	-0.034	-0.478	0.972	-0.394	0.711	0.710	109.824	136.945
		0.458	*0.327*	*0.503*	*0.207*	*0.135*	*0.171*	*16.701*	*20.990*
Z	C	-1.355	-3.562	0.669	-2.412	-4.806	-6.859	-1.560	-7.755
		0.527	*0.556*	*0.994*	*1.053*	*1.106*	*1.221*	*3.017*	*3.112*
	ln(POP)	0.774	0.837	0.801	0.892	0.953	0.915	0.779	0.977
		0.023	*0.031*	*0.045*	*0.044*	*0.048*	*0.061*	*0.212*	*0.128*
	ln(YPC)	0.845	0.912	1.058	1.055	0.874	0.792	2.670	2.591
		0.052	*0.046*	*0.068*	*0.064*	*0.099*	*0.083*	*0.367*	*0.322*
	ln(DEN)	0.041	0.212	-0.332	-0.152	-0.211	-0.051	0.884	0.562
		0.031	*0.035*	*0.042*	*0.051*	*0.073*	*0.075*	*0.139*	*0.120*
	ln(HK)	0.057	0.275	-0.291	0.047	0.331	0.779	1.639	2.354
		0.103	*0.111*	*0.188*	*0.218*	*0.211*	*0.188*	*1.633*	*1.144*
	DR1:W.Eu.	-0.688		-0.637		-1.350		-3.166	
		0.155		*0.160*		*0.272*		*0.474*	
	DR2:C.Am.	-0.568		-0.649		-0.284		-11.366	
		0.321		*0.292*		*0.549*		*1.068*	
	DR3:S.Am.	-1.074		-0.565		-0.712		-11.366	
		0.170		*0.214*		*0.263*		*1.068*	
	DR4:M.E.	-0.583		-0.436		-2.963		-11.366	
		0.202		*0.284*		*0.451*		*1.068*	
	DR5:E.As.	1.332		2.623		2.336		-2.977	
		0.208		*0.230*		*0.343*		*1.101*	
	DR6:S.As.	-0.174		0.183		-1.370		-11.366	
		0.246		*0.324*		*0.464*		*1.068*	
	DR7:Afri.	-1.258		-0.787		-1.290		-11.366	
		0.221		*0.287*		*0.387*		*1.068*	
	DR8:Ocea.	0.263		0.645		1.054		-11.366	
		0.170		*0.217*		*0.237*		*1.068*	

[NOTE] Time Dummies (DT1 - DT5) are included in all regressions.
The numbers in italics below the estimates are Eicker-White standard errors.
Z' = { C : Constant , POP : Population , YPC : per capita GNP , DEN : Density
HK : Human Capital , DR1 - DR8 : Region Dummies}

TABLE 2b

JAPAN: TRADE AND INVESTMENT EQUATIONS

ln (a + V) = max [Z'b + u , ln a]

Without Human Capital

Maximum Likelihood, Tobit Estimates

V		Export	Export	Import	Import	DFI out	DFI out	DFI in	DFI in
Observation #		570	570	570	570	570	570	570	570
Log likelihood		-3795.8	-4002.4	-3747.5	-3897.4	-3477.2	-3634.5	-399.8	-415.7
a		0.094	-0.550	0.470	-0.622	0.854	0.840	111.955	135.012
		0.495	*0.286*	*0.385*	*0.128*	*0.149*	*0.167*	*16.198*	*19.830*
Z	**C**	-0.256	-1.592	0.248	-1.751	0.348	-0.912	8.310	1.009
		0.383	*0.483*	*0.638*	*0.646*	*0.969*	*1.034*	*2.832*	*2.162*
	ln(POP)	0.739	0.773	0.800	0.877	0.722	0.700	0.723	1.049
		0.022	*0.032*	*0.040*	*0.040*	*0.050*	*0.064*	*0.157*	*0.097*
	ln(YPC)	0.921	0.970	1.103	1.084	0.961	0.995	3.840	3.651
		0.038	*0.024*	*0.057*	*0.039*	*0.088*	*0.055*	*0.535*	*0.385*
	ln(DEN)	0.045	0.184	-0.322	-0.183	-0.138	-0.045	0.977	0.599
		0.028	*0.035*	*0.042*	*0.051*	*0.071*	*0.074*	*0.158*	*0.111*
	DR1:W.Eu.	-0.765		-0.559		-1.862		-3.388	
		0.143		*0.155*		*0.282*		*0.658*	
	DR2:C.Am.	-0.478		-0.484		-0.722		-12.242	
		0.272		*0.268*		*0.523*		*0.792*	
	DR3:S.Am.	-1.023		-0.397		-1.154		-12.242	
		0.159		*0.213*		*0.294*		*0.792*	
	DR4:M.E.	-0.461		0.092		-3.061		-12.242	
		0.179		*0.288*		*0.418*		*0.792*	
	DR5:E.As.	1.318		2.705		1.586		-3.488	
		0.179		*0.221*		*0.354*		*1.533*	
	DR6:S.As.	0.020		0.545		-1.608		-12.242	
		0.210		*0.330*		*0.449*		*0.792*	
	DR7:Afri.	-1.125		-0.345		-2.265		-12.242	
		0.197		*0.265*		*0.403*		*0.792*	
	DR8:Ocea.	0.397		0.860		0.633		-12.242	
		0.173		*0.244*		*0.308*		*0.792*	
	DR9:E.Eu.	-2.020		-1.445		-5.369		-12.242	
		0.183		*0.228*		*0.419*		*0.792*	

[NOTE] Time Dummies (DT1 - DT5) are included in all regressions.
The numbers in italics below the estimates are Eicker-White standard errors.
Z' = { C : Constant , POP : Population , YPC : per capita GNP , DEN : Density
DR1 - DR9 : Region Dummies}

TABLE 3a

U. S. : TRADE AND INVESTMENT EQUATIONS

$\ln (a + V) = \max [Z'b + u , \ln a]$

With Human Capital

Maximum Likelihood, Tobit Estimates

V		Export	Export	Import	Import	DFI out	DFI out	DFI in	DFI in
Observation #		546	546	546	546	546	546	546	546
Log likelihood		-3912.6	-4081.0	-4080.9	-4230.6	-3665.3	-3766.1	-2222.9	-2241.6
a		3.246	2.123	4.188	1.809	9.086	9.642	6.310	6.903
		0.534	*0.484*	*1.332*	*1.038*	*1.543*	*1.775*	*1.275*	*1.318*
Z	C	0.269	-3.540	0.228	-4.250	-3.064	-4.019	-2.870	-5.386
		0.558	*0.611*	*0.763*	*0.730*	*1.240*	*1.136*	*1.705*	*1.526*
	ln(POP)	0.782	0.776	0.849	0.828	1.018	0.871	1.103	1.052
		0.028	*0.033*	*0.032*	*0.036*	*0.052*	*0.056*	*0.077*	*0.071*
	ln(YPC)	0.848	0.799	1.082	0.814	1.186	1.023	2.041	1.865
		0.057	*0.054*	*0.060*	*0.050*	*0.100*	*0.073*	*0.162*	*0.122*
	ln(DEN)	0.076	0.103	0.067	0.145	0.091	0.030	0.176	0.133
		0.024	*0.032*	*0.030*	*0.031*	*0.048*	*0.044*	*0.073*	*0.053*
	ln(HK)	0.228	0.993	0.407	1.026	0.436	1.088	0.707	1.407
		0.111	*0.136*	*0.160*	*0.158*	*0.236*	*0.215*	*0.431*	*0.395*
	DR1:W.Eu.	-2.371		-2.410		-1.793		-1.524	
		0.118		*0.093*		*0.213*		*0.301*	
	DR2:C.Am.	-0.774		-0.383		0.047		-0.289	
		0.173		*0.162*		*0.368*		*0.687*	
	DR3:S.Am.	-1.620		-1.219		-0.459		-0.593	
		0.141		*0.136*		*0.249*		*0.328*	
	DR4:M.E.	-2.331		-3.164		-3.290		-1.704	
		0.338		*0.348*		*0.564*		*0.509*	
	DR5:E.As.	-1.341		-0.567		-0.714		-1.084	
		0.165		*0.137*		*0.306*		*0.479*	
	DR6:S.As.	-2.750		-1.596		-3.027		-1.521	
		0.214		*0.187*		*0.373*		*0.609*	
	DR7:Afri.	-3.028		-1.923		-1.714		-2.100	
		0.160		*0.171*		*0.332*		*0.536*	
	DR8:Ocea.	-1.882		-2.198		-0.148		-0.678	
		0.139		*0.108*		*0.262*		*0.336*	
	DR10:JPN	-2.013		-1.597		-2.906		-1.480	
		0.138		*0.155*		*0.243*		*0.414*	

[NOTE] Time Dummies (DT1 - DT5) are included in all regressions.
The numbers in italics below the estimates are Eicker-White standard errors.
Z' = { C : Constant , POP : Population , YPC : per capita GNP , DEN : Density
HK : Human Capital , DR1 - DR8 , DR10 : Region Dummies}

TABLE 3b

U. S. : TRADE AND INVESTMENT EQUATIONS

ln (a + V) = max [Z'b + u , ln a]

Without Human Capital

Maximum Likelihood, Tobit Estimates

	V	Export	Export	Import	Import	DFI out	DFI out	DFI in	DFI In
Observation #		630	630	630	630	630	630	630	630
Log likelihood		-4442.6	-4702.0	-4670.2	-4880.3	-4059.9	-4250.6	-2512.1	-2559.6
	a	3.117	1.379	3.592	1.193	9.348	10.825	6.498	7.330
		0.549	*0.408*	*1.243*	*0.707*	*1.579*	*1.863*	*1.145*	*1.276*
Z	**C**	1.463	0.430	2.268	-0.172	0.838	1.340	-0.108	-0.328
		0.391	*0.436*	*0.507*	*0.468*	*0.886*	*0.849*	*1.096*	*1.043*
	ln(POP)	0.777	0.745	0.817	0.798	0.955	0.779	1.070	1.016
		0.025	*0.031*	*0.030*	*0.033*	*0.050*	*0.053*	*0.072*	*0.068*
	ln(YPC)	0.963	1.074	1.189	1.087	1.549	1.345	2.175	2.195
		0.040	*0.035*	*0.037*	*0.033*	*0.078*	*0.049*	*0.131*	*0.077*
	ln(DEN)	0.071	0.082	0.060	0.107	0.105	-0.012	0.203	0.135
		0.022	*0.032*	*0.029*	*0.032*	*0.044*	*0.047*	*0.068*	*0.052*
	DR1:W.Eu.	-2.445		-2.492		-2.232		-1.604	
		0.102		*0.095*		*0.189*		*0.289*	
	DR2:C.Am.	-0.625		-0.501		0.332		-0.394	
		0.149		*0.155*		*0.306*		*0.594*	
	DR3:S.Am.	-1.516		-1.217		-0.174		-0.612	
		0.119		*0.131*		*0.194*		*0.316*	
	DR4:M.E.	-2.310		-3.184		-3.058		-2.094	
		0.287		*0.293*		*0.469*		*0.438*	
	DR5:E.As.	-1.349		-0.601		-0.846		-1.370	
		0.135		*0.130*		*0.282*		*0.435*	
	DR6:S.As.	-2.585		-1.589		-2.304		-1.735	
		0.190		*0.173*		*0.316*		*0.516*	
	DR7:Afri.	-2.930		-2.042		-1.357		-2.511	
		0.135		*0.153*		*0.268*		*0.448*	
	DR8:Ocea.	-2.017		-2.174		-0.227		-0.829	
		0.128		*0.134*		*0.250*		*0.336*	
	DR9:E.Eu.	-4.075		-3.827		-7.931		-3.896	
		0.151		*0.185*		*0.602*		*0.463*	
	DR10:JPN	-2.096		-1.614		-3.248		-1.607	
		0.124		*0.159*		*0.210*		*0.399*	

[NOTE] Time Dummies (DT1 - DT5) are included in all regressions.
The numbers in italics below the estimates are Eicker-White standard errors.
Z' = (C : Constant , POP : Population , YPC : per capita GNP , DEN : Density
DR1 - DR10 : Region Dummies)

TABLE 4
TRADE AND INVESTMENT ELASTICITIES

JAPAN

With Human Capital

	With region dummies				Without region dummies			
	Export	Import	DFI out	DFI in	Export	Import	DFI out	DFI in
Population	0.774	0.801	0.953	1.671	0.837	0.892	0.915	2.370
Income per capita	0.845	1.058	0.874	5.726	0.912	1.055	0.792	6.287
Density	0.041	-0.332	-0.211	1.895	0.212	-0.152	-0.051	1.364
Human Capital	0.057	-0.291	0.331	3.514	0.275	0.047	0.779	5.714

Without Human Capital

	With region dummies				Without region dummies			
	Export	Import	DFI out	DFI in	Export	Import	DFI out	DFI in
Population	0.739	0.800	0.722	1.603	0.772	0.876	0.700	2.588
Income per capita	0.921	1.103	0.962	8.514	0.970	1.083	0.996	9.010
Density	0.045	-0.322	-0.138	2.166	0.184	-0.183	-0.045	1.478

U. S.

With Human Capital

	With region dummies				Without region dummies			
	Export	Import	DFI out	DFI in	Export	Import	DFI out	DFI in
Population	0.783	0.850	1.021	1.105	0.777	0.828	0.874	1.054
Income per capita	0.849	1.083	1.189	2.046	0.800	0.814	1.026	1.870
Density	0.076	0.067	0.092	0.176	0.103	0.145	0.031	0.133
Human Capital	0.228	0.407	0.437	0.709	0.994	1.026	1.091	1.410

Without Human Capital

	With region dummies				Without region dummies			
	Export	Import	DFI out	DFI in	Export	Import	DFI out	DFI in
opulation	0.778	0.817	0.959	1.072	0.745	0.799	0.782	1.018
come per capita	0.964	1.190	1.554	2.180	1.075	1.087	1.350	2.201
ensity	0.071	0.060	0.105	0.204	0.082	0.107	-0.012	0.136

TABLE 5a

REGIONAL RANKINGS

Japan

With Human Capital

Export		Import		DFI out		DFI in	
DR5:E.As.	3.788	DR5:E.As.	13.778	DR5:E.As.	10.335	DR0:N.Am.	1.000
DR8:Ocea.	1.301	DR8:Ocea.	1.906	DR8:Ocea.	2.868	DR5:E.As.	0.051
DR0:N.Am.	1.000	DR6:S.As.	1.177	DR0:N.Am.	1.000	DR1:W.Eu.	0.042
DR6:S.As.	0.840	DR0:N.Am.	1.000	DR2:C.Am.	0.753	DR2:C.Am.	0.000
DR2:C.Am.	0.567	DR4:M.E.	0.646	DR3:S.Am.	0.491	DR3:S.Am.	0.000
DR4:M.E.	0.558	DR3:S.Am.	0.568	DR7:Afri.	0.275	DR4:M.E.	0.000
DR1:W.Eu.	0.503	DR1:W.Eu.	0.529	DR1:W.Eu.	0.259	DR6:S.As.	0.000
DR3:S.Am.	0.341	DR2:C.Am.	0.523	DR6:S.As.	0.254	DR7:Afri.	0.000
DR7:Afri.	0.284	DR7:Afri.	0.455	DR4:M.E.	0.052	DR8:Ocea.	0.000

Without Human Capital

Export		Import		DFI out		DFI in	
DR5:E.As.	3.735	DR5:E.As.	14.960	DR5:E.As.	4.885	DR0:N.Am.	1.000
DR8:Ocea.	1.488	DR8:Ocea.	2.362	DR8:Ocea.	1.884	DR1:W.Eu.	0.034
DR6:S.As.	1.020	DR6:S.As.	1.724	DR0:N.Am.	1.000	DR5:E.As.	0.031
DR0:N.Am.	1.000	DR4:M.E.	1.096	DR2:C.Am.	0.486	DR2:C.Am.	0.000
DR4:M.E.	0.631	DR0:N.Am.	1.000	DR3:S.Am.	0.315	DR3:S.Am.	0.000
DR2:C.Am.	0.620	DR7:Afri.	0.708	DR6:S.As.	0.200	DR4:M.E.	0.000
DR1:W.Eu.	0.465	DR3:S.Am.	0.672	DR1:W.Eu.	0.155	DR6:S.As.	0.000
DR3:S.Am.	0.359	DR2:C.Am.	0.616	DR7:Afri.	0.104	DR7:Afri.	0.000
DR7:Afri.	0.325	DR1:W.Eu.	0.572	DR4:M.E.	0.047	DR8:Ocea.	0.000
DR9:E.Eu.	0.133	DR9:E.Eu.	0.236	DR9:E.Eu.	0.005	DR9:E.Eu.	0.000

TABLE 5b

REGIONAL RANKINGS

U. S.

With Human Capital

Export		Import		DFI out		DFI in	
DR0:N.Am.	1.000	DR0:N.Am.	1.000	DR2:C.Am.	1.048	DR0:N.Am.	1.000
DR2:C.Am.	0.461	DR2:C.Am.	0.682	DR0:N.Am.	1.000	DR2:C.Am.	0.749
DR5:E.As.	0.262	DR5:E.As.	0.567	DR8:Ocea.	0.862	DR3:S.Am.	0.552
DR3:S.Am.	0.198	DR3:S.Am.	0.296	DR3:S.Am.	0.632	DR8:Ocea.	0.508
DR8:Ocea.	0.152	DR6:S.As.	0.203	DR5:E.As.	0.490	DR5:E.As.	0.338
DR10:JPN	0.134	DR10:JPN	0.202	DR7:Afri.	0.180	DR10:JPN	0.228
DR4:M.E.	0.097	DR7:Afri.	0.146	DR1:W.Eu.	0.166	DR6:S.As.	0.218
DR1:W.Eu.	0.093	DR8:Ocea.	0.111	DR10:JPN	0.055	DR1:W.Eu.	0.218
DR6:S.As.	0.064	DR1:W.Eu.	0.090	DR6:S.As.	0.048	DR4:M.E.	0.182
DR7:Afri.	0.048	DR4:M.E.	0.042	DR4:M.E.	0.037	DR7:Afri.	0.122

Without Human Capital

Export		Import		DFI out		DFI in	
DR0:N.Am.	1.000	DR0:N.Am.	1.000	DR2:C.Am.	1.393	DR0:N.Am.	1.000
DR2:C.Am.	0.535	DR2:C.Am.	0.606	DR0:N.Am.	1.000	DR2:C.Am.	0.675
DR5:E.As.	0.260	DR5:E.As.	0.548	DR3:S.Am.	0.840	DR3:S.Am.	0.542
DR3:S.Am.	0.220	DR3:S.Am.	0.296	DR8:Ocea.	0.797	DR8:Ocea.	0.437
DR8:Ocea.	0.133	DR6:S.As.	0.204	DR5:E.As.	0.429	DR5:E.As.	0.254
DR10:JPN	0.123	DR10:JPN	0.199	DR7:Afri.	0.258	DR1:W.Eu.	0.201
DR4:M.E.	0.099	DR7:Afri.	0.130	DR1:W.Eu.	0.107	DR10:JPN	0.200
DR1:W.Eu.	0.087	DR8:Ocea.	0.114	DR6:S.As.	0.100	DR6:S.As.	0.176
DR6:S.As.	0.075	DR1:W.Eu.	0.083	DR4:M.E.	0.047	DR4:M.E.	0.123
DR7:Afri.	0.053	DR4:M.E.	0.041	DR10:JPN	0.039	DR7:Afri.	0.081
DR9:E.Eu.	0.017	DR9:E.Eu.	0.022	DR9:E.Eu.	0.000	DR9:E.Eu.	0.020

TABLE 6
CORRELATION OF RESIDUALS

JAPAN
With Human Capital

With Region Dummies

	EXPORTS	IMPORTS	DFI OUT	DFI IN
EXPORTS	1.000	0.295	0.504	0.012
IMPORTS		1.000	0.454	0.005
DFI OUT			1.000	0.022
DFI IN				1.000

Without Region Dummies

	EXPORTS	IMPORTS	DFI OUT	DFI IN
EXPORTS	1.000	0.555	0.612	0.010
IMPORTS		1.000	0.594	0.001
DFI OUT			1.000	0.024
DFI IN				1.000

USA
With Human Capital

With Region Dummies

	EXPORTS	IMPORTS	DFI OUT	DFI IN
EXPORTS	1.000	0.396	0.419	0.181
IMPORTS		1.000	0.344	0.085
DFI OUT			1.000	0.460
DFI IN				1.000

Without Region Dummies

	EXPORTS	IMPORTS	DFI OUT	DFI IN
EXPORTS	1.000	0.582	0.546	0.172
IMPORTS		1.000	0.517	0.111
DFI OUT			1.000	0.453
DFI IN				1.000

Country Codes for Figure 1 - 8

North America

US : United States
CA : Canada
ME : Mexico

Western Europe

UK : United Kingdom
AU : Austria
BL : Belgium-Luxembourg
DE : Denmark
FR : France
GE : Germany
IT : Italy
NE : Netherlands
NO : Norway
SD : Sweden
SZ : Switzerland
FI : Finland
GR : Greece
IC : Iceland
IR : Ireland
MT : Malta
PO : Portugal
SP : Spain
TU : Turkey

East Asia

HK : Hong Kong
IN : Indonesia
KO : Korea
MA : Malaysia
PH : Philippines
SI : Singapore
TH : Thailand
CH : China, People's Rep.

Japan

JA : Japan

Figure 1

Per Capita Exports & GNP (Japan)
3 regions, w/o Hong Kong & Singapore

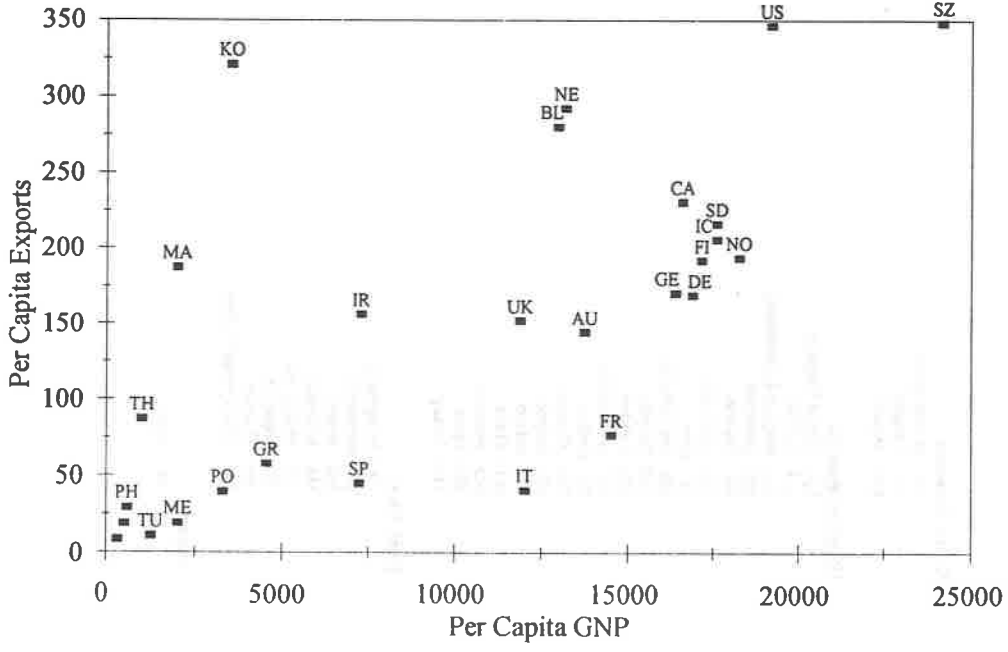

Figure 2

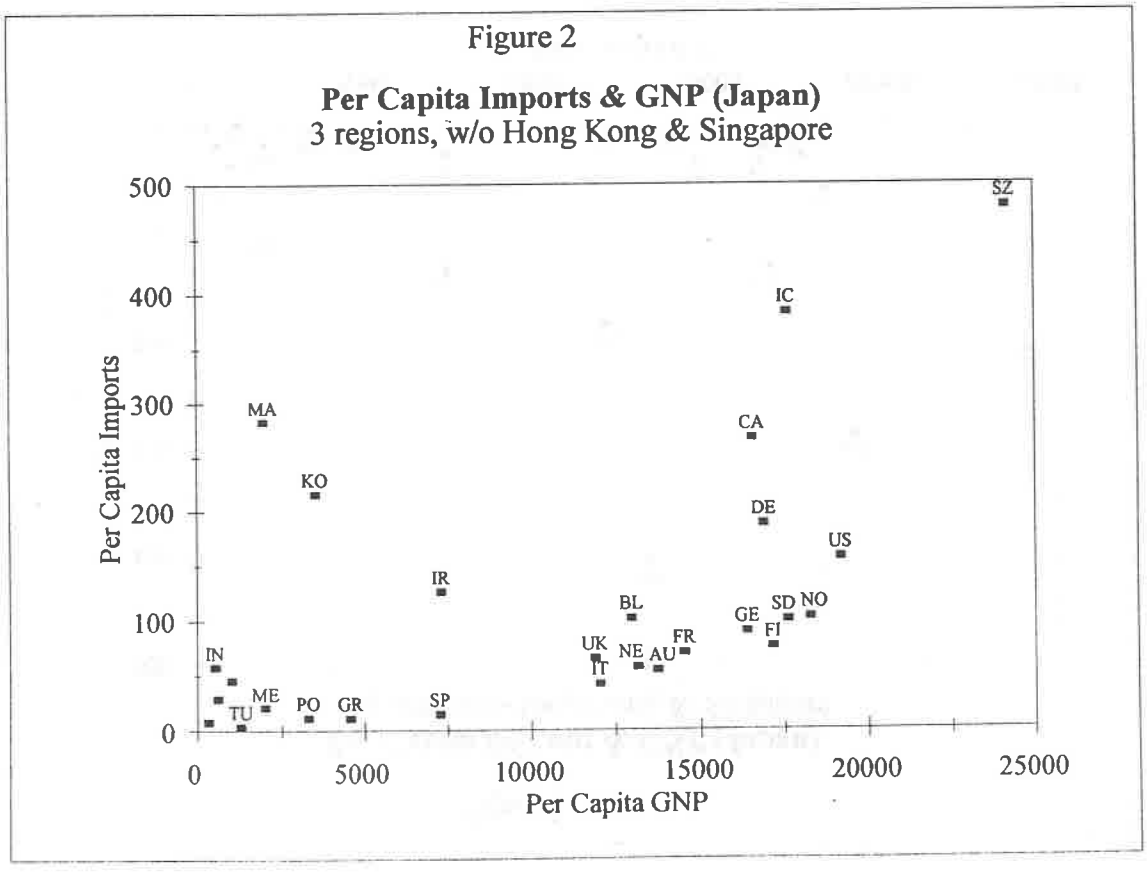
Per Capita Imports & GNP (Japan)
3 regions, w/o Hong Kong & Singapore
Per Capita Imports
Per Capita GNP
500
400
300
200
100
0
0
5000
10000
15000
20000
25000
SZ
IC
MA
CA
KO
DE
US
IR
BL
SD
NO
GE
FI
FR
UK
NE
AU
IT
IN
ME
PO
GR
SP
TU

Figure 3

Per Capita DFI out & GNP (Japan)
3 regions, w/o Hong Kong & Singapore

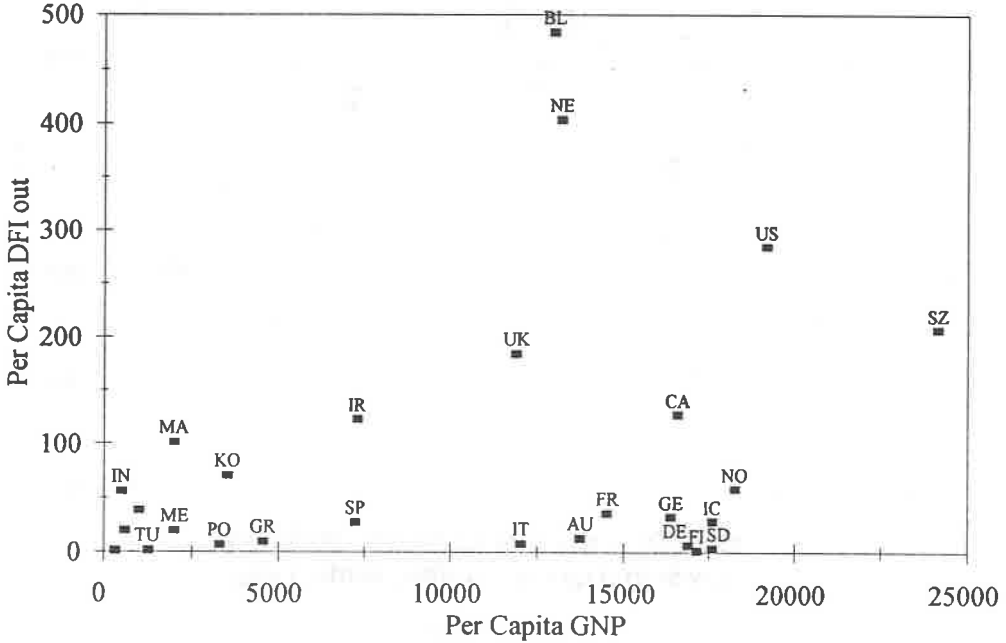

Figure 4

Per Capita DFI in & GNP (Japan)

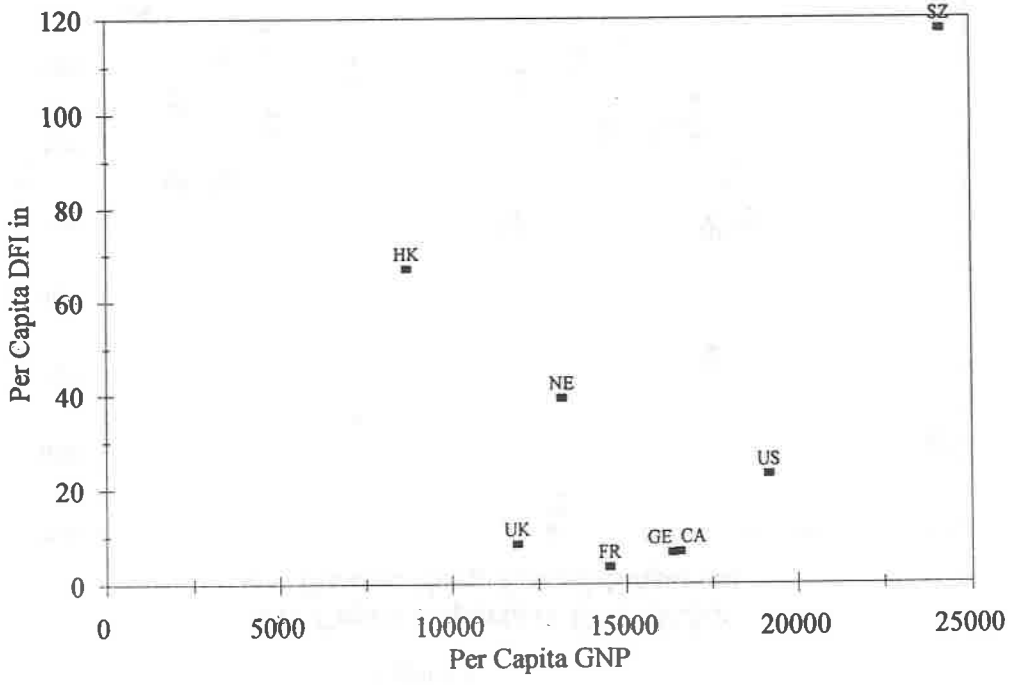

Figure 5

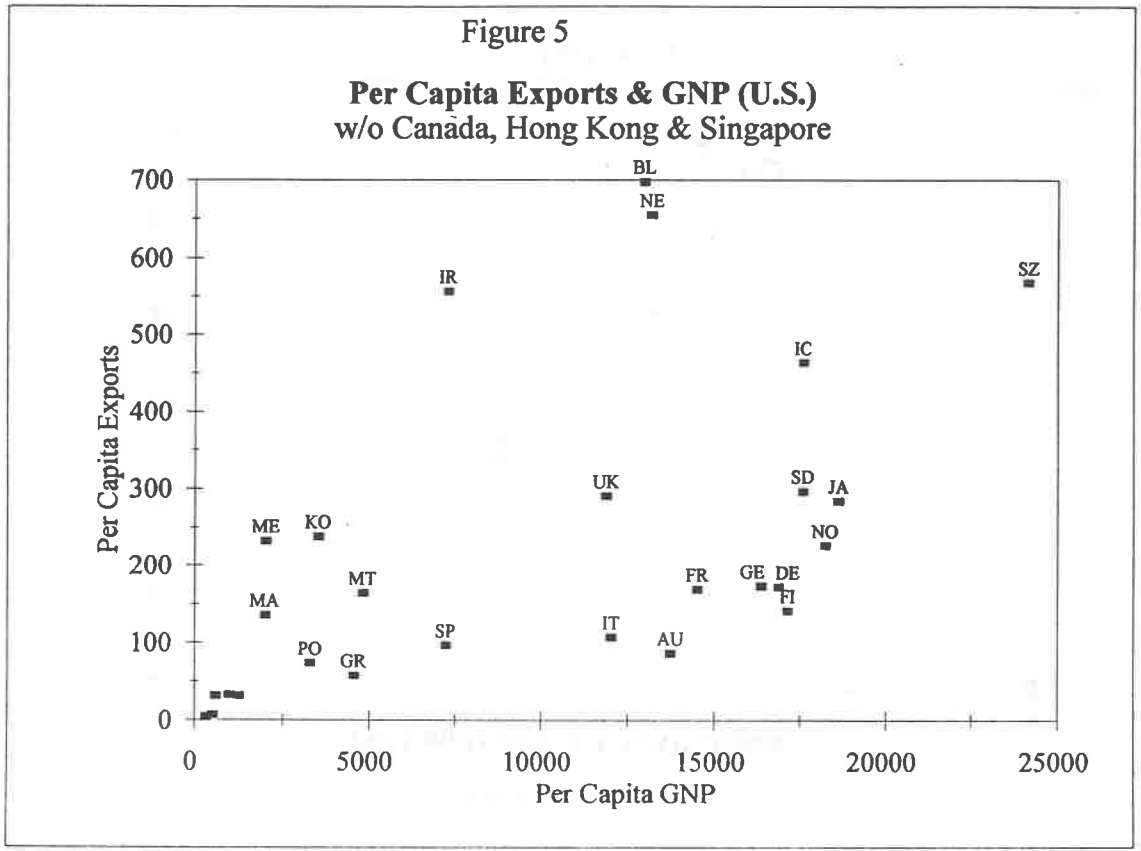
Per Capita Exports & GNP (U.S.)
w/o Canada, Hong Kong & Singapore
Per Capita Exports
Per Capita GNP
0
100
200
300
400
500
600
700
0
5000
10000
15000
20000
25000
BL
NE
IR
SZ
IC
UK
SD
JA
ME
KO
NO
MT
FR
GE
DE
MA
FI
IT
SP
AU
PO
GR

Figure 6

Per Capita Imports & GNP (U.S.)
w/o Canada, Hong Kong & Singapore

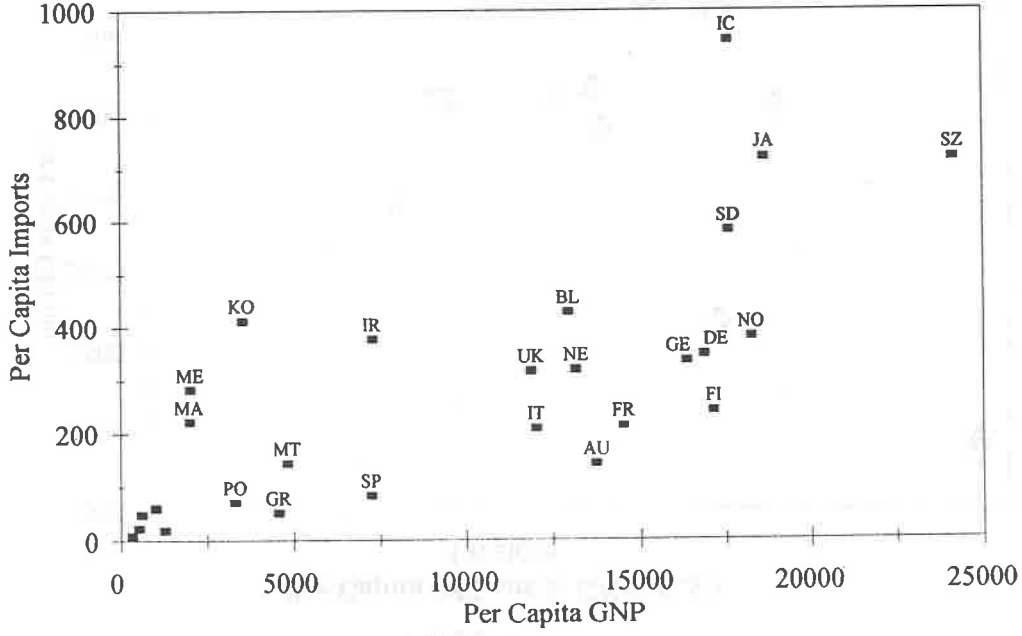

Figure 7

Per Capita DFI out & GNP (U.S.)

4 regions

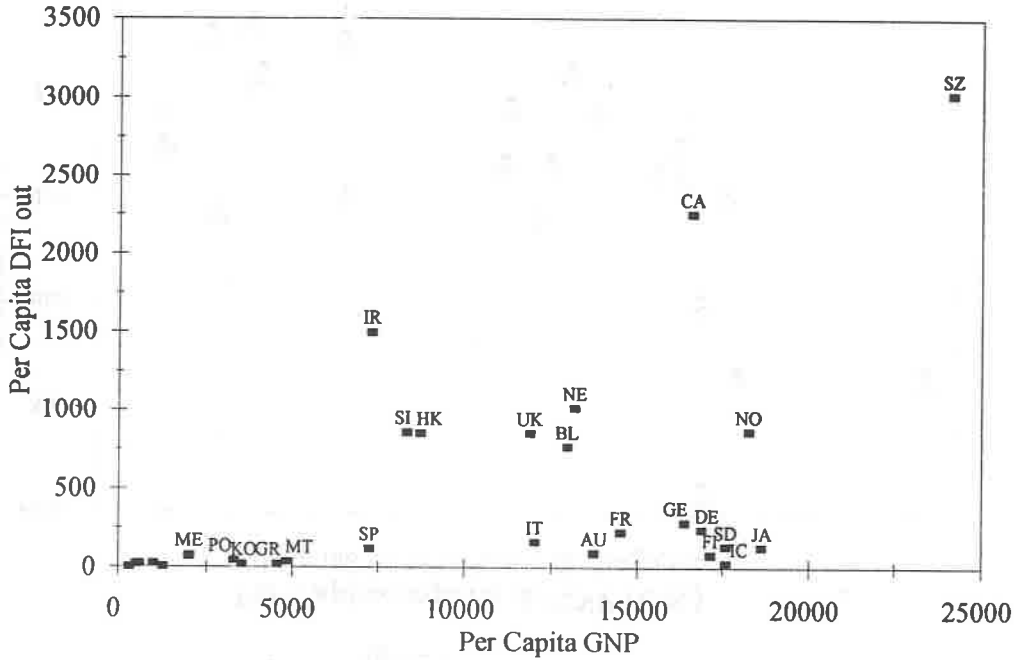

Figure 8

Per Capita DFI in & GNP (U.S.)

4 regions, w/o NE. & SZ

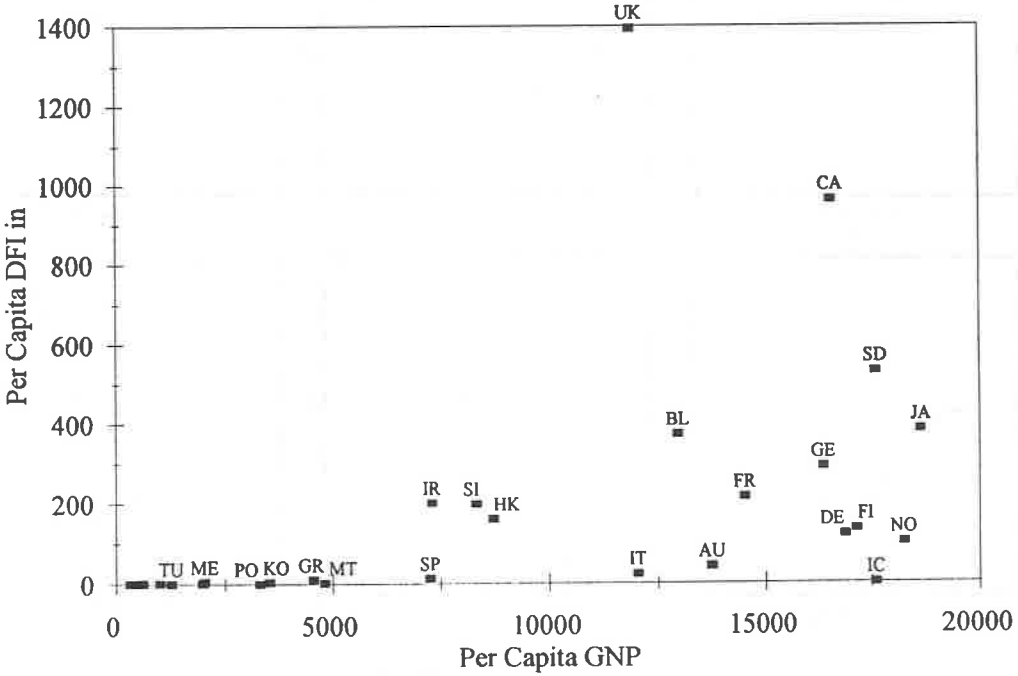

FIGURE 9: TIME PATTERNS OF RESIDUAL CORRELATIONS (JAPAN)
(with regional dummies and human capital)

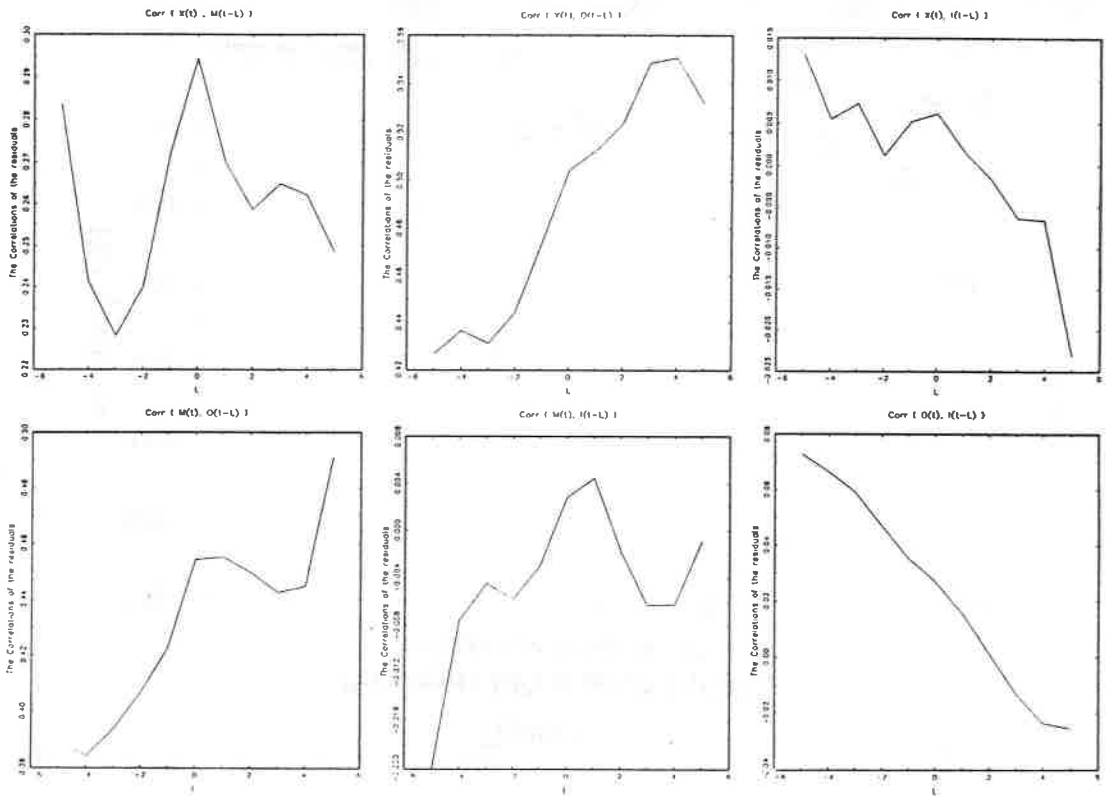

FIGURE 10: TIME PATTERNS OF RESIDUAL CORRELATIONS (JAPAN)
(without regional dummies and with human capital)

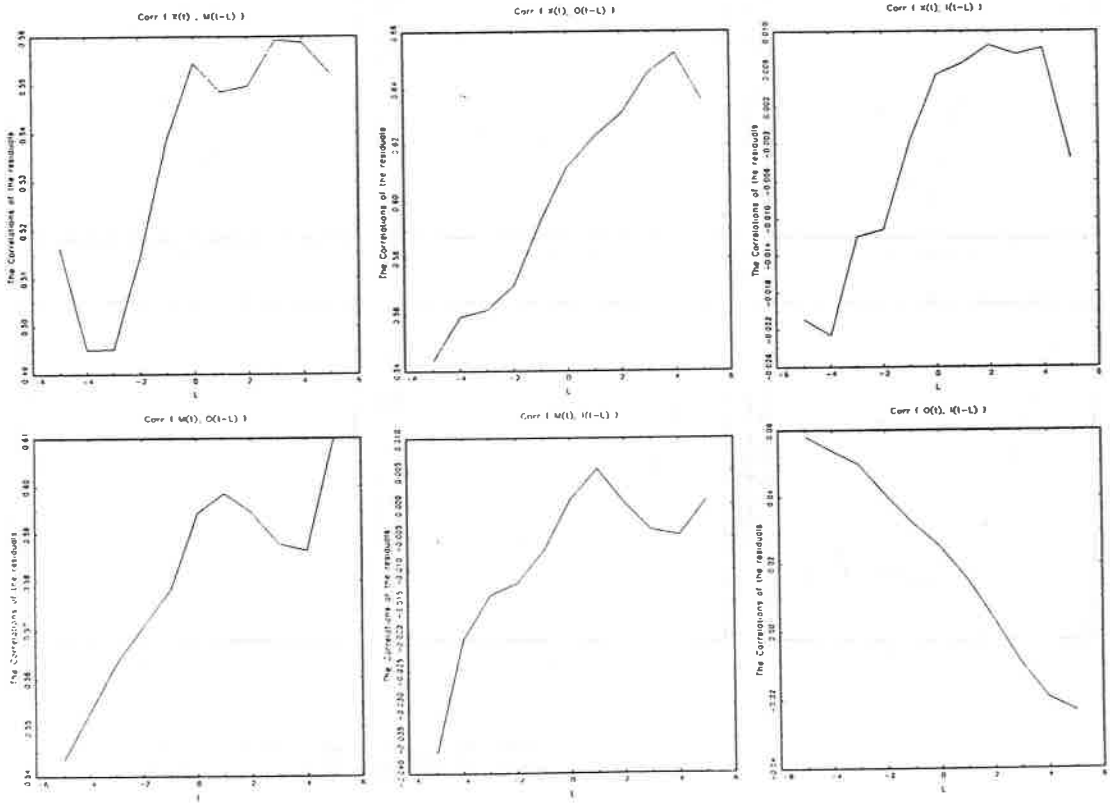

FIGURE 11: TIME PATTERNS OF RESIDUAL CORRELATIONS (UNITED STATES)
(with regional dummies and humab capital

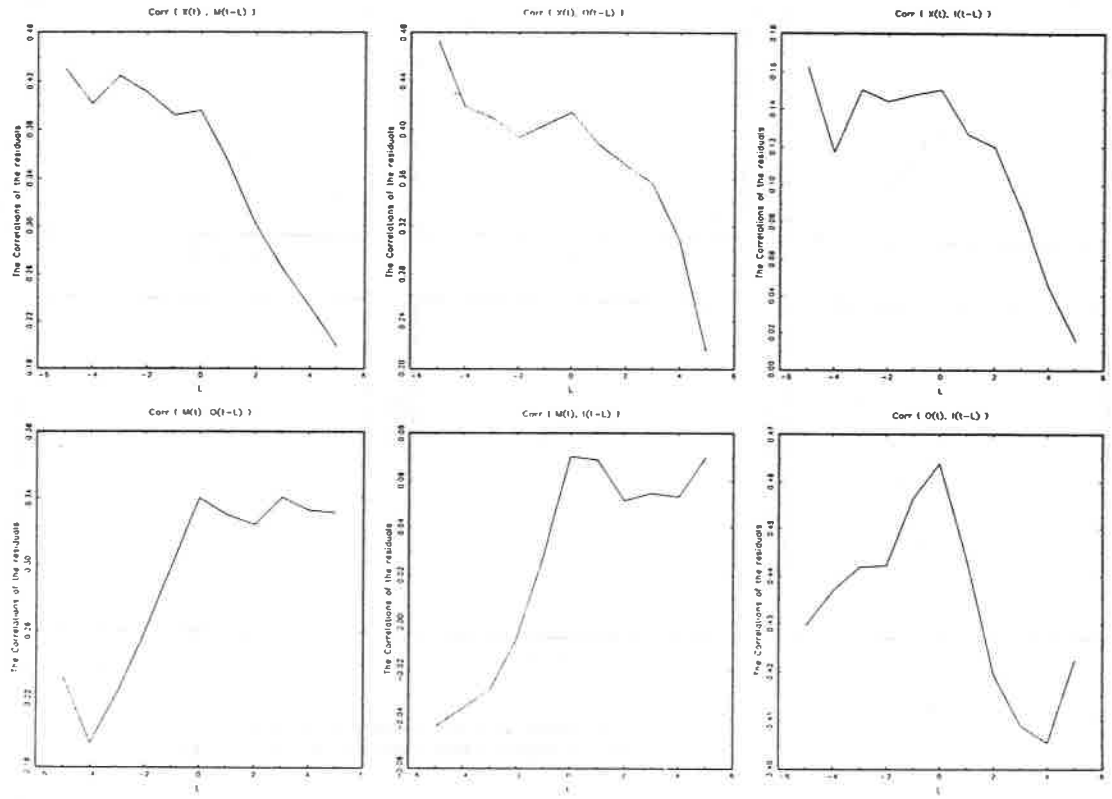

FIGURE 12: TIME PATTERNS OF RESIDUAL CORRELATIONS (UNITED STATES)
(without regional dummies and with human capital)

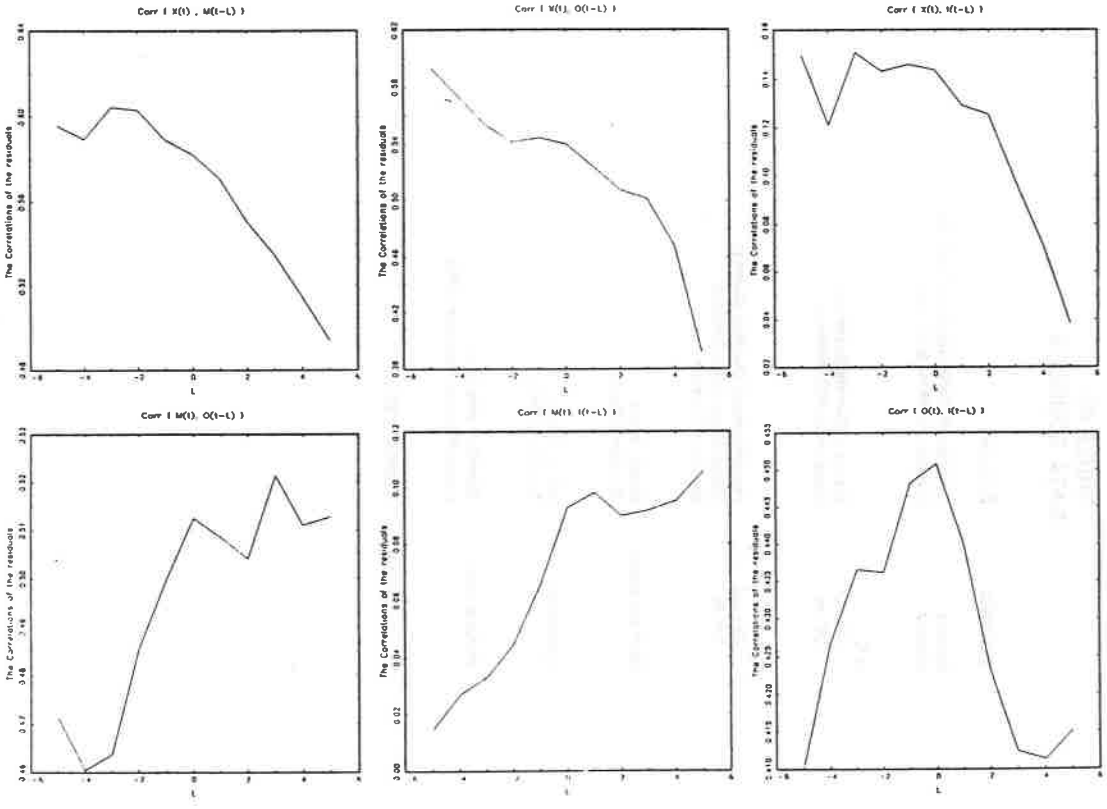

TABLE A1
DATA SOURCES

Variable	Source
Exports Imports	*Direction of Trade Statistics Yearbook,* International Monetary Fund
U.S. DFI out DFI in	*Survey of Current Bussiness,* Department of Commerce
Japan DFI out DFI in	*Fiscal/Financial Statistics Monthly,* (Zaisei-Kinyu Tokei Geppou) Ministry of Finance
GNP per capita	*World Tables,* The World Bank
Population	*World Tables* The World Bank
Surface Area	*Statistical Yearbook,* United Nations, Statistical office
Human Capital	Kyriacou (1991)