Measuring Network Effects on Trade: Are Japanese Affiliates Distinctive?

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Abstract

This paper examines network effects on trade by comparing the trade patterns of foreign affiliates in the US with the trade patterns of US-owned firms. The evidence strongly supports the following hypotheses: 1) foreign affiliates behave differently from US firms in their trade patterns; 2) in particular, foreign affiliates display strong home biases in their trade patterns; and 3) among the foreign affiliates, Japanese affiliates demonstrate by far the strongest home bias in their trade patterns. Controlling for income and distance effects, foreign affiliates from Australia, Canada, France, Germany, the Netherlands, Switzerland, and the UK traded on average 14 times more with their respective home countries, while Japanese affiliates traded a whopping 200 times more with Japan.

1 The author thanks the participants in the pre-conference meeting of authors, particularly Keith Head and John Ries, for helpful comments and the East-West Center for providing funding and research accommodations during the early stages of this project.
1. Introduction

In recent years, economists have begun to describe and quantify the impacts of business and social networks on international trade. In an international environment where contracts are not always enforceable and product information is imperfect, relationships between buyers and sellers matter. In some countries and cultures, they seem to matter more than in others. While examples of such relationships or networks can be found throughout history (e.g., the 11th century Maghribi traders studied by Greif, 1993), most economists have focused on networks that impact trade today. Japanese *keiretsu* and overseas Chinese networks are often cited as contemporary examples of networks that may affect international trade, but empirical work measuring network effects is still limited.

Gould (1994), Head and Ries (1998), and Rauch and Trindade (2002) demonstrate the importance of network effects by examining the influence of immigrants on international trade. They find that immigrants have a statistically significant positive effect on bilateral trade between their countries of emigration and immigration. Rauch and Trindade (2002) specifically examine the trade effects of ethnic Chinese networks, as proxied by the product of ethnic Chinese population shares. They find that these networks increased bilateral trade both within Southeast Asia and for other country pairs.

Although many observers assert the importance of Japanese *keiretsu* for international trade, empirical work has focused almost exclusively on the potential for *keiretsu* to depress Japanese imports. Fung (1991) and Lawrence (1991) both find that the extent of horizontal and vertical *keiretsu* presence in an industry is negatively correlated with import penetration.\(^2\) At the firm level, however, Ueda and Sasaki (1998) report that *keiretsu* firms import at least as much as

\(^2\) Lawrence (1991) also finds that vertical, but not horizontal, *keiretsu* presence is positively correlated with industry exports.
non-keiretsu firms. Focusing on auto parts trade, Head, Ries and Spencer (2004) find that US exports to Japan are lower for parts where vertical keiretsu are prominent in Japan. These papers leave open the question of how Japanese keiretsu might affect world trade beyond Japan’s importing. Perhaps as importantly, none of them considers the possibility that Japanese business networks could extend beyond traditional keiretsu linkages.

This paper addresses both of these questions and compares the trade impacts of Japanese business groups to those of several other industrialized countries. Targeting all of these objectives involves some necessary tradeoffs. Rather than trying to cover world trade, I limit my attention to US trade flows. I examine how networks, particularly Japanese networks, affect US trade by comparing the trade patterns of foreign affiliates in the US with those of US-owned firms. I address the following research questions: Do foreign affiliates behave differently from US firms in their trade patterns? Among affiliates, do network effects have a significant impact on trade? Has the strength of network effects changed over time? Do Japanese affiliates behave differently than the affiliates of other countries in terms of their trade pattern? Do Japanese affiliates appear to have particularly strong networks, and has the strength of these networks changed over time? What are the implications for trade and trade policy?

Theoretical work that links network effects to international trade includes Greif (1993), Rauch (1996), McLaren (1999), Kranton and Minehard (2001), Casella and Rauch (2002) and Greaney (2003). In Greaney (2003), network effects are modeled as a cost advantage in selling to buyers from the producer’s own country. Asymmetry across countries in the strength of this network effect results in lower inward FDI, lower total imports but larger volumes of reverse imports\(^3\) into the country with strong network effects (e.g., Japan). The model’s predictions

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\(^3\) Reverse imports are imports from overseas affiliates of that country’s own firms.
match observed asymmetric trade and investment flows that sometimes lead to US-Japan trade friction.

This paper is an empirical complement to Greaney (2003) but does not limit its focus to Japanese networks alone. Here I measure the strength of network effects on the trade of eight industrialized countries’ foreign affiliates operating in the US. Network effects are estimated by examining the extent of affiliates’ home bias in their exporting and importing activities, while controlling for income and distance effects. I find that the affiliates on average display strong home bias in their trade activities, and that Japanese affiliates display by far the highest level of home bias.

2. Data Details

Other papers on network effects on trade have developed proxy measures of cross-border networks using immigration flows (Gould (1994), Head and Ries (1998)), population shares (Rauch and Trindade (2002)) or colonial ties and distance (Rauch (1999)). I use a more direct measure of network effects by disaggregating US trade with eight trade partners into trade by American-owned firms versus trade by foreign affiliates located in the US.⁴ Networks between affiliates and suppliers or buyers in their home countries would tend to create a home bias in their trade patterns.

For affiliates’ trade data, I use the Bureau of Economic Analysis’ survey Foreign Direct Investment in the US, which is conducted every five years. The most recent survey results that are available are for years 1987, 1992 and 1997. The published survey results identify bilateral trade by affiliates’ country of ultimate beneficial owner (UBO) for only eight countries—

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⁴ The distinction between American-owned and foreign affiliate follows the Bureau of Economic Analysis definition, where a foreign affiliate (or “U.S. affiliate of foreign direct investors”) involves foreign direct investment (FDI). FDI occurs when “a single foreign person owns or controls, directly or indirectly, 10% or more of the voting securities or an equivalent interest”. (Bureau of Economic Analysis, 1997)
Australia, Canada, France, Germany, Japan, the Netherlands, Switzerland, and the UK. This allows for comparison of the trade pattern of Japanese affiliates to that of seven other industrialized countries’ affiliates in the US. For US bilateral trade data, I use Statistics Canada’s World Trade Analyzer. For the gravity model estimations, the IMF’s International Financial Statistics provided GDP data and the “empirical investigations in international trade” website (formerly maintained by Jon Haveman, PhD) provided kilometer distances between capitol cities.

3. Activities of Foreign Affiliates

Tables 1 and 2 show summary statistics on the activities of foreign affiliates by country of ultimate beneficial owner (UBO) in 1987 and 1997. Since bilateral trade data for subsequent tables is available for only eight specific countries’ affiliates, I focus on these countries along with presenting some regional totals in these tables. Japan stands out even as early as 1987 for having the highest number of affiliates and these affiliates had the largest total assets, expenditures for property, plant and equipment, sales, and by far the highest level of participation in exporting and importing of any of the countries’ affiliates. By 1997, Japanese affiliates maintained their lead in all of these categories and had surpassed Canadian and British affiliates in the number of companies consolidated and in gross property, plant and equipment. Again, the strongest difference between the Japanese affiliates and their other foreign counterparts is the much larger volume of exports and imports generated by the Japanese affiliates—$52.5 billion in exports and $120.7 billion in imports versus the next highest trade figures of $14.5 billion in exports for UK affiliates and $15.3 billion in imports for Canadian affiliates. This large gap might be explained by a preponderance of Japanese affiliates involved

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5 For the sake of brevity, results for the intermediate year—1992—are reported only for the gravity model estimations later in the paper.
explicitly in trade activities (i.e., trading companies). To investigate this possibility, I next examine evidence on the importing and exporting patterns of the affiliates by industry.

Tables 3-6 help to clarify the reasons for the high level of trade conducted by Japanese affiliates. Tables 3 and 4 show US imports of goods shipped to affiliates by industry in 1987 and 1997. In 1987, $68.2 billion or 93.9% of the imports of Japanese affiliates were shipped to affiliates involved in wholesale trade, particularly those engaged in motor vehicles and equipment trade (45.5%). Only German affiliates appeared similar in having a large share of their imports (71.5% or $12.3 billion) going to affiliates in wholesale trade, particularly to those in autos and auto parts trade (53.9%). In contrast, only 5.8% ($4.2 billion) of Japanese affiliates’ imports went to manufacturing affiliates, while 25.0% (German) to 60.3% (Australian) of the other eight countries’ affiliates went to manufacturing affiliates in 1987. By 1997, the dominant importing role of Japanese wholesale trade affiliates had lessened somewhat, to 68.2% ($82.3 billion) of imports, with only 24.7% for autos and auto parts affiliates, while importing by manufacturing affiliates rose to 31.1% of the total.

Tables 5 and 6 show the pattern of exporting across industries by different countries’ affiliates in 1987 and 1997. The trend seen in the importing activities of Japanese affiliates is repeated in their exporting activities. In 1987, Japanese affiliates in wholesale trade accounted for almost all exporting by Japanese affiliates ($19.2 billion of $20.4 billion, or 94.1%), while manufacturing affiliates accounted for only 5.5%. Wholesale trade affiliates in metals and minerals accounted for $10.2 billion or 50.0% of all exports, while farm-product raw materials affiliates added another 20.3%. In 1997, the export activities of Japanese wholesale trade affiliates were up to $35.1 billion but this represented only 66.7% of total exports. Japanese manufacturing affiliates exported $16.5 billion or 31.4% of the total.
To examine how important foreign affiliates’ trade activities are relative to America’s total trade, I disaggregate bilateral trade into affiliates’ trade and US firms’ trade in Table 7. By far, foreign affiliates play the largest role in US trade with Japan. In 1987, affiliates accounted for 61.6% of US exports to Japan and 78.2% of US imports from Japan, while the comparable figures for affiliates’ share of total US trade were 17.4% and 34.4%, respectively. In 1997, affiliates’ share of US exports to Japan was a much lower 47.4% while their import share from Japan was slightly higher at 82.7%. The shares for affiliates’ in US total trade were 19.2% and 29.6%, respectively. Next to Japan, foreign affiliates played the largest role in US imports from Germany (52.6%) and Switzerland (62.6%) in 1997.

The dominant role foreign affiliates played in US trade with Japan remains the largest outlier in Table 7. To connect these figures to the potential role of Japanese trading companies and/or intra-firm trade by Japanese multinationals, I need to identify what portion of US trade with Japan is generated by Japanese affiliates in the US, rather than by all foreign affiliates, as in Table 7. The first two columns of Table 8 answer this question. Japanese affiliates exported 51.2% of total US exports to Japan in 1987 and 38.5% in 1997, much higher percentages than the 0.5% to 13.7% range for the selected other countries’ affiliates. In importing, foreign affiliates accounted for even larger shares of bilateral trade with their individual home countries and Japanese affiliates again accounted for the largest shares. Japanese affiliates were responsible for 76.3% and 80.7% of US imports from Japan in 1987 and 1997, while the next highest levels of affiliate control of importing from their home countries were the 51.5% and 47.0% figures attributed to German affiliates in 1987 and 1997.

By changing the denominator, the next two columns of Table 8 show the degree of home bias in the exporting and importing activities of the foreign affiliates. In 1987, Japanese
affiliates had by far the highest degree of home bias in their exporting, at 77.3%. The next highest degree of home bias in exporting was only 30.7% for Canadian affiliates. In 1997, Japanese affiliates’ home bias in exporting fell to 51.8%, just below the 52.3% posted by Canadian affiliates. Japanese affiliates’ had an extremely high degree of home bias in importing in 1987, 93.1%, although this was not too much higher than the home bias shown by West German affiliates (82.5%) and Canadian affiliates (73.4%). The home bias of Japanese affiliates in importing fell to 81.1% in 1997, below that of Canadian affiliates (85.6%) but the Canadian affiliates face much lower transportation costs in importing from home.

The next two columns of Table 8 compare the home bias of affiliates with the trade pattern of US firms. The numbers result from the following calculation:

\[
(1) \quad \frac{\sum_{i} X_{i}^{i=k}}{\sum_{i} X_{US}^{i}} \cdot \frac{\sum_{i} X_{US}^{i=k}}{\sum_{i} X_{US}^{i}}
\]

where \( X_{i}^{k} \) are the exports from (imports to) country \( k \) affiliates to (from) country \( i \) and \( X_{US}^{i} \) are the exports from (imports to) US firms to (from) country \( i \). The numerator represents the home bias of affiliates from country \( k \). The denominator represents the tendency of US firms to trade with country \( k \) among all other trade partners.

Any degree of network effects would tend to raise these ratios to levels above one, indicating that on average foreign affiliates have a greater tendency to trade with their particular home country than does an American firm. Higher ratios indicate even larger divergences between the trading behavior of the foreign affiliates and the US firms. In terms of exporting in 1987, Japanese and Swiss affiliates had the highest home bias divergence from US firms’ export pattern, with ratios of 14.9 and 15.2, respectively. The decline in Japanese affiliates’ export home bias in 1997 is reflected in a lower ratio of 8.3, meaning Japanese affiliates on average
favor Japan over other export destinations 8 times more than do US firms on average. That year, Australian and Swiss affiliates posted higher ratios of 9.95 and 19.4, respectively. In importing, although Japanese affiliates displayed very high levels of home bias in importing in 1987 and 1997, their tendency to buy from Japan did not diverge as much from US firms’ importing patterns as did the home bias displayed by several other countries’ affiliates. Five of the other seven countries’ affiliates had higher ratios than Japan’s 13.2 in 1987, and three had higher ratios than Japan’s 24.3 in 1997. Overall, the statistics in these two columns of Table 8 indicate tremendous divergence between the trade pattern of US firms and that of foreign affiliates with respect to their home countries. This provides suggestive evidence of the strength of network effects in the activities of foreign affiliates in the US.

The final two columns of Table 8 focus specifically on intra-group trade tendencies of affiliates, without regard to whether the other group firms are located in the home country or elsewhere. Japanese affiliates appear to have a somewhat higher intra-group export bias of 53.2% and 60.6% in 1987 and 1997 than do Canadian or European affiliates, which averaged between 17% and 50%. Japanese affiliates showed an even stronger preference for purchasing imports from within their corporate groups, 79.0% in 1987 and 79.7% in 1997. However, several of the other countries’ affiliates showed even stronger intra-group biases in importing—West German (86.9%) affiliates in 1987, and Canadian (85.4%), German (80.7%) and Swiss (80.9) affiliates in 1997.

Overall, the descriptive statistics provide evidence that foreign affiliates have strong biases towards trade with their home countries. This evidence is consistent with a hypothesis that national business networks matter for international trade. The descriptive evidence is more mixed regarding the particular strength of Japanese networks. Japanese affiliates have much
higher home biases in their exporting and importing activities than do most European affiliates. The high home biases in the trade activities of Japanese affiliates are matched only by Canadian affiliates, whose home trade biases are supported by low transportation costs. However, in comparing the trade patterns of the foreign affiliates to those of US-owned firms, Japanese affiliates are not such outliers. Australian and a few European affiliates showed greater divergence in their trade patterns relative to US firms than did Japanese affiliates.

4. Gravity Model Estimates of Network Effects

To further explore the role of networks in international trade, I adopt a gravity model to examine the determinants of US bilateral trade. Since foreign affiliates accounted for almost 20% of US exports and almost 30% of US imports in 1997, they are likely to have a significant effect on the US trade pattern. The first set of gravity results will disaggregate US trade with eight developed countries—Australia, Canada, France, Germany, Japan, the Netherlands, Switzerland, and the UK—for which trade data is available by the affiliates’ country of UBO. This will allow for comparisons of bilateral trade determinants of US firms’ versus foreign affiliates’ trade.

More importantly, subsequent regressions will measure the strength of network effects in the trade patterns of the foreign affiliates. The basic gravity equation follows Feenstra (2002) in using country fixed effects to account for unobserved price indices for countries. The gravity equation estimated for the results shown in the first four columns of Tables 9-11 is as follows:

\[
\ln(\frac{X_{ij}^k}{Y_i^k Y_j^k}) = \alpha \ln(\text{dist}1^\|) + B_1 \delta_i^k + B_2 \delta_j^k + \epsilon_{ij}
\]

where \(X_{ij}^k\) represents exports from country \(i\) to country \(j\) by firms of type \(k\), \(Y_i^k\) and \(Y_j^k\) represent the GDP’s of countries \(i\) and \(j\), \(\text{dist}1^\|\) is the distance between the two trading countries, and \(\delta_i^k\) and \(\delta_j^k\) are the source and destination dummy variables for country \(i\). As shown in the tables,
“type \( k \) firms” means all firms located in the US in the first column, then in the subsequent columns US bilateral trade is disaggregated by firm type. The second column uses trade by US-owned firms, the third column uses trade by all foreign affiliates and the remaining columns use trade by foreign affiliates by country of UBO (for 8 countries).

The last three columns in the tables include two different variables designed to capture network effects and a separate Japan network effect. “HomeLink” is a dummy variable that takes on the value of one if the affiliates’ country of UBO matches the trade partner. The coefficient reflects the tendency for the affiliate to trade with, either import from or export to, its home country. The “dist2” variable measures the kilometer distance between the affiliates’ trade partner and their country of UBO. If the trade partner matches the country of UBO, dist2 takes on the value of one to avoid taking the natural log of zero. The HomeLink variable measures network effects in a discrete manner, while the dist2 variable measures it as a continuous variable. The dist2 variable is particularly noteworthy because it represents a new way of measuring networks effects that is completely separate from any type of trade costs since the observations do not involve trade between the affiliates’ country of UBO and their trade partner.\(^6\)

An affiliate’s most direct business network may be its link with its parent company or group in its home country, measured by the HomeLink variable. The affiliate may also be linked into the parent’s business network, which presumably is strongest in the vicinity of the parent company and grows weaker as one moves further away from the parent location (i.e., the affiliate’s country of UBO). A negative and significant coefficient on the dist2 variable would reflect the affiliate’s tendency to trade less with buyers and sellers located farther away from its country of UBO.

\(^6\) The author thanks Keith Head for this insight.
Table 9 shows the gravity equation estimates for US bilateral trade with eight major trade partners in 1997. Thanks to the country fixed effects, almost all of the variation in bilateral trade can be explained with these equations. The results in the first three columns are reported merely as benchmarks, to show the progression in disaggregating US trade into trade according to firm ownership. The results in the last four columns reflect gravity model estimates for affiliates’ trade by country of UBO. With eight countries of UBO and export and import data with eight trade partners, I have 128 potential observations for these regressions. Some of these observations were dropped in each year because the trade data were suppressed to avoid disclosing the information of individual companies. In a few cases, observations where bilateral trade was reported as zero were dropped to avoid taking the natural log of zero. These data problems resulted in 118 observations for 1997, out of 128 potential observations.

The gravity model produced highly significant estimated coefficients of the expected sign for both network variables. Column 5 in Table 9 shows an estimated coefficient of 3.016 on the discrete HomeLink variable. This means that after controlling for distance and income effects, affiliates trade a tremendous 20.47 times more with their home countries than with other countries. Measuring network effects with a continuous variable, dist2, produced a significant coefficient of –0.377, as shown in column 6. In other words, a 1% increase in the distance between the affiliates’ home country and the trade partner implies 0.377% less trade.

The last column in Table 9 adds to the basic gravity equation a Japan dummy variable, along with the HomeLink variable described above. The Japan variable takes the value of one when trade involves Japanese affiliates exporting to Japan or importing from Japan. The large, positive and significant coefficient on the Japan variable suggests that Japanese affiliates tend to trade with their home country much more than do the affiliates from other countries. The
A positive, significant coefficient on the HomeLink variable can be interpreted as the average tendency among all affiliates to trade with their home countries. Controlling for distance and incomes, affiliates on average traded 14.4 times more with their home countries, while Japanese affiliates traded an extra 15.3 times more with Japan in 1997. This result supports the hypothesis that Japanese affiliates tend to have particularly strong network links with their home country.

Tables 10 and 11 show very similar gravity model results using bilateral trade data for 1992 and 1987. The coefficients on the networks and Japan variables are significant and of very similar magnitude in all three years tested. In comparing across the three years from the oldest to the most recent, the HomeLink, dist2 and Japan variables tend to increase slightly in absolute value, but tests on the pooled data show no significant time trends in these coefficients.

Since no significant time trends were found, the pooled data also was used to calculate a Japan-specific effect separate from the home bias tendency of all of the other countries’ affiliates. Table 12 reports results using the pooled affiliates’ trade data for the three years. Columns 1 and 3 in Table 12 report results analogous to columns 7 and 6, respectively, in Tables 9-11. Columns 2 and 4 in Table 12 redefine the variables of interest to better isolate the Japan networks effect and the networks effect measured by dist2. The HomeLink variable was changed between columns 1 and 2 by replacing the “1’s” for trade between Japanese affiliates and Japan with “0’s”, so that the Japan dummy would fully reflect the home bias of the Japanese affiliates. This produced significant coefficients of 2.656 and 5.301 for the new HomeLink variable and Japan dummy variable. This implies that affiliates from the other seven countries on average traded 14.3 times more with their home countries, while Japanese affiliates traded a whopping 201.7 times more with Japan than one would predict based on incomes and distance.

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7 Derived by taking the exponent of the estimated coefficient.
In column 4 of Table 12, the dist2 variable is estimated after dropping all observations of homelinked trade, where dist2 had previously been set to one to avoid taking the natural log of zero. As expected, the coefficient on dist2 drops in absolute value, from –0.349 to –0.197, when the homelinked observations are not included. The new estimate, however, reflects regional network effects that are completely separate from the home country trade bias of the affiliates. A 1% increase in the distance between the affiliates’ home country and trade partner implies 0.197% less trade. For example, this would imply that Dutch affiliates in the US will trade 8.2% more with Germany than with the UK since Germany is approximately 41.7% closer to the Netherlands than is the UK.  

The pooled data also was used to check if adding a country dummy for any of the other countries would produce a significant, positive coefficient, as in Japan’s case. Among the other seven countries, only Australia had a significant country dummy coefficient and it had a negative value. This result supports the conclusion that Japanese affiliates are distinctive in terms of the strength of their home trade bias.

While the regression results consistently support the hypotheses that network effects matter for affiliates’ trade patterns and that Japanese affiliates have particularly strong networks, one disturbing outcome of all of the regressions is the unrealistically large estimates (in absolute value terms) of the trade distance coefficient on dist1. The problem is not unique to this study, but my estimates are even further from what might be considered a reasonable range than most other studies. Grossman (1998) pointed out that McCallum’s (1995) distance coefficient estimate of –1.42 seemed much too high in absolute value terms; I find estimates between –2.20

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8 The following distances apply: 235 km. for the Netherlands—Germany, 359 km. for the Netherlands—UK.
9 The coefficient of –2.169 on Australia’s dummy, along with a 3.259 coefficient on the HomeLink dummy including Australia means that Australian affiliates had a significantly lower level of home bias in their trade pattern than did the other seven countries’ affiliates.
and -3.42. I tried adding a constant term to the gravity model to see if that might help in lowering the magnitude of the distance elasticities. For bilateral trade flows at a sufficiently aggregate level (i.e., total US trade, US firm trade and aggregate affiliate trade), the estimated distance elasticity fell into a more reasonable –0.6 to –0.7 range with the addition of a constant. However, with the smaller trade flows involved in affiliates’ trade by country of UBO, the distance elasticities become positive and insignificant with the addition of a constant term so this specification is not adopted. Another explanation for large distance elasticities was provided by Coe and Tamarisa (2002). They find that the distance elasticities are lower when one includes the observations of zero trade that have been dropped in this, and many other, studies due to the use of log trade values.

5. Conclusions

Descriptive statistics and gravity model evidence support the conclusion that network effects strongly influence the trade pattern of foreign affiliates in the US. Affiliates from all of the eight countries examined had much higher tendencies to trade with their home countries than did US firms trade with those same countries. The home country bias was particularly strong for importing by many of the countries’ affiliates. Using gravity equations with both discrete and continuous variables to measure network linkages between affiliates and their home countries, I obtain coefficients that are highly significant and of the expected sign. Affiliates have a tremendously higher tendency to engage in trade with their home countries than with other countries. Controlling for distance, income and Japan effects, affiliates on average tended to

10 Anderson and van Wincoop (2003) discuss this issue and indicate that trade elasticities below 1.0, and preferably below 0.5, in absolute value seem reasonable to reflect trade costs.

11 In these cases, the trade/GDP values are extremely small, making the log values negative and large in magnitude. The constant term in these cases is negative and quite large while the distance elasticity estimate is insignificant.
trade 14.2 times more with their home countries than with other countries, using the pooled data from 1987, 1992 and 1997.

Using a continuous variable to measure network effects, I find that affiliates tend to trade less with countries that are located further from their home countries. The distance between an affiliate’s home country and its trade partner is introduced as a new method of measuring network effects that is completely separate from transportation and other trade costs. I find that a 1% increase in this distance lowers trade by 0.349% when a country’s home trade bias is included or by 0.197% without this bias. The latter effect measures the tendency of foreign affiliates in the US to trade with partners located close to their home country, after controlling for income and trade distance effects.

Both descriptive measures and gravity model estimates indicate that Japanese affiliates have an even higher tendency to trade with their home country than do the affiliates of the other seven countries. Using pooled trade data for years 1987, 1992 and 1997, I find that Japanese affiliates traded a whopping 201.7 times more with Japan than would be predicted by income and distance effects alone, while foreign affiliates from the other seven industrialized countries traded on average only 14.3 times more with their respective home countries. None of the other seven countries had a significant, positive home trade bias beyond that captured in the HomeLink estimated coefficient. I also find no evidence to support a conclusion that the strength of network effects or Japan-specific network effects has changed over time.

Japanese affiliates in the US are found to participate more in trade and to have stronger home bias in their trade pattern than do the other countries’ affiliates. These results suggest that Japanese business networks have stronger impacts on US trade than do the networks of other industrialized countries’ multinational firms. Strong trade networks may enhance trade
opportunities for network “insiders” but hinder them for “outsiders”. This may lead to greater trade friction with countries that have stronger trade networks. This hypothesis regarding the potential link between trade networks and trade policy is not analyzed in this study. However, the results regarding the distinctive strength of Japanese trade networks may help in explaining Noland’s (1997) finding that Japan is targeted disproportionately (after controlling for country size) in US unilateral trade actions.
References


### Table 1

**Selected Financial and Operating Data of Affiliates, by Country of UBO, 1987**

<table>
<thead>
<tr>
<th>Country Type</th>
<th>Number of affiliates</th>
<th>Number of companies consolidated</th>
<th>Thousands of employees</th>
<th>Smillions</th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total assets</td>
</tr>
<tr>
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<td>22,937</td>
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<td>1,946</td>
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<td>5,024</td>
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</table>

Source: BEA (1987), Table A-2

Notes: "L. America+" refers to Latin America & Other Western Hemisphere
### Table 2

**Selected Financial and Operating Data of Affiliates, by Country of UBO, 1997**

<table>
<thead>
<tr>
<th></th>
<th>Number of affiliates</th>
<th>Number of companies consolidated</th>
<th>Thousands of employees</th>
<th>$millions</th>
<th>Total assets</th>
<th>Gross property, plant, and equipment</th>
<th>Expenditures for property, plant and equipment</th>
<th>Sales</th>
<th>Net income</th>
<th>Gross product</th>
<th>Compensation of employees</th>
<th>U.S. exports of goods shipped by affiliates</th>
<th>U.S. imports of goods shipped to affiliates</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>All countries</strong></td>
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<td>5,202</td>
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<td>757</td>
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<td>31,571</td>
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</table>

Source: BEA (1997), Table A-2

Notes: "L. America+" refers to Latin America & Other Western Hemisphere
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<th></th>
<th>All industries</th>
<th>Canada</th>
<th>France</th>
<th>Germany</th>
<th>Netherlands</th>
<th>Switzerland</th>
<th>UK</th>
<th>Australia</th>
<th>Japan</th>
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<td>(D)</td>
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<td>(D)</td>
<td>0</td>
<td>(D)</td>
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<tr>
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<td>(D)</td>
<td>(D)</td>
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<td>0</td>
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<td>4,312</td>
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<td>1,632</td>
<td>3,339</td>
<td>304</td>
<td>4,195</td>
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<td>(D)</td>
<td>526</td>
<td>34</td>
<td>(D)</td>
<td>197</td>
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<td>711</td>
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<td>(D)</td>
<td>829</td>
<td>(D)</td>
<td>(D)</td>
<td>159</td>
<td>(*)</td>
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<td>(D)</td>
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</table>

Source: BEA (1987), Table G-6

Note: Industries that contributed less than 2% to total exports shipped by all countries’ affiliates (i.e., less than $2,871 million) were dropped from the table for the sake of brevity. An asterick "(*)" indicates a value between 0 and $500,000; a "(D)" indicates that the data have been suppressed to avoid the disclosure of data of individual companies.
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<th>Industry</th>
<th>All countries</th>
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<th>France</th>
<th>Germany</th>
<th>Netherlands</th>
<th>Switzerland</th>
<th>UK</th>
<th>Australia</th>
<th>Japan</th>
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<td>All industries</td>
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<td>(D)</td>
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<td>(D)</td>
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<td>(D)</td>
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<td>(D)</td>
<td>9</td>
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<td>(*)</td>
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<td>28</td>
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<td>1</td>
<td>(D)</td>
<td>(D)</td>
<td>(D)</td>
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<td>(D)</td>
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<td>(D)</td>
<td>(D)</td>
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</table>

Source: BEA (1997), Table H-6

Note: Industries that contributed less than 2% to total exports shipped by all countries' affiliates (i.e., less than $5298 million) were dropped from the table for the sake of brevity. An asterick "(*)" indicates a value between 0 and $500,000; a "(D)" indicates that the data have been suppressed to avoid the disclosure of data of individual companies.
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<th>Canada</th>
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<th>Germany</th>
<th>Netherlands</th>
<th>Switzerland</th>
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<th>Australia</th>
<th>Japan</th>
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<td>3,636</td>
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<td>(D)</td>
<td>(D)</td>
<td>(D)</td>
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<td>770</td>
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<td>750</td>
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<td>(D)</td>
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<td>Machinery, except electrical</td>
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<td>19</td>
<td>231</td>
<td>(D)</td>
<td>30</td>
<td>(D)</td>
<td>284</td>
<td>(D)</td>
<td>211</td>
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<tr>
<td>Electric and electronic equipment</td>
<td>2,048</td>
<td>151</td>
<td>19</td>
<td>(D)</td>
<td>(D)</td>
<td>299</td>
<td>(D)</td>
<td>102</td>
<td></td>
</tr>
<tr>
<td>Other manufacturing</td>
<td>3,173</td>
<td>(D)</td>
<td>455</td>
<td>352</td>
<td>(D)</td>
<td>117</td>
<td>973</td>
<td>(D)</td>
<td>393</td>
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<tr>
<td>Wholesale trade</td>
<td>29,165</td>
<td>459</td>
<td>4,249</td>
<td>536</td>
<td>332</td>
<td>1,068</td>
<td>659</td>
<td>47</td>
<td>19,203</td>
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<tr>
<td>Motor vehicles and equipment</td>
<td>3,111</td>
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<td>(D)</td>
<td>189</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>(D)</td>
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<tr>
<td>Metals and minerals, except petroleum</td>
<td>11,007</td>
<td>72</td>
<td>(D)</td>
<td>192</td>
<td>(D)</td>
<td>(D)</td>
<td>(*)</td>
<td>10,213</td>
<td></td>
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<tr>
<td>Machinery, equipment, and supplies</td>
<td>1,058</td>
<td>64</td>
<td>15</td>
<td>43</td>
<td>(*)</td>
<td>32</td>
<td>60</td>
<td>(D)</td>
<td>379</td>
</tr>
<tr>
<td>Groceries and related products</td>
<td>1,418</td>
<td>(D)</td>
<td>(*)</td>
<td>9</td>
<td>1</td>
<td>(D)</td>
<td>309</td>
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<td>656</td>
</tr>
<tr>
<td>Farm-product raw materials</td>
<td>9,753</td>
<td>(D)</td>
<td>(D)</td>
<td>(D)</td>
<td>(D)</td>
<td>0</td>
<td>0</td>
<td>4,150</td>
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</tr>
<tr>
<td>Other nondurable goods</td>
<td>1,200</td>
<td>(D)</td>
<td>25</td>
<td>32</td>
<td>1</td>
<td>204</td>
<td>(D)</td>
<td>(D)</td>
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<tr>
<td>Other industries</td>
<td>1,075</td>
<td>448</td>
<td>(D)</td>
<td>(D)</td>
<td>19</td>
<td>(D)</td>
<td>53</td>
<td>(D)</td>
<td></td>
</tr>
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</table>

Source: BEA (1987), Table G-3

Note: Industries that contributed less than 2% to total exports shipped by all countries' affiliates (i.e., less than $962 million) were dropped from the table for the sake of brevity. An asterisk "(*)" indicates a value between 0 and $500,000; a "(D)" indicates that the data have been suppressed to avoid the disclosure of data of individual companies.
Table 6
$millions

<table>
<thead>
<tr>
<th></th>
<th>All countries</th>
<th>Canada</th>
<th>France</th>
<th>Germany</th>
<th>Netherlands</th>
<th>Switzerland</th>
<th>UK</th>
<th>Australia</th>
<th>Japan</th>
</tr>
</thead>
<tbody>
<tr>
<td>All industries</td>
<td>141,305</td>
<td>8,155</td>
<td>14,112</td>
<td>14,114</td>
<td>4,713</td>
<td>5,857</td>
<td>14,461</td>
<td>1,235</td>
<td>52,524</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>71,251</td>
<td>4,585</td>
<td>7,210</td>
<td>10,633</td>
<td>4,278</td>
<td>4,815</td>
<td>11,999</td>
<td>749</td>
<td>16,513</td>
</tr>
<tr>
<td>Food</td>
<td>2,846</td>
<td>95</td>
<td>68</td>
<td>19</td>
<td>43</td>
<td>(D)</td>
<td>696</td>
<td>15</td>
<td>965</td>
</tr>
<tr>
<td>Chemicals</td>
<td>15,443</td>
<td>435</td>
<td>1,375</td>
<td>4,585</td>
<td>1,309</td>
<td>1,479</td>
<td>2,589</td>
<td>(D)</td>
<td>1,879</td>
</tr>
<tr>
<td>Basic chemicals</td>
<td>4,911</td>
<td>(D)</td>
<td>848</td>
<td>1,306</td>
<td>(D)</td>
<td>198</td>
<td>626</td>
<td>(D)</td>
<td>678</td>
</tr>
<tr>
<td>Pharmaceuticals and medicines</td>
<td>4,002</td>
<td>(D)</td>
<td>273</td>
<td>(D)</td>
<td>6</td>
<td>1,149</td>
<td>494</td>
<td>0</td>
<td>214</td>
</tr>
<tr>
<td>Primary and fabricated metals</td>
<td>5,236</td>
<td>924</td>
<td>408</td>
<td>355</td>
<td>21</td>
<td>167</td>
<td>488</td>
<td>(D)</td>
<td>838</td>
</tr>
<tr>
<td>Primary metals</td>
<td>3,183</td>
<td>(D)</td>
<td>(D)</td>
<td>186</td>
<td>(D)</td>
<td>154</td>
<td>66</td>
<td>(D)</td>
<td>602</td>
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<tr>
<td>Machinery</td>
<td>8,698</td>
<td>120</td>
<td>51</td>
<td>1,702</td>
<td>104</td>
<td>1,747</td>
<td>1,222</td>
<td>123</td>
<td>1,612</td>
</tr>
<tr>
<td>Computers and electronic products</td>
<td>14,238</td>
<td>(D)</td>
<td>(D)</td>
<td>211</td>
<td>(D)</td>
<td>533</td>
<td>960</td>
<td>4</td>
<td>4,834</td>
</tr>
<tr>
<td>Communications equipment</td>
<td>4,570</td>
<td>(D)</td>
<td>(D)</td>
<td>(D)</td>
<td>0</td>
<td>(D)</td>
<td>(D)</td>
<td>1</td>
<td>1,150</td>
</tr>
<tr>
<td>Semiconductors and other electronic components</td>
<td>2,848</td>
<td>24</td>
<td>86</td>
<td>70</td>
<td>(D)</td>
<td>5</td>
<td>460</td>
<td>(*)</td>
<td>909</td>
</tr>
<tr>
<td>Electrical equipment, appliances, and components</td>
<td>4,664</td>
<td>8</td>
<td>(D)</td>
<td>(D)</td>
<td>17</td>
<td>(D)</td>
<td>(D)</td>
<td>271</td>
<td></td>
</tr>
<tr>
<td>Transportation equipment</td>
<td>7,930</td>
<td>212</td>
<td>766</td>
<td>1,148</td>
<td>(D)</td>
<td>2</td>
<td>1,054</td>
<td>(*)</td>
<td>4,317</td>
</tr>
<tr>
<td>Motor vehicles, bodies and trailers, and parts</td>
<td>6,881</td>
<td>211</td>
<td>(D)</td>
<td>(D)</td>
<td>(D)</td>
<td>0</td>
<td>431</td>
<td>(*)</td>
<td>4,292</td>
</tr>
<tr>
<td>Wholesale trade</td>
<td>62,222</td>
<td>1,822</td>
<td>5,902</td>
<td>2,517</td>
<td>418</td>
<td>925</td>
<td>1,011</td>
<td>234</td>
<td>35,052</td>
</tr>
<tr>
<td>Motor vehicles and motor vehicle parts and supplies</td>
<td>4,816</td>
<td>(D)</td>
<td>1</td>
<td>(D)</td>
<td>1</td>
<td>(*)</td>
<td>39</td>
<td>2</td>
<td>3,336</td>
</tr>
<tr>
<td>Electrical goods</td>
<td>4,924</td>
<td>(D)</td>
<td>40</td>
<td>51</td>
<td>23</td>
<td>4</td>
<td>76</td>
<td>2</td>
<td>2,713</td>
</tr>
<tr>
<td>Other durable goods</td>
<td>14,684</td>
<td>422</td>
<td>309</td>
<td>929</td>
<td>158</td>
<td>162</td>
<td>450</td>
<td>(D)</td>
<td>6,856</td>
</tr>
<tr>
<td>Petroleum and petroleum products</td>
<td>5,902</td>
<td>(D)</td>
<td>(D)</td>
<td>(*)</td>
<td>(D)</td>
<td>(D)</td>
<td>3</td>
<td>(*)</td>
<td>(D)</td>
</tr>
<tr>
<td>Other nondurable goods</td>
<td>29,843</td>
<td>597</td>
<td>(D)</td>
<td>(D)</td>
<td>87</td>
<td>(D)</td>
<td>429</td>
<td>(D)</td>
<td>(D)</td>
</tr>
<tr>
<td>Other industries</td>
<td>4,623</td>
<td>(D)</td>
<td>(D)</td>
<td>0</td>
<td>(D)</td>
<td>(D)</td>
<td>901</td>
<td>(D)</td>
<td>92</td>
</tr>
<tr>
<td>Mining</td>
<td>3,859</td>
<td>1,541</td>
<td>(D)</td>
<td>(D)</td>
<td>0</td>
<td>(D)</td>
<td>901</td>
<td>(D)</td>
<td>(D)</td>
</tr>
</tbody>
</table>

Source: BEA (1997), Table H-3
Note: Industries that contributed less than 2% to total exports shipped by all countries' affiliates (i.e., less than $2,826 million) were dropped from the table for the sake of brevity. An asterisk "(*)" indicates a value between 0 and $500,000; a "(D)" indicates that the data have been suppressed to avoid the disclosure of data of individual companies.
Table 7
Foreign Affiliates' Role in US Bilateral Trade, 1987 and 1997
($millions)

<table>
<thead>
<tr>
<th>Source</th>
<th>Destination</th>
<th>1987</th>
<th></th>
<th></th>
<th>1997</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>Affiliate</td>
<td>US firm</td>
<td>Affiliate</td>
<td>Total</td>
<td>Affiliate</td>
</tr>
<tr>
<td>US</td>
<td>Canada</td>
<td>69,890</td>
<td>4,169</td>
<td>65,721</td>
<td>0.0597</td>
<td>146,853</td>
<td>22,519</td>
</tr>
<tr>
<td>US</td>
<td>France</td>
<td>10,008</td>
<td>826</td>
<td>9,182</td>
<td>0.0825</td>
<td>20,527</td>
<td>3,082</td>
</tr>
<tr>
<td>US</td>
<td>Germany</td>
<td>13,247</td>
<td>2,164</td>
<td>11,083</td>
<td>0.1634</td>
<td>28,421</td>
<td>6,384</td>
</tr>
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<td>US</td>
<td>Netherlands</td>
<td>7,206</td>
<td>1,181</td>
<td>6,025</td>
<td>0.1639</td>
<td>16,211</td>
<td>3,269</td>
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<tr>
<td>US</td>
<td>Switzerland</td>
<td>2,887</td>
<td>617</td>
<td>2,270</td>
<td>0.2137</td>
<td>8,793</td>
<td>2,529</td>
</tr>
<tr>
<td>US</td>
<td>UK</td>
<td>15,338</td>
<td>2,568</td>
<td>319</td>
<td>0.1674</td>
<td>39,508</td>
<td>6,181</td>
</tr>
<tr>
<td>US</td>
<td>Australia</td>
<td>4,844</td>
<td>472</td>
<td>4,372</td>
<td>0.0974</td>
<td>12,924</td>
<td>1,709</td>
</tr>
<tr>
<td>US</td>
<td>Japan</td>
<td>30,820</td>
<td>18,983</td>
<td>11,837</td>
<td>0.6159</td>
<td>70,749</td>
<td>33,549</td>
</tr>
<tr>
<td>US</td>
<td>8-country sum</td>
<td>154,241</td>
<td>30,980</td>
<td>123,261</td>
<td>0.2009</td>
<td>343,986</td>
<td>79,222</td>
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<tr>
<td>US</td>
<td>All</td>
<td>275,656</td>
<td>48,091</td>
<td>227,565</td>
<td>0.1745</td>
<td>735,357</td>
<td>141,305</td>
</tr>
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<td>77,020</td>
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<td>69,068</td>
<td>0.1032</td>
<td>185,676</td>
<td>25,475</td>
</tr>
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<td>US</td>
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<td>3,189</td>
<td>7,639</td>
<td>0.2945</td>
<td>19,529</td>
<td>6,921</td>
</tr>
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<td>US</td>
<td>27,648</td>
<td>16,372</td>
<td>11,276</td>
<td>0.5922</td>
<td>45,379</td>
<td>23,868</td>
</tr>
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<td>US</td>
<td>4,480</td>
<td>1,173</td>
<td>3,307</td>
<td>0.2619</td>
<td>7,430</td>
<td>2,783</td>
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<td>Switzerland</td>
<td>US</td>
<td>4,133</td>
<td>2,421</td>
<td>1,712</td>
<td>0.5857</td>
<td>8,278</td>
<td>5,181</td>
</tr>
<tr>
<td>UK</td>
<td>US</td>
<td>18,060</td>
<td>4,754</td>
<td>13,306</td>
<td>0.2632</td>
<td>35,792</td>
<td>11,018</td>
</tr>
<tr>
<td>Australia</td>
<td>US</td>
<td>3,200</td>
<td>849</td>
<td>2,351</td>
<td>0.2653</td>
<td>4,665</td>
<td>738</td>
</tr>
<tr>
<td>Japan</td>
<td>US</td>
<td>88,573</td>
<td>69,266</td>
<td>19,307</td>
<td>0.7820</td>
<td>121,274</td>
<td>100,236</td>
</tr>
<tr>
<td>8-country sum</td>
<td>US</td>
<td>233,942</td>
<td>105,976</td>
<td>127,966</td>
<td>0.4530</td>
<td>428,023</td>
<td>176,220</td>
</tr>
<tr>
<td>All</td>
<td>US</td>
<td>416,975</td>
<td>143,537</td>
<td>273,438</td>
<td>0.3442</td>
<td>894,063</td>
<td>264,924</td>
</tr>
</tbody>
</table>

### Table 8

**Trade Activities of Foreign Affiliates in the US**

<table>
<thead>
<tr>
<th>Country of UBO</th>
<th>Share of US exports to home** (%)</th>
<th>Share of US imports from home** (%)</th>
<th>Home** bias in exporting (%)</th>
<th>Home** bias in importing (%)</th>
<th>Export home bias rel. to US firms' export 1987</th>
<th>Export home bias rel. to US firms' export 1997</th>
<th>Import home bias rel. to US firms' import 1987</th>
<th>Import home bias rel. to US firms' import 1997</th>
<th>Intra-group export bias (%)</th>
<th>Intra-group import bias (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All countries</td>
<td>2.18 2.91</td>
<td>7.66 7.07</td>
<td>30.67 52.34</td>
<td>73.42 85.59</td>
<td>1.06 2.50</td>
<td>2.91 3.36</td>
<td>17.69 36.70</td>
<td>39.74 44.60</td>
<td>75.38 76.38</td>
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<tr>
<td>Canada</td>
<td>9.58 13.11</td>
<td>36.07 35.28</td>
<td>39.25 34.89</td>
<td>69.73 65.45</td>
<td>1.39 1.51</td>
<td>3.15 3.69</td>
<td>30.16 32.24</td>
<td>71.90 70.98</td>
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<td></td>
</tr>
<tr>
<td>Europe</td>
<td>3.48 7.37</td>
<td>22.27 25.68</td>
<td>6.42 10.72</td>
<td>55.70 39.04</td>
<td>1.59 3.65</td>
<td>19.94 19.48</td>
<td>17.23 20.97</td>
<td>75.38 54.39</td>
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</tr>
<tr>
<td>Germany*</td>
<td>10.19 13.65</td>
<td>44.15 44.18</td>
<td>15.18 20.49</td>
<td>42.75 55.13</td>
<td>15.22 19.43</td>
<td>68.27 112.00</td>
<td>30.46 40.07</td>
<td>76.32 80.93</td>
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</tr>
<tr>
<td>Netherlands</td>
<td>4.80 5.94</td>
<td>19.41 17.84</td>
<td>19.73 16.22</td>
<td>33.01 41.71</td>
<td>3.52 2.89</td>
<td>6.78 10.59</td>
<td>30.12 23.57</td>
<td>46.88 60.83</td>
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<td></td>
</tr>
<tr>
<td>Switzerland</td>
<td>0.75 1.39</td>
<td>8.93 5.18</td>
<td>13.52 40.46</td>
<td>64.42 74.59</td>
<td>1.07 1.75</td>
<td>5.67 3.94</td>
<td>23.57 34.25</td>
<td>60.45 69.82</td>
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<td></td>
</tr>
<tr>
<td>UK</td>
<td>0.70 (D)</td>
<td>3.27 1.15</td>
<td>8.45 (D)</td>
<td>46.12 37.25</td>
<td>3.65 (D)</td>
<td>15.45 15.57</td>
<td>8.25 (D)</td>
<td>40.44 43.12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latin America</td>
<td>1.56 1.15</td>
<td>1.97 20.71</td>
<td>59.68 40.03</td>
<td>71.35 82.26</td>
<td>15.16 9.56</td>
<td>16.80 30.22</td>
<td>54.15 46.76</td>
<td>78.36 81.83</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asia/Pacific</td>
<td>25.04 18.14</td>
<td>42.41 35.84</td>
<td>85.45 65.05</td>
<td>96.85 89.98</td>
<td>3.91 2.35</td>
<td>2.75 2.74</td>
<td>54.67 59.87</td>
<td>79.52 79.52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td>0.52 1.80</td>
<td>4.53 7.07</td>
<td>11.90 18.79</td>
<td>28.77 29.02</td>
<td>6.20 9.95</td>
<td>33.46 46.50</td>
<td>13.33 19.68</td>
<td>39.68 48.28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>51.18 38.48</td>
<td>76.30 80.73</td>
<td>77.27 51.83</td>
<td>93.13 81.11</td>
<td>14.85 8.28</td>
<td>13.19 24.26</td>
<td>53.23 60.62</td>
<td>79.04 79.72</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Author's calculations based on BEA (1987), Tables G24, G26, G30, & G32; BEA (1997), Tables H24, H26, H30 & H32; and World Trade Analyzer data.

*West Germany in 1987

***"Home" refers to the affiliates' country of UBO or a regional total."
### Table 9
Gravity model results using US bilateral trade with 8 major trade partners, 1997

<table>
<thead>
<tr>
<th>dependent variable, numerator $X_{ik}$</th>
<th>US trade, total (1)</th>
<th>US firm trade (2)</th>
<th>Affiliate trade, aggregate (3)</th>
<th>Affiliate trade by country of UBO (4)</th>
<th>Affiliate trade by country of UBO (5)</th>
<th>Affiliate trade by country of UBO (6)</th>
<th>Affiliate trade by country of UBO (7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ln(Dist1)</td>
<td>-2.312** (0.180)</td>
<td>-2.402** (0.174)</td>
<td>-2.565** (0.214)</td>
<td>-2.614** (0.087)</td>
<td>-2.682** (0.068)</td>
<td>-2.371** (0.068)</td>
<td>-2.674** (0.659)</td>
</tr>
<tr>
<td>HomeLink</td>
<td></td>
<td></td>
<td></td>
<td>3.016** (0.356)</td>
<td>2.670** (0.371)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ln(Dist2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-0.377** (0.038)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.730** (1.040)</td>
<td></td>
</tr>
<tr>
<td>Adj. R sq.</td>
<td>0.984</td>
<td>0.986</td>
<td>0.981</td>
<td>0.995</td>
<td>0.997</td>
<td>0.997</td>
<td>0.997</td>
</tr>
<tr>
<td>observations</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>118</td>
<td>118</td>
<td>118</td>
<td>118</td>
</tr>
</tbody>
</table>

Notes: Dist1 = distance between source and destination countries of trade; Dist2 = distance between non-US source or destination country and affiliates' country of UBO; HomeLink = a binary variable that takes on a value of 1 if the trade is between foreign affiliates and their home country; Japan = a binary variable that takes on a value of 1 if trade is between Japanese affiliates and Japan; * indicates significance at the 5% level; ** indicates significance at the 1% level; standard errors shown in parentheses; exponent of coefficient shown in brackets.
<table>
<thead>
<tr>
<th>dependent variable, numerator $X_{ik}$</th>
<th>US trade, total (1)</th>
<th>US firm trade (2)</th>
<th>Affiliate trade, aggregate (3)</th>
<th>Affiliate trade by country of UBO (4)</th>
<th>Affiliate trade by country of UBO (5)</th>
<th>Affiliate trade by country of UBO (6)</th>
<th>Affiliate trade by country of UBO (7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ln(Dist1)</td>
<td>-2.639** (0.017)</td>
<td>-2.660** (0.017)</td>
<td>-2.950** (0.015)</td>
<td>-2.424** (0.097)</td>
<td>-2.527** (0.071)</td>
<td>-2.200** (0.076)</td>
<td>-2.516** (0.068)</td>
</tr>
<tr>
<td>HomeLink</td>
<td></td>
<td></td>
<td></td>
<td>3.012** (0.318)</td>
<td></td>
<td>2.671** (0.328)</td>
<td></td>
</tr>
<tr>
<td>ln(Dist2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-0.347** (0.038)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.662** (0.915)</td>
<td></td>
</tr>
<tr>
<td>Adj. R sq.</td>
<td>0.999</td>
<td>0.999</td>
<td>1.00</td>
<td>0.995</td>
<td>0.998</td>
<td>0.998</td>
<td>0.998</td>
</tr>
<tr>
<td>observations</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>109</td>
<td>109</td>
<td>109</td>
<td>109</td>
</tr>
</tbody>
</table>

Notes: Dist1 = distance between source and destination countries of trade; Dist2 = distance between non-US source or destination country and affiliates' country of UBO; HomeLink = a binary variable that takes on a value of 1 if the trade is between foreign affiliates and their home country; Japan = a binary variable that takes on a value of 1 if trade is between a Japanese affiliate and Japan; * indicates significance at the 5% level; ** indicates significance at the 1% level; standard errors shown in parentheses; exponent of coefficient shown in brackets.
Table 11
Gravity model results using US bilateral trade with 8 major trade partners, 1987

<table>
<thead>
<tr>
<th>dependent variable, numerator $X_{ik}$</th>
<th>US trade, total (1)</th>
<th>US firm trade (2)</th>
<th>Affiliate trade, aggregate (3)</th>
<th>Affiliate trade by country of UBO (4)</th>
<th>Affiliate trade by country of UBO (5)</th>
<th>Affiliate trade by country of UBO (6)</th>
<th>Affiliate trade by country of UBO (7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ln(Dist1)</td>
<td>-2.591** (0.008)</td>
<td>-2.604** (0.004)</td>
<td>-2.976** (0.048)</td>
<td>-2.489** (0.082)</td>
<td>-2.549** (0.065)</td>
<td>-2.243** (0.078)</td>
<td>-2.542** (0.063)</td>
</tr>
<tr>
<td>HomeLink</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.907** (0.379)</td>
<td></td>
<td>2.585** (0.396)</td>
</tr>
<tr>
<td>ln(Dist2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-0.311** (0.048)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.538* (1.112)</td>
</tr>
<tr>
<td>Adj. R sq.</td>
<td>1.00</td>
<td>1.00</td>
<td>0.999</td>
<td>0.995</td>
<td>0.997</td>
<td>0.996</td>
<td>0.997</td>
</tr>
<tr>
<td>observations</td>
<td>16</td>
<td>16</td>
<td>16</td>
<td>106</td>
<td>106</td>
<td>106</td>
<td>106</td>
</tr>
</tbody>
</table>

Notes: Dist1 = distance between source and destination countries of trade; Dist2 = distance between non-US source or destination country and affiliates' country of UBO; HomeLink = a binary variable that takes on a value of 1 if the trade is between foreign affiliates and their home country; Japan = a binary variable that takes on a value of 1 if trade is between a Japanese affiliate and Japan; * indicates significance at the 5% level; ** indicates significance at the 1% level; standard errors shown in parentheses; exponent of coefficient shown in brackets.
Table 12  
Gravity model results using US bilateral trade with 8 major trade partners, 
pooled for years 1987, 1992, 1997

<table>
<thead>
<tr>
<th>dependent variable, numerator $X_k^{ij}$</th>
<th>Affiliate trade by country of UBO (1)</th>
<th>Affiliate trade by country of UBO (2)</th>
<th>Affiliate trade by country of UBO (3)</th>
<th>Affiliate trade by country of UBO (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ln(Dist1)</td>
<td>-3.411** (0.031)</td>
<td>-3.429** (0.028)</td>
<td>-2.970** (0.040)</td>
<td>-2.308** (0.066)</td>
</tr>
<tr>
<td>HomeLink</td>
<td>2.656** (0.206) [14.24]</td>
<td>[14.32]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HomeLink7 (not incl. Japan)</td>
<td></td>
<td></td>
<td>2.662** (0.207)</td>
<td></td>
</tr>
<tr>
<td>ln(Dist2)</td>
<td></td>
<td></td>
<td></td>
<td>-0.349** (0.023)</td>
</tr>
<tr>
<td>ln(Dist2) (drop homelinked observations)</td>
<td></td>
<td></td>
<td></td>
<td>-0.197** (0.062)</td>
</tr>
<tr>
<td>Japan</td>
<td>2.645** (0.579) [14.08]</td>
<td>5.307** (0.542) [201.74]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adj. R sq. observations</td>
<td>0.997 333</td>
<td>0.997 333</td>
<td>0.997 333</td>
<td>0.997 285</td>
</tr>
</tbody>
</table>

Notes: Dist1 = distance between source and destination countries of trade;  
Dist2 = distance between non-US source or destination country and affiliates' country of UBO;  
HomeLink = a binary variable that takes on a value of 1 if the trade is between foreign affiliates and their home country;  
Japan = a binary variable that takes on a value of 1 if trade is between Japanese affiliates and Japan;  
* indicates significance at the 5% level;  
** indicates significance at the 1% level;  
standard errors shown in parentheses; exponent of coefficient shown in brackets.