Overseas Assembly and Country Sourcing Choices

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Abstract:

The fragmentation of production has resulted in an increasing degree of vertical specialization across countries. This paper studies one venue that has facilitated growth in U.S. vertical specialization, examining how the cross-country pattern of U.S. overseas assembly responds to changes in country and competitor costs. A number of interesting regularities emerge. Changes in sourcing are influenced not only by changes in import values, but also by a high degree of country entry to and exit from the program. Both developed and developing countries face exit pressures when their own costs rise, or their competitor's costs decline. For those countries that are selected to provide assembly, the value of assembly imports is also influenced by own and competitor costs. In all cases the estimated cost sensitivity for developing countries is larger than it is for the richer nations of the OECD.

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Production and trade increasingly involves the flow of intermediate goods moved from one location to the next as multiple countries complete successive steps in the production process.[1] It is argued that advances in transportation and communications have facilitated this trend towards the dispersion of production activities, and casual observation of these production changes has fueled speculation that trade and foreign activities increasingly pressure labor markets, depressing worker wages at least for the least skilled. However, with the exception of Feenstra and Hanson (1999), there is scant evidence on the connection between outsourcing choices and wages.

While popular concerns assume that outsourcing places downward pressure on wages, outsourcing can only intensify labor market competition if firms are capable of quickly and easily changing their international sourcing choices as relative market costs change. However, the nature of international outsourcing may in fact prevent rapid firm changes. To begin, as Rauch (1999) highlights, information appears to play a large role in determining trade volumes, especially for differentiated products. Even when country costs change, it is not obvious that firms know enough about other markets to quickly change their international sourcing decisions. Grossman and Helpman's (2002b) recent work on international outsourcing includes just such an informational feature; while Northern firms seek partners in the South they have to expend resources on information gathering as they search for potential partners that suitably match their needs. In this context, Northern firms may be dissuaded from international outsourcing when the cost of gaining information is high. Similarly, if a firm is hit by a cost shock in one country

[1] Feenstra (1998) provides a survey and description of trends in international sourcing. Hummels, Ishii & Yi (2001) and Yi (1999) estimate that vertical specialization may now account for 30 percent of all trade flows.

where it operates, it may only seek information on alternative outsourcing partners if the shock is sufficiently large to warrant the expenditure required by a new information search.

Other cost factors may also inhibit rapid international sourcing changes. As Grossman and Helpman (2002b) describe, fruitful international outsourcing projects are likely to require that foreign partners undertake relationship-specific investments. Due to incomplete contracts however, Northern partners may have difficulties writing contracts that ensure their Southern outsourcing partners will undertake the appropriate level of relationship-specific investments.[2] As a result outsourcing is less likely to involve countries with weak legal systems, even if these countries offer favorable production costs. Second, as has been noted in the general trade literature, if there are fixed costs of entry and exit from markets, trade is likely to exhibit hysteresis.[3] As a component of trade flows, it is not unreasonable to expect that outsourcing might also be characterized by similar factors, including fixed cost driven hysteresis.

To date, there is little systematic evidence documenting whether firms' outsourcing decisions are "footloose" as is often claimed, or whether information, contracting difficulties and fixed costs preclude a high degree of sensitivity to changes in country cost conditions. To examine this question, I study U.S. outsourcing conducted through the provisions of the offshore assembly program (OAP) which is known as 9802 in the current tariff code. The OAP was designed to assist firms that perform assembly

[2] In a related vein, Qui and Spencer (2002) show how trade policy loses its potency when relationship-specific investments cause firms to purchase intermediate inputs from affiliates rather than unrelated parties.

[3] For examples, see Baldwin (1988), Baldwin and Krugman (1989), Dixit (1989), Krugman (1989) or Tybout and Roberts (1999).

operations overseas using U.S.-produced components. The primary benefit of the 9802/OAP program is that it limits duties on assembled items to the portion of the product's value that arises from foreign value-added. No duties are assessed on the portion of product value that originates from U.S. components or materials. When products are returned to the U.S., the operation of the 9802/OAP program requires firms to report both the U.S. and foreign dutiable value of their products. As a result, the conduct of 9802/OAP activities allows one to examine how cross-country sourcing patterns respond to changes in country cost conditions.

A second goal of this paper is to test whether outsourcing from developing countries responds more vigorously to costs than does developed country outsourcing. A number of factors could motivate differences in sensitivity that vary with country development. First, if more developed countries produce goods that are more highly differentiated than those originating from developing countries, cost changes may exert a greater influence on decisions about the more homogenous products assembled in developing countries. Further, higher worker skill levels in developed countries may also provide better insulation from cost-based production shifts.[4] To the extent that lower skilled workers are more interchangeable, there may be fewer frictions that prevent the movement of simple assembly operations from one developing country to the next.

In related work, Riker and Brainard (1997) study the employment decisions of U.S. multinational firms and their foreign affiliates. Their findings indicate that the

[4] A related phenomenon is noted in the literature on multinational firms. (See Markusen's (1995) review.) Multinationals generally conduct research and development, market distribution, and other proprietary activities in developed countries due to their need for a highly skilled workforce. For coordination reasons, they may also retain their high value-added headquarters activities at home. In contrast, multinationals are more likely to conduct simple component production and assembly operations in countries that have less skilled workforces and much lower labor costs.

degree of substitution among a firm's numerous foreign affiliates is much higher than the small degree of substitution between parent firms and their foreign affiliates. In addition, the degree of flexibility depends on host country skill differences. If outsourcing responsiveness is conditioned by the availability of high or low skilled labor, country development levels are likely to influence the degree of cost sensitivity observed for different outsourcing activities.[5]

Studies examining how multinational trade and investment affect labor markets typically focus on developed countries and the activities of multinational firms.[6] It is not clear however, that developed country experience provides a reasonable guide to the effects experienced by less developed locations. This concern is particularly relevant if multinational activities are less successfully completed at a distance. If assembly operations are more easily moved than are other activities of the multinational enterprise, it is possible that such production shifts will exert greater downward pressure on wages in the developing countries.

In studying 9802/OAP outsourcing a number of interesting regularities emerge. First, I find that increased country costs, as measured by real exchange appreciation in the previous year, depress sourcing from any particular country. However, changes in 9802/OAP imports are not only influenced by changes in import values, but by a high degree of country entry and exit from the program. While developed countries are not exempt from entry and exit pressures, developing countries appear to face a higher risk that they may be selected in to or out of the program when their own costs change. The

[5] 9802/OAP outsourcing encompasses many organizational forms, ranging from the activities of vertically integrated multinational firms to trade in products assembled under contract.

[6] See for example, Head and Ries (2002) which studies the effects of foreign investment on Japanese firm labor, and Haskel and Slaughter's (1999) examination of the effects of trade on workers in the U.K.

value of 9802/OAP imports from developing countries is also more closely governed by cost changes in competitor countries, falling more sharply when competitor cost decline than do those originating from developed countries. In addition, when the costs in competing countries rise, developing countries experience a larger increase in their probability of being selected for 9802/OAP activity than do developed countries. Nonetheless, both developed and developing countries face strong cost pressures influencing their selection in to and out of the program.

The rest of the paper is organized as follows. To motivate the regression analysis, section two describes outsourcing trends and growth, and provides a description of the U.S. 9802/OAP program that facilitates U.S. overseas assembly operations. Section three provides a description of the data and its summary statistics. Section four analyzes 9802/OAP outsourcing trade responses, focusing on the margins of trade adjustment, and on the nature of competition. A brief conclusion follows in section five.

2. A Description of OAP and Outsourcing Trends

While it is now referred to as 9802 in the U.S. tariff code, the U.S. Overseas Assembly Program originated with the Tariff Act of 1930.[7] The 9802/OAP program allows firms to produce materials, parts and components in the U.S. that are shipped overseas for assembly abroad and returned to the U.S. when the assembled item is completed. Typically U.S. customs duties apply to an imported product's full value. However, the 9802/OAP program recognizes that a portion of the product's value originated in the U.S. As a result, when tariffs are levied on 9802/OAP imports, tariffs

[7] This program was called 806/807 in the TSUSA based U.S. tariff code, and is now called the 9802 provision of the Harmonized System which replaced the TSUSA system in 1989.

are levied only on the addition to product value that was generated abroad while the portion of product value that can be attributed to U.S. parts and components is exempt from U.S. duties.[8] Administration of the duty program requires that 9802/OAP importers provide information about product composition, and whether the value of the product is attributable to dutiable 9802/OAP import, or non-dutiable U.S.-origin components. Throughout its history the 9802/OAP program has received the support of component makers while angering U.S.-based assemblers.

Figure 1 displays the broad changes in the usage of the 9802/OAP program, following the evolution of 9802/OAP imports between 1971 and 2000. Over this period the real value of 9802/OAP imports grew more than 5-fold. Figure 1 also displays the breakdown of total 9802/OAP imports between dutiable 9802/OAP import value and non-dutiable U.S. materials and components. In all years, the value of dutiable 9802/OAP activities conducted abroad exceeded the value of the U.S. inputs contained in 9802/OAP products.

There is one large spike in the usage of the 9802/OAP program in the late 1980's that disappears by the early 1990's. Further examination of the data at a more disaggregated level shows that the spike is driven by a surge in 9802/OAP auto activities in the late 1980's. If auto activities are removed from the series, the time pattern of 9802/OAP program usage exhibits smooth, though slower sustained growth during the late 1980's and beginning of the 1990's.[9]

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[8] The program was designed to assist the steel industry as it sought to accommodate the practices of U.S. steel firms, many of which had large international shipments of intermediate inputs from Canada. In later years, the program grew to include other industries and countries. See Hanson (1997) for a description of the program's development.

[9] The spike in program usage does not influence the general findings presented later. If transportation (SIC 37) or automobiles (SIC 371) are removed from the sample the general results do not change.

While most countries supply only a small fraction of U.S. 9802/OAP imports, the same can not be said for Mexico. As a result, one must be consider how policy changes influence U.S.-Mexican outsourcing activities and the methods by which they are conducted. In particular, the availability of alternative outsourcing venues may have exerted an especially large effect on observed U.S. 9802 imports from Mexico in the late 1990's.[10] Due to Mexico's prominence in outsourcing activities, the treatment of the Mexican data is not likely to be innocuous. Since the relative share of U.S. 9802 imports from Mexico appear to be declining in the mid to late 1990's as other programs grew in importance, the data analyzed in this paper end with 1994.

The growth in 9082/OAP outsourcing mirrors trends observed by other authors who have used different methods to impute outsourcing growth. Outsourcing is most commonly measured by combining information from input/output tables with data on the share of imports in product markets. Using this technique, Feenstra and Hanson (1997) and Irwin (1996) for the U.S., or Campa and Goldberg (1997) for the U.S., U.K., Japan, and Canada, document that the usage of imported intermediate inputs has increased in almost all cases since the 1970's.[11] Hummels, Ishii and Yi (2001) consider an even broader set of 10 OECD and four emerging markets, documenting that increases in vertical specialization can account for 30% of export growth between 1970 and 1990, and that vertical specialization accounted for 21% of these countries' exports in 1990.

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[10] In 1994 Mexico accounted 38.9% of all U.S. 9802 imports. Following the implementation of the NAFTA, U.S. 9802 imports from Mexico have declined since the mid-1990's. According to official statistics from Mexico's Department of Commerce and Industrial Development (SECOFI), 81 percent of Mexico's exports to the United States are generated by production-sharing activities. However, SECOFI's estimates of U.S.-Mexican production-sharing trade exceed U.S. 9802 measures by $23.6 billion, since the SECOFI estimates include the activities of the Maquiladora and PITEX programs as well as the activities conducted through 9802. Since 1994 SECOFI estimates that these alternatives to 9802 have grown 41%. [USITC (1998) p2-2.]

11. Japan is the one outlier in Campa and Goldberg's analysis.

A second method for investigating vertical specialization relies on the analysis of programs that facilitate production sharing. Swenson (1997, 2000), and Feenstra, Hanson and Swenson (2000) show that cost conditions affect the relative usage of home versus foreign inputs in production, though the economic magnitude of cost responsiveness is modest. This same finding is echoed in Gorg (2001), who shows how other factors including comparative advantage affect outsourcing. This paper adopts the program approach for measuring outsourcing activity. However, in contrast with prior work that has examined the tradeoffs between home and foreign production this study focuses instead on the cross-country distribution of outsourcing activities.

Finally, other authors have examined the growth of vertical specialization within the context of multinational firms. Much of this work, including Brainard and Riker (1997), Slaughter (2001), and Head and Ries (2002) focuses on the connection between the home versus foreign activities of multinational firms. In a related vein, Zeile (1998) reports that firms operating abroad have different characteristics than domestically headquartered firms, providing evidence that the home/foreign dichotomy is driven by the location of a firm's headquarters, rather than characteristics of the host. In examining U.S. data, Zeile finds that foreign affiliates in the U.S. have lower U.S. content than do domestically owned parent manufacturing firms in the U.S. The difference is due to the lower value-added share generated by foreign manufacturing affiliates in the U.S. as well as due to the higher use of imported inputs by foreign affiliates. Recent work by Hanson, Mataloni and Slaughter (2001) suggests that the overseas activity of U.S. firms, especially when conducted in developing countries, often helps facilitate vertical specialization.

3.0 Summary Statistics

The data for this project track U.S. outsourcing conducted through the 9082/OAP program, following import values for separate 4-digit SIC industries between the years 1980 and 1994. At this level of data aggregation, there were 399 separate industries and 66 different countries that participated in the program during the period of study. In the final year of the sample, U.S. production sharing imports were valued at 59.3 billion dollars, which represented 9.02 percent of all U.S. imports.

Of imports that entered through the 9802 program in 1994, 37.9 percent of the import value originated from developed countries, while the remaining 62.1 percent was imported from developing countries. Mexico was the largest source of U.S. 9802/OAP imports, supplying 38.9 percent of 9802 imports in 1994 - a volume that was more than 10 times higher than the next largest developing country suppliers of 9802 products. As explained earlier, the data sample ends in 1994 since U.S. 9802/OAP imports are likely to understate U.S. overseas assembly in Mexico in the mid- to late 1990's as other tariff reduction programs began to provide alternative conduits for production sharing trade. In other words, while the actual production sharing arrangements continued and/or expanded throughout the 1990's, the recorded value of 9802 imports from Mexico declined as imports entered the U.S. through the provisions of NAFTA, PITEX or the maquiladora program instead.[12]

When country costs change, it is possible that outsourcing may change in a

[12] The recording of Canadian production sharing activities may have changed similarly with the introduction of the Canada-US Free Trade Agreement. However, Canada has never shipped the same volume of 9802/OAP imports as has Mexico. To examine whether the treatment of the Canadian data affects the regression analysis, alternative specifications were estimated that 1) eliminated Canada from the sample, or 2) included a dummy variable for Canada in the years after the implementation of the Canada-US Free Trade Agreement. Neither specification has any substantial effect on the general results.

number of ways. First, the volume of outsourcing imports may change, falling if costs become less favorable. Second, if costs change in the country of assembly, the price of outsourced products may change if part or all of the cost shock is passed through to the U.S. importer. Finally, entire operations may begin or close down, with unfavorable cost shocks potentially ending assembly operations in some countries, while the activities cease or are moved elsewhere.

When international sourcing relocates it could in principle relocate to any other country. However, it is not clear that all countries are truly at risk for selection. As Grossman and Helpman (2002b) emphasize low labor costs are not an adequate inducement by themselves, since low cost countries may not offer suitable facilities, infrastructure or skills required by the assembler. Even if the country has adequate assembly facilities, transportation or other costs may remove the country from consideration as a potential supplier.

In this paper countries are considered *potential suppliers* for a particular 4-digit SIC industry if the country exported any 9802/OAP products in that 4-digit SIC during any of the years in the 1980 to 1994 sample period. Using this definition, Table 1 describes the range of supplier countries for the different 4-digit industries. Across the 399 SIC industries that used the 9802/OAP program, the average industry involved 9802/OAP imports originating from more than 16 different countries during the sample period. The typical industry had a median of 13 country suppliers over the time interval. If the dichotomy between developed and developing countries is defined by OECD membership, it is clear that most 4-digit products originated from both developed and developing locations. Here, 387 different 4-digit industries were represented in U.S.

9802/OAP imports from OECD countries, while 357 were imported from non-OECD locations.

The number of competing countries differs substantially across 2-digit industries. As might be expected, the largest number of competing countries were seen in SIC 23 - Textiles and Apparel. Here, the typical 4-digit SIC industry received 9802/OAP imports from 35.6 countries, 8.9 of whom were members of the OECD, 26.7 who were not.

While Table 1 displays the breadth of supplier origins over the sample period, it does not indicate how supplies changed over time. Table 2 provides more information on the flux of supply by industry by following entry and exit. In this context I define 9802/OAP sourcing entry and exit as:

$Entry_{ict}$: if the U.S. sourced for industry i from country c in year t, but did not do so in year t-1.

$Exit_{ict}$: if the U.S. sourced for industry i from country c in year t, but discontinued sourcing i from country c in year t+1.

In the average year 7.6 percent of U.S. 9802/OAP import partners were new entrants, or countries that had not sold products in the 4-digit SIC industry in the previous year. At the same time, 7.2 percent of 9802/OAP partners were at risk of not supplying products in the same 4-digit SIC industry in the following year. While there is some variation across the 2-digit SIC sub-industries shown in Table 2, it is clear that the risks of entry or exit were comparable for most industries.[13]

[13] In studying U.S. import data at the finer product level, Besedes and Prusa (2001) document the high intensity of entry into and out of importing. Their analysis examines the duration of import spells for country-products following the observation of positive import. They find that over half of the spells are of no more than a year in duration.

4.0 Results

The analysis focuses on two question. First, how do changes in a country's costs affect the amount of U.S. 9802/OAP outsourcing in the country? And second, how do outsourcing choices respond to competitor country cost conditions? As the summary statistics indicate changes in U.S. 9082/OAP imports are driven both by changes in import volumes over time, as well as a high degree of entry and exit by trade partners. As a result, in order to estimate how U.S. 9802/OAP imports respond to cost and competitor changes, the estimation that follows uses maximum likelihood Heckman techniques to control for selection.

The analysis is based on U.S. 9802/OAP imports between 1980 and 1994. The dependent variable is the dutiable value of U.S. 9802/OAP imports, D_{ict}, originating from country c in year t and industry i, where industry is defined at the 4-digit SIC level. The data panel follows all country-industry pairs for which there was at least one year of positive 9802/OAP imports. The primary estimating equation relates U.S. 9802/OAP import values to a set of cost and economic conditions that influence the attractiveness of outsourcing activities using the following specification:

$$\ln (D_{ict}) = \alpha + \beta^* \ln(R_{c,t-1}) + \gamma^* X_{ict} + \varepsilon_{ic\,t.}$$

The real exchange rate $R_{c,t-1}$ is used to capture production costs in country c, with an increase reflecting an appreciation of country c's currency vis a vis the U.S. dollar. Since outsourcing responses are likely to involve time, either due to the use of ongoing contracts or the time involved in collecting information, the previous year's exchange rate is used rather than the current value of the exchange rate. An increase in country c's real

exchange rate, because it implies higher real production costs, is expected to trigger reductions in the *volume* of outsourcing activities conducted in country c. However, since the dependent variable reports the dutiable value of imports - import volume multiplied by price - it is possible that dollar depreciation may cause a rise in dutiable import value. This could happen in a number of ways. First, if US 9802/OAP import volumes do not adjust to cost changes, and higher costs are passed through to U.S. import prices, dollar depreciation will increase the dollar cost of the observed value of 9802/OAP imports. In this benchmark case, the coefficient on the exchange rate term would be one if the cost shock were completely passed through to U.S. import prices. Second, it is possible that 9802/OAP import volumes do fall when country c's costs rise. However, if the percentage change in costs passed through to the price of 9802/OAP imports exceeds the decline in import volumes, the value of 9802/OAP imports will still rise, even though actual import quantities have declined. If the coefficient on the cost term is negative, this means that the value of 9802/OAP imports has declined following an appreciation of county c's currency. In this case, one can be fairly certain that the change in import values is at least partially caused by a decline in the quantity of items sourced from country c.

The remaining independent variables measure county and industry characteristics. Since it is my primary interest to examine how countries gain or lose 9802/OAP activities when their costs or the costs of their competitors increase, it is important to remove general changes in 9802/OAP sourcing that were influenced by worldwide trends. For example, over the sample period changes in production and communication technologies may have enabled 9802/OAP firms to place an increasing fraction of their activities

overseas. [14] To measure this effect, the regressions include the value of 9802/OAP sourcing conducted worldwide in the industry. Inclusion of this variable has the second benefit of focussing the analysis on reallocations across countries, since it removes general fluctuations caused by the replacement of U.S. with foreign activity.[15]

To capture a country's attractiveness as a location for outsourcing I also include country GDP in the regressions for import value. The inclusion of GDP is motivated by its common usage in gravity equations describing international trade in differentiated goods. As with trade generally, I expect the value of 9802/OAP sourcing will increase with country GDP. In addition, since there is a noticeable difference between the dutiable value of 9802/OAP imports assembled in developed and developing countries, I include a dummy variable for developed countries.[16] Since capital intensity of an industry may condition the suitability of the industry for outsourcing, I include a measure of capital intensity in the regression specifications. Finally, to capture other industry sources

[14] If the worldwide sourcing variable is excluded from the basic specification, the estimated coefficient on the own country exchange rate increases in magnitude. The remaining coefficients are qualitatively unchanged.

[15] It is important to remember that when a country's costs increase, U.S. importers using the 9802/OAP program have two options. For example, consider an increase in the cost of Mexican production caused by an appreciation of the Mexican Peso against the U.S. dollar. The Peso appreciation may cause firms to move some of their sourcing out of Mexico as they relocate the very same operations to other countries, or expand operations that were previously established abroad. However, when the Peso appreciates against the U.S. dollar, the Peso appreciation itself may be driven by a general international weakening of the dollar against all other currencies. In this case the firm may decide to relocate some activities back to the U.S. not only from Mexico, but also from all other foreign locations reflecting the relative attractiveness of completing activities at home versus abroad, which in part reflects general cost changes. The inclusion of the world sourcing term controls for these overall changes.

[16] While 9802/OAP imports originating from developed countries account for less than one-half of overall 9802/OAP imports, developed countries are responsible for a disproportionately large portion of dutiable 9802/OAP value. For example, in 1994 37.9% of 9802 imports originated from developed countries. However, developed countries were responsible for 52.3% of dutiable value entering the U.S. through 9802 in that year.

In most regressions, countries that are members of the OECD are defined as "developed". I also experimented with alternative definitions of development based on per capita incomes and country education levels. The general results are not qualitatively changed by the definition of development chosen.

of variation that influence outsourcing trade, most of the regressions also include a set of 2-digit SIC industry dummy variables.

The regression specification describing 9802/OAP imports would be complete by itself, if it weren't for the high degree of entry and exit observed in the data. As Table 2 shows, countries faced roughly a 7% risk of entry or exit from 9802/OAP activities in any year. In addition, if I take the full panel of country-industry pairs at risk of providing 9802/OAP assembly, only 40% were engaged in outsourcing assembly in any given year. In other words, for most country-industry-year observations in the panel, there is a greater than 50 percent probability that no 9802/OAP imports will be observed. For that reason, I control for selection using Heckman's techniques.[17]

The selection equation uses the following functional form to describe the probability that positive 9802/OAP imports will be observed:

$$\Pr[D_{ict} > 0] = \zeta + \eta * \ln(R_{c,t-2}) + \theta * Z_{ict} + \nu_{ict.}$$

As with dutiable value, I assume that country costs matter for selection. However, since informational requirements associated with location changes are arguably more detailed, and because moving into or out of a market may involve some fixed costs, I assume that the choice to enter or exit a country is influenced by costs two years prior to the sourcing volume decision. As a result, the cost variable in the selection equation is the country's real exchange rate lagged two years, $R_{c,t-2}$.[18]

As with the equation for dutiable value, I assume that capital intensity may

[17] If I run the equation for dutiable value, without using Heckman's selection techniques, the coefficients on the cost variables are a bit smaller than those reported in the tables.

[18] The qualitative estimation results do not change if I turn to a single period lag in the selection equation. However, model fit measured by regression log likelihood is higher when I choose the two period lag.

condition the flexibility of outsourcing movements across countries. Since 9802/OAP outsourcing focuses on assembly, it is possible that the flexibility of assembly will not vary across industries to any large degree, if the capital intensity at the industry level is associated only with the production of components. However, if more capital intense component production results in components that are more highly differentiated. specialized or complex, the assembly of these components may require a better skills match. While the data do not allow one to characterize the capital intensity of the various production stages, the estimation indicates whether capital intense industries are less prone to changes in to and out of international outsourcing. Such evidence would be consistent with the implication that capital intense industries face higher costs of moving that cause them to wait for larger cost shifts before they change their assembly location.

The selection equations also include regional dummy variables. These regional variables are motivated by the idea that distance is likely to inhibit all trade. As a result, greater distance from the U.S. reduces the desirability of particular regions for 9802/OAP outsourcing. I include separate sets of regional dummy variables for developing and developed countries. While distance is likely to narrow the range of countries considered for production sharing, distance will play a smaller role if the final goods produced abroad are sold in the producing country and region, in addition to the U.S. Since there is greater potential for alternate sales in developed country markets, the coefficients on regional indicator variables are allowed to differ for developed and developing countries. The coefficients on the dummy variables are allowed to differ for a second reason as well. When the U.S. imports 9802/OAP products from a developing country the product is often produced by a U.S.-based firm that has contracted for assembly in the developing

country, or built a foreign affiliate in the developing country. However, many of the 9802/OAP activities originating from developed countries are completed under the direction of foreign-based firms. As a result, the general differences in ownership structure may influence the propensity for firms to use the provisions provided by the 9802/OAP programs.

Table 3 presents the basic results. The results in column (1) indicate that changes in a country's costs influence not only the value of 9802/OAP imports, but also the probability that a country will be selected for 9802/OAP activity. When a country's exchange rate appreciates, the value of dutiable 9802/OAP imports increases by a small though significant amount. Since the coefficient is less than one in magnitude, the estimated effect implies that 9802/OAP import volumes declined, and/or the cost shock was not fully passed through to the U.S. dollar price of 9802/OAP imports. The results clearly show evidence of a selection effect. When a country's exchange rate appreciates against the U.S. dollar, it suffers a reduced probability of providing 9802/OAP imports to the U.S.

While the baseline result focuses on the effects of own country costs on 9802/OAP activity, it is quite possible that changes in outsourcing from one location also depend on changes in other countries. To account for potential competition, I first develop a definition of *competitor* countries, and then create measures to capture the *competitive pressures* they exert.

In this paper, competition is defined at 4-digit SIC level. While it is possible that any country might assemble any 4-digit SIC product, I choose to limit the definition of *competitors* to those countries that provided 9802/OAP imports in a 4-digit SIC category

for at least one year during the 1980-1994 period of observation. By using this method to define *competitors* I lose latent competitive forces, since I am excluding countries that might have been under consideration, and were close to selection, but for a slight disadvantage that was not remedied during the sample period. However, there is no convincing method that would allow me to identify countries that were closely considered, though never part of the process between 1980 and 1994. The advantage of defining competitors more narrowly is that it prevents the false inclusion of countries that never exerted competitive pressures in the industry.[19]

To quantify competitive pressures, I introduce two variables. The first variable measures the cost pressures exerted by *competitor countries*, as given by a weighted average of *competitor country* exchange rates. In this case, the competitor exchange rate measure for country c' in year t is defined as:

$$CompetitorExchangeRate_{c'it} = \sum_{c \neq c'} \left[\frac{DV(80-94)_{ci}}{\sum_{c \neq c'} DV(80-94)_{ci}} * R_{ct} \right]$$

The weights are based on the total dutiable value of 9802/OAP imports between 1980 and 1994 for all countries c producing in industry i, $DV(80\text{-}94)_{ci}$. The real exchange rate for country c, R_{ct}, is measured against the U.S. dollar, with the value in 1990 set to one for all countries. An increase in the *Competitor Exchange Rate* variable indicates that costs in competitor countries, when measured in dollars, are rising. As with Goldberg and Knetter (1999), I expect that an increase in the competitor cost variable

[19] If the panel were created by taking all 399 industries for the 66 countries over the sample period, fewer than 10 percent of the country-industry-year import observations would be non-zero.

benefits the country under consideration. The effect could operate through one of two dimensions, potentially boosting the probability that a currently inactive country will be selected, and for those countries that are selected, increasing the value of imports demanded. I assume that the effects of competitor cost changes operate over the same time interval as do reactions to own exchange rate changes. As a result, the world competitor exchange rate is lagged once in the equation for dutiable value, and twice in the selection equation.

When firms in one country negotiate contracts, their ability to command higher prices depends on the number of competitor countries that could assume the activity if it were to relocate. To gauge the range of substitution opportunities, the second competition measure is the count of competitors which counts the number of countries that are defined as *competitors* for each 4-digit SIC industry. There are two competitor counts that are relevant - one that counts developed country competitors by industry, the second counts developing country competitors by industry.[20] I draw a distinction between developed and developing country competitors, since worker skill are likely to vary with country development in ways that influence the countries' suitability for 9802/OAP assembly activities. If workers in developed countries are more skilled, it is likely that they are performing activities that are more complexly tailored, and their particular skills will be more difficult to replace in developing locations. For developed country observations, competition is measured by the number of developed country competitors in the industry. Similarly, competition for developing country observations is measured by the count of developing country competitors in industry. In most of the

regressions the dichotomy between developed and developing countries is defined by country membership in the OECD. However, to test for robustness, I also examine how the results are affected by alternative definitions of development based on per capita income differences or educational attainment.

Including variables that describe *competition* improves the fit of the estimating equations substantially. As the second column of Table 3 shows, the competitor exchange rate variable influences both the selection probability and import value. In particular, a country is more likely to be selected for 9802/OAP activity when competitor country costs rise. In addition, the value of 9802/OAP imports from a country rise when *competitor* country costs increase. The rise in value may occur either because the country ships larger quantities of imports to the U.S., or because the country demands a higher price for the products it ships.

The results also show how the presence of competitors affects selection and import values. The selection probability appears to increase when there are a larger number of competitors. While this finding may seem counterintuitive at first, it may reflect two factors. First, if McLaren's (2000) and Grossman and Helpman's (2002b) theories of outsourcing are correct, the prevalence of outsourcing activities is related to the thickness in the market for partners, which is often endogenous.[21] In this context, observing a greater number of *competitor* countries during the sample period also

[20] I also experimented with regression specifications that consider all competitors as a single group by industry. However, the fit is always better when distinctions are drawn between the number of developing and developed country competitors.

[21] McLaren shows that two equilibria are possible - one in which firms outsource through "arm's length" agreements, and another where firms choose to integrate. Due to market thickness, the "arm's length" outsourcing arrangement is most likely for any particular firm if it is the arrangement selected by other firms. In Grossman and Helpman the degree of outsourcing is influenced by firm's likelihood of finding a suitable outsourcing partner, which is enhanced by market thickness.

provides a measure of market thickness - which in itself indicates that the particular 4-digit industry is better suited than other industries for outsourcing activities. The second possibility is related to construction of the cost competition variable. The competitor counts, like the data panel itself are based only on country-industry pairs for which the country-industry was selected at least once during the sample period. As a result, the positive coefficient in the selection equation also reflects the size of the potential selection pool during the sample period.

The results in Table 3 indicate that the presence of many competitors unambiguously reduces the dutiable value of the 9802/OAP imports a country ships. The surprising finding here is that the prevalence of competitors exerts a stronger downward influence on the dutiable value of imports originating from developed countries than it does for developing countries. Finally, while the presence of many competitors is associated with a higher likelihood of selection, as well as a negative effect on the dutiable value of 9802/OAP imports, the net effect of competitor numbers on 9802/OAP dutiable import values is negative. In other words, the positive selection effect is overwhelmed by the negative effect on import value. In the case of OECD countries additional competitors are associated with a 14.2 percent reduction in import value, while for the non-OECD countries the net effect is a 3.2 percent reduction in import value.

The initial measurement of competition is based on weighted exchange rates that include all competitor countries that produce in a given industry. However, from a competitive perspective the cost changes that matter most may be the cost changes occurring in countries that are at a comparable level of development. To test this idea I formed alternative competitor cost variable, the *Similar Competitor Exchange Rate*,

which is a weighted average of competitor exchange rates. However, for developed countries competitors are now defined as all other developed countries that produced in the given industry, and for developing countries, the exchange rate was formed as the weighted average of all other developing countries who produced for a given industry.

When I use the *similar competitor exchange rates* the explanatory power of the regression specification declines, as is shown by the inferior regression fit in the third column of Table 3.[22] The results for 9802/OAP import values are qualitatively similar to the previous results found with the broader competitor cost variable: U.S. imports from any particular country rise when the competitor country cost conditions rise. However, the coefficient on competitor costs in the selection equation is now puzzling since it implies that the probability of observing positive 9802/OAP imports from a country is positively correlated with reductions in competitor costs. It is unlikely that declines in competitor costs cause 9802/OAP import activity to shift away from the now cheaper competitor countries. The use of the similar country cost variable is motivated by the idea that developed countries compete most directly with other developed countries, while developing countries compete most directly with other developing countries. However, one cost of implementing the more finely detailed definition of competitor country costs is that the thinner set of countries may not be sufficient to identify the effect of competitors on selection. The relevance of this concern is highlighted by the inferior fit of the regressions based on similar country cost measures.

While Table 3 introduces separate competition measures for developed and developing countries, it assumes that the effects of competition on selection and import

values is the same for both types of countries. The validity of this assumption is tested in Table 4, where developing and developed countries are allowed to exhibit differential responses to all features of the economic environment. In the first two columns, the basic specification is re-estimated, again focussing on the effects of own country exchange rate changes. The results show that developing country 9802/OAP activity is more sensitive to shifts in own country costs than are activities conducted in developed countries. To begin, if the currency of a developing country appreciates by 10 percent against the U.S. dollar it suffers a much larger reduction in its probability of being selected for 9802/OAP activity than would a developed country facing a comparable appreciation of its currency. In addition, the differential response shows up in the valuation of 9802/OAP imports. For developed countries, the value of 9802/OAP imports is found to decline somewhat when the country's currency appreciates against the dollar. In the case of the developing countries, the value of 9082/OAP imports for those countries that continue to provide imports, rises with the appreciation.

Taken together, the evidence suggests that developing countries face a more competitive environment than do the developed countries. When their costs rise, developing countries are more likely to be eliminated from participation in the 9802/OAP program. However, if the developing country remains in the market, it appears to pass-through a larger portion of the cost change. This response is consistent with a market characterized by perfect competition, as perfect competition will force firms to pass on any and all cost increases they experience.

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[22] The regression fit does not improve if an even finer definition of *competitor* is used, which classifies countries as competitors if a) both produced 9802/OAP goods of a particular 4-digit SIC category, b) both countries were at similar levels of development, and c) both were located in the same geographic region.

Differences in firm structure and contract form may also cause 9802/OAP imports from developing countries to respond more vigorously to competitor cost conditions than do 9802/OAP imports from developed countries. The 9802/OAP program is open to firms of all nationalities. As a result, 9802/OAP imports include U.S. imports of at least 3 general types: imports from the foreign-based subsidiaries of U.S. firms, imports of products purchased under contractual agreement or through a joint venture with a foreign partner by firms located in the U.S., and imports of products from foreign headquartered firms that use some U.S. components and parts. Due to the relative skill mix of developed and developing countries, it is likely that 9802/OAP imports from developing countries will be typified by the first two types of trade flows, while the third type of 9802/OAP imports will more commonly originate from developed countries. Arguably the first two trade types are more easily relocated than the third. When costs rise in a U.S. firm's foreign subsidiaries, it is likely to relocate activity to its lower cost foreign subsidiaries, as was observed by Riker and Brainard (1997). Similarly, if the costs that apply to contracts or joint venture rise, U.S. firms may seek new contracts or joint venture partners. However, in the case of foreign assembly conducted by foreign firms, cost responsiveness may be smaller. This is because the foreign firm is headquartered in its home location, and substitution between headquarters activity and other country activity is smaller than substitution between different foreign subsidiaries of a firm. In addition, foreign firms or U.S. subsidiaries located in developed countries generally enjoy the added benefit of larger demand in the foreign firm's home market. Since the firm is located near many of its customers, it may continue to produce in the developed country

location since it benefits from lower barriers, both transportation and tariff, as well as proximity to customers.[23]

Table 4 also tests whether competition has equal effects on the value of 9802/OAP inputs from developed and developing countries. As before, adding competition measures improves the fit of the estimating equation markedly. As with the own cost variables, developing countries are found to respond more vigorously to the movements of competitor costs than do developed countries. When their competitor's exchange rates appreciate, developing countries experience a larger boost in their probability of being selected for 9802/OAP activity. In addition, when their competitor's costs rise, it appears that developing countries benefit from a more substantial increase in the value of the 9802/OAP imports they ship to the U.S. Such a rise is consistent with these countries increasing their prices when exchange rates force their competitors to raise prices.

Since country development levels influence the responsiveness of outsourcing to cost shocks, alternative development measures were tested to examine the robustness of the results. While the previous regressions define development based on membership in the OECD, Tables 5 introduces two new measures of development; the first is based on country education levels, while the second is based on per capita income.[24] While the coefficient values change somewhat, the results show that the general cost findings are not affected by the definition of development chosen. The selection of developing countries is always more sensitive to changes in the developing country's exchange rate, or those of competitors, than is the selection of developed countries. Second, the dutiable

[23] See Brainard (1997) for arguments.

value of 9802/OAP imports from developing countries is more positively influenced by the appreciation of competitors than is the dutiable value originating from developed countries. The effects of own exchange rates on dutiable import values are mixed across equations and specifications, but this is because changes in dutiable import values are driven both by volume and price responses to changes in currency value.

As a final check on the results, I estimated the regressions separately for 4-digit sub-industries contained in the three biggest segments of 9802/OAP usage.[25] The results are reported in Table 6. As before, developing countries' 9802/OAP activities respond more vigorously to cost conditions than do developed countries. Nonetheless, while the specific coefficients differ across individual industry segments, the qualitative results are very similar to those for the sample as a whole.

5.0 Conclusion

This paper analyzes U.S. 9802/OAP outsourcing imports to examine how cross-country outsourcing choices respond to changes in country costs. The results show that changes in country and competitor costs act on two dimensions, influencing both selection probabilities and import values. First, when currency appreciation causes a country's own costs to rise, a country's probability of providing 9802/OAP shipments to the U.S. declines. As with all cost effects in this paper, the selection effect is more dramatic for the case of developing countries than it is for developed countries. Second,

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[24] I adopt Riker and Brainard's (1997) use of 6 or more years education as the definition of a high education country. The determination is based on Barro and Lee's data for 1990.

[25] In the sample, Apparel & Finished Fabric (SIC 23) constituted 20.4 percent of all positive country-industry import observations. Non-Electrical Machinery (SIC 35) and Electrical Machinery (SIC 36) constituted 13.7 and 19.2 percent respectively. The remaining two digit industries each accounted for fewer than 8 percent of positive country-industry import observations in the sample.

both developed and developing countries benefit from an increased probability of being selected for 9802/OAP activity when competitor costs rise. The rise in competitor costs also enables countries to increase the value of their 9802/OAP exports to the U.S., with competitor costs exerting a greater influence on U.S. 9802/OAP imports from developing countries than U.S. 9802/OAP imports from developed countries.

Own cost changes are also found to influence the value of U.S. 9802/OAP imports. However, these results need to be interpreted with caution as the value response reflects both changes in import quantities as well as changes in import prices. In most cases, the estimation results seem to suggest that increases in own country costs cause foreign exporting countries to either reduce the volume of their 9802/OAP exports to the U.S., and/or reduce the mark-ups they apply to their 9802/OAP exports. However, learning more about the relative contributions of these two responses will require future research that turns to product rather than industry-level data.

In relating these results to outsourcing activities more generally, it is important to remember that the 9802/OAP program is designed to facilitate foreign assembly of final products that incorporate U.S. materials or components. While this program accounts for about nine percent of U.S. imports, it does not include all U.S. outsourcing activities, such as the purchase of foreign components for assembly in the U.S. If assembly is generally less complex than the production of components, then the outsourcing frictions described by Grossman and Helpman (2002b) are likely to impose even greater restrictions on outsourcing flexibility in other contexts than is observed in the 9802/OAP program.

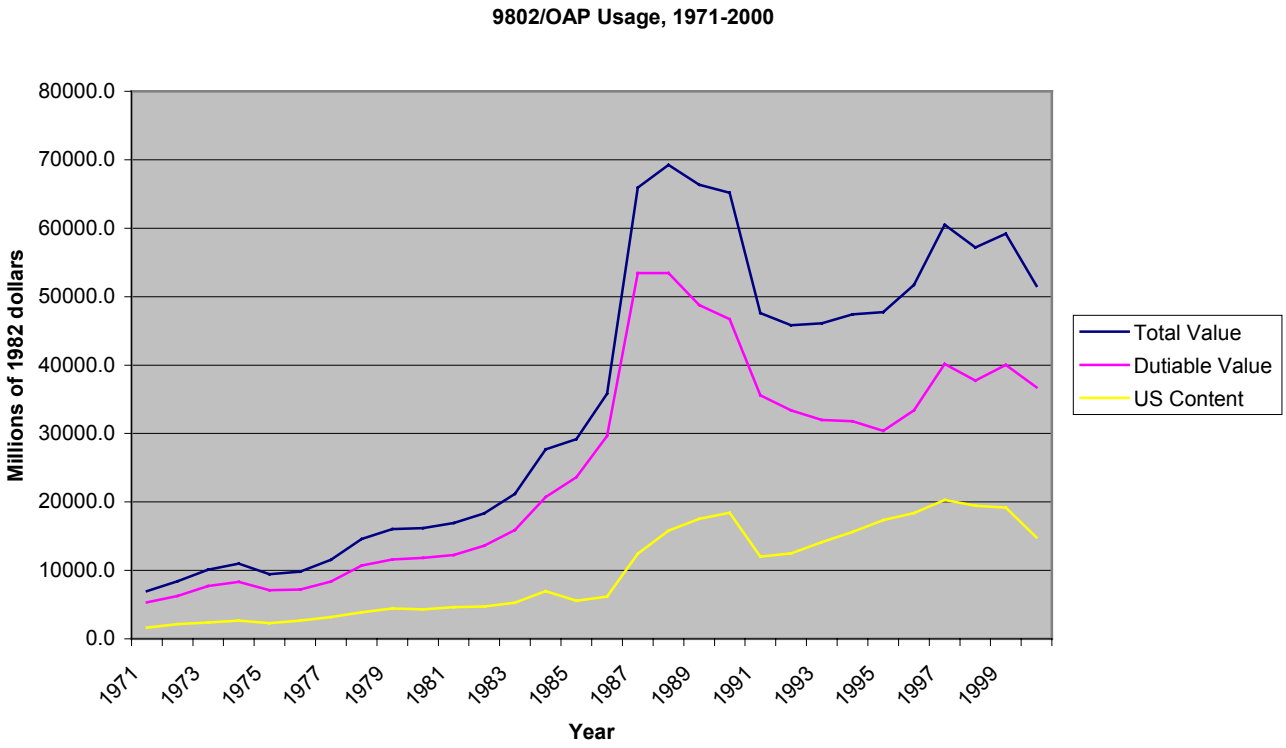
9802/OAP Usage, 1971-2000
Millions of 1982 dollars
80000.0
70000.0
60000.0
50000.0
40000.0
30000.0
20000.0
10000.0
0.0
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
Year
Total Value
Dutiable Value
US Content

TABLE 1: COUNTRY COMPETITION BY INDUSTRY.

	ALL COUNTRIES			OECD			NON-OECD		
	# of SICs	# of Countries		# of SICs	# of Countries		# of SICs	# of Countries	
		Mean	Median		Mean	Median		Mean	Median
Industry									
All Industries	399	16.6	13	387	7.7	6	357	10.2	7
SIC 20	27	2.9	1	23	1.8	1	13	2.8	1
SIC 22	28	11.6	8	28	4.3	3	27	7.6	4
SIC 23	33	35.6	35	33	8.9	7	33	26.7	25
SIC 24	17	8.5	3	17	4.6	2	14	4.8	2
SIC 25	13	25	25	13	11	11	13	14	14
SIC 26	15	12.5	7	14	7.1	5	15	5.9	3
SIC 27	13	6.5	6	13	4	2	8	4	3
SIC 28	23	4.9	4	19	3.7	4	19	2.2	2
SIC 29	5	5	7	4	3.5	4	5	2.2	3
SIC 30	6	21	19.5	6	9.5	9	5	14	13
SIC 31	11	17.8	17	10	4.8	3.5	11	13.5	12
SIC 32	20	5.1	4	20	2.8	2.5	15	3.1	2
SIC 33	25	16.3	14	25	9.6	9	22	7.5	5
SIC 34	32	12.6	9	32	7.4	6	30	5.5	4
SIC 35	44	19.2	17	44	11.4	12	42	8.1	5
SIC 36	39	27.8	28	39	12.2	13	39	15.6	15
SIC 37	16	19.6	18	16	10.6	11	14	10.2	7
SIC 38	13	29.5	28	13	14.1	16	13	15.5	15
SIC 39	18	16.9	15.5	18	6.5	7	18	10.4	8

"# of SICs" is the count of 4-digit industries in each 2-digit industry category. Counts of countries indicate how many countries exported products within a 4-digit SIC industry category during the sample period.

TABLE 2: Entry and Exit Rates for 4-digit SIC Industries

Industry	# of 4-digit SIC Industries	Entry Rate	Min Entry Rate	Max Entry Rate	Exit Rate
All Industries	399	.076	0	.231	.072
SIC 20	27	.067	0	.107	.077
SIC 22	28	.072	0	.115	.065
SIC 23	33	.084	.057	.107	.061
SIC 24	17	.079	.026	.231	.085
SIC 25	13	.068	0	.068	.074
SIC 26	15	.080	.038	.092	.085
SIC 27	13	.064	.038	.103	.074
SIC 28	23	.074	.026	.154	.066
SIC 29	5	.072	.051	.077	.078
SIC 30	6	.080	.038	.095	.062
SIC 31	11	.071	.050	.089	.064
SIC 32	20	.082	.026	.154	.084
SIC 33	25	.084	.058	.111	.078
SIC 34	32	.075	.038	.135	.073
SIC 35	44	.079	0	.154	.075
SIC 36	39	.071	.048	.096	.071
SIC 37	16	.078	.048	.103	.067
SIC 38	13	.078	.059	.106	.065
SIC 39	18	.076	.049	.099	.067

TABLE 3: COUNTRY COSTS AND PRODUCTION SHARING DECISIONS.

	(1)	(2)	(3)
Dutiable Value			
Own Exchange Rate (-1)	.088(.042)	-.062(.042)	.046(.044)
World Compet Exch Rate (-1)		.546(.039)	
Similar Compet Exch Rate (-1)			.268(.055)
Count of OECD competitors		-.220(.008)	-.255(.008)
Count of non-OECD competitors		-.050(.002)	-.054(.003)
Worldwide Sourcing	.702(.007)	.710(.008)	.692(.008)
GDP	.442(.010)	.328(.010)	.437(.011)
Capital Intensity	.530(.042)	.089(.040)	.117(.042)
Trend	-.042(.004)	-.060(.005)	-.050(.005)
OECD	-1.613(.056)	.383(.112)	.273(.117)
Constant	15.003(1.735)	21.718(1.763)	18.105(1.844)
Selection Equation			
Own Exchange Rate (-2)	-.176(.011)	-.296(.013)	-.253(.013)
World Compet Exch Rate (-2)		.531(.013)	
Similar Compet Exch Rate (-2)			-.079(.014)
Count of OECD competitors		.094(.002)	.092(.002)
Count of non-OECD competitors		.025(.001)	.027(.001)
Capital Intensity	-.161(.009)	.010(.010)	-.006(.010)
Region Dummies (OECD& non)	Yes	Yes	Yes
Log likelihood	-114,737	-110,595	-111,157

Notes: Standard Errors in ( ). 69714 Observations of which 28,228 are not censored.

TABLE 4: COUNTRY COSTS AND PRODUCTION SHARING DECISIONS.

	(1)		(2)	
	OECD	non-OECD	OECD	non-OECD
Dutiable Value				
Own Exchange Rate (-1)	-.018(.050)	.793(.087)	-.108(.050)	.484(.085)
World Compet Exch Rate (-1)			.293(.047)	.995(.058)
Count of OECD competitors			-.259(.009)	
Count of non-OECD competitors				-.052(.003)
Worldwide Sourcing	.715(.009)	.684(.010)	.787(.011)	.682(.011)
GDP	.205(.024)	.518(.011)	.127(.024)	.349(.012)
Capital Intensity	.786(.061)	.336(.057)	.707(.055)	-.373(.057)
OECD Dummy	.656(.789)		5.368(.798)	
Constant	1.9344(.542)		2.096(.545)	
Selection Equation				
Own Exchange Rate (-2)	-.078(.013)	-.447(.021)	-.145(.015)	-.595(.022)
World Compet Exch Rate (-2)			.341(.019)	.646(.019)
Count of OECD competitors			.096(.002)	
Count of non-OECD competitors				.024(.001)
Capital Intensity	.012(.013)	-.309(.013)	.067(.014)	-.041(.014)
Region Dummies	Yes	Yes	Yes	Yes
Log likelihood	-114,230		-110,011	

Notes: Standard Errors in ( ). 69714 Observations of which 28,228 are not censored.

TABLE 5: COMPETITION AND SOURCING CHOICES
DEVELOPMENT DEFINED BY EDUCATION AND INCOME

	(1) DEVELOPMENT DEFINED BY EDUCATION LEVELS		(2) DEVELOPMENT DEFINED BY INCOME LEVELS	
COUNTRY GROUP	HIED	LOED	HI PCY	LOW PCY
Dutiable Value				
Own Exch Rate (-1)	-.090(.044)	.424(.086)	-.062(.044)	.657(.077)
Competitor Exch Rate (-1)	.283(.046)	.700(.062)	.283(.046)	.885(.058)
Count of Competitors	-.207(.005)	-.056(.003)	-.192(.006)	-.073(.003)
Worldwide Sourcing	.704(.011)	.697(.014)	.682(.013)	.731(.012)
GDP	.128(.014)	.382(.012)	.058(.022)	.334(.010)
Capital Intensity	-.556(.060)	-.098(.008)	-.717(.072)	-.098(.008)
Trend	-.053(.006)	-.049(.007)	-.041(.007)	-.049(.007)
Industry Dummies	Yes	Yes	Yes	Yes
Constant	-1.155(.974)		-095(.913)	
Selection Equation				
Own Exch Rate (-2)	-.188(.014)	-.492(.022)	-.207(.015)	-.416(.019)
Competitor Exch Rate (-2)	.386(.016)	.595(.019)	.429(.017)	.446(.016)
Count of Competitors	.044(.001)	.019(.001)	.041(.001)	.017(.001)
Capital Intensity	.113(.012)	-.029(.016)	.155(.014)	.024(.016)
Region Dummies	Yes	Yes	Yes	Yes
Development Dummy	-.804(.061)		-.534(.076)	
Constant	-.779(.031)		-.988(.046)	
Log Likelihood	-110,599		-111,365	

Notes: Standard Errors in ( ). Both regressions have 71533 Observations, of which 28167 are uncensored. The development dummy in regression (1) is based on country education, while it is based on per capita income in regression (2)

TABLE 6: SOURCING CHOICES BY INDUSTRY
OECD/NON-OECD COUNTRIES - WORLD DEFINITION OF COMPETITION

	SIC 23 TEXTILES & APPAREL		**SIC 35** NON-ELECTRICAL MACHINERY		**SIC 36** ELECTRICAL MACHINERY	
COUNTRY GROUP	OECD	NON-OECD	OECD	NON-OECD	OECD	NON-OECD
Dutiable Value						
Own Exchange Rate (-1)	.046 (133)	.592 (.121)	-.134 (.103)	-.199 (.336)	-.056 (.109)	.223 (.235)
Competitor Exch Rate (-1)	.511 (.367)	1.143 (.152)	.326 (.199)	1.765 (.389)	.876 (.232)	1.553 (.156)
Count of Competitors	-.273 (.026)	-.075 (.005)	-.238 (.026)	-.078 (.013)	-.276 (.026)	-.010 (.009)
Worldwide Sourcing	.543 (.048)	.795 (.027)	.534 (.034)	.684 (.055)	.423 (.034)	.728 (.035)
GDP	.255 (.074)	.319 (.019)	.331 (.051)	.483 (.045)	-.082 (.048)	.325 (.027)
Capital Intensity	-.497 (.265)	-.049 (.132)	.426 (.043)	-.091 (.228)	-.904 (.166)	.071 (.160)
Trend	.004 (.021)	-.062 (.011)	-.077 (.014)	-.063 (.021)	-.091 (.016)	-.110 (.014)
OECD Dummy	-6.758(2.154)		4.263(2.236)		1.856(1.857)	
Selection Equation						
Own Exch Rate (-2)	-.012 (.040)	-.401 (.038)	-.189 (.036)	-.694 (.076)	-.167 (.039)	-.615 (.060)
Competitor Exch Rate (-2)	.086 (.092)	.349 (.046)	.602 (.074)	1.175 (.103)	.189 (.069)	.758 (.052)
Count of Competitors	.058 (.006)	.020 (.001)	.094 (.005)	.023 (.002)	.107 (.006)	.309 (.002)
Capital Intensity	-.041 (.068)	-.169 (.038)	-.039 (.043)	.128 (.053)	-.152 (.042)	-.063 (.039)
Region Dummies	Yes	Yes	Yes	Yes	Yes	Yes
OECD Dummy	-.176(.163)		-.211(.165)			
Log Likelihood	-19,699		-15,141		-20,268	
Observations	11,795		9,407		11,986	
Uncensored Observations	5,540		3,920		5,411	

Notes: Standard Errors in ( ). Equation constants are not reported.

Data Appendix

9802/OAP Imports

The import data are taken from United States International Trade Commission (USITC) reports on 806/807 and 9082 imports. Between 1980 and 1988 the data on OAP import values originate from information on 806/807 imports from the Tariff Schedule of the United States, and the provisions of 9802 under the Harmonized System for the years 1989 to 1994. The data for the years 1980 to 1988 were scanned from hard copies of the trade data, while the later years were available electronically. Due to poor quality of the hard copy originals, it was not possible to include data from the years 1982 or 1988. The product level data from these programs were then aggregated to the 4-digit SIC industry level to facilitate comparison with U.S. industry production data. The categorization of U.S. imports to four-digit industries is available from the National Bureau of Economic Research, at http://www.nber.org/data_index.html, as constructed by Robert Feenstra.

Industry Characteristics

Data on industry characteristics were collected from the NBER Manufacturing Database, which is available from the National Bureau of Economic Research data site, at http://www.nber.org/data_index.html, as constructed by Bartlesman, Becker and Gray.

Macroeconomic Variables

Macroeconomic Variables were collected from the International Monetary Fund's International Financial Statistics.

Education Variables

Data on educational attainment were used in some regressions to classify country development. Here, as in Riker and Brainard (1997), countries were classified as developed if average educational attainment was 6 or more years in 1990 based on the data collected by Barro and Lee, and available from the National Bureau of Economic Research, at http://www.nber.org/data_index.html.

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