

Dollar Appreciation, Foreign Trade, and the U.S. Economy

The U.S. economy has faced an unprecedented cumulative appreciation of the dollar against the currencies of the major industrial countries over the last two years. The resulting loss of U.S. competitiveness from comparatively more expensive exports and less expensive imports has important implications for the performance of domestic industries. The strong dollar hurts sales for existing U.S. exporters and reduces incentives for U.S. producers to develop new foreign markets. Domestically produced goods that compete with imports face stiffer competition from foreign suppliers, and imports in general rise. By the end of next year, export sales could be roughly \$35 billion lower and the U.S. import bill could be about \$10 billion higher because of the dollar appreciation over the last two years.

At the same time, U.S. inflation has come down and the appreciating dollar has contributed to this success. The strong dollar helps in the winding-down of inflationary momentum by directly lowering the prices of many imports. And it intensifies pressures on U.S. producers to hold down prices and wages in the face of stronger competition from foreign producers both in U.S. markets and in export markets. The U.S. price level could be as much as 3 to 4 percent lower by the end of next year as a result of the strong dollar.

This article provides an assessment of the implications of the recent dollar appreciation for the U.S. merchandise trade balance. This topic has become increasingly important as trade flows have come to involve a larger share of U.S. economic activity. In

1970, for example, merchandise imports and exports each accounted for about 4 percent of U.S. gross national product (GNP), rising to about 6½ percent in 1975. In 1980, imports accounted for 9½ percent and exports for 8½ percent. More striking, exports accounted for about one fifth of the goods produced in the United States.

Historical perspective

There have been two major periods of large swings in the foreign exchange value of the dollar over the last half of the 1970s and into the early 1980s. The first period was one of dollar depreciation in 1977 and 1978. The second has been the more recent appreciation of the dollar—the subject of this article.

Charts 1 and 2 show selected bilateral exchange rates for the dollar on a quarterly basis. Over the eight quarters of 1977 and 1978 the dollar fell in value by about 20 percent against the German mark and by about 30 percent against the Japanese yen. Its decline was considerably less against the other currencies shown, and it actually rose in value against the Canadian dollar. By comparison, from the third quarter of 1980 to the second quarter of 1982 the dollar rose in value by over 50 percent against the Italian lira and the French franc, by over 30 percent against the German mark and the British pound, by about 10 percent against the Japanese yen, and by about 7 percent against the Canadian dollar.

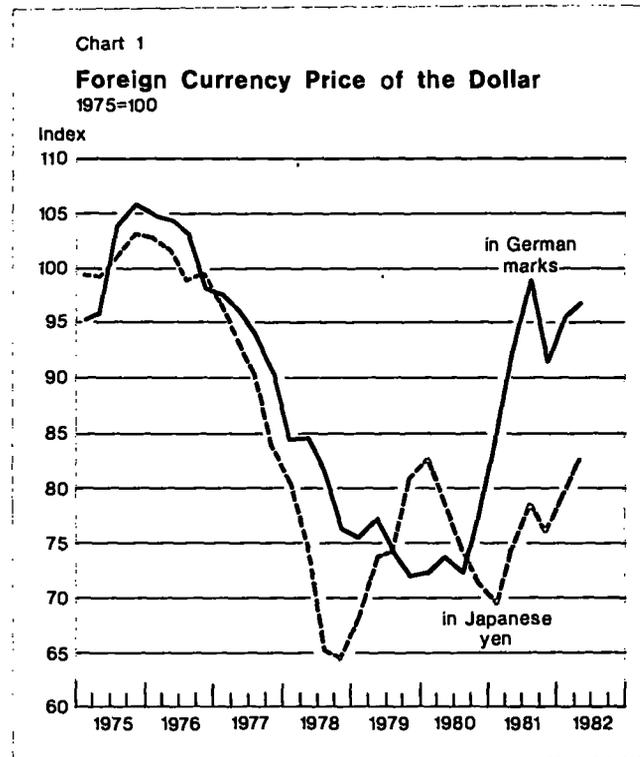
On a weighted average or “effective” exchange rate basis (Chart 3), the dollar fell in value by about 14

percent over the 1977-78 period. Over the last two years, the effective dollar has increased in value by about 20 percent to a level higher than that just before the 1977-78 depreciation.¹

Following the 1977-78 dollar depreciation, U.S. exports accelerated sharply and the merchandise trade deficit narrowed considerably (see the Winter 1978-79 issue of this *Review*). The 1978 merchandise trade deficit of \$34 billion contracted to \$25 billion in 1980. A useful method of analysis is to exclude agricultural exports and petroleum imports from the trade position because of their special characteristics. On that basis, the trade balance shifted from a deficit of \$21 billion in 1978 to a surplus of \$12 billion in 1980.

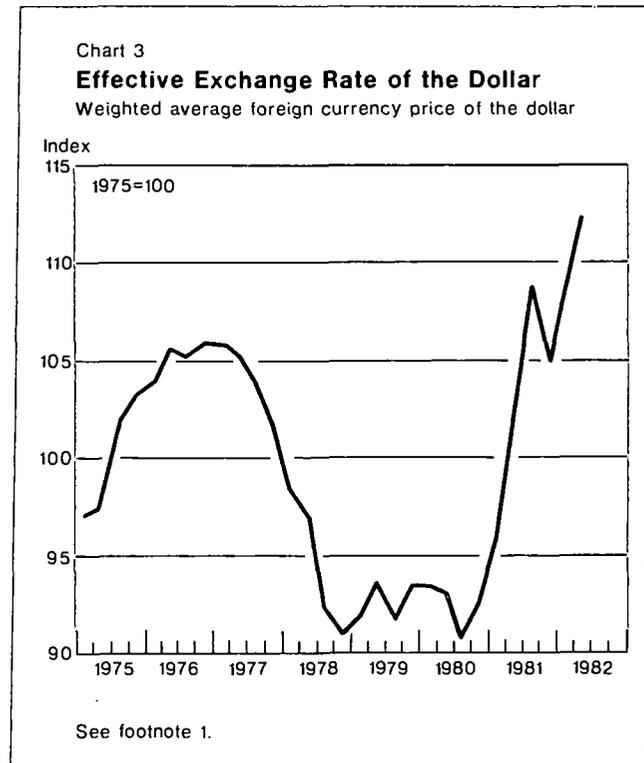
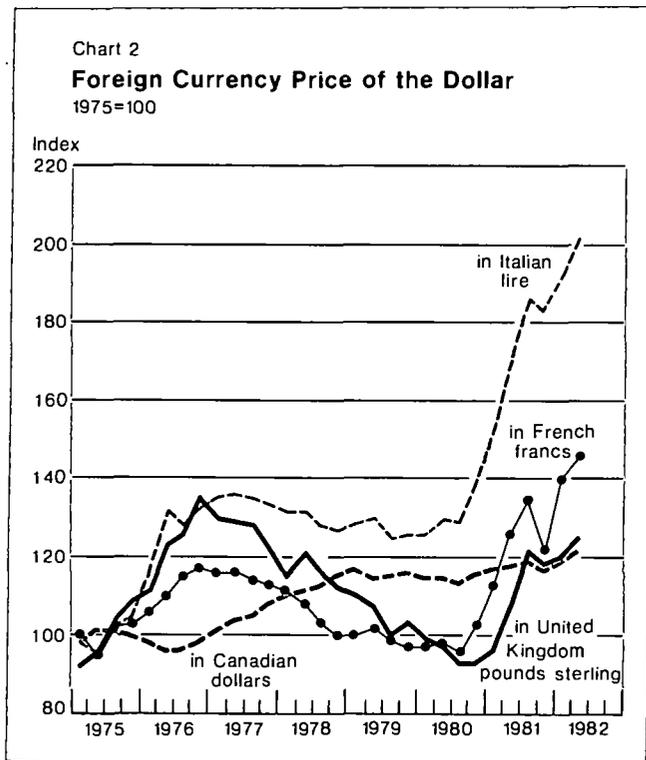
By the same token, a large appreciation of the dollar also has an important impact on U.S. trade performance. Because the dollar appreciation started in the latter part of 1980, some of its adverse effects on U.S. trade have undoubtedly already taken place. Last year's fourth-quarter trade deficit, for example, was \$37 billion, compared with a fourth-quarter deficit of \$21 billion in the previous year. Over the same period, the balance for nonagricultural exports and nonpetroleum imports fell from a \$14 billion surplus to a \$7 billion deficit. But factors other than exchange rate movements, notably cyclical and inflation develop-

¹ In a world of many currencies, no one measure captures movements in the value of the dollar perfectly. Focusing on the value of one currency, even a currency as important as the German mark, may be misleading if other currencies are moving differently. "Effective" exchange rate indexes have been developed to deal with this problem, but there are several ways to calculate effective exchange rates, each using different weights to calculate a weighted average from bilateral exchange rates. Different choices of weights and country coverage give different results. However, if, for example, one effective exchange rate index shows a larger change than another, the corresponding exchange rate "elasticity" that measures the response of some variable, say, the volume of exports, to the change will generally be smaller. Thus, different analysts' estimates of exchange rate effects on trade flows based on different measures of effective exchange rates may be similar, but estimated elasticities will generally differ and one has to be careful to interpret an exchange rate elasticity based on one particular effective exchange rate index as being specific to that index. The differences in measured effective exchange rate changes can be highlighted by examining the movements of three different indexes. The International Monetary Fund's MERM (multilateral exchange rate model) effective exchange rate index shows a 14.5 percent depreciation from the fourth quarter of 1976 to the fourth quarter of 1978 and a 25.9 percent appreciation from the third quarter of 1980 to the second quarter of 1982, while the Board of Governors effective exchange rate index shows a 16.9 percent depreciation and a 33.5 percent appreciation over the same periods. By comparison, the effective exchange rate index developed for analysis of U.S. trade at the Federal Reserve Bank of New York shows a 14.1 percent depreciation and a 24.0 percent appreciation over the two periods. These latter calculations for our effective exchange rate index are somewhat different from those presented in the text because for comparative purposes with the other two indexes they are based on the foreign currency price of the dollar as opposed to the dollar price of foreign currency. For an excellent discussion of effective exchange rates, see "Summary Measures of the Dollar's Foreign Exchange Value", *Federal Reserve Bulletin* (October 1978), pages 783-89.



ments in the United States and abroad, have also played a role in the trade balance movements just cited. Thus, to the extent possible, one needs to isolate the exchange rate effects to analyze the impact of the recent dollar appreciation.

The following analysis draws on empirical research undertaken at the Federal Reserve Bank of New York, as well as some other recent empirical studies. This research is based on historical relationships, even though the past is an imperfect guide to the future as relationships between economic variables may change over time. Moreover, the analysis depends on relationships being symmetrical—that is, a 1 percent rise in dollar exchange rates is assumed to affect the behavior of exporters and importers to the same extent as a 1 percent fall in the dollar, but in the opposite direction. With regard to the effects of exchange rate changes, some argue the effects are not symmetrical—that the response of exporters and importers to a dollar appreciation differs appreciably in size from their response to an equivalent dollar depreciation. In addition, the effects of a continued high value of the dollar may build and, therefore, be larger than those anticipated on the basis of a model estimated over a period where changes in the value of the dollar have been reversed. The experience with floating exchange



rates, however, does not provide many examples of long, sustained exchange rate changes.

Nevertheless, relationships drawn from the past are the most reliable guide available to evaluate the likely effects of the dollar appreciation. With these caveats in mind, a broad overview of how exchange rate changes influence merchandise trade flows through their impact on price and quantity adjustments follows.

Trade flow adjustments to exchange rate changes

One of the ways that a change in the value of the dollar affects merchandise trade is by altering the prices of goods imported and exported. Specifically, for reasons discussed later, both import and export prices in dollars tend to fall after an appreciation. If the quantity of imports and exports does not respond to these changes in price, the dollar value of imports and exports would fall. In addition, the trade balance effects of the appreciation would depend only on the relative size of these declines.

The volume of exports and imports also responds to price adjustments. Lower dollar-priced imports tend to raise the demand for imports and, therefore, import volume. Although dollar prices for exports decline, the appreciation raises their foreign currency prices which tends to reduce the demand for exports

and, therefore, export volume. The size of these volume adjustments also determines the impact of the dollar appreciation on the trade balance.

Whether or not the trade balance falls after an appreciation depends on the combined effect of these price and quantity adjustments. Hypothetically, the trade balance could actually rise following an appreciation. If, for example, the fall in import prices (measured in dollars) is larger than the fall in export prices (measured in dollars) and volume shows only a small response, then the trade balance could rise.²

Our results, however, indicate that a sizable fall in the U.S. trade balance follows a dollar appreciation. First, although import prices in dollars fall, the resulting rise in import volume is sufficient to offset the fall in their price, raising the dollar value of im-

²A commonly cited condition for whether or not the trade balance falls after an appreciation is the Marshall-Lerner condition. From the perspective of the United States, this condition assumes that a dollar appreciation will lead to a proportional fall in the dollar price of imports, that there will be no change in the dollar price of exports (but a proportional rise in their foreign currency price), and that the trade balance is initially in balance. Under these assumptions, an appreciation reduces the trade balance if the sum of the absolute values of the import and export volume elasticities exceeds unity, where these elasticities are defined as the percentage change in import and export volume given a 1 percent change in their respective prices.

ports. Second, the dollar price of exports falls, but they become more expensive in terms of foreign currency so that export volume drops. This decline in export volume, combined with the drop in export prices in dollars, leads to a significant fall in the dollar value of exports.

The next section examines import and export price adjustments in greater detail, followed by a closer look at import and export volume adjustments.

Import and export price adjustments

The extent to which a change in the exchange rate leads to a change in import prices is commonly referred to as the "pass-through" from exchange rate changes to these prices. To illustrate how an appreciation might be passed through onto lower dollar-priced imports, consider three stylized examples. In the first example, assume that prices charged by foreign exporters (suppliers of U.S. imports) are fixed in terms of foreign currency. After an appreciation, import prices measured in dollars would fall, since fewer dollars would be required to purchase a given amount of foreign currency. In fact, import prices in dollars would fall by the full proportion of the appreciation in this example. The exchange rate appreciation would be said to be completely passed through. At the other extreme, assume that prices charged by foreign exporters are fixed in terms of dollars. In this second example, there would be no pass-through of the appreciation, since import prices expressed in dollars would be unchanged.

However, a dollar appreciation provides incentives for foreign exporters to alter their prices. Specifically, they could simultaneously raise their foreign currency prices and reduce their dollar prices as long as the size of these changes is proportionately less than the appreciation. In doing so, profit margins would rise from the increase in foreign currency prices. At the same time, there would be some gain in competitive advantage and potential to increase sales from the fall in dollar prices. In this third example, the exchange rate change would be partially passed through.

In practice, a mixture of these examples takes place. That is, the prices of some imports are essentially fixed in dollar terms, the dollar prices of other imports change by the full amount of any exchange rate change, and the dollar prices of still others reflect a partial pass-through of any exchange rate change. The extent of the pass-through depends on market conditions for the various imported products, as well as the profit and market share objectives of the individual firms producing those products.

Since foreign firms sacrifice some increase in profit

margins when they lower dollar prices, the pass-through tends to be higher in industries where sales and market share objectives are a particularly important factor in firms' pricing decisions. One important condition, of course, is that sales respond to lower dollar prices, or else there would be less incentive to pass through the dollar appreciation. Another is that output can be expanded to meet rising sales without incurring additional costs so large that they offset the advantages of the pass-through. Finally, whether additional suppliers will appear if foreign profit margins expand also matters because a sufficiently large response from new suppliers would keep a lid on profit margins and put additional downward pressure on dollar import prices.³

Industries producing differentiated consumer goods, such as apparel, wine, and household goods, are examples of industries where a higher pass-through would be expected. Imported products from many other industries also display some of the characteristics necessary for a higher pass-through.

A lower pass-through would be expected for industries where the United States has a major share in the markets as either a producer or consumer, and where relatively homogeneous commodities, such as agricultural goods or minerals, are produced. For these commodities, dollar prices are determined on the world market by the interaction of supply and demand. If what happens within the United States has very heavy weight in determining the global balance of supply and demand, exchange rate changes will have little effect on dollar prices. For some commodities, sales may also be governed by long-term dollar-priced contracts, so that there would be no exchange rate pass-through over the contract period even if the world market were affected.

Other factors may also limit the extent of an exchange rate pass-through. When products are specialized and there are relatively few close substitutes, the demand responsiveness to price changes is low. In this case, there is less incentive for foreign suppliers to reduce dollar prices since no significant gains in sales or market share would be expected.

³ The above list is by no means exhaustive. The existence of many foreign sources of supply can be another factor, since the potential threat to market share from some producers passing through a dollar appreciation may by itself put pressure on other producers to reduce their dollar prices. Other considerations, such as initial profit margins, can also be important. If profit margins limit the amount that domestic producers of import-competing goods can reduce their prices, there is an even greater incentive for foreign producers to reduce dollar prices in anticipation of increasing sales and market share. If foreign profit margins are high to begin with, there may be a greater tendency to pass through an appreciation to lower dollar prices in order to raise sales and market share rather than to limit the pass-through to raise profits.

Table 1

Change in Nonpetroleum Import and Nonagricultural Export Prices from a 10 Percent Dollar Appreciation

In percent

Source of estimate	Import prices measured in:		Export prices measured in:	
	Dollars	Foreign currency	Dollars	Foreign currency
Federal Reserve Bank of New York	-6.0	+4.0	-6.0	+4.0
Simple average of results from other recent studies	-8.0	+2.0	-5.0	+5.0

Sources: P. Hooper, "Forecasting U.S. Export and Import Prices and Volumes in a Changing World Economy", International Finance Discussion Paper No. 99 (Board of Governors of the Federal Reserve System, 1976), E. Spittler, "Short-Run Effects of Exchange Rate Changes on Terms of Trade and Trade Balance", *IMF Staff Papers* (1980), and R. Stern, C. Baum, and M. Greene, "Evidence on Structural Change in the Demand for Aggregate U.S. Imports and Exports", *Journal of Political Economy* (1979) for both imports and exports; M. Kreinin, "The Effect of Exchange Rate Changes on the Prices and Volumes of Foreign Trade", *IMF Staff Papers* (1977) for imports only; and W. Robinson, T. Webb, and M. Townsend, "The Influence of Exchange Rate Changes on Prices: A Study of 18 Industrial Countries", *Economica* (1979) for exports only. Hooper's study is based on nonpetroleum imports and nonagricultural exports, while the others are based on total imports and exports.

Instead, producers would take advantage of the appreciation by raising profit margins.⁴

When looking at exports, the fall in the dollar price depends on the extent to which an exchange rate change is *not* passed through to higher local currency prices in the importer's country. The considerations are the same as for U.S. imports. To illustrate the case for exports, consider a U.S. producer selling goods abroad, initially assuming prices are fixed in dollars. Following an appreciation, foreign currency prices rise as a dollar translates into a greater amount of foreign currency than before. From the foreign purchaser's point of view, U.S. goods consequently become more expensive.

U.S. producers would have to absorb more of an appreciation by reducing prices in dollars in markets where demand is sensitive to price changes or there is strong competition from other countries, such as markets for many manufactured goods, computers, and office machines. Otherwise, sales and market share would be lost to other sources of supply. If, however, U.S. producers absorb a part or all of an appreciation, profit margins from exporting would fall.

If foreign demand is insensitive to price changes and if competition from foreign suppliers is weak, U.S. producers might be able to maintain these prices without having sales volume contract. Probably the best example of an industry in this position is the U.S. oil- and gas-drilling equipment industry. For goods,

such as some farm machinery, where a large portion of sales are to the U.S. domestic market and exports are only of limited interest, there is also more likely to be a pass-through effect since loss of export sales and foreign market share would be of minimal concern to the firm.

Empirical evidence. At the aggregate level, econometric evidence supports the notion of a partial pass-through. Based on the empirical research at the Federal Reserve Bank of New York reported in Table 1,⁵ both export and import prices expressed in dollars fall by about 6 percent for every 10 percent appreciation of the dollar. Put another way, the pass-through for U.S. imports is a little less than two thirds, while the pass-through for U.S. exports is a little more than one third. Table 1 also reports the average for some other representative estimates from other relatively recent studies. It should be noted that some of the latter estimates included in the average are for total imports and exports, while those from the Federal Reserve Bank of New York exclude petroleum imports and agricultural exports. Also, for reasons that are discussed later, import and export price adjustments to the dollar appreciation do not occur instantaneously, but only after some delay.

Import and export volume adjustments

The demand for imports, and therefore import volume, tends to rise following an appreciation of the dollar

⁴ Still, some pass-through might ultimately be expected. As long as some increase in sales is expected, even a profit-maximizing monopolist in the U.S. market would reduce dollar prices somewhat in response to an appreciation.

⁵ Detailed analysis of the estimates and underlying methodology is given in R. Feldman, "The Trade Balance Effects of the Dollar's Recent Strength", Federal Reserve Bank of New York, Research Paper No. 8206 (1982).

because the dollar price of imports falls, making imports more attractive than domestically produced goods. The demand for exports, and therefore export volume, tends to drop after an appreciation. When the pass-through is only partial, foreign currency export prices rise even though their dollar prices fall, so that U.S. exports become less attractive than goods produced abroad. The extent of these volume adjustments depends on the price adjustments previously discussed and on the sensitivity of demand to price changes. In addition, as discussed later, these volume adjustments occur with a lag.

Empirical evidence. Table 2 summarizes the empirical evidence on the relative price elasticities for aggregate import and export volume. As the table indicates, U.S. import volume is responsive to changes in relative prices (import price divided by the price of domestically produced competing goods). Based on empirical research at the Federal Reserve Bank of

New York, a 10 percent fall in the relative price of imports (excluding petroleum) results in a 16 percent rise in import volume. As noted earlier, a 10 percent appreciation of the dollar, everything else being equal, leads to a 6 percent decline in relative import prices, which we can now predict will lead to about a 10 percent increase in import volume. But, since the price and volume effects move in the opposite direction, the growth of the dollar value of imports, at about 4 percent, is relatively small.

Table 2 also indicates that export volume is responsive to changes in its relative price (export price divided by the price of foreign-produced competing goods converted to dollars at the current exchange rate). Based on our estimates, a 10 percent rise in the relative price of exports (excluding agriculture) results in a 13 percent fall in export volume. Since a 10 percent appreciation of the dollar, everything else being equal, results in a 4 percent rise in relative export prices, export volume will decline over 5 percent and the dollar value of exports will fall over 11 percent.

Table 2

Change in Nonpetroleum Import and Nonagricultural Export Volumes

Based on a 10 percent fall in import prices relative to domestic prices and a 10 percent rise in export prices relative to foreign prices

In percent

Source of estimate	Imports	Exports
Federal Reserve Bank of New York	+16	-13
Stern, Francis, and Schumacher*	+17	-14
Simple average of results from other recent studies	+15	-10

* Based on total imports and exports. The authors—R. Stern, J. Francis, and B. Schumacher, *Price Elasticities in International Trade* (London: MacMillan, 1976)—consider these the "best" estimates of price elasticities; they are based on the approximate median of estimates from several studies.

Other sources: M. Deppler, and D. Ripley, "The World Trade Model: Merchandise Trade", *IMF Staff Papers* (1978), T. Gylfason, "The Effect of Exchange Rate Changes on the Balance of Trade in Ten Industrial Countries", unpublished manuscript (1978), and P. Hooper, "The Stability of Income and Price Elasticities in U.S. Trade, 1957-1977", International Finance Discussion Paper No. 119 (Board of Governors of the Federal Reserve System, 1978) for both imports and exports; and M. A. Akhtar, "Income and Price Elasticities of Non-oil Imports for Six Industrial Countries", *The Manchester School* (1981) for imports only. Hooper's study is based on nonpetroleum imports, as is Akhtar's, and on nonagricultural exports. Deppler and Ripley's study is based on manufactured goods, while Gylfason's is based on total imports and exports.

Estimated impact of the dollar appreciation on U.S. merchandise trade balance

This section pulls together the previous analysis so that plausible ranges can be estimated for the impact of the appreciation of the dollar on the U.S. merchandise trade balance. However, just as it appears that the favorable response of the trade balance to the 1977-78 depreciation took time to materialize, the adverse effects of the recent dollar appreciation can be expected to have full impact only after some delay. These lags in trade adjustment are reviewed first.

Timing of price and volume adjustments

Part of the lagged response of trade flows to exchange rate changes is in the adjustment of prices. For some products, sales may be governed by dollar-priced contracts, so that there is no exchange rate pass-through for these imports and a complete pass-through for these exports until the contracts expire. Another reason for lags is that exporters and importers are less likely to alter their behavior in response to incentives they consider to be only temporary. More specifically, exchange rates are known to fluctuate considerably, and changes in the value of the dollar may initially be viewed as transitory rather than permanent. While exchange rate changes affect the pricing of imports and exports as the new rates hold, adjustment may take a number of calendar quarters. Most empirical work has found that import and export prices do indeed respond to changed exchange rates with a lag.

There may also be a considerable further lag before volume responds. Since price effects occur with a lag, volume adjustments to changed prices also occur with a lag. But other factors may also lengthen the lag of the volume response.

For purchasers of goods, whether the goods are imports or exports, shifting sources of supply involves adjustment costs, and buyers may not be willing to incur these costs until they feel a price advantage from shifting suppliers is broadly expected to be sustained. This may be especially true if a long-standing business relationship has been built up or a long-term sales contract is in force.

Further, once purchasers decide to change their suppliers, it may still take some time before their demands can be met, unless new suppliers have sufficient inventories on hand or output can be easily expanded. Even then, there may be a lag between the time new orders are made and delivery takes place because of production and transportation time.

From the suppliers' standpoint, it may take some time to respond to changing profit incentives. For example, when the dollar appreciates, U.S. profit margins from exporting are generally squeezed as dollar export prices fall. It may also take time after an appreciation for foreign suppliers to focus their sales effort on penetrating markets where they can compete more easily with U.S. producers. This is particularly true for products that are differentiated among national producers by distinctive characteristics or that are built to specification, such as industrial machinery or computers. Here, an even greater sales effort may be required to inform prospective customers of the potential benefits of the product. A still longer lag is needed before foreign producers can build plants and buy equipment to pursue new foreign trade opportunities that exchange rate changes bring. By the same token, U.S. producers may continue to produce and remain competitive by accepting narrow profit margins, but they may not choose to replace capacity as it wears out.

Indeed, just as the trade balance effects of the 1977-78 depreciation did not materialize until years afterward, the lagged effects of the dollar appreciation can be expected to last at least through next year. Empirical evidence suggests adjustment lags are long, sometimes up to four years or more, although the major portion of the adjustment takes place within about two years.

The J-curve

One outcome of the lagged response of the merchandise trade balance to exchange rate changes is the possibility of an initial trade balance improvement

following an appreciation, or what is called a J-curve response after the shape of the supposed adjustment path subsequent to a depreciation.

The immediate effect of an exchange rate appreciation is to lower the dollar price of imports, while the dollar price of exports falls somewhat more slowly. By themselves, these price adjustments tend to reduce the dollar value of imports more than exports, and the trade balance is increased. Once volume begins to adjust, it will take some time until the rise in import volume and the fall in export volume are sufficient to offset the valuation effects from falling dollar prices. The adjustment path would look somewhat like an inverted J.

Empirically, however, this J-curve phenomena does not appear to be large for the United States. By the third quarter following an exchange rate appreciation, the trade balance shows a net deterioration.

First-round trade balance effects

Looked at from a longer term perspective, estimates of price and quantity adjustments to exchange rate changes based on research at the Federal Reserve Bank of New York, reported in Tables 1 and 2, imply that the roughly 20 percent appreciation of the dollar that has occurred over the last two years could eventually be responsible for more than a \$45 billion deterioration in the U.S. merchandise trade balance.⁶ Specifically, import volume (excluding petroleum) rises by over 18 percent while prices fall by roughly 10 percent from their pre-appreciation levels. But, although the appreciation's impact on import prices and volume is large, the total effect on value is much smaller, since price and volume move in opposite directions. For exports (excluding agriculture), both price and volume fall by over 10 percent from their pre-appreciation levels. These adjustments then imply that, in value terms, exports are affected to a larger extent than imports as the appreciation lowers the level of exports by over \$35 billion and raises the level of imports by over \$10 billion.

Taking adjustment lags into account, a major portion of the trade balance response to the dollar appreciation should take place by the end of next year. Thus, the estimates imply that the resulting loss of U.S. competitiveness from the dollar appreciation alone could add as much as \$45 billion to the U.S. merchandise trade deficit by the end of 1983, compared with what it would have been in the absence of the dollar appreciation.

⁶ The base period for these calculations is the third quarter of 1980 when the effective exchange rate of the dollar was at one of its lowest levels in the last five years. However, the effective value of the dollar was not significantly above that level through much of 1979 and 1980.

The previous analysis concentrates on the exchange rate effects through nonagricultural exports and non-petroleum imports. Only limited attention has been paid to agricultural exports and petroleum imports up to this point. One reason is that the trade balance effects through these latter two components are likely to be relatively small, compared with the effects through the other two components. In the first place, among the factors that move agricultural exports and petroleum imports around, such as harvests and Organization of Petroleum Exporting Countries (OPEC) pricing and production decisions, exchange rate effects are comparatively small. Secondly, the appreciation would probably lower both the dollar value of U.S. agricultural exports and petroleum imports so that the combined impact on the trade balance is reduced, and the direction of change depends on the extent of the reduction of each component.⁷

Impact on the U.S. economy and feedback effects

The estimated first-round import and export price and quantity adjustments have substantial effects on U.S. real economic activity and inflation. Looking at the volume effects alone, the rise in import volume, combined with the fall in export volume, will directly reduce the level of U.S. real GNP at the end of next year by 1 to 1½ percent of its third quarter 1980 pre-appreciation level.⁸ Looking at the price effects alone, the sizable drop in import and export prices in dollars contributes to an improved U.S. inflation outlook. Econometric evidence suggests that the dollar appreciation could reduce the level of U.S. prices by as much as 3 to 4 percent by the end of next year.

The ultimate effects of the dollar appreciation also depend on policy responses, if any, to the appreciation. For example, monetary authorities abroad might choose to accommodate price increases stem-

ming from currency depreciations. U.S. exports could then rise as a result of more expansionary policies in foreign countries, reducing the trade deficit. Alternatively, macro policies abroad could become more contractionary to combat the inflationary effects of higher traded goods prices or because of exchange market intervention to support the foreign currency. More contractionary policies abroad could reduce U.S. exports and further enlarge the U.S. trade deficit.

Similarly, the total effect on economic activity and trade will also depend on the policy stance in the United States. With unchanged monetary targets and fiscal policy, the exchange rate appreciation may lower interest rates through contractionary effects on aggregate demand stemming from lower real economic activity and prices. However, reductions of interest rates induced by exchange rate appreciation may tend to attenuate the fall in domestic aggregate demand and lessen the domestic constraint of fixed monetary targets.

The changes in real economic activity and inflation, both here and abroad, induced by the dollar appreciation also feed back onto U.S. trade balance adjustments.

In response to a decline in import prices, domestic producers of import-competing goods may reduce their prices to offset some of their lost competitiveness. Moreover, lower domestic production costs from the reduced price of imported materials and other inputs may further facilitate price and wage reductions. If so, the relative price of imports may not fall by as much as the drop in import prices alone.

Similarly, in response to the rise in U.S. foreign currency export prices, foreign producers of competing goods may also raise their prices to increase profit margins, while still remaining competitive with U.S. exports.

Higher import prices may tend to add to wage pressures—directly in countries where wage indexation is prevalent. And foreign producers may face higher production costs if they use some U.S. exports or dollar-denominated goods as inputs to production. Higher production costs, in turn, may put upward pressure on foreign export prices.

Put in more general terms, the dollar appreciation tends to lower the U.S. price level for many reasons, including the resulting lower costs for imported goods used as production inputs and the direct spillover of lower import prices onto prices of import-competing goods. Upward pressure on wages may also be reduced, depending on the weight of imports in the cost of living, further lowering cost and price pressures for U.S. goods. Mirroring the reduction of U.S. inflation from the dollar appreciation, average

⁷ A dollar appreciation can lower both agricultural exports and petroleum imports. For agricultural exports, prices and volume will decline although probably not by much. Attempts to measure the effects of exchange rate changes on agricultural export prices and volume have not been successful. If OPEC maintains an unchanged oil price, the U.S. oil-import bill would remain unchanged. But higher oil prices in other countries could contribute to softness in oil markets, as it seems to have this year, and constrain OPEC pricing policies. Since OPEC imports from countries with depreciating currencies would be cheaper, OPEC would have a second reason to keep the dollar price of oil down. Cheaper oil would mean somewhat greater demand, but oil price elasticity estimates indicate that the net effect would be a smaller oil bill for the United States than otherwise.

⁸ The dollar appreciation may have an expansionary wealth effect on economic activity as well as a contractionary effect working through the trade balance. When foreign goods become cheaper, the real wealth of U.S. residents is likely to be increased, and this may lead them to spend more on domestic as well as on foreign goods. The wealth effect on foreigners reduces spending, including spending on U.S. exports.

foreign price levels should analogously be higher because of the corresponding depreciations of their currencies. According to our estimates, feedback effects from lower relative U.S. inflation could reduce the first-round impact of the dollar appreciation on the trade balance by roughly \$10 billion by the end of next year.

Changes in U.S. and foreign real aggregate demand also alter trade balance adjustments. On the one hand, these influences would tend to reduce the estimated trade balance impact of the dollar appreciation. The reduction of U.S. aggregate demand from a rising trade deficit would eventually reduce imports, while higher foreign aggregate demand, spurred by the corresponding improvements in their external sectors from currency depreciations, would raise exports. On the other hand, the reduction of U.S. inflation and the rise in foreign inflation caused by the dollar appreciation implies that a larger increase in real output can be accommodated in the United States, consistent with an anti-inflation policy stance, while the opposite holds abroad. This might lead to higher imports and lower exports. On balance, however, empirical evidence suggests that aggregate demand effects reduce the first-round impact of an appreciation when money supply growth is unchanged.

Based on the average historical response of imports and exports to changes in U.S. and foreign real GNP, the impact of these feedback effects on our first-round estimates probably would be relatively small, as a sizable increase in foreign real GNP and a fall in U.S. real GNP would be required to reduce the estimated trade balance effects by about one fourth. As one example, a 2 percent rise in foreign real GNP and a 1½ percent fall in U.S. real GNP would reduce our trade balance estimates by roughly \$10 billion.

Finally, there is always the possibility of a reversal of the dollar appreciation based on both the historical experience and empirical evidence that suggests a growing trade deficit can put downward pressure on the dollar. Even so, there would be a considerable

lag before trade flows respond. As a result, the appreciation, unless immediately reversed, will still have considerable impact over the next two years.

Summary of results

The appreciation of the dollar to date can be expected to increase the U.S. merchandise trade deficit by the end of next year by as much as \$45 billion. Export sales could be roughly \$35 billion lower, and the U.S. import bill could be \$10 billion higher.

Through its effects on export and import volume, the appreciation will also significantly reduce the level of U.S. real GNP. By the end of next year, the appreciation will reduce the level of export volume to more than 10 percent below—and raise the level of import volume to over 18 percent above—what they otherwise would have been. From these volume effects, the end of next year's level of U.S. real GNP will be directly lower by 1 to 1½ percent than the third quarter 1980 pre-appreciation level, everything else being equal.

Exchange rate changes also have important price effects. The dollar appreciation has a sizable direct impact on both import and export prices. By the end of next year, the appreciation will reduce the level of both export and import prices (measured in dollars) to 10 percent or more below what they otherwise would have been. Changes in these prices directly alter the U.S. merchandise trade balance. They also contribute both directly and indirectly to an improved U.S. inflation outlook.

There is, of course, considerable uncertainty attached to these estimates. What happens to the U.S. trade balance also depends on policy developments and on other important factors such as real income and inflation. Trade developments influence real income and inflation so as to offset a part of the first-round effects. However, the trade balance impact of the dollar appreciation is substantial and likely to be visible in a widening deficit during the rest of 1982 and 1983.

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