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Will Dollar Depreciation Improve the U.S.-Japanese Trade Deficit? A Disaggregated Study

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A statistic that is probably as well-known by government policymakers and economists as it is by lay people is that the United States has consistently run a merchandise trade deficit with Japan. In 1996, the U.S. trade deficit with Japan registered $50.4 billion and has been in a deficit since 1965. In fact, the trade deficit with Japan has increased, in nominal and real terms, despite the dollar's depreciation from its peak against the yen in 1985. Given these statistics, it may be no surprise that the trade imbalance between the United States and Japan has been and continues to be an economic source of conflict between the two countries. Foreign exchange intervention to reduce the value of the dollar against the yen, especially in the late 1980s, has been used as a covert trade policy tool in dealing with Japan.

It is an open question with respect to U.S.-Japanese trade whether orchestrated depreciations of the U.S. dollar against the yen can be relied upon to produce a reversal in the trade imbalance. (c.f. Ceglowski (1997)). As well, the self-propelled depreciations of the dollar that the U.S. has experienced since the early 1990s may not produce the anticipated trade balance adjustment. Balance of trade adjustment between the U.S. and Japan whether through foreign exchange intervention or market forces will depend, in part, on how sensitive commodities that contribute the most to the U.S.-Japanese trade imbalance are to the exchange rate.

Sectoral or commodity-specific effects of foreign exchange intervention have received little attention although the basis for linking a macroeconomic policy like foreign exchange intervention to a commodity-specific study has its roots in the work of Orcutt (1950) and Armington (1969) who estimate commodity-by commodity exchange rate elasticities. More recently, work on the hysteretic effects of the U.S. dollar appreciation in the mid-1980s on U.S. imports (as in Baldwin (1989) and Dixit (1989)) provides a foundation for considering commodity-specific effects of foreign exchange intervention.

This paper uses disaggregated commodity data on bilateral trade between the U.S. and Japan to examine how responsive specific commodities are to changes in the real exchange rate. The commodity data is disaggregated at the one-, two-, and three-digit *Standard International Trade Classification* (*SITC*) level. For example, the data set includes trade in medical and pharmaceutical products, office machines and automatic data processing machines, fertilizers, vegetables and fruit, furniture, apparel, and metal working machinery, to name a few. The data span the period of 1978:I - 1996:III which include two distinct exchange rate episodes of dollar appreciation and dollar depreciation. The panel nature of the data set affords the opportunity to test hypotheses about exchange rate elasticities across commodities and across time.

To our knowledge, there is scant academic work conducted on the U.S.-Japanese trade imbalance that uses data disaggregated at more than the one-digit level of detail. Indeed, a large proportion of articles written pertaining to U.S.-Japanese trade appear in policy proceedings and publications by policy think tanks. (See: Hooper and Marquez (1995), Cline (1993), Petri (1991) Corker (1989) and Sakamoto (1988)). These articles focus on U.S.-Japanese total trade volumes. There is even less research conducted by academia and other research institutions on disaggregated measures of U.S.-Japanese trade. Lenz (1992) undertakes a disaggegated examination of total U.S. exports and imports while Parsley and Wei (1993) examine data on a few commodities traded between the U.S. and Japan.

The rest of this paper is organized as follows. In section I, the data are described and the profile of U.S. trade with Japan since 1978 is presented. Section I shows that a very small proportion of commodities have consistently accounted for 50 percent or more of U.S. exports to Japan and U.S. imports from Japan. There have been large changes across the commodities that are ranked as the top contributors to U.S. exports to Japan between 1978-96 with little change in the commodities that are ranked as the top contributors to U.S. imports from Japan. Section I also shows the dominant influence of road vehicles to U.S. imports from Japan, a rise in prominence of computers to U.S. exports and the decline of agriculture, crude materials, and mineral fuels in U.S. exports. Section I also points out that motor cars and motor vehicles have contributed from 20-25 percent to U.S. imports from Japan and that aircraft have been one of the top contributors to U.S. exports to Japan.

In section II, we estimate real exchange rate elasticities (using the sum of eight lags of the yen/dollar real exchange rate) for fifty-eight two-digit exports and imports using data from 1979:I - 1996:III. We establish that there is a broad range of point estimates for the elasticities. We then classify the commodities according to product or market attributes theorized to matter to exporters and importers. Here, we estimate exchange rate elasticities for the broad classifications of commodities and compare whether they are different across classifications. We find some evidence that the distinction between durables and nondurables (as in Burda and Gerlach (1992)) affects the exchange rate elasticities. We also find that the exchange rate elasticity of automobiles is significantly different than the exchange rate elasticity of consumer durables and industrial durables and that in some cases, the elasticities differ in a predictable way. Further, we find that differences in market structure correspond to differences in elasticities although the point estimates of the coefficients do not always support the theory. We also test whether the elasticities are different across the sample period split at 1985:I after the dollar began to depreciate and after which the Plaza and Louvre accords on coordinated foreign exchange intervention were signed. Hysteresis in trade flows suggests that the exchange rate elasticities of U.S. exports and imports should be smaller. We find evidence of a structural break for high fixed cost commodities, commodities produced in monopolistically competitive or oligopolistic market structures, and for durables, nondurables, and automobiles. However, we only find evidence of hysteresis for high fixed costs exports and nondurable exports. In section III, we summarize our findings and offer directions for future research.

I. A Disaggregated Analysis of U.S. trade with Japan

Data on U.S. exports to Japan and U.S. imports from Japan, disaggregated to the three-digit *SITC* level of detail, were purchased from the U.S. Census Bureau's Foreign Trade Division.[1] The data set contains monthly observations of export and import values for the period January 1978 - November 1996. There are ten one-digit classifications of exports and imports, sixty-seven two-digit classifications of exports and imports, two hundred seventy-five three-digit classifications of exports, and two hundred eighty-one three-digit classifications of imports. The classifications are based on the 1987 *Revision 3* to the *SITC* system.

We highlight some of the more striking aspects of U.S. trade with Japan over four exchange rate episodes around which we organize the data analysis. The episodes are based on average changes in the yen-dollar exchange rate for periods defined by well-known historical economic events that may have a bearing on trade flows between the U.S. and Japan. The four distinct episodes of exchange rate activity are: (1) the pre-U.S. dollar appreciation era, 1978 - 1980; (2) the U.S. dollar appreciation era, 1981 - 1985; (3) the dollar depreciation and exchange rate management era, 1986 - 1991; and the record-low era, 1992 - 1996. For the most part, we will present statistics at the one and two-digit level of disaggregation and supplement them with a discussion of salient features of the data at the three-digit level.

Table 1 presents the U.S.-Japanese trade balance at the one-digit level of detail for classifications 0 - 8 across the four exchange rate episodes. (Division 9 is a special division, which includes gold shipments and special items and will not be analyzed). The last row of Table 1 presents the overall U.S.-Japanese trade balance. Table 1 shows that the U.S. trade balance with Japan has been in a deficit over the 1978-96 sample period. The table also

[1]The authors acknowledge support from the College of Business Administration's Small Grants Fund at the University of South Carolina.

shows that divisions 0, 1, 2, 3, 4, and 5 have remained net surplus contributors to the trade balance whereas divisions 6, 7, and 8 have remained net deficit contributors throughout the sample period.

Table 1 also presents the percentage of total exports (or imports) of each division. One of the striking findings is that from 1978-96, machinery and transportation equipment alone comprised nearly 75 percent of total U.S. imports from Japan and only 25 percent of U.S. exports to Japan. The table shows that U.S. exports to Japan are more diversified than imports, at least at the one-digit level of detail. Table 1 also reveals that trade appears to be growing more rapidly in higher-technology products and highly processed items included in divisions 6, 7, and 8. It is also apparent that the U.S. has experienced a significant decline in the exportation of agricultural commodities (division 0) to Japan as well as crude materials and mineral fuels (divisions 2 and 3).

Table 2 presents the number of three-digit *SITC* commodities that have comprised the top 50 percent of all U.S. exports to Japan for each year and Table 3 presents the number of three-digit *SITC* commodities that have comprised the top 50 percent of all U.S. imports from Japan for each year. Each table also lists the commodities classified by their three-digit code that make up the total number. Table 4 lists for 1996, the top contributors to U.S. exports to Japan and U.S. imports from Japan and their corresponding percent of total exports (imports). Appendix A provides the commodity names corresponding to each three-digit code.

A comparison of Tables 2 and 3 shows that, in almost every case, the number of goods comprising the top 50 percent of U.S. exports to Japan is double that of the number of goods accounting for the top 50 percent of U.S. imports from Japan. Over the 1978-96 period, no more than 22 (or 8 percent) of the three-digit *SITC* commodities have accounted for 50 percent of U.S. exports to Japan and no more than 8 (or 2.8 percent) of the three-digit *SITC* commodities have accounted for 50 percent of U.S. imports from Japan. The tables suggest that a relatively small group of commodities account for a disproportionate amount of trade between the U.S. and Japan. Table 2 shows that the mix of top exports has changed dramatically in the latter half of the 1980s as the composition of U.S. exports to Japan shifted towards machinery and transportation equipment (division 7) and away from agricultural products, crude materials and mineral fuels (divisions 0, 2, and 3). Table 3, by contrast, shows that the mix of top imports has changed very little over the sample period. The mix of top imports is and has been concentrated in machinery and transportation equipment, (division 7). From 1978-96, motor cars and other motor vehicles (division 781) remained the top contributor to U.S. imports despite large swings in the value of the dollar in real and nominal terms and despite the voluntary export restraints agreed to in 1985. As for U.S. exports of motor cars and motor vehicles, Table 2 shows that these items did not enter as a contributor to the top 50 percent of U.S. exports until 1990.

The differences in behavior across the top contributors to exports and imports suggests that U.S. firms have shifted their production mix, perhaps to take advantage of the dollar depreciation whereas Japanese firms have not. The small degree of change in Japanese exports to the U.S. (U.S. imports from Japan) is consistent with stories that Japanese firms' practice pricing-to-market and thus are better able to dodge the effects of dollar depreciation on their exports. The table also suggests that Dixit's (1989) "band of inaction" for U.S. firms is narrower than for Japanese firms. The change in the commodity composition of the top exporters suggests that the dollar appreciation and depreciation have caused a significant reconfiguration of the industries (and firms) that contribute the most to U.S. exports to Japan. Alternatively, the table suggests that there may be more pronounced hysteresis in Japanese exports to the U.S. than in U.S. exports to Japan.

Table 4 presents in detail information from Tables 2 and 3 for the year 1996. The table shows that, in 1996, the top contributor to U.S. exports to Japan is thermionic, cold cathode, and photocatmode valves, etc. with a 6.4 percent share of total U.S. exports to Japan. The remaining top contributors range in percent of total exports from 1.43 to 4.81. By contrast, the top contributor to U.S. imports from Japan is motor cars and other motor vehicles with a 17.44 percent share of total U.S. imports from Japan. The next highest contributor to U.S. imports from Japan is thermionic, cold cathode, photocatmode valves, etc. at 8.18 percent. This table also reveals that U.S. exports to Japan are much more diversified than U.S. imports from Japan. U.S. exports include not only high tech products like aircraft, computers, and telecommunications, but items like wood, tobacco, oil seeds, and maize.

Returning to Tables 2 and 3, a comparison shows that division 7 commodities are the only product group of the top 50 percent of U.S. exports and imports in which the U.S. and Japan engage in intraindustry trade. For example, intraindustry trade occurs in automatic data process machines and units thereof (division 752); parts, etc. for office machines and automatic data process machines (division 759); telecommunications equipment and parts (division 764); thermionic, cold cathode, photocatmode valves, etc. (division 776); motor cars and other motor vehicles (division 781), and road vehicles (division 784).

Given the prominence of machinery and transportation equipment (division 7) in trade between the U.S. and Japan, we analyze division 7 at the two-digit level of detail. Table 5 presents the percentage of total U.S. exports (imports) to Japan for each two-digit commodity in division 7. The table shows that trade in office machines/adp (division 75) and electrical machinery (division 77) grew throughout the sample more than tripling their shares over the sample period.[2] Exports of office machines and electrical machinery increased from roughly 3 percent of total exports to roughly 7.5 percent of total exports. Imports of office machines and electrical machinery increased from 4-5 percent to 13-14 percent of total imports.

Imports of telecommunications and sound reproducing equipment (division 76) accounted for up to 14 percent of total imports from Japan prior to the dollar depreciation and then fell to 8 percent by the end of 1996. This division includes fax machines, cordless telephones, answering machines, videocassette recorders, camcorders, and compact disc players. Telecommunications' share of total exports remained nearly unchanged over the sample period.

A look at Table 6, which disaggregates division 76 at the three-digit level, is more revealing. The table shows that imports of televisions, radio broadcast receivers, and sound recorders, as a percentage of total imports, declined substantially over the sample period while imports of telecommunications equipment, as a percentage of total imports, remained approximately constant.[3] These changes are somewhat surprising given the story that the U.S. has been on a consumption binge (typically thought to imply consumer electronics) of Japanese products.

Table 7 produces more information that could be taken to dispute the consumption binge story. Table 7 shows that imports of road vehicles (division 78) have declined from 35 percent of U.S. imports from Japan to 27 percent. The percent of imports attributed to motor cars and other motor vehicles (division 781) has declined from 25 percent to 20 percent.[4] The table also shows that there has been little net change in the percent of imports contributed by the other division 78 commodities.

Tables 5, 6, and 7 do not corroborate the consumption binge story that is used to explain the trade deficit the U.S. continues to sustain with Japan since they show notable

[2]Division 75 includes typewriters, calculators, photocopiers, automated data processing machines (computers) and computer parts. Division 77 includes electric power machinery, equipment for distributing electricity, electro-diagnostic apparatus, electromedical equipment, home appliances, electronic parts, electrical goods not elsewhere specified, and more.

[3]In terms of dollar values, the imports of televisions, radios, and sound recorders have all declined from between 1986-88. However, imports of telecommunications have in increased since 1985.

[4]In terms of nominal values, imports of division 781 have remained fairly constant since 1986.

declines in consumer electronics and automobiles as a percentage of total imports since 1985. Burda and Gerlach (1992) make a similar argument.

In sum, Tables 1 - 7 indicate that exports and imports may not behave uniformly in the face of changes in the dollar/yen real exchange rate. Anecdotal evidence from the tables suggests that dollar depreciation may have had substantial sectoral effects on U.S. exports to Japan and more modest effects on U.S. imports from Japan with little effect on the composition of imports. Further, anecdotal evidence from the tables suggests that foreign exchange intervention to bring down the dollar or keep the yen/dollar rate low may prove unfruitful in promoting trade balance adjustment.

We turn now to estimating the real exchange rate elasticities of exports and imports, disaggregated at the two-digit level, and investigate whether these elasticities have changed significantly following the peak of the dollar appreciation as well as whether these elasticities are significantly different across commodities.

II. Estimating Commodity-specific Exchange Rate Elasticities

Before discussing the estimation of equations for exports and imports, we discuss some data transformations that we undertook. We chose to estimate equations using commodities disaggregated at the two-digit level of detail since the three-digit level of detail would create the opportunity for too many hypothesis tests that we thought may be both uninformative (relative to using the two-digit data) and cumbersome in terms of comparing, generalizing, and drawing conclusions. Furthermore, the two-digit data is sufficiently disaggregated to pick up commodity-specific characteristics that may be missed at the one-digit level of detail. For example, division 8 -- miscellaneous manufactured articles includes items such as prefabricated buildings (division 81); furniture and parts, bedding, mattresses, mattress supports, cushions, and similar stuffed furnishings (division 82); travel goods, handbags, and similar containers (division 83); articles of apparel and clothing accessories (division 84); and so on. Clearly, it may not make sense to aggregate all of these commodities into one division and estimate an elasticity for the division given the broad range of commodity characteristics. However, at the two-digit level of detail, the commodities are much more similar in terms of their product characteristics (both on the production and consumption side).

We aggregated the data from monthly to quarterly since some of the explanatory variables we use are available only quarterly. Since exports and imports are reported in nominal terms, we deflated them so a measure of exchange rate elasticities can be inferred in the estimation. Since we do not know in which currency exports and imports are invoiced, we deflate U.S. exports to Japan and U.S. imports to Japan by an evenly-weighted average of the U.S. consumer price index and the Japanese consumer price index. We believe the use of an evenly-weighted average of the U.S. and Japanese consumer price indexes will produce a sufficient proxy for deflating exports and imports at the two-digit level of detail.[5]

i. ***Empirical estimates of exchange rate elasticities***

We estimated a variety of specifications for exports and imports. Based on equation diagnostics, we have selected the following equation for estimating exchange rate elasticities for each two-digit commodity:

(1) $$x_{j,t} = c + \left[\sum_{i=1}^{8} \alpha_i \left(r_{t-i}\right)\right] + \left[\sum_{i=1}^{4} \beta_i \left(y_{t-i}\right)\right] + \rho\left(x_{j,t-1}\right) + \theta t_0 + \varepsilon_{j,t}$$

where $x_{j,t}$ is either U.S. exports of commodity j to Japan or U.S. imports of commodity j from Japan (i.e. Japan's exports of commodity j to the U.S.); r is the real exchange rate which is constructed from the period-average yen/dollar exchange rate and the U.S. and Japanese consumer price indexes. For U.S. exports to Japan, y is real GDP in Japan (a proxy for Japanese expenditure). For U.S. imports from Japan, y is real GDP in the U.S. (a proxy for U.S. expenditure). Modeling spending behavior by the U.S. on Japanese goods (and vice-versa) as a function of lagged values of relative prices and economic activity in determining current period spending is also conventional in consumption expenditure equations.

We also include a time trend and the lagged value of the dependent variable. The lagged dependent variable and time trend was included to eliminate possible serial correlation (which was found in the equations of total U.S. exports to Japan). Also, the lagged dependent variable may pick up any cyclical adjustment in exports (arising from two-period or more contracts). The time trend variable can also be considered a proxy for other (omitted) trending variables (i.e. price of non-tradables) that may influence exports.

[5]We are aware that there are several other methods that we could use to deflate the data. However, since our study uses bilateral trade data in nominal terms and without knowing the currency of invoice, we thought that the averaged consumer price indexes would create a better proxy for deflating exports and imports than would an export price index or an import price index based on U.S. exports and imports to the world. However, our strategy is not without its tradeoffs. A weighted-average of the consumer price indexes may create an inappropriate deflator for industrial goods and may be inappropriate because it includes non-tradable goods. The influence of nontradables in the consumer price indexes should be somewhat mitigated given that the U.S. and Japan share similar per capita GDPs. The correlation between our deflator and the U.S. export price index from the IFS is 0.96 and for the U.S. import price index is 0.89.

All variables (except the time trend) are logged.[6] Contemporaneous values are excluded to avoid simultaneous equations bias. The model includes eight lags of the real exchange rate and four lags of either U.S. or Japanese real GDP depending on whether we are modeling U.S. exports to Japan or Japanese exports to the U.S. The lag length on the exchange rate and GDP is common in many time series studies that attempt to explain consumption behavior.

Table 8 presents the sum of the real exchange rate elasticities over eight lags, (hereafter referred to as the exchange rate elasticity), and the associated p-value for each of the two-digit level commodities for U.S. exports to Japan and U.S. imports from Japan.[7] The exchange rate elasticity for U.S. exports should be negative and for U.S. imports positive. For U.S. exports, fifty exchange rate elasticities are negative as predicted by theory. However, only nineteen of them are significantly different from zero at the 5 percent level. For U.S. imports, forty-one of the exchange rate elasticities are positive as predicted by theory. However, only sixteen are significantly different from zero at the 5 percent level, some of which are incorrectly signed. The range of the exchange rate elasticities for U.S. exports to Japan is from -1.724 (fixed vegetable fats and oils, commodity 42) to +0.799 (inorganic chemicals, commodity 52). The range of exchange rate elasticities for U.S. imports from Japan is broader: -3.301 (dairy products and birds' eggs, commodity 02) to 1.517 (hides, skins and furskins, raw, commodity 21).

ii. *Hypotheses about exchange rate elasticities of commodities classified by attribute*

Next, we consider whether particular commodity attributes provide any explanatory power for differences across the range of point estimates. We consider three commodity attributes according to which we classify the commodities (industries). We consider (1) whether the commodity is produced in an industry that incurs high or low fixed costs, (2) the market structure of the industry in which the commodity is produced, and (3) the durability of the commodity.

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[6] The use of the level of the real exchange rate instead of its first-difference is justified based on recent findings that the real yen/dollar exchange rate (and many others) are stationary. See Froot and Rogoff (1996). Since our study does not focus on the coefficient estimates of the expenditure variable, we are agnostic on whether the series is stationary or nonstationary.

[7] Division 3 -- mineral fuels, lubricants, and related materials -- is excluded from the analysis. This division includes petroleum and petroleum products, gas -- natural and manufactured, and coal, coke, and briquettes. Since traditional, theoretic trade models may be inappropriate in describing the behavior of these variables, they are excluded from the study. Most studies typically exclude oil-related products from their analysis.

The first classification is motivated by Dixit (1992) who develops a model of entry and exit when firms have large sunk costs and the real exchange rate changes. He finds that there is a band within which real exchange rate changes do not deter entry (when firms would more than cover their total costs) or exit (when firms may not be covering their variable costs). The band of inaction means that exports (which are imports of another country) of industries with high sunk costs may not be as responsive to exchange rate changes as the exports of industries with low sunk costs. Uncertainty about the future value of the exchange rate coupled with sunk costs creates the band of inaction. Based on Dixit's model, we hypothesize that the exports of firms with high fixed costs will be less elastic to the real exchange rate than firms with low fixed costs. Exporting firms with high fixed costs may be less willing to exit the market in the face of exchange rate movements given uncertainty about future changes as well as the cost of shutting down and then re-entering the market.

We classified industries by high and low fixed costs based on the percentage of total assets that are fixed for each industry. Data are taken from Sutton (1991) and information from the 1992 Census of Manufactures' General Summary and is available only for the U.S. However, we assume that the categorization of Japanese industries would be similar to that of the U.S. Using this criteria, we classify twelve industries as high fixed cost and forty-six as low fixed cost industries. In most cases, the classifications would be considered conventional. For example, aircraft, automobiles, and computers show up as industries with high fixed costs.

The second classification is motivated by Baldwin (1989) who develops a model of importing where the market structure is monopolistically competitive. Baldwin claims that in imperfectly competitive markets, competition between domestic and foreign producers leads to incomplete pass through. In this way, exporters may be less likely to lose customers when the customers' currency depreciates. Baldwin's theory thus suggests that in imperfectly competitive markets, exports are less likely to be sensitive to changes in the real exchange rate. Dornbusch (1987) has also identified competitive market conditions as a determinant of the extent of pass-through. Baldwin's theory does not establish whether exchange rate pass-through will be more complete in oligopolistic industries than in monopolistically competitive industries. However, an implicit assumption is that exchange rate pass-through will be complete in perfectly competitive markets and so we hypothesize that the elasticity of exports will be higher the more competitive is the market structure. Baldwin's theory pertains to the nominal exchange rate.

We classified the market structure of U.S. exports to Japan using the concentration ratios reported in the U.S. Census of Manufactures, 1992. We used a four-firm concentration ratio of greater than 40 percent to define an industry as oligopolistic. Based on our classification, for exports, ten industries are classified as oligopolistic and forty-eight as monopolistically competitive. No industries were classified as monopolies since a degree of competition is always present in an international setting. For U.S. imports from Japan, we classified ten industries as perfectly competitive based on information published by the Ministry of Agriculture, Forestry, and Fisheries. We classified the remaining forty-eight industries as oligopolistic according to *Market Share in Japan*, 1993 which classifies industries by market oligopoly shares (concentration ratios). We also take some liberty in categorizing industries based on convention. It is not surprising that practically all the industries of Japan that we consider are oligopolistic given the well-known *keirestu* relationships under which Japanese businesses operate.

The third classification is based on Burda and Gerlach (1992) who develop a model in which exchange rate overvaluation is expected to worsen the trade balance in durables more than in nondurables. The different elasticities for durables and nondurables stem from the role intertemporal prices play in durable goods consumption absent in nondurable goods consumption. Burda and Gerlach argue that the user cost, not the purchase price, is more relevant for durable goods and that temporary changes in the real exchange rate should have a larger effect on trade in durables than on nondurables. For example, a real exchange rate appreciation today (or expected future depreciation) would be expected to have more of an impact on durables goods than on nondurable goods since the user cost (rather than the purchase price) will be lower today. Burda and Gerlach empirically estimate the effects of current prices and intertemporal prices on the U.S. trade balance in durables and nondurables and on U.S. imports of durables and nondurables. They find evidence that intertemporal prices are significant for explaining the behavior of durables but not significant for nondurables. We extend Burda and Gerlach and hypothesize that the elasticity of durable goods with respect to the exchange rate will be higher than for nondurable goods.

We use the breakdown in the U.S. Department of Commerce's National Income and Product Accounts, *Survey of Current Business, 1995* to define commodities as either durable or nondurable. Burda and Gerlach (1992) follow the same convention. Using this convention, nineteen commodities were classified as durable and the remaining thirty-nine as nondurable.

We also hypothesize that the exchange rate elasiticities for U.S. exports to Japan and for Japanese exports to the U.S. will be smaller in absolute value since the dollar appreciation era. The sustained dollar appreciation may have caused U.S. exporters to not only exit the market but to have become more hesitant about re-entry. This would suggest that since the dollar appreciation, U.S. exports will be less responsive to the exchange rate than before. On the other hand, Japanese exporters may have developed a foothold in the U.S. market during the dollar appreciation era that they have not been willing to forego despite the dollar depreciation. This would suggest that since the dollar appreciation, U.S. imports from Japan will be less responsive to the exchange rate. The hypothesized change in the exchange rate elasticity would be evidence of hysteresis in U.S. exports and U.S. imports.

Before turning to the empirical estimation, in Table 9, we present as information, a comparison of the commodity/industry characteristics of the top contributors[8] to 50 percent of U.S. exports to Japan and U.S. imports from Japan for 1978 and 1996. The table shows that based on the classification of commodities that we use, the composition of U.S. exports to Japan has shifted from predominantly low fixed cost, monopolistically competitive, nondurable commodities to a more balanced mixed of commodities whether they are classified as low or high fixed cost, monopolistically competitive or oligopolistic, or durable versus nondurable. However, for U.S. imports from Japan, there has been no shift at all. In 1978, the top contributors to U.S. imports from Japan were all classified as either high fixed cost commodities, commodities from an oligopolistic market structure, or as durable goods. By 1996, all of the top imports from Japan fell into the same classification.

iii. *How different are exchange rate elasticities of commodities classified by attribute?*

Tables 10, 11, and 12 report the real exchange rate elasticities (as the sum of eight lags of the coefficients estimated on the exchange rate) from equation (1) along with the associated p-values for classifications of the data by fixed cost, market structure, and durability of good for three different sample periods.[9] Note that the nominal exchange rate is used to test Baldwin's theory. The three different sample periods that we consider are the full sample period of 1979:I - 1996:III, and the two subsamples split at 1985:1 which divide the

[8] The top contributors are disaggregated at the three-digit *SITC* level. For example, we classify industries in Table 4 as high or low fixed cost, as monopolistically competitive or oligopolistic, and as durable or nondurable. The results of this classification are then reported in Table 9.

[9] Data for all j industries classified with a particular attribute are summed up for each time series observation to eliminate the influence of cross-sectional variation on the coefficient estimates where comparisons are made across the sample period. While we considered estimating a fixed effects model, the number of industry

yen/dollar movement into a period of sustained appreciation and sustained depreciation coupled with foreign exchange intervention. The p-values for tests for differences in the exchange rate elasticities across the two subsamples are also reported.

Results for the case of high versus low fixed costs industries are presented in Table 10. In all three time periods, the sum of the estimated coefficients on the lags of the real exchange rate (hereafter referred to as the "exchange rate elasticity") for high fixed cost exports is significant at the 6.3 percent level for the full sample period and has the predicted sign. For the subsamples, the elasticities are not significantly different from zero. However, for the dollar appreciation era, the elasticity has the predicted sign. For low fixed cost exports, the exchange rate elasticity has the predicted sign and is significant at better than the 5 percent level but only for the full sample period.

For the case of imports, the elasticity for high fixed cost imports is significant at the 6.5 percent level for the full sample period and has the predicted sign. For the subsamples, the elasticities are not significantly different from zero and only for the dollar depreciation era is the exchange rate elasticity correctly signed.

The tests for a structural break between the dollar appreciation and dollar depreciation eras is significant for high fixed cost exports and for high fixed costs imports. However, the structural break may be picking up the perverse sign change across the two sample periods. Thus, there is no evidence to support hysteresis.

A look at the point estimates of the exchange rate elasticities also shows that the hypothesis that high fixed cost commodities should have a smaller (in absolute value) exchange rate elasticity than low fixed costs commodities is supported but only for the full sample period. Table 10 presents the results of tests for whether the elasticity of high fixed costs exports (imports) is equal to the elasticity for low fixed costs exports (imports) for each of the three sample periods. The p-values in Table 10 show three cases in which the elasticities are significantly different from each other but only for the full sample period do the elasticities across the commodity characteristics have the predicted relationship.

Table 11 presents the results for industries classified by market structure and reveals that there is some evidence that market structure matters.[10] For all three sample periods, the nominal exchange rate elasticity for monopolistically competitive exports and oligopoly

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dummies would have substantially reduced the degrees of freedom.

[10]A comparison of the commodities classified by fixed cost and market structure is very similar. All industries but three classified as high fixed cost are also characterized as oligopolistic. Only one industry classified as low fixed cost (tobacco and tobacco manufactures) is classified as oligopolistic.

exports are of the predicted sign. In the full sample period both monopolistically competitive exports and oligopoly exports are significantly different from zero at better than the 5 percent level. For the dollar depreciation era, the elasticity of monopolistically competitive exports is significantly different from zero. For oligopolistic exports, the nominal exchange rate elasticity is significant at the 6.4 percent level for the dollar depreciation period. Stronger results hold for the dollar appreciation era. For the dollar depreciation era, the elasticity for oligopolistic exports does not have the predicted sign and is not significantly different from zero.

For the case of imports, the elasticity for perfectly competitive imports has the predicted sign and is significant at the 5 percent level for the full sample period and for the dollar depreciation era. For the dollar appreciation era, the elasticity is not significantly different from zero and is not of the predicted sign. The elasticity for oligopolistic imports has the predicted sign only for the full sample period but is not significantly different from zero. For both the dollar appreciation and depreciation eras, the elasticity for oligopolistic imports does not have the predicted sign but is significant in the dollar appreciation era.

The tests for a structural break between the dollar appreciation and dollar depreciation eras are significant for monopolistically competitive exports and for oligopolistic exports at better than the 5 percent level. There is some evidence of hysteresis as the elasticity for oligopoly exports in the appreciation era is greater than the elasticity for oligopoly exports in the depreciation era. There is no evidence that hysteresis is supported for monopolistically competitive exports. For imports, the test of a structural break is significant for oligopoly imports. However, the structural break may be picking up the perverse sign change across the two sample periods. Thus, there is no evidence to support hysteresis.

A look at the point estimates of the nominal exchange rate elasticities shows that the exchange rate elasticity for oligopolistic exports is smaller in absolute value than for monopolistically competitive exports as predicted in the full sample period. The p-value in Table 11 also shows that the elasticities of monopolistically competitive exports and oligopolistic exports are not significantly different from each other in the full sample period. There is one other case in which the elasticities across commodity attributes within a sample period are significantly different from each other. The cases arise when comparing the elasticity of monopolistically competitive exports to the elasticity of oligopolistic exports for the dollar depreciation era. The elasticities of monopolistically competitive exports and oligopoly exports are significantly different from each other at the 10.4 percent level in the dollar depreciation era. There is no case where perfectly competitive imports and oligopoly imports are significantly different from each other.

Table 12 presents the results for commodities classified by durability. The exchange rate elasticity for durable exports is significantly different from zero at the 5 percent level and has the predicted sign for the full sample period. However, for the subsamples, the elasticity is not significantly different from zero and is incorrectly signed for the dollar depreciation era. The elasticity for nondurable exports has the predicted sign and is significantly different from zero at the 5 percent level for the full sample period and for the dollar depreciation era. For the dollar appreciation era, the elasticity does not have the predicted sign.

For the case of imports, the exchange rate elasticity is significantly different from zero at the 7.1 percent level for durable imports for the full sample period but is not significant for nondurables. The elasticities of durable and nondurable imports for both the dollar appreciation and dollar depreciation eras do not have the predicted sign. However, during the dollar appreciation era, the elasticities for durable and nondurables imports are significant at the 7.3 percent level or better.

The tests for a structural break between the dollar appreciation and dollar depreciation eras is significant in all cases except for nondurable imports. For nondurable exports, the point estimates support hysteresis since the estimated elasticity is smaller in absolute value during the dollar depreciation era.   However, hysteresis in durable exports and durable imports is not supported despite evidence of a structural break for durable exports and durable imports. This happens because the perverse sign changes on the elasticities make it difficult to interpret evidence of a structural break as evidence of hysteresis.

Table 12 also shows that a test of whether the exchange rate elasticity of durable goods exports is different from the elasticity of nondurable goods exports for each sample period is significant in a few instances. For the full sample period, the elasticity of durable exports is significantly different from the elasticity of nondurable exports at the 7.8 percent level. However, the point estimates do not support the theory that the elasticity of durable commodities would be greater than of nondurable commodities. For the dollar depreciation era, the elasticity on durable exports is significantly different than for nondurables exports. However, the significant difference probably arises because of the perverse differences in the signs of the elasticities. For the dollar appreciation era, the elasticity on durable and nondurable imports are significantly different from each other. However, neither of the elasticities has the predicted sign.

Finally, we decided to disaggregate durable goods into consumer durables, industrial durables, capital goods, and automobiles as is done in the *Survey of Current Business*. Across these commodities, expenditure decisions by households and businesses may be sufficiently different given their different commodity characteristics to justify their disaggregation and to conduct a comparison of their elasticities. We hypothesize that an increased degree of the durability of the commodity will correspond to a higher exchange rate elasticity. This is an ad hoc extension of Burda and Gerlach's (1992) paper. We consider a spectrum of durability across which we classify durable commodities. We hypothesize that more durable commodities will have higher exchange rate elasticities. We assume that capital goods are the most durable, followed by industrial durables, followed by automobiles, followed by consumer durables. Capital goods include items such as engines and machinery and scientific instruments. Industrial durables include items such as cork, metal, and paper pulp. Consumer durables include items like TVs, VCRs, home appliances, etc.

Table 13 reports the results of the elasticities for durable exports and durable imports within these commodity classifications for three different sample periods. Also reported are the p-values corresponding to the test for a structural break at the peak of the dollar appreciation in 1985:I and the p-values for pair-wise tests of significant differences across the elasticities.

Table 13 shows that for the full sample period, the elasticities of all export classifications has the predicted sign. However, only the elasticities on consumer durables and capital goods is significant at better than the 5 percent level. For the subsamples, none of the export elasticities are significantly different from zero and in several cases, the elasticities do not have the predicted sign. For imports, the elasticities on consumer durables and automobiles are significantly different from zero and have the predicted sign. The elasticities on industrial durables and capital goods do not have the predicted sign but are not significantly different from zero. For the subsamples, none of the import elasticities are significantly different from zero and in several instances, the elasticities do not have the predicted sign.

The tests for a structural break show that there are three cases for which the elasticities are different from each other across the dollar appreciation and dollar depreciation eras. For exports, there is evidence of a structural break for industrial durables. However, the perverse sign change makes it difficult to interpret this as evidence of hysteresis. The same is true of exports of automobiles and imports of industrial durables.

Table 13 provides some evidence that the exchange rate elasticities for consumer durables, industrial durables, capital goods, and automobiles are significantly different from each other. For the full sample period, the elasticity of industrial durables is significantly different from the elasticity of consumer durables and from the elasticity of capital goods. A look at the point estimates shows that the predicted relationship between the elasticity of consumer durables and industrial durables holds since the elasticity for industrial durables (the relatively more durable commodity) is higher in absolute value than the elasticity of consumer durables. However, the ad hoc hypothesis about the relationship of the elasticities between industrial durables and capital goods is not supported. For the dollar appreciation era, the elasticity of automobiles is significantly different from consumer durables, industrial durables, and capital goods. However, a comparison of the elasticities shows that only is the predicted relationship between the elasticity of automobiles and consumer durables upheld. For the dollar depreciation era, none of the elasticities show up as significantly different from each other.

Unfortunately, the perverse signs on the elasticities of some of the commodities interfere with better substantiating the ad hoc relationship about the degree of durability and the exchange rate elasticity.

III. Conclusions and Directions for Future Research

The U.S. has had a merchandise trade deficit with Japan for over twenty years despite substantial variations in the yen/dollar exchange rate in both real and nominal terms. Over that time, there have been substantial changes in the composition of the top contributors to U.S. exports to Japan with much less pronounced changes in the composition of the top contributors to U.S. imports from Japan. Until now, these compositional changes have been largely unreported in the academic literature, probably because of data inaccessibility. However, numerous testable hypotheses based on commodity attributes about exports and imports have emerged. We use a new data set on U.S.-Japanese trade that contains data disaggregated to the three-digit *SITC* level of detail for 1978-96. The panel data set affords the opportunity to test some of the newer hypotheses about the relationship between trade and exchange rates and also to assess whether or not foreign exchange intervention to depreciate the dollar against the yen can be expected to improve the U.S. trade deficit with Japan. We found some evidence that commodity attributes map into predictable exchange rate elasticities although the findings are not uniformly supported across the dollar appreciation era and the dollar depreciation era. There is some evidence that supports the hypothesis of hysteresis in exports and imports since some exchange rate elasticities appear to be smaller after the dollar appreciation than before it. We also found that only nineteen of 58 exports would increase in response to a real depreciation of the dollar over two years. In 1995, these nineteen exports accounted for 34 percent of total U.S. exports to Japan. For imports, we found that sixteen of 58 imports would decline in response to a real depreciation of the dollar over two years. In 1996, these sixteen imports accounted for 27 percent of total U.S. imports from Japan. However, of the nineteen exports, twelve of the elasticity estimates were less than 1 (in absolute value). Of the sixteen imports, twelve were less than 1. Thus, if policymakers desire to promote adjustment in the U.S. merchandise trade imbalance with Japan through a dollar depreciation, the depreciation will need to be rather sizable and may need to be used in concert with other trade adjustment mechanisms.

Despite the weak empirical evidence on exchange rate elasticities of commodities classified by attribute, the richness of the data set has enabled us to uncover, we believe, noteworthy changes in U.S. exports to Japan and U.S. imports from Japan. The data analysis we undertook in the study, we hope will inform our audience about the nature and economic profile of trade between the U.S. and Japan and that it will provide the basis for further theoretical and applied research.

There are several directions in which we will continue to work. First, we will examine hysteresis more carefully by using the approach taken in Parsley and Wei (1993) who find little evidence to support it for U.S. chemical imports from Canada and for U.S. imports from Japan for five different commodities. Their data set covers 1975-87. Second, we will classify commodities according to several other attributes and conduct cross-attribute comparisons of exchange rate elasticities. For example, we could classify commodities according to whether they are for end use by household or producer (or both). Or, we could classify commodities according to the type of trade policy directed at them. We could also conduct cross-attribute comparisons of income elasticities as well. Thirdly, we may use the data set to conduct case studies of particular industries.

TABLE 1 U.S.-Japan Exports and Imports by One-Digit Section (expressed as a percent of total U.S. exports/imports) and U.S.-Japan Trade Balance by One-Digit Section (in billions of dollars)

U.S.-JAPAN EXPORTS AND IMPORTS BY ONE-DIGIT SECTION												
One-Digit SITC	1978-1980			1981-1985			1986-1991			1992-1996		
	% export	% import	Trade Balance	% export	% import	Trade Balance	% export	% import	Trade Balance	% export	% import	Trade Balance
Section 0: Food and Live Animals	21.63	0.93	**$6.17**	19.83	0.71	**$5.26**	16.38	0.38	**$6.30**	16.99	0.27	**$7.84**
Section 1: Beverages and Tobacco	1.66	0.03	**0.41**	1.88	0.04	**0.51**	2.99	0.05	**1.22**	3.68	0.04	**1.78**
Section 2: Crude Materials, Inedible, Except Fuels	25.19	0.23	**8.20**	17.48	0.17	**5.40**	14.29	0.19	**5.70**	9.36	0.16	**5.40**
Section 3: Mineral Fuels, Lubricants and Related Materials	7.27	0.21	**2.10**	9.44	0.08	**2.70**	3.37	0.19	**1.30**	1.11	0.17	**0.82**
Section 4: Animal and Vegetable Oils, Fats, and Waxes	0.48	0.02	**0.13**	0.33	0.01	**0.09**	0.28	0.03	**0.04**	0.17	0.01	**0.07**
Section 5: Chemicals and Related Products	9.39	2.14	**1.30**	11.87	2.13	**2.10**	12.57	2.46	**1.50**	9.64	3.29	**0.89**
Section 6: Manufactured Goods Classified Chiefly by Material	4.66	19.71	**-7.80**	4.92	14.71	**-7.10**	6.01	8.05	**-4.40**	4.98	6.47	**-3.20**
Section 7: Machinery and Transport Equipment	17.64	66.05	**-26.73**	22.11	74.21	**-39.10**	27.31	80.85	**-62.77**	32.87	78.22	**-61.83**
Section 8: Miscellaneous Manufactured Articles	6.60	8.31	**-2.70**	6.72	7.50	**-3.70**	10.80	7.78	**-4.40**	12.65	8.08	**-3.50**
Overall U.S.-Japan Trade Balance	**-18.92**			**-33.84**			**-55.51**			**-51.73**		

TABLE 2 Top Three-digit SITC Subgroups Accounting for Over 50 % of Total U.S. Exports to Japan

YEAR	# of SITC codes totaling 50% of exports	SITC Codes
1978	14	222 247 044 322 792 041 263 011 000 211 874 282 045 121
1979	15	247 044 222 322 792 041 263 874 011 211 282 752 541 248 045
1980	14	044 322 247 222 792 041 684 263 045 288 874 011 752 246
1981	15	044 322 792 222 247 041 263 011 874 541 045 684 752 759 524
1982	15	322 044 222 792 247 041 011 263 541 334 874 524 759 684 752
1983	15	044 792 222 322 247 041 011 334 541 874 263 752 759 524 341
1984	16	044 222 792 322 247 263 524 752 759 874 334 541 011 041 776 728
1985	16	792 044 222 322 752 759 247 334 874 541 524 011 034 041 776 263
1986	22	792 044 222 247 011 752 759 524 541 034 874 322 334 776 041 251 057 714 641 211 764 288
1987	18	792 247 044 759 011 752 222 874 034 541 776 251 524 334 122 322 248 057
1988	19	792 044 752 011 247 759 034 874 222 776 541 251 684 122 322 288 764 248 714
1989	21	792 752 247 044 759 776 874 034 896 684 251 011 222 122 764 525 248 541 321 288 012
1990	19	792 752 247 044 896 759 776 122 034 874 684 011 781 764 222 251 525 248 714
1991	21	792 752 759 776 044 247 122 874 034 684 764 222 011 525 781 251 012 248 714 541 728
1992	19	792 752 759 034 247 776 044 122 874 011 222 781 764 012 525 684 251 248 714
1993	20	792 247 752 776 044 759 034 122 874 011 781 764 222 012 525 248 081 784 898 714
1994	19	792 776 752 781 247 759 122 874 764 044 011 034 222 012 248 525 898 728 784
1995	18	776 781 792 752 764 759 044 874 247 011 122 034 012 728 222 251 641 784
1996	17	776 752 792 781 044 759 764 874 247 122 011 012 034 728 222 784 872

TABLE 3 Top Three-digit SITC Subgroups Accounting for Over 50 % of Total U.S. Imports from Japan

YEAR	# of SITC codes totaling 50% of imports	SITC Codes
1978	8	781 764 784 674 785 763 762 678
1979	8	781 674 784 764 785 763 678 751
1980	7	781 784 678 764 785 763 674
1981	6	781 678 764 782 763 785
1982	7	781 678 764 763 782 785 751
1983	7	781 763 764 782 751 776 759
1984	8	781 763 764 782 776 752 759 674
1985	7	781 763 764 782 784 759 752
1986	6	781 763 782 764 784 752
1987	7	781 782 764 763 784 759 752
1988	7	781 784 759 764 752 763 776
1989	7	781 752 764 784 776 759 763
1990	7	781 752 784 764 776 759 763
1991	6	781 752 764 784 776 759
1992	6	781 752 784 776 764 759
1993	6	781 752 776 784 764 759
1994	6	781 752 776 784 764 759
1995	6	781 776 752 784 759 764
1996	7	781 776 752 784 759 713 763

TABLE 4 Top Three-digit SITC Subgroups Accounting for Over 50 % of Total U.S. Exports to and Imports from Japan, 1996

1996	EXPORTS		IMPORTS	
	776 ‣ Thermionic, cold cathode, photocatmode valves etc	**6.40**	781 ‣ Motor cars and other motor vehicles	**17.44**
	752 ‣ Automatic data process machines and units thereof	**4.81**	776 ‣ Thermionic, cold cathode, photocatmode valves etc.	**8.18**
	792 ‣ Aircraft and associated equipment, spacecraft vehicles and parts	**4.29**	752 ‣ Automatic data process machines and units thereof	**8.02**
	781 ‣ Motor cars and other motor vehicles	**3.67**	784 ‣ Road vehicles, n.e.s.	**5.63**
	044 ‣ Maize (not including sweet corn) unmilled	**3.66**	759 ‣ Parts etc. for office machine and auto data process machine	**4.75**
	759 ‣ Parts etc. for office machine and auto data process machine	**3.41**	713 ‣ Internal combustion piston engines, and parts, n.e.s.	**4.55**
	764 ‣ Telecommunications equipment, n.e.s. and parts, n.e.s.	**3.27**	763 ‣ Sound recorders, tv recorders, recordings/ media unr	**3.05**
	874 ‣ Measuring/checking/analyzing and controlling instruments and apparatus n.e.s.	**3.18**		
	247 ‣ Wood in the rough or roughly squared	**2.51**		
	122 ‣ Tobacco, manufactured whether containing tobacco substitute	**2.33**		
	011 ‣ Meat of bovine animal, fresh, chilled, or frozen	**2.27**		
	012 ‣ Meat n.e.s. and edible offal, fresh, chilled, or frozen	**1.99**		
	034 ‣ Fish, fresh (live or dead), chilled or frozen	**1.96**		
	728 ‣ Machinery etc. specialized for particular industries n.e.s.	**1.95**		
	222 ‣ Oil seeds/oleaginous fruit for extra soft fixed vegetable oil	**1.72**		
	784 ‣ Road vehicles, n.e.s.	**1.60**		
	872 ‣ Instruments and apparatus, n.e.s., for medical, dental etc. purpose	**1.43**		

TABLE 5 **U.S.-Japan Exports and Imports Section 7 (expressed as a percent of total U.S. exports/imports)**

SECTION 7 MACHINERY AND TRANSPORTATION EQUIPMENT								
Two-Digit Divisions	1978-1980		1981-1985		1986-1991		1992-1996	
	% export	% import	% export	% import	% export	% import	% export	% import
Division 71: Power Generating Machinery and Equipment	1.28	1.93	2.08	2.01	1.90	3.30	2.04	4.68
Division 72: Machinery Specialized for Particular Industries	1.79	2.53	2.67	2.44	1.97	4.97	2.06	3.72
Division 73: Metal Working Machinery	0.48	1.56	0.42	3.95	0.68	2.55	0.64	1.71
Division 74: General Industrial Machinery and Equipment, n.e.s., and Machine Parts, n.e.s.	1.87	3.15	1.61	3.05	1.87	4.47	1.90	4.40
Division 75: Office Machines/ADP	2.95	3.77	4.81	7.01	7.00	11.23	7.46	14.75
Division 76: Telecommunications	0.22	11.52	0.20	14.19	0.25	11.71	0.27	7.91
Division 77: Electrical Machinery	3.02	5.29	3.70	6.77	5.00	8.96	7.57	13.21
Division 78: Road Vehicles	1.31	34.88	0.84	34.15	2.25	33.93	4.96	27.26
Division 79: Other Transport Equipment	4.73	0.43	5.77	0.64	6.58	0.56	5.95	0.56
Section 7: One-Digit	17.64	66.05	22.11	74.21	27.31	80.85	32.87	78.22
Section 7: Trade Balance	-$26.73		-$39.10		-$62.77		-$61.83	

TABLE 6 **U.S.-Japan Exports and Imports Section 7, division 76 (expressed as a percent of total U.S. exports/imports)**

SECTION 7 MACHINERY AND TRANSPORTATION EQUIPMENT								
Division 76: Telecommunications and Sound Recording and Reproducing Equipment	**1978-1980**		**1981-1985**		**1986-1991**		**1992-1996**	
	% export	**% import**	**% export**	**% import**	**% export**	**% import**	**% export**	**% import**
761 Television Receivers	0.01	1.26	0.01	0.81	0.03	0.39	0.03	0.25
762 Radio-broadcast Receivers	0.01	2.43	0.01	2.00	0.02	1.78	0.06	0.77
763 Sound Recorders	0.10	3.38	0.09	5.84	0.10	4.33	0.09	2.39
764 Telecommunication Equipment	0.10	4.45	0.09	5.54	0.10	5.21	0.09	4.50
Division 76: Two-Digit	0.22	11.52	0.20	14.19	0.25	11.71	0.27	7.91
Section 7: One-Digit	17.64	66.05	22.11	74.21	27.31	80.85	32.87	78.22

TABLE 7 U.S.-Japan Exports and Imports Section 7, division 78 (expressed as a percent of total U.S. exports/imports)

SECTION 7 MACHINERY AND TRANSPORTATION EQUIPMENT								
Division 78: Road Vehicles	1978-1980		1981-1985		1986-1991		1992-1996	
	% export	% import	% export	% import	% export	% import	% export	% import
781 Motor Cars and Other Motor Vehicles	0.72	25.18	0.18	25.23	1.01	23.59	3.26	19.50
782 Motor Vehicles for Transport of Goods and Special Purchase Vehicles	0.07	1.10	0.05	4.41	0.08	3.59	0.15	1.20
783 Parts and Accessories of Motor Vehicles, etc.	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00
784 Road Vehicles, n.e.s.	0.44	4.78	0.54	2.11	0.84	5.09	1.32	5.70
785 Motorcycles and Cycles, Motorized and not Motorized	0.07	3.82	0.06	2.40	0.13	0.81	0.18	0.85
786 Trailers and Semi-trailers, Other Vehicles not Mechanically Propelled	0.01	0.00	0.01	0.00	0.18	0.85	0.04	0.01
Division 78: Two-Digit	1.31	34.88	0.84	34.15	2.25	33.93	4.96	27.26
Section 7: One-Digit	17.64	66.05	22.11	74.21	27.31	80.85	32.87	78.22

TABLE 8 U.S. Exports to and Imports from Japan sum of Coefficient on the Real Exchange Rate at the Two-Digit Level

EXPORTS			IMPORTS		
Commodity	*Sum of coefficient on the real exchange rate*	*p-value*	*commodity*	*Sum of coefficient on the real exchange rate*	*p-value*
X00	-1.30053	[0.133]	*M00*	-0.637834	[0.758]
X01	**-1.40374**	**[0.027]**	*M01*	-0.964197	[0.226]
X02	-0.276620	[0.549]	***M02***	**-3.30123**	**[0.013]**
X03	-0.917090	[0.356]	***M03***	**0.707947**	**[0.009]**
X04	**-0.673083**	**[0.004]**	***M04***	**0.554977**	**[0.040]**
X05	**-0.834731**	**[0.001]**	*M05*	0.259253	[0.386]
X06	**-0.874494**	**[0.000]**	***M06***	**1.03528**	**[0.001]**
X07	-0.529803	[0.231]	*M07*	0.416601	[0.310]
X08	**-0.727644**	**[0.020]**	*M08*	-0.328350	[0.560]
X09	**-1.51542**	**[0.001]**	***M09***	**0.886014**	**[0.008]**
X11	-1.06660	[0.117]	*M11*	0.882846	[0.006]
X12	0.012495	[0.992]	*M12*	1.06608	[0.353]
X21	0.490808	[0.282]	*M21*	1.51676	[0.352]
X22	**-0.734458**	**[0.037]**	*M22*	0.698952	[0.209]
X22	-0.322012	[0.192]	*M22*	0.000248	[0.999]
X24	-0.433351	[0.116]	*M24*	-0.109837	[0.936]
X25	-0.250491	[0.247]	*M25*	-2.92236	[0.120]
X26	-0.612699	[0.348]	***M26***	**0.549354**	**[0.022]**
X27	-0.348471	[0.088]	*M27*	0.525291	[0.211]
X28	0.077143	[0.813]	*M28*	-0.900778	[0.187]
X29	0.143751	[0.643]	*M29*	0.351026	[0.149]
X41	**-1.62511**	**[0.011]**	*M41*	0.023378	[0.968]
X42	**-1.72412**	**[0.004]**	*M42*	0.357723	[0.127]
X43	-0.330691	[0.556]	***M43***	**-1.98821**	**[0.043]**
X51	-0.298080	[0.145]	*M51*	0.180290	[0.895]
X52	0.799986	[0.073]	*M52*	-0.205991	[0.162]
X53	-0.305199	[0.162]	***M53***	**0.801789**	**[0.000]**
X54	-0.074211	[0.601]	*M54*	0.046258	[0.826]
X55	-0.281246	[0.302]	*M55*	0.440386	[0.129]
X56	0.277470	[0.601]	*M56*	-0.351823	[0.536]
X57	-0.517148	[0.773]	*M57*	-1.54749	[0.391]
X58	-0.123509	[0.677]	*M58*	0.252077	[0.081]
X59	-0.341037	[0.132]	***M59***	**-1.62864**	**[0.000]**
X61	0.475209	[0.436]	*M61*	0.197584	[0.629]
X62	-0.034332	[0.906]	*M62*	-0.042289	[0.732]
X63	**-1.11697**	**[0.000]**	*M63*	0.697643	[0.091]
X64	-0.337806	[0.097]	*M64*	0.304516	[0.092]
X65	-0.308275	[0.120]	***M65***	**0.517381**	**[0.001]**
X66	-0.045667	[0.834]	*M66*	0.072172	[0.611]
X67	**-0.932971**	**[0.027]**	*M67*	-0.0119807	[0.514]
X68	-0.384417	[0.306]	***M68***	**0.770658**	**[0.003]**
X69	**-0.277702**	**[0.035]**	*M69*	0.211914	[0.090]
X71	-0.352402	[0.250]	*M71*	0.0001389	[0.999]
X72	**-0.561234**	**[0.001]**	***M72***	**0.400403**	**[0.040]**
X73	-0.302483	[0.346]	*M73*	0.164057	[0.383]
X74	-0.288582	[0.107]	*M74*	0.062535	[0.438]
X75	-0.028849	[0.876]	*M75*	0.076820	[0.629]
X76	-0.413126	[0.060]	*M76*	0.423677	[0.065]
X77	**-0.343524**	**[0.004]**	*M77*	-0.081939	[0.440]
X78	**-0.745265**	**[0.023]**	***M78***	**0.448549**	**[0.002]**
X79	0.546405	[0.335]	*M79*	0.103480	[0.755]
X81	**-1.11290**	**[0.008]**	*M81*	-0.333763	[0.355]
X82	**-0.582811**	**[0.049]**	***M82***	**0.641705**	**[0.021]**
X84	**-1.63575**	**[0.008]**	*M84*	-1.10688	[0.707]
X85	0.262541	[0.412]	*M85*	0.654044	[0.157]
X87	**-0.504478**	**[0.003]**	***M87***	**0.194938**	**[0.051]**
X88	-0.176586	[0.264]	*M88*	0.064340	[0.525]
X89	-0.273167	[0.290]	*M89*	0.270074	[0.287]

TABLE 9 Comparison by Attribute of Top Exports and Imports: 1978 versus 1996

Commodity Attribute	EXPORTS		IMPORTS	
	1978	1996	1978	1996
Low Fixed Cost	13	8	0	0
High Fixed Cost	1	8	8	7
Monopolistic Competition	12	7	0	0
Oligopoly	2	9	8	7
Nondurable	12	10	0	0
Durable	2	6	8	7

Note: In 1978, there were fourteen commodities (of two hundred seventy-five) that contributed to the top 50 percent of U.S. exports to Japan and eight commodities (of two hundred eighty-one) that contributed to the top 50 percent of U.S. imports from Japan. In 1996, there were sixteen commodities that contributed to the top 50 percent of U.S. exports to Japan and seven commodities that contributed to the top 50 percent of U.S. imports from Japan.

TABLE 10 U.S. Exports to and Imports from Japan Sum of the Coefficients on the Real Exchange Rate for High Fixed Cost versus Low Fixed Cost Industries, selected time periods

HIGH FIXED COST VERSUS LOW FIXED COST INDUSTRIES					
EXPORTS			**IMPORTS**		
Fixed cost	***Sum of coefficient on the real exchange rate***	***p-value***	***Fixed cost***	***Sum of coefficient on the real exchange rate***	***p-value***
1979:01 –1996:03					
High Fixed cost	-0.212480	[0.063]	***High Fixed cost***	0.617275	[0.065]
Low Fixed cost	-0.661048	**[0.001]***	***Low Fixed cost***	0.234023	[0.639]
1979:01 –1985:01					
High Fixed cost	-0.519512	[0.504]	***High Fixed cost***	-0.505698	[0.104]
Low Fixed cost	-0.281167	[0.987]	***Low Fixed cost***	-0.126790	**[0.000]***
1985:02 –1996:03					
High Fixed cost	0.204286	[0.517]	***High Fixed cost***	0.116958	[0.865]
Low Fixed cost	-0.411427	[0.304]	***Low Fixed cost***	-0.524937	[0.667]
STRUCTURAL BREAK PARAMETER TESTS					
p-value for test of sum of lags of real exchange rate on high fixed cost exports 1979:01-1985:01 = sum of lags of real exchange rate on high fixed cost exports 1985:02-1996:03		**[0.022]***	***p-value for test of sum of lags of real exchange rate on high fixed cost imports 1979:01-1985:01 = sum of lags of real exchange rate on high fixed cost imports 1985:02-1996:03***		**[0.000]***
p-value for test of sum of lags of real exchange rate on low fixed cost exports 1979:01-1985:01 = sum of lags of real exchange rate on low fixed cost exports 1985:02-1996:03		[0.339]	***p-value for test of sum of lags of real exchange rate on low fixed cost imports 1979:01-1985:01 = sum of lags of real exchange rate on low fixed cost imports 1985:02-1996:03***		[0.632]

HIGH FIXED COST VERSUS LOW FIXED COST INDUSTRIES		
1979:01-1996:03	**High Fixed Cost Exports**	**Low Fixed Cost Imports**
High Fixed Cost Imports	***Na***	[0.602]
Low Fixed Cost Exports	**[0.000]***	***Na***
1979:01 –1985:01	**High Fixed Cost Exports**	**Low Fixed Cost Imports**
High Fixed Cost Imports	***Na***	**[0.001]***
Low Fixed Cost Exports	[0.940]	***Na***
1985:02 –1996:03	**High Fixed Cost Exports**	**Low Fixed Cost Imports**
High Fixed Cost Imports	***Na***	[0.592]
Low Fixed Cost Exports	**[0.003]***	***Na***

TABLE 11 U.S. Exports to and Imports from Japan Sum of the Coefficients on the Nominal Exchange Rate for Different Market Structures, selected time periods

MARKET STRUCTURE					
U.S. EXPORTS TO JAPAN			**U.S. IMPORTS FROM JAPAN**		
Market Structure	***Sum of coefficient on the real exchange rate***	***p-value***	***Market Structure***	***Sum of coefficient on the real exchange rate***	***p-value***
1979:01 –1996:03					
Monopolistic Competition	-0.516469	**[0.000]***	***Perfect Competition***	0.710668	**[0.004]***
Oligopoly	-0.388278	**[0.053]***	***Oligopoly***	0.682914	[0.363]
1979:01 –1985:01					
Monopolistic Competition	-0.498281	[0.705]	***Perfect Competition***	-1.51696	[0.432]
Oligopoly	-1.85333	[0.408]	***Oligopoly***	-2.40730	**[0.024]***
1985:02 –1996:03					
Monopolistic Competition	-1.26720	**[0.000]***	***Perfect Competition***	1.00866	**[0.002]***
Oligopoly	-0.684136	[0.064]	***Oligopoly***	-0.871686	[0.561]
STRUCTURAL BREAK PARAMETER TESTS					
p-value for test of sum of lags of real exchange rate on monopolistically competitive exports 1979:01-1985:01 = sum of lags of real exchange rate on monopolistically competitive exports 1985:02-1996:03		**[0.002]***	***p-value for test of sum of lags of real exchange rate on perfectly competitive imports 1979:01-1985:01 = sum of lags of real exchange rate on perfectly competitive imports 1985:02-1996:03***		[0.306]
p-value for test of sum of lags of real exchange rate on oligopoly exports 1979:01-1985:01 = sum of lags of real exchange rate on oligopoly exports 1985:02-1996:03		**[0.006]***	***p-value for test of sum of lags of real exchange rate on oligopoly imports 1979:01-1985:01 = sum of lags of real exchange rate on oligopoly imports 1985:02-1996:03***		**[0.000]***

MARKET STRUCTURE		
1979:01-1996:03	***Monopolistic Competition Exports***	***Perfect Competition Imports***
Oligopoly Exports	[0.339]	***Na***
Oligopoly Imports	***Na***	[0.963]
1979:01 –1985:01	***Monopolistic Competition Exports***	***Perfect Competition Imports***
Oligopoly Exports	[0.403]	***Na***
Oligopoly Imports	***Na***	[0.397]
1985:02 –1996:03	***Monopolistic Competition Exports***	***Perfect Competition Imports***
Oligopoly Exports	[0.104]	***Na***
Oligopoly Imports	***Na***	[0.138]

Note: The number in brackets are p-values; an asterisk denotes significance at the 5 percent level.

TABLE 12 U.S. Exports to and Imports from Japan Sum of the Coefficients on the Real Exchange Rate for Durables versus Nondurables, selected time periods

DURABLE VERSUS NONDURABLE COMMODITIES					
EXPORTS			IMPORTS		
Commodity	*Sum of coefficient on the real exchange rate*	*p-value*	*Commodity*	*Sum of coefficient on the real exchange rate*	*p-value*
1979:01 –1996:03					
Durable Good	-0.270623	**[0.018]***	***Durable Good***	0.680544	[0.071]
Non-durable Good	-0.519117	**[0.000]***	***Non-durable Good***	0.233717	[0.639]
1979:01 –1985:01					
Durable Good	-0.503143	[0.545]	***Durable Good***	-0.571499	[0.073]
Non-durable Good	-0.55646	[0.966]	***Non-durable Good***	-0.505972	**[0.002]***
1985:02 –1996:03					
Durable Good	0.113786	[0.721]	***Durable Good***	-0.905056	[0.907]
Non-durable Good	-0.100070	**[0.000]***	***Non-durable Good***	-0.522308	[0.669]
STRUCTURAL BREAK PARAMETER TESTS					
p-value for test of sum of lags of real exchange rate on durable exports 1979:01-1985:01 = sum of lags of real exchange rate on durable exports 1985:02-1996:03		**[0.052]***	***p-value for test of sum of lags of real exchange rate on durable imports 1979:01-1985:01 = sum of lags of real exchange rate on durable imports 1985:02-1996:03***		**[0.000]***
p-value for test of sum of lags of real exchange rate on nondurable exports 1979:01-1985:01 = sum of lags of real exchange rate on nondurable exports 1985:02-1996:03		**[0.001]***	***p-value for test of sum of lags of real exchange rate on nondurable imports 1979:01-1985:01 = sum of lags of real exchange rate on nondurable imports 1985:02-1996:03***		[0.629]

DURABLE VERSUS NONDURABLE COMMODITIES		
1979:01-1996:03	***Durable Good Export***	***Non-durable good Import***
Durable Good Import	***Na***	[0.605]
Non-durable good Export	[0.078]	***Na***
1979:01 –1985:01	***Durable Good Export***	***Non-durable good Import***
Durable Good Import	***Na***	**[0.002]***
Non-durable good Export	[0.722]	***Na***
1985:02 –1996:03	***Durable Good Export***	***Non-durable good Import***
Durable Good Import	***Na***	[0.597]
Non-durable good Export	**[0.001]***	***Na***

TABLE 13 U.S. Exports to and Imports from Japan Sum of the Coefficients on the Real Exchange Rate for Disaggregated Durables, selected time periods

DURABLE COMMODITIES					
EXPORTS			**IMPORTS**		
Commodity	***Sum of coefficient on the real exchange rate***	***p-value***	***Commodity***	***Sum of coefficient on the real exchange rate***	***p-value***
1979:01 –1996:03					
Consumer Durables	-0.105810	**[0.016]***	***Consumer Durables***	0.416437	**[0.028]***
Industrial Durables	-0.234912	[0.234]	***Industrial Durables***	-0.121471	[0.749]
Capital Goods	-0.118917	**[0.003]***	***Capital Goods***	-0.138601	[0.107]
Automobiles	-0.930369	[0.275]	***Automobiles***	0.605029	**[0.004]***
1979:01 –1985:01					
Consumer Durables	-0.771808	[0.270]	***Consumer Durables***	-0.160552	**[0.031]***
Industrial Durables	0.751483	[0.681]	***Industrial Durables***	-0.209859	**[0.000]***
Capital Goods	0.34009	[0.880]	***Capital Goods***	-0.127730	**[0.051]***
Automobiles	-0.612339	[0.183]	***Automobiles***	-0.591253	[0.766]
1985:02 –1996:03					
Consumer Durables	0.602835	[0.629]	***Consumer Durables***	-0.357900	[0.320]
Industrial Durables	-0.607123	[0.169]	***Industrial Durables***	0.208289	[0.678]
Capital Goods	-0.112670	[0.429]	***Capital Goods***	-0.112961	[0.523]
Automobiles	0.368562	[0.870]	***Automobiles***	0.864289	[0.838]
STRUCTURAL BREAK PARAMETER TESTS					
p-value for test of sum of lags of real exchange rate on consumer durables exports 1979:01-1985:01 = sum of lags of real exchange rate on consumer durables exports 1985:02-1996:03		[0.183]	***p-value for test of sum of lags of real exchange rate on consumer durables imports 1979:01-1985:01 = sum of lags of real exchange rate on consumer durables imports 1985:02-1996:03***		[0.395]
p-value for test of sum of lags of real exchange rate on industrial durables exports 1979:01-1985:01 = sum of lags of real exchange rate on industrial durables exports 1985:02-1996:03		**[0.002]***	***p-value for test of sum of lags of real exchange rate on industrial durables imports 1979:01-1985:01 = sum of lags of real exchange rate on industrial durables imports 1985:02-1996:03***		**[0.000]***
p-value for test of sum of lags of real exchange rate on capital goods exports 1979:01-1985:01 = sum of lags of real exchange rate on capital goods exports 1985:02-1996:03		[0.301]	***p-value for test of sum of lags of real exchange rate on capital goods imports 1979:01-1985:01 = sum of lags of real exchange rate on capital goods imports 1985:02-1996:03***		[0.888]
p-value for test of sum of lags of real exchange rate on automobile exports 1979:01-1985:01 = sum of lags of real exchange rate on automobile exports 1985:02-1996:03		**[0.000]***	***p-value for test of sum of lags of real exchange rate on automobile imports 1979:01-1985:01 = sum of lags of real exchange rate on automobile imports 1985:02-1996:03***		[0.109]

TABLE 13 – continued from previous page

DURABLE COMMODITIES EXPORTS			
1979:01-1996:03	***Consumer Durables***	***Industrial Durables***	***Capital Goods***
Industrial Durables	**[0.046]***	***Na***	***Na***
Capital Goods	[0.523]	**[0.011]***	***Na***
Automobiles	[0.899]	[0.371]	[0.749]
1979:01 –1985:01	***Consumer Durables***	***Industrial Durables***	***Capital Goods***
Industrial Durables	**[0.002]***	***Na***	***Na***
Capital Goods	[0.232]	[0.372]	***Na***
Automobiles	**[0.048]***	**[0.002]***	**[0.008]***
1985:02 –1996:03	***Consumer Durables***	***Industrial Durables***	***Capital Goods***
Industrial Durables	[0.298]	***Na***	***Na***
Capital Goods	[0.590]	[0.658]	***Na***
Automobiles	[0.973]	[0.588]	[0.500]
DURABLE COMMODITIES IMPORTS			
1979:01-1996:03	***Consumer Durables***	***Industrial Durables***	***Capital Goods***
Industrial Durables	[0.110]	***Na***	***Na***
Capital Goods	[0.161]	[0.086]	***Na***
Automobiles	[0.548]	**[0.001]***	**[0.000]***
1979:01 –1985:01	***Consumer Durables***	***Industrial Durables***	***Capital Goods***
Industrial Durables	[0.110]	***Na***	***Na***
Capital Goods	[0.161]	**[0.005]***	***Na***
Automobiles	[0.485]	[0.130]	[0.555]
1985:02 –1996:03	***Consumer Durables***	***Industrial Durables***	***Capital Goods***
Industrial Durables	[0.207]	***Na***	***Na***
Capital Goods	[0.338]	[0.376]	***Na***
Automobiles	**[0.040]***	[0.803]	[0.411]

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