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Introduction

Exchange rate pass-through refers to the degree to which exchange rate changes are reflected in the destination-currency (local) prices of traded goods. Studies of pass-through commonly find that local currency prices do not respond fully to exchange rate changes. In their literature review Goldberg and Knetter (1997) concluded that the median rate of pass-through is approximately 50 percent for shipments to the United States. The rate of pass-through, however, varies both across and within industries, a point demonstrated recently by Yang (1997).

The present study explores two basic issues that have received limited attention. The issues—one focusing on the appropriate exchange rate index and the other focusing on whether appreciations and depreciations have different pass-through effects—raise the following questions. Are estimates of pass-through sensitive to the exchange rate index? If so, which index is best? Turning to the second issue the question is whether the estimates of pass-through are symmetric? That is, are estimates of pass-through associated with appreciations indistinguishable from those associated with depreciations?

Few studies have addressed the question of the appropriate exchange rate index. Because U.S. imports arrive from various destinations, the exchange rate measure used in most pass-through studies is an average foreign exchange value of the dollar relative to a group of other currencies.[1] Numerous trade-weighted exchange rate indexes for the U.S. dollar exist. Studies by Woo (1984) and Feinberg (1991) indicate that the choice of the exchange rate index is nontrivial. Different indexes generate different pass-through results.

Woo (1984), as part of a study examining the connection between exchange rate changes and the U.S. price level, concluded that foreign manufacturers price their products according to

U.S. demand and cost conditions with some adjustment for exchange rate changes. His estimate of the pass-through of exchange rate changes ranges from approximately 40 percent using an index produced by the Board of Governors of the Federal Reserve System to 70 percent using an exchange rate index based on import shares.[2]

Feinberg (1991) corroborated Woo's finding that different exchange rate measures yield different pass-through estimates. He examined pass-through to domestic producer prices using three exchange rate indexes – an index produced by the Board of Governors (the same one that was used by Woo); an index produced by the Federal Reserve Bank of Dallas (Dallas), and an industry specific exchange rate index.[3] Feinberg found that the industry specific index generated the lowest estimate of pass-through—a result contrary to Woo's finding using an index based on import shares—while the Dallas index generated the highest degree of pass-through.

Neither Woo nor Feinberg address systematically which exchange rate measure yields the best results. Making a definitive judgement is difficult because researchers lack knowledge about the true extent of pass-through. Feinberg argued that his industry-specific exchange rate index might best "proxy demand-side pressures on domestic prices (via import competition)" related to exchange rate changes. The Dallas index, he argued, might best measure the effects of changes in the prices of imported inputs on domestic prices. In the current study, we remain unable to identify a superior exchange rate measure; however, for the first time we compare systematically the informational content of exchange rate measures.

The Woo and Feinberg studies highlight the importance of the number of currencies included and the weighting scheme used in the construction of these trade-weighted exchange

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[1] See Coughlin and Pollard (1996) for a brief introduction to the construction of trade-weighted exchange rate indexes.
[2] In 1999 the Board of Governors discontinued their index, replacing it with other measures.
[3] The index produced by the Federal Reserve Bank of Dallas was also discontinued in 1999, but is similar to the Board of Governors' "Broad" index used in this paper.

rate indexes.[4] A recent development is the construction of these indexes by a chain approach. Coughlin, Pollard and Betts (1998) provide evidence suggesting that indexes based on a chain formula, which avoid problems associated with arbitrary choice of base years, generate measures of exchange rate changes differing from their Laspeyres and Paasche-based counterparts. Recently introduced exchange rate measures by the Board of Governors, which are constructed via chaining, are used in the present study.[5]

In addition to exploring the effects of different exchange rate indexes on pass-through estimates, we explore whether the price response to an appreciation at the industry level is identical to that of a depreciation.[6] Strategically, a firm is faced with different opportunities in these two cases and there is no certainty that the response will be symmetric.

Why might the price response be asymmetric? For a foreign firm exporting to the United States a dollar depreciation leaves the firm possessing some market power with undesirable choices – either decrease its markup of price over cost to maintain the dollar price of its product (no pass-through) or increase the dollar price to reflect the depreciation and likely lose some market share (complete pass-through) or some combination of both (partial pass-through).[7] If there is no pass-through, then the profits of the foreign firm fall as sales in the U.S. remain unchanged while the home-currency price of its product (sold in the U.S.) falls. With either complete or partial pass-through the effect on profits of the foreign firm is also negative. With complete pass-through the home-currency price of its product (sold in the U.S.) remains

[4] There are two noteworthy differences between the measures produced previously by the Board of Governors and the Federal Reserve Bank of Dallas. First, the number of currencies included differed – 10 for the Board of Governors' measure versus 101 for the Federal Reserve Bank of Dallas' measure. Second, the weighting scheme differed – the Board of Governors' measure was a Laspeyres-based index, while the Federal Reserve Bank of Dallas measure was a Paasche-based index.

[5] Details on the construction of these measures can be found in Leahy (1998).

[6] The general issue of asymmetric price response is likely to attract increased research effort due to recent findings by Peltzman (2000). In more than two of every three markets in his study, output prices were found to rise faster when input prices rose than they fell when input prices declined. Moreover, this phenomenon was found to persist.

unchanged, but the firm's U.S. sales decline, resulting in a fall in revenue and hence profit. The extent to which profits fall is determined by the elasticity of U.S. demand for the foreign product.[8] With partial pass-through both the home currency price of its product and U.S. sales falls, with the decline in profits again being determined by the elasticity of U.S. demand.

On the other hand, a dollar appreciation presents desirable options—the foreign firm can either increase markup by maintaining the dollar price (no pass-through) or decrease the dollar price in accordance with the appreciation hoping to increase market share (complete pass-through) or some combination of both. In the case of no pass-through, the home-currency price rises while U.S. sales are unaffected, raising the profits of the foreign firm. In the case of complete pass-through, the home-currency price remains constant while U.S. sales rise, again raising the profits of the foreign firm. If partial pass-through occurs, the home-currency price rises while U.S. sales rise, both resulting in an increase in profits. As in the case of a dollar depreciation, the extent of the change in the foreign firm's profits when pass-through occurs depends on the elasticity of U.S. demand.

The foreign firm's choices when the dollar appreciates, however, may be limited by particular circumstances. For example, Gil-Pareja (2000) and others have pointed out that the existence of binding quantity constraints, due to distribution capacity limitations or restrictions on import quantities, may limit price reductions and, thus, induce firms to increase their profit margins. The possibility of dumping complaints may also reduce a firm's willingness to reduce dollar prices when the dollar appreciates.[9] Thus, one might expect to see larger degrees of pass-through when the dollar depreciates than when it appreciates.

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[7] Admittedly, in many cases the foreign firm might have more choices. For example, Gron and Swenson (2000) stress that transplant production in the United States allows foreign automobile manufactures to substitute U.S. inputs for foreign inputs to reduce the cost-increasing effects of a dollar depreciation.

[8] In the extreme case of perfectly inelastic demand, the profits of the foreign firm are unaffected.

[9] A recent case in point is the dumping case brought by the U.S. steel industry following the sharp appreciation of the dollar relative to the East Asian currencies in the wake of the Asian financial crisis.

Empirical results on this issue are sparse and far from definitive. For example, comparing a period of dollar depreciation (1977:I – 1980:IV) with a period of dollar appreciation (1981:I – 1985:II), Mann (1986) found results for some products – footwear, textiles and apparel – suggesting that exchange rate changes were passed through more fully in the former period than the latter period. The difference in pass-through between price changes stemming from depreciation versus appreciation, however, was not statistically significant, a fact that Mann attributed to the short sample period.

Kreinin, Martin, and Sheehy (1987) also provide evidence suggesting the likely existence of asymmetry via an examination of two periods of large appreciations and two periods of large depreciations. Their results, using 4-digit SIC industries, indicate that industry characteristics affect the extent of pass-through. The coefficient estimates of the influence of specific characteristics appear to depend on the direction of the movement of the foreign exchange value of the dollar. These asymmetry results, however, were not subjected to statistical scrutiny. Moreover, the results do not yield information on whether dollar depreciations tend to generate larger or smaller pass-through effects than dollar appreciations.

Marston (1990) has produced stronger results concerning asymmetry. In a pricing-to-market study of Japanese manufacturers, primarily in the transportation and electrical machinery industries, he found statistical evidence of asymmetric pricing for 5 of 17 products. These five products were small passenger cars, small trucks, motorcycles, microwave ovens, and cameras. During periods when the yen appreciated, firms producing these products varied the relative price of export to domestic goods more than when the yen depreciated. Thus, from the perspective of the importer, Marston's results reveal larger degrees of pass-through when the importer's currency appreciates than when it depreciates.

More recently, two other studies have produced results on asymmetry consistent with Mann's (1986). Goldberg (1995), in simulations for the automobile industry, and Kadiyali (1997), in the photographic film industry, found that import prices increased relatively more in periods of dollar depreciations than they declined in dollar appreciations.

On the other hand, a small number of studies did not find statistical, or even suggestive, evidence in support of asymmetry. For example, Feinberg's (1989) results for various U.S. industries were consistent with symmetric pass-through in domestic prices; however, he highlighted the possibility that a longer sample period might yield a different result. In addition, Lawrence (1990) found that U.S. trade prices responded symmetrically to the dollar's appreciation and depreciation during the 1980s. Two other studies not focused on the United States also found virtually no support for asymmetry. Athukorala (1991) did not find any statistical support for asymmetry in export pricing by Korean manufacturers. Finally, using several European Union exporting countries and highly disaggregated product categories, Gil-Pareja (2000) found little evidence of asymmetry in the response of export prices to exchange rate changes.

Does the Exchange Rate Index Matter?

We use a model developed by Yang (1997) to determine the effects of the exchange rate choice on pass-through estimates. Changes in U.S. import prices (MP) for industry i in period t are determined by changes in the nominal trade-weighted dollar exchange rate index (TWEX); changes in the U.S. producer prices (PP) in industry i; and the previous period change in import prices in industry i.[10]

$$(1) \qquad \Delta \ln MP_{i,t} = \beta_{1,i} \Delta \ln TWEX_t + \beta_{2,i} \Delta \ln PP_{i,t} + \beta_{3,i} \Delta \ln MP_{i,t-1} + \varepsilon_{i,t}$$

An appreciation of the dollar, which is an increase in TWEX, lowers the dollar-equivalent price of foreign goods. If this reduction in price is passed-through (fully or partially) import prices will fall. A depreciation of the dollar, in contrast, raises the dollar-equivalent price of foreign goods and hence import prices, if pass-through occurs. As a result, it is expected that $-1 \leq \beta_{1,i} \leq 0 \ \forall i$, where $\beta_{1,i} = 0$ indicates no pass-through and $\beta_{1,i} = -1$ indicates complete pass-through.[11]

Importers may respond to market conditions in the United States, raising prices as U.S. domestic prices rise and vice versa, so that $\beta_{2,i} > 0$. The inclusion of the lagged dependent variable in the regression is used to pick up persistence in import prices, so $\beta_{3,i} > 0$ is expected.

Data

The import price data cover 87 SIC industries (51 three-digit and 36 four-digit SIC industries). The producer price series are also based on SIC classifications, although exact matches with the import price series were not always available.[12] Both the import price and producer price series are from the U.S. Bureau of Labor Statistics.[13] All data are quarterly and the full sample period extends from the fourth quarter of 1980 through the first quarter of 1992, with some industries having shorter sample periods.

The exchange rate index used by Yang was the J.P. Morgan nominal effective dollar index. It tracked the value of the dollar relative to 15 other currencies.[14] We consider two other

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[10] Theoretically a case exists for using real rather than nominal TWEXs. Such a change, however, does not alter our basic findings concerning either the choice of index or asymmetry.

[11] Yang uses the reciprocal of the exchange rate index in his regression and so the expected sign of his pass-through estimates is positive.

[12] See Yang (1997) for a discussion of the procedure used to match the import price and producer price series.

[13] Some of the producer prices data used by Yang were obtained from Citibase.

[14] The countries whose currencies are in the Morgan index are: Australia, Austria, Belgium, Canada, Denmark, France, Germany, Italy, Japan, Netherlands, Norway, Spain, Sweden, Switzerland and the United Kingdom. Although the index produced by J.P. Morgan has been revised (new currencies were added and the weighting scheme changed), for consistency with Yang's results we use the old version of the index.

trade-weighted exchange rate indexes, both produced by the Board of Governors of the Federal Reserve System. The weight given to each currency in the Morgan index is based on bilateral U.S. exports and imports of manufactured goods. The Major and Broad indexes use bilateral U.S. exports and imports of goods and services and incorporate third country trade. In addition, unlike the Morgan index where the weights are fixed, both of these indexes are chain-weighted. The first of the Board of Governors indexes, the major currency index (Major) calculates the value of the dollar relative to 16 other currencies.[15] The second of these indexes, the broad currency index (Broad) calculates the value of the dollar relative to 35 other currencies.[16]

Results

To determine the effect of the exchange rate index choice on the pass-through estimates, we first replicated Yang's regression results using the Morgan index and equation (1). Then, we re-estimated equation (1) first using the Major and then the Broad exchange rate indexes.

In general we find that $-1 \leq \beta_{1,i} \leq 0$ regardless of the index chosen. In all of the industries in which $\beta_{1,i} > 0$, the coefficients were not statistically significant. In two industries – industrial inorganic chemicals (SIC 281) and special industry machinery (SIC 355) – $\beta_{1,i} < -1$ when the Broad index was used, indicating that pass-through was more than complete (see appendix tables A1a and A1b). In both of these cases the results were statistically significant.

[15] The countries whose currencies are in the Major index are the same as those in the Morgan index except the Major index adds Finland, Ireland and Portugal and deletes Denmark and Norway. With the introduction of the euro in January 1999, this index now calculates the value of the dollar relative to 7 other currencies.

[16] The Broad index includes the currencies in the Major index, plus those of Argentina, Brazil, Chile, China, Colombia, Hong Kong, India, Indonesia, Israel, Korea, Malaysia, Mexico, the Philippines, Russia, Saudi Arabia, Singapore, Taiwan, Thailand and Venezuela. With the introduction of the euro, this index is now based on 26 currencies.

From the 87 industries included in his study, Yang created a nonoverlapping sample of 64 SIC industries (41 three-digit and 23 four-digit).[17] To ease the presentation of the results, these industries are then grouped by their two-digit SIC code. Table 1 shows the unweighted average pass-through across industries for each of the three exchange rate indexes in both the short and long-run.[18] The long-run estimates are given by $\beta_{1,i} /(1 - \beta_{3,i})$. Following Yang, the industries used in calculating the 2-digit and overall averages include only those industries in the nonoverlapping sample for which the pass-through elasticity had the expected sign. Thus, the 64-industry overlapping sample was reduced to 56 industries.[19]

As Table 1 indicates, Yang's finding that the degree of pass-through varies across industries is robust to the exchange rate index chosen. However, the pass-through estimates are sensitive to the choice of the exchange rate index. In general pass-through estimates using the Morgan index are lower than those using either the Major or Broad indexes. In none of the industry groupings listed in Table 1 does the Morgan index show the highest degree of pass-through either in the short or long-run. Moreover, in only seven out of the 87 full-sample of industries is the estimate of short-run pass-through highest using the Morgan index, and none of these seven estimates are statistically significant (see the appendix tables A1a and A1b). Turning to the long-run pass-through estimates, the Morgan index shows the highest degree of pass-through in 11 of the 87 industries (see the appendix tables A2a and A2b).

[17] The criterion for selecting the nonoverlapping sample is as follows: all three-digit SIC industries were selected unless the industry overlapped with two or more four-digit industries, then the four digit industries were selected.
[18] The results for the Morgan index reported in Table 1 differ slightly from Yang's results for some industries. These differences occur in the industries for which Yang used Citibase data for the producer price series. Because these series were unavailable from Yang we used Bureau of Labor Statistics data.
[19] The estimates for β_1 for SIC industries 201, 207, 221, 233, 262 and 301 were positive regardless of the exchange rate index. For industries 261 and 3313 these estimates were positive only when using the Morgan index. To facilitate comparability, these industries were excluded across all exchange rate indexes. None of these pass-through estimates were statistically significant.

The Broad index generally shows higher pass-through estimates than the Major index, but exceptions are frequent. The unweighted average across the non-overlapping sample is highest for the Broad index in both the short-run and long-run, as shown in Table 1. The Broad index showed the greatest degree of pass-through in 9 of the 16 industry groupings in the short-run and in 10 of the industry groupings in the long-run. This supports Feinberg's (1991) result that the broadest index produced the greatest degree of pass-through. The Broad index also showed the highest level of short-run pass-through for 49 of the 87 industries, with the Major index having the highest short-run pass-through in 30 industries. The long-run pass-through estimates for the Broad index were greatest in 55 of the 87 industries, with the Major index having the highest long-run pass-through in 21 industries.

The industry variation in pass-through effects is generally similar across exchange rate indexes. The stone, clay and glass products industry (SIC 32), industrial machinery (SIC 35) and the instruments and related products industry (SIC 38) exhibit short-run pass-through rates of more than 50 percent, regardless of the exchange rate index chosen. The estimate of pass-through in the chemical industry (SIC 28), however, is much higher if the Broad index is used rather than either of the other two exchange rate indexes. The lumber and woods products industry (SIC 24) and the apparel industry (SIC 23) have low estimates of pass-through across all exchange rate indexes. The textile industry (SIC 22) has a much lower pass-through estimate using the Broad index then either the Morgan or the Major index.

Which Index is Best?

To assess the significance of the differences in pass-through estimates under the three exchange rate indexes we use the J test.[20] The J test allows us to compare the following two hypotheses:

$$H_0: \quad \Delta \ln MP_{i,t} = \beta_{1,i} \Delta \ln TWEX_{k,t} + \beta_{2,i} \Delta \ln PP_{i,t} + \beta_{3,i} \Delta \ln MP_{i,t-1} + \varepsilon_{i,t}$$

$$H_1: \quad \Delta \ln MP_{i,t} = \gamma_{1,i} \Delta \ln TWEX_{j \neq k,t} + \gamma_{2,i} \Delta \ln PP_{i,t} + \gamma_{3,i} \Delta \ln MP_{i,t-1} + \nu_{i,t}$$

where j and k refer to any of the three possible exchange rate series. The J test consists of first estimating the equation associated with H_0. Next, the fitted values from this estimation are used as an additional right-hand-side variable in the equation associated with H_1. If these fitted values are statistically significant, then H_1 is rejected. Reversing the process will determine if H_0 can rejected. Thus there are four possible outcomes for each j and k pair of exchange rate indexes: reject H_0 and H_1; reject H_0 but not H_1; reject H_1 but not H_0; or, don't reject either H_0 or H_1.

Table 2 lists the import industries for which at least one of the exchange rate indexes was rejected using the J test. The rejections are classified as "strong" or "weak". A strong rejection occurs if a particular exchange rate index was rejected when paired with either of the other exchange rate indexes. Whereas a weak rejection occurs if a particular exchange rate index was rejected when paired with one but not both of the other two exchange rate indexes. For example, let k = the Broad index in H_0. If H_0 is rejected when j = the Major index and when j = the Morgan index, then we strongly reject H_0. If H_0 is rejected when j = the Major index but not when j = the Morgan index, then we weakly reject H_0.

In 58 of the 87 industries, we were able to reject at least one of the exchange rate indexes as being the correct model. The Broad index was rejected in 44 industries, and most of these

[20] See Davidson and MacKinnon (1981).

were strong rejections. The Morgan index was rejected in 46 industries, with slightly more than one-third being strong rejections. The Major index was rejected in 24 industries, but only 1 of these were strong rejections.

The finding that no one index is preferred for all industries is not surprising in view of the different currencies included in the exchange rate indexes and the different trade patterns across industries. Nonetheless, if one is planning to use only one index, these J test results provide some evidence that the Major exchange rate index is the preferred index.

Is Pass-through Symmetric?

Most studies that have examined pass-through asymmetries have broken the sample period into two parts, a period in which the dollar was generally appreciating and one in which the dollar was generally depreciating. These studies address the question: Was the influence of changes in the exchange rate different in a period of general dollar appreciation than in a period of general dollar depreciation? We attempt to answer this question as well, but we use a different approach. Rather than splitting the sample into two periods we extract the quarter by quarter appreciations and depreciations over the whole sample period. Our approach addresses the question: Does the magnitude of pass-through when the dollar is appreciating differ from when it is depreciating?

Figure 2 plots the quarterly changes in the log of each of the exchange rate indexes over our sample period. In only three of the 17 quarters prior to the second quarter of 1985 did the dollar depreciate using either the Morgan or Major index. The Broad index shows the dollar depreciating in only one of these 17 quarters. In the period after the first quarter of 1985 the behavior of the dollar was more mixed. The Morgan and Major indexes show the dollar depreciating in 19 and 18 of the 28 quarters, respectively. The Broad index shows dollar

depreciations in 13 of the 28 quarters. Thus, while the first part of our sample period was characterized by a nearly steady appreciation of the dollar regardless of the exchange rate measure, the second part was characterized by a mix of quarterly appreciations and depreciations. Moreover, in this latter period the behavior of the dollar is more sensitive to the exchange rate index chosen.

To determine the effects of depreciations versus appreciations on pass-through, we estimated the following equation for each of the three exchange rate indexes:

$$\Delta \ln MP_{i,t} = \beta_{1,i}\Delta \ln TWEX_t * dum1_t + \beta_{2,i}\Delta \ln TWEX_t * dum2_t + \beta_{3,i}\Delta \ln PP_{i,t} + \beta_{4,i}\Delta \ln MP_{i,t-1} + \varepsilon_{i,t} \quad (2)$$

where:

dum1=1 when Δln TWEX >0 and 0 otherwise
dum2=1 when Δln TWEX <0 and 0 otherwise.

Table 3 provides an overview of the results of these regressions. Pass-through tends to be more often statistically different from zero when the dollar is depreciating. In those industries in which pass-through is found to be statistically significant either when the dollar is appreciating and/or depreciating, the estimate of pass-through is generally greater when the dollar is depreciating.[21]

The full results are reported in appendix tables A3a and A3b. Some examples, however, may help illustrate these results. The estimated pass-through into import prices in the wine and brandy industry (SIC 2084) based on equation (1) was about 16 percent using either the Morgan or the Major index. Separating the effects of appreciations and depreciations (equation (2)) indicates that pass-through was only significant when the dollar was depreciating, and was slightly higher using the Major index, see Table 4. Using the Broad index, pass-through was not

[21] This also holds if we look only at the industries in which pass-through is significant both when the dollar is appreciating and depreciating. In this case the pass-though is greater when the dollar is depreciating in 71 percent of the industries using the Morgan index, 60 percent using the Major index and 100 percent using the Broad index.

statistically significant when equation (1) was estimated. However, separating appreciations and depreciations showed a strong pass-through (64 percent) when the dollar was depreciating. The relative infrequency of dollar depreciations under the Broad index over the sample period for this industry (1982:I-1992:I) may account for the lack of evidence of pass-through when no distinction is made between appreciations and depreciations.

Import prices in the calculating and accounting machines industry (SIC 3574) displayed no evidence of pass-through under any of the three exchange rates indexes.[22] This lack of pass-through is maintained even when separately estimating appreciations and depreciations, as shown in Table 5.

Pass-through estimates for the other office machines industry (SIC 3579), based on equation (1) were 67 percent using the Morgan index and about 83 percent using either the Major or the Broad index. Estimating equation (2) showed that pass-through occurred with both appreciations and depreciations, but pass-through was greater when the dollar depreciated (see Table 6). Note, however, that pass-through was more than complete using the Broad index when the dollar depreciated. As shown in the appendix, this result was not uncommon when using the Broad index.

Pass-through of the exchange rate into import prices in the men's and boys' suits industry (SIC 231) based on equation (1) was 21 percent using the Morgan index, 18 percent using the Major index and 24 percent using the Broad index. Separating out the effects of appreciations and deprecations showed that only the effects of depreciations were passed-through (see Table 7). Twenty-seven percent of the exchange rate change was passed-through when the dollar

[22] The import price industry classifications used by Yang and hence this study were based on the 1977 SIC. Computers were grouped in the calculating machines industry.

depreciated using the Morgan index, and 27 percent using the Major index. The Broad index, however, showed a 63 percent pass-through when the dollar depreciated.

Conclusion

This paper has considered two issues with respect to the pass-through of exchange rate changes into import prices. One issue revolves around the appropriate exchange rate index. Two questions addressed. Are estimates of pass-through sensitive to the exchange rate index chosen? If so, which index is best? The second issue revolves around the possibility that the magnitude of pass-through might be sensitive to whether the exchange rate change was an appreciation or a depreciation. One question was addressed. Is pass-through asymmetric with respect to appreciations and depreciations?

Pass-through estimates are sensitive to the exchange rate index. Our results support those of Feinberg (1991) in finding that the more inclusive the exchange rate index the higher the pass-through estimates. Our key extension of research on the exchange-rate-index issue is a comparison of the informational content of alternative measures. A broader index may seem preferable since it is less likely to exclude the currencies of the major sources of imports for any given industry. Our results, however, provide some evidence that a narrower exchange rate index may better fit the data over our sample period. Of the three exchange rate indexes studied in this paper, the Broad index was most often rejected based on J-test results. Moreover, the Broad index produced estimates of pass-through in excess of 100 percent in some industries, particularly when the dollar was depreciating. Comparing the two narrower exchange rate indexes used in this study, the J-test results more often rejected the Morgan index relative to the

Major index.[23] Thus, the J-test results indicated that the Major index may best fit the data, at least in certain industries. At the very least, our results suggest that caution should be exercised in the choice of the exchange rate index.

In addressing the asymmetry of exchange rate pass-through our paper takes a different approach from many previous studies. Rather than splitting the sample period into a period of a general appreciation of the dollar and one of a general depreciation of the dollar, we separately estimated the effects of quarterly appreciations and depreciations. We find that in many industries firms react asymmetrically to exchange rate changes. Pass-through is more likely when the dollar is depreciating. In addition, in industries in which pass-through occurs both when the dollar is appreciating and depreciating, the extent of pass-through is generally higher in the latter case. Thus, similar to Peltzman's (2000) general findings that output prices rise faster than they fall and that this phenomenon persists, we find that U.S. import prices rise more due to a depreciation than they fall due to an appreciation. Our results strengthen prior research findings, many of which were suggestive at best, that pass-through effects are relatively larger during dollar depreciations than dollar appreciations.

[23] There are two key differences in the construction of the Morgan and Major indexes. The weights given to each currency in the Morgan index are based on 1980 bilateral U.S. exports and imports of manufactured goods. The Major index uses chain-weights based on bilateral U.S. exports and imports of goods and services.

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Table 1
Pass-through Estimates Across Industries

SIC	# of industries	Morgan short-run	Morgan long-run	Major short-run	Major long-run	Broad short-run	Broad long-run
20	8	-0.182	-0.243	-0.208	-0.253	-0.220	-0.273
22	2	-0.204	-0.306	-0.253	-0.346	-0.130	-0.219
23	3	-0.109	-0.105	-0.122	-0.125	-0.143	-0.141
24	2	-0.090	-0.081	-0.091	-0.100	-0.097	-0.109
25	1	-0.297	-0.349	-0.386	-0.399	-0.459	-0.529
28	2	-0.363	-0.404	-0.439	-0.443	-0.807	-0.801
30	1	-0.429	-0.532	-0.526	-0.559	-0.412	-0.509
31	3	-0.284	-0.314	-0.334	-0.343	-0.314	-0.357
32	1	-0.621	-0.884	-0.800	-0.970	-0.609	-0.908
33	3	-0.164	-0.218	-0.265	-0.339	-0.320	-0.394
34	4	-0.216	-0.307	-0.298	-0.398	-0.271	-0.393
35	10	-0.558	-0.753	-0.721	-0.766	-0.782	-0.964
36	8	-0.292	-0.391	-0.384	-0.453	-0.451	-0.583
37	1	-0.214	-0.358	-0.275	-0.401	-0.187	-0.332
38	4	-0.547	-0.726	-0.726	-0.796	-0.615	-0.759
39	3	-0.218	-0.282	-0.317	-0.388	-0.342	-0.424
Average	56	-0.315	-0.414	-0.406	-0.460	-0.425	-0.528

Table 2
J-test Results

SIC	Reject Broad	Reject Major	Reject Morgan	SIC	Reject Broad	Reject Major	Reject Morgan
2011		WEAK	WEAK	355	STRONG		WEAK
208	WEAK			3552	STRONG	WEAK	WEAK
2084	STRONG			3555	STRONG		WEAK
209	STRONG			3559	WEAK		
229	STRONG			356	STRONG	WEAK	STRONG
231		WEAK		3562	STRONG		WEAK
242		WEAK		3569	STRONG	WEAK	WEAK
2421	WEAK	WEAK	WEAK	3574			WEAK
259	WEAK		STRONG	3579	STRONG		WEAK
261	WEAK	WEAK	WEAK	362	STRONG		WEAK
281		WEAK	WEAK	363	WEAK		WEAK
301		WEAK		3639	STRONG		WEAK
307	STRONG	WEAK	WEAK	364	STRONG		WEAK
314	STRONG		WEAK	3643	STRONG		WEAK
3143	STRONG	WEAK	WEAK	365			STRONG
3144	STRONG			3651			STRONG
326	STRONG	WEAK	WEAK	366	WEAK		WEAK
331		WEAK	STRONG	3661			STRONG
3312		WEAK	STRONG	3662	WEAK		
333			STRONG	3679	WEAK		WEAK
345		WEAK	STRONG	369	STRONG	WEAK	WEAK
349	WEAK			371	STRONG	WEAK	WEAK
3494	STRONG	WEAK		382	STRONG	WEAK	WEAK
3499	WEAK		WEAK	383	STRONG	STRONG	WEAK
353	STRONG		STRONG	386	WEAK	WEAK	STRONG
3531	STRONG		WEAK	387	STRONG		WEAK
3537	WEAK		WEAK	391			WEAK
354	STRONG		STRONG	394	WEAK		WEAK
3541	STRONG	WEAK		396	WEAK	WEAK	WEAK

Table 3

	Number of Industries with Statistically Significant Pass-through Effects				Percent with Greater Pass-through with Depreciation
Index	Appreciation	Depreciation	Both	Either	
Morgan	20	44	17	47	81
Major	35	48	30	53	68
Broad	31	47	23	55	96

Table 4

Industry 2084 -- Wine and Brandy

Morgan		**Major**		Broad	
-0.156		**-0.159**		-0.098	
(-3.115)		**(-2.766)**		(-1.418)	
Appreciation	**Depreciation**	**Appreciation**	**Depreciation**	**Appreciation**	**Depreciation**
-0.073	**-0.219**	-0.070	**-0.238**	-0.010	**-0.642**
(-.856)	**(-2.997)**	(-.727)	**(-2.64)**	(-.130)	**(-2.764)**

Table 5

Industry 3574 -- Calculating and Accounting Machines

Morgan		**Major**		**Broad**	
-0.046		-0.18		-0.27	
(-.313)		(-1.233)		(-1.051)	
Appreciation	**Depreciation**	**Appreciation**	**Depreciation**	**Appreciation**	**Depreciation**
0.185	-0.090	-0.112	-0.188	-0.093	-0.621
(-.543)	(-.563)	(-.283)	(-1.193)	(-.305)	(-1.505)

Table 6

Industry 3579 -- Office Machines NES

Morgan		**Major**		**Broad**	
-0.666		**-0.827**		**-0.832**	
(-6.681)		**(-9.118)**		**(-4.462)**	
Appreciation	**Depreciation**	**Appreciation**	**Depreciation**	**Appreciation**	**Depreciation**
-0.495	**-0.745**	**-0.756**	**-0.857**	**-0.520**	**-2.054**
(-2.794)	**(-6.225)**	**(-4.623)**	**(-7.890)**	**(-3.147)**	**(-6.206)**

Table 7

Industry 231 -- Men's and Boys' Suits and Coats

Morgan		**Major**		**Broad**	
-0.214		**-0.178**		**-0.254**	
(-3.209)		**(-2.386)**		**(-2.505)**	
Appreciation	**Depreciation**	**Appreciation**	**Depreciation**	**Appreciation**	**Depreciation**
-0.128	**-0.274**	-0.047	**-0.265**	-0.148	**-0.625**
(-1.051)	**(-2.786)**	(-0.349)	**(-2.503)**	(-1.224)	**(-2.403)**

Table A1a

Pass-through Estimates: 3-Digit SIC Codes

	MORGAN		MAJOR		BROAD	
SIC	pass-through	t-stat	pass-through	t-stat	pass-through	t-stat
201	0.002	0.008	0.114	0.546	0.122	0.504
202	**-0.282**	**-2.482**	**-0.289**	**-2.154**	**-0.481**	**-2.460**
203	-0.234	-0.881	-0.330	-1.611	-0.291	-0.834
206	-0.427	-1.437	-0.179	-0.542	-0.239	-0.609
207	0.823	1.671	1.106	1.993	1.127	1.487
208	-0.072	-1.865	**-0.089**	**-2.179**	-0.049	-0.955
209	**-0.394**	**-4.297**	**-0.418**	**-3.771**	-0.274	-1.673
221	0.061	0.546	0.072	0.589	0.000	0.002
222	-0.144	-0.741	-0.239	-1.178	-0.055	-0.225
229	**-0.264**	**-3.327**	**-0.267**	**-2.979**	-0.204	-1.674
231	**-0.214**	**-3.209**	**-0.178**	**-2.386**	**-0.254**	**-2.505**
232	-0.047	-0.793	-0.054	-0.857	-0.029	-0.353
233	0.042	0.348	0.052	0.382	0.007	0.037
238	-0.066	-0.842	-0.133	-1.643	-0.147	-1.343
242	-0.145	-1.571	-0.056	-0.555	-0.042	-0.272
243	-0.035	-0.351	-0.127	-1.215	-0.152	-1.241
259	**-0.297**	**-4.981**	**-0.386**	**-6.843**	**-0.459**	**-5.295**
261	0.045	0.237	-0.115	-0.553	**-0.454**	**-2.037**
262	0.076	1.151	0.114	1.633	0.121	1.468
281	-0.475	-1.494	-0.570	-1.729	**-1.200**	**-2.702**
289	**-0.250**	**-3.350**	**-0.308**	**-3.859**	**-0.414**	**-3.227**
301	0.057	1.435	0.022	0.474	0.007	0.134
307	**-0.429**	**-5.461**	**-0.526**	**-6.659**	**-0.412**	**-3.029**
314	**-0.214**	**-3.010**	**-0.287**	**-3.980**	**-0.193**	**-2.042**
317	-0.116	-1.470	-0.127	-1.494	-0.191	-1.417
326	**-0.621**	**-5.723**	**-0.800**	**-7.892**	**-0.609**	**-3.775**
331	-0.043	-0.691	**-0.139**	**-2.179**	**-0.169**	**-2.314**
333	-0.176	-0.916	-0.379	-1.958	**-0.526**	**-2.425**
335	**-0.262**	**-3.170**	**-0.266**	**-3.096**	**-0.267**	**-2.612**
345	**-0.167**	**-2.214**	**-0.288**	**-4.073**	**-0.312**	**-3.787**
349	**-0.209**	**-2.827**	**-0.274**	**-3.610**	**-0.291**	**-2.375**
353	**-0.467**	**-6.515**	**-0.608**	**-9.739**	**-0.682**	**-6.111**
354	**-0.571**	**-8.216**	**-0.711**	**-11.997**	**-0.829**	**-7.464**
355	**-0.730**	**-6.551**	**-0.895**	**-8.142**	**-1.153**	**-5.488**
356	**-0.615**	**-7.815**	**-0.787**	**-13.494**	**-0.867**	**-6.835**
357	-0.178	-2.010	**-0.246**	**-2.791**	-0.285	-1.922
362	**-0.437**	**-4.680**	**-0.569**	**-6.721**	**-0.687**	**-4.085**
363	**-0.256**	**-4.332**	**-0.325**	**-5.959**	**-0.453**	**-4.445**
364	**-0.521**	**-5.770**	**-0.679**	**-8.480**	**-0.635**	**-4.543**
365	-0.086	-1.736	**-0.138**	**-2.711**	**-0.183**	**-2.949**
366	**-0.198**	**-3.316**	**-0.251**	**-4.369**	**-0.297**	**-3.239**
367	**-0.216**	**-2.152**	**-0.237**	**-2.183**	**-0.372**	**-2.641**
369	**-0.416**	**-5.773**	**-0.560**	**-9.135**	**-0.559**	**-4.762**
371	**-0.214**	**-4.018**	**-0.275**	**-5.071**	**-0.187**	**-2.524**
382	**-0.651**	**-6.663**	**-0.843**	**-10.466**	**-0.673**	**-4.538**
383	**-0.653**	**-6.243**	**-0.894**	**-11.727**	**-0.747**	**-5.082**
386	**-0.316**	**-4.632**	**-0.459**	**-8.360**	**-0.437**	**-5.238**
387	**-0.568**	**-5.945**	**-0.706**	**-7.762**	**-0.602**	**-4.307**
391	-0.227	-1.700	**-0.355**	**-2.600**	**-0.408**	**-2.188**
394	-0.112	-1.783	**-0.185**	**-2.861**	-0.153	-1.728
396	**-0.316**	**-3.390**	**-0.413**	**-4.396**	**-0.466**	**-2.903**

Note: Bold indicates significance at the 5% level.

Table A1b
Pass-through Estimates: 4-Digit SIC Codes

	MORGAN		MAJOR		BROAD	
SIC	pass-through	t-stat	pass-through	t-stat	pass-through	t-stat
2011	-0.046	-0.259	0.145	0.785	0.086	0.403
2033	0.042	0.147	-0.111	-0.360	-0.069	-0.184
2062	-0.114	-0.907	-0.114	-0.827	-0.171	-0.836
2066	-0.190	-1.075	-0.236	-1.284	-0.394	-1.511
2076	0.685	1.094	0.580	0.833	0.290	0.316
2082	-0.042	-0.944	-0.037	-0.747	-0.009	-0.152
2084	**-0.156**	**-3.115**	**-0.159**	**-2.766**	-0.098	-1.418
2085	-0.046	-0.994	-0.080	-1.604	-0.044	-0.687
2321	-0.068	-1.065	-0.066	-0.979	-0.045	-0.491
2421	-0.188	-1.691	-0.014	-0.117	0.008	0.053
2435	-0.023	-0.225	-0.104	-0.967	-0.141	-1.116
3143	**-0.330**	**-4.736**	**-0.429**	**-6.159**	**-0.350**	**-3.296**
3144	**-0.406**	**-3.756**	**-0.447**	**-4.057**	**-0.403**	**-2.494**
3312	-0.055	-0.887	**-0.151**	**-2.392**	**-0.168**	**-2.286**
3313	0.010	0.042	-0.114	-0.445	-0.223	-0.764
3331	-0.457	-1.719	-0.407	-1.377	-0.280	-0.731
3494	**-0.377**	**-3.552**	**-0.468**	**-4.126**	**-0.446**	**-2.360**
3496	-0.065	-1.064	-0.094	-1.459	-0.073	-0.956
3499	**-0.253**	**-2.760**	**-0.344**	**-3.684**	**-0.255**	**-2.179**
3531	**-0.402**	**-4.616**	**-0.554**	**-6.755**	**-0.582**	**-4.099**
3537	**-0.593**	**-3.461**	**-0.805**	**-6.373**	**-0.825**	**-2.528**
3541	**-0.556**	**-7.052**	**-0.654**	**-6.915**	**-0.759**	**-4.172**
3552	**-0.662**	**-6.789**	**-0.852**	**-10.650**	**-0.881**	**-5.484**
3555	**-0.757**	**-5.623**	**-0.923**	**-6.708**	**-0.928**	**-3.871**
3559	**-0.597**	**-3.953**	**-0.756**	**-5.252**	**-0.972**	**-4.146**
3562	**-0.535**	**-6.539**	**-0.652**	**-8.205**	**-0.704**	**-4.082**
3569	**-0.750**	**-6.646**	**-0.953**	**-9.738**	**-0.994**	**-5.319**
3574	-0.046	-0.313	-0.180	-1.233	-0.270	-1.051
3579	**-0.666**	**-6.681**	**-0.827**	**-9.118**	**-0.832**	**-4.462**
3639	**-0.281**	**-3.546**	**-0.337**	**-4.385**	**-0.320**	**-2.167**
3643	**-0.658**	**-5.199**	**-0.827**	**-6.624**	**-0.781**	**-3.992**
3651	-0.081	-1.561	**-0.132**	**-2.463**	**-0.192**	**-3.028**
3661	-0.174	-1.644	**-0.298**	**-2.723**	**-0.393**	**-2.882**
3662	**-0.228**	**-3.957**	**-0.268**	**-4.712**	**-0.328**	**-3.636**
3679	**-0.198**	**-3.586**	**-0.260**	**-5.079**	**-0.266**	**-3.039**
3949	-0.061	-0.962	-0.094	-1.423	-0.158	-1.622

Note: Bold indicates signficnace at the 5% level.

Table A2a
Long-run Pass-through Estimates
3-Digit SIC codes

SIC	Morgan	Major	Broad
201	0.002	0.106	0.112
202	-0.609	-0.571	-0.856
203	-0.191	-0.270	-0.238
206	-0.039	-0.161	-0.212
207	0.900	1.195	1.235
208	-0.149	-0.185	-0.111
209	-0.487	-0.443	-0.342
221	0.070	0.083	0.001
222	-0.163	-0.267	-0.060
229	-0.449	-0.426	-0.378
231	-0.172	-0.148	-0.214
232	-0.070	-0.081	-0.045
233	0.037	0.046	0.006
238	-0.074	-0.148	-0.163
242	-0.121	-0.046	-0.035
243	-0.042	-0.153	-0.184
259	-0.349	-0.399	-0.529
261	0.062	-0.166	-0.645
262	0.075	0.114	0.118
281	-0.393	-0.453	-0.915
289	-0.416	-0.433	-0.687
301	0.089	0.036	0.012
307	-0.532	-0.559	-0.509
314	-0.215	-0.284	-0.192
317	-0.155	-0.163	-0.254
326	-0.884	-0.970	-0.908
331	-0.086	-0.302	-0.356
333	-0.179	-0.385	-0.521
335	-0.373	-0.340	-0.340
345	-0.299	-0.518	-0.535
349	-0.231	-0.281	-0.320
353	-0.726	-0.756	-0.996
354	-0.710	-0.722	-0.946
355	-0.981	-0.912	-1.219
356	-0.816	-0.839	-1.043
357	-0.225	-0.281	-0.388
362	-0.459	-0.515	-0.661
363	-0.400	-0.427	-0.770
364	-0.728	-0.836	-0.882
365	-0.178	-0.284	-0.329
366	-0.212	-0.242	-0.299
367	-0.263	-0.285	-0.427
369	-0.616	-0.687	-0.811
371	-0.358	-0.401	-0.332
382	-0.876	-0.933	-0.854
383	-0.925	-1.004	-0.969
386	-0.466	-0.586	-0.598
387	-0.635	-0.661	-0.614
391	-0.267	-0.419	-0.472
394	-0.187	-0.283	-0.242
396	-0.394	-0.463	-0.557

Table A2b			
Long-run Pass-through Estimates			
4-Digit SIC codes			
SIC	Morgan	Major	Broad
2011	-0.049	0.159	0.093
2033	0.039	-0.105	-0.065
2062	-0.082	-0.082	-0.125
2066	-0.163	-0.201	-0.331
2076	0.836	0.714	0.367
2082	-0.055	-0.049	-0.012
2084	-0.295	-0.292	-0.210
2085	-0.066	-0.117	-0.066
2321	-0.101	-0.099	-0.068
2421	-0.175	-0.013	0.007
2435	-0.033	-0.148	-0.200
3143	-0.492	-0.547	-0.525
3144	-0.295	-0.320	-0.292
3312	-0.101	-0.292	-0.321
3313	0.021	-0.242	-0.474
3331	-0.395	-0.347	-0.242
3494	-0.534	-0.560	-0.639
3496	-0.098	-0.142	-0.110
3499	-0.298	-0.372	-0.289
3531	-0.572	-0.662	-0.823
3537	-0.903	-0.857	-1.050
3541	-0.850	-0.789	-1.040
3552	-0.819	-0.866	-0.925
3555	-1.093	-1.026	-1.226
3559	-0.676	-0.704	-0.923
3562	-0.782	-0.719	-1.000
3569	-0.952	-1.000	-1.181
3574	-0.038	-0.159	-0.245
3579	-0.985	-0.948	-1.323
3639	-0.327	-0.364	-0.397
3643	-0.914	-1.015	-1.063
3651	-0.169	-0.273	-0.342
3661	-0.165	-0.276	-0.349
3662	-0.317	-0.316	-0.438
3679	-0.307	-0.353	-0.447
3949	-0.088	-0.132	-0.234

Table A3a
Asymmetry of Pass-through Estimates -- 3 Digit SIC codes

	Morgan		Major		Broad	
SIC	Appreciation	Depreciation	Appreciation	Depreciation	Appreciation	Depreciation
201	-0.048	0.034	0.155	0.092	0.149	-0.088
202	-0.371	-0.246	-0.227	-0.313	-0.447	-0.571
203	-0.485	-0.051	-0.535	-0.194	-0.292	-0.285
206	**-1.184**	0.093	-0.756	0.160	-0.359	0.627
207	0.744	0.857	0.977	1.150	0.808	2.686
208	0.006	**0.135**	-0.008	**-0.159**	0.023	**-0.394**
209	-0.130	**-0.534**	-0.180	**-0.560**	-0.033	**-1.467**
221	-0.059	0.110	-0.036	0.115	0.001	-0.000
222	0.166	-0.375	0.010	-0.420	0.090	-1.034
229	-0.205	**-0.303**	-0.184	**-0.327**	-0.057	**-0.852**
231	-0.128	**-0.274**	-0.047	**-0.265**	-0.148	**-0.625**
232	-0.048	-0.046	-0.022	-0.075	0.041	-0.294
233	-0.406	0.305	**-0.652**	**0.516**	-0.461	**1.190**
238	-0.039	-0.082	-0.020	-0.205	-0.087	-0.374
242	-0.297	-0.107	-0.203	-0.017	-0.070	0.038
243	-0.096	0.011	-0.151	-0.109	-0.136	-0.278
259	**-0.353**	**-0.260**	**-0.405**	**-0.372**	**-0.372**	**-0.751**
261	-0.513	0.420	**-0.722**	0.308	**-0.610**	0.571
262	0.040	0.106	0.145	0.091	0.104	0.238
281	-0.942	-0.270	-0.668	-0.528	**-1.199**	-1.201
289	-0.137	**-0.290**	-0.151	**-0.374**	-0.195	**-0.861**
301	0.043	0.067	0.018	0.024	0.006	0.013
307	-0.097	**-0.608**	-0.184	**-0.725**	-0.074	**-1.839**
314	-0.144	**-0.269**	-0.223	**-0.337**	-0.093	**-0.838**
317	-0.192	-0.087	-0.276	-0.075	-0.250	-0.090
326	**-0.350**	**-0.849**	**-0.494**	**-1.062**	**-0.315**	**-2.459**
331	-0.120	0.016	-0.199	-0.097	**-0.162**	-0.226
333	-0.480	0.024	**-0.819**	-0.134	**-0.583**	-0.091
335	**-0.314**	**-0.234**	**-0.322**	**-0.235**	**-0.222**	**-0.623**
345	-0.153	-0.178	**-0.288**	**-0.288**	**-0.247**	**-0.820**
349	-0.055	**-0.279**	-0.135	**-0.344**	-0.066	**-0.814**
353	**-0.463**	**-0.468**	**-0.622**	**-0.599**	**-0.440**	**-1.458**
354	**-0.617**	**-0.543**	**-0.673**	**-0.737**	**-0.620**	**-1.563**
355	-0.729	**-0.731**	**-1.043**	**-0.814**	**-1.000**	**-1.432**
356	**-0.536**	**-0.665**	**-0.798**	**-0.779**	**-0.567**	**-1.826**
357	-0.046	-0.219	-0.074	**-0.304**	-0.071	**-0.836**
362	-0.386	**-0.454**	**-0.467**	**-0.610**	-0.276	**-1.446**
363	**-0.284**	**-0.248**	**-0.328**	**-0.324**	**-0.316**	**-0.758**
364	**-0.355**	**-0.618**	**-0.516**	**-0.783**	**-0.368**	**-1.800**
365	-0.092	-0.081	-0.148	-0.131	**-0.148**	**-0.413**
366	-0.122	**-0.230**	-0.171	**-0.278**	-0.160	**-0.743**
367	**-0.366**	-0.131	-0.346	-0.188	**-0.340**	-0.504
369	-0.259	**-0.514**	**-0.419**	**-0.647**	**-0.307**	**-1.381**
371	-0.092	**-0.295**	-0.089	**-0.405**	-0.058	**-0.922**
382	**-0.467**	**-0.798**	**-0.723**	**-0.939**	**-0.426**	**-2.245**
383	**-0.391**	**-0.859**	**-0.653**	**-1.084**	**-0.448**	**-2.608**
386	-0.197	**-0.409**	**-0.351**	**-0.541**	**-0.276**	**-1.407**
387	**-0.433**	**-0.676**	**-0.694**	**-0.715**	**-0.413**	**-1.809**
391	**-0.558**	0.008	**-0.656**	-0.178	-0.454	-0.273
394	0.080	**-0.279**	0.060	**-0.365**	0.033	**-0.876**
396	-0.335	**-0.306**	**-0.501**	**-0.365**	-0.277	-0.836

Note: Bold indicates significance at the 5% level.

Table A3b
Asymmetry of Pass-through Estimates -- 4 Digit SIC codes

	Morgan		Major		Broad	
SIC	Appreciation	Depreciation	Appreciation	Depreciation	Appreciation	Depreciation
2011	-0.174	-0.054	0.082	0.188	0.076	0.160
2033	-0.284	-0.277	-0.378	0.067	-0.138	0.381
2062	-0.453	0.009	-0.349	-0.041	-0.298	0.197
2066	-0.609	-0.060	-0.741	-0.082	-0.424	-0.294
2076	-0.262	1.161	-0.638	1.129	-0.137	2.381
2082	-0.045	-0.040	-0.053	-0.025	0.003	-0.073
2084	-0.073	**-0.219**	-0.070	**-0.238**	-0.010	**-0.642**
2085	-0.038	-0.051	-0.001	-0.126	0.007	-0.254
2321	-0.088	-0.055	-0.046	-0.080	0.037	-0.342
2421	-0.257	-0.136	-0.090	0.040	-0.006	0.121
2435	-0.087	0.026	-0.160	-0.063	-0.135	-0.188
3143	-0.153	**-0.463**	**-0.253**	**-0.566**	-0.160	**-1.373**
3144	**-0.464**	**-0.374**	**-0.469**	**-0.433**	-0.246	**-1.126**
3312	-0.131	0.003	**-0.220**	-0.103	**-0.161**	-0.225
3313	-0.117	0.107	-0.265	-0.009	-0.256	0.025
3331	-0.090	-0.640	-0.019	-0.583	-0.074	-1.550
3494	0.016	**-0.584**	-0.157	**-0.650**	0.077	**-1.625**
3496	-0.002	-0.114	-0.074	-0.109	-0.054	-0.208
3499	-0.105	**-0.375**	-0.237	**-0.431**	-0.150	**-1.047**
3531	-0.279	**-0.464**	**-0.428**	**-0.621**	-0.259	**-1.535**
3537	-0.822	-0.447	**-1.033**	**-0.669**	-0.481	-1.618
3541	**-0.501**	**-0.582**	**-0.584**	**-0.694**	**-0.509**	**-1.455**
3552	-0.371	**-0.860**	**-0.653**	**-0.980**	**-0.379**	**-2.482**
3555	**-0.555**	**-0.877**	**-0.671**	**-1.084**	-0.511	**-2.227**
3559	-0.487	**-0.660**	**-0.840**	**-0.711**	**-0.896**	-1.122
3562	**-0.413**	**-0.581**	**-0.547**	**-0.698**	-0.365	**-1.664**
3569	**-0.641**	**-0.820**	**-0.915**	**-0.977**	**-0.599**	**-2.245**
3574	0.185	-0.090	-0.112	-0.188	-0.093	-0.621
3579	**-0.495**	**-0.745**	**-0.756**	**-0.857**	**-0.520**	**-2.054**
3639	-0.074	**-0.348**	-0.164	**-0.403**	-0.049	**-1.058**
3643	-0.344	**-0.841**	**-0.592**	**-0.980**	**-0.439**	**-2.350**
3651	-0.122	-0.046	-0.163	-0.109	**-0.163**	**-0.384**
3661	-0.274	-0.102	**-0.366**	-0.255	**-0.364**	-0.575
3662	-0.142	**-0.264**	-0.159	**-0.308**	**-0.179**	**-0.813**
3679	-0.065	**-0.256**	-0.158	**-0.302**	-0.113	**-0.762**
3949	-0.045	-0.069	0.053	-0.168	-0.120	-0.230

Note: Bold indicates significance at the 5% level.

Figure 1

Dollar Exchange Rate Indexes

(1980:4 = 100)

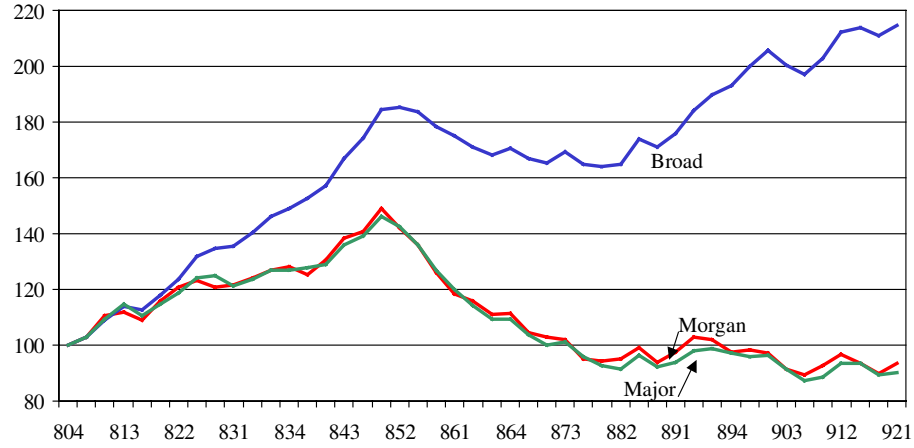

Figure 2

Quarterly Changes in the Dollar Exchange Rate Indexes

(1981:1 - 1992:1)