Explaining the Persistence of the U.S. Trade Deficit in the Late 1980s

by Susan Hickok and Juann Hung

The United States ran a larger, more persistent trade deficit during the 1980s than many trade analysts had anticipated. To be sure, the dollar's rise in the early 1980s led most observers to predict a sharp increase in the trade deficit in the middle of the decade However, the return of the dollar to its 1979-80 level (measured in real terms) by 1987, coupled with strong growth in foreign demand, raised expectations that before the decade's end, the U.S merchandise trade deficit would also return to roughly the level registered at the beginning of the 1980s—about $25 billion, or 1 percent of U S. GNP. Instead, the deficit remained above $100 billion, or more than 2 percent of U S GDP, through 1990. Only in 1991 did the deficit slide below the $100 billion level, reflecting to some extent the effects of the U.S. recession

Several hypotheses were advanced in the second half of the 1980s to explain the trade gap's persistence, but to date no attempt has been made to assess the relative merits of these theories. This article returns to the puzzle of the enduring deficit and evaluates some efforts by earlier researchers to solve it. As a first step, we investigate whether macroeconomic factors and the debt problems of developing countries played a role in keeping the deficit high We then turn to a detailed analysis of two prominent interrelated hypotheses put forward to explain the deficit's surprising magnitude in the late 1980s. Our analysis includes a careful review of the statistical evidence bearing on the hypotheses In addition, it presents an expanded trade model specifically geared to test each theory

The first hypothesis we investigate argues that the rise in the dollar in the early 1980s depressed U.S capital stock investment relative to investment abroad, hurting U.S. supply capability and hence the U S. trade balance. The dollar's fall in the mid-1980s began reversing this process, but the reversal was not yet complete by the decade's end. With time, further improvement in the trade balance is expected as this reversal plays itself out. The second hypothesis argues that shifts in the structure of U.S. trade flows, affecting both the commodities traded and the participants in trade, significantly weakened the ability of the United States to adjust its trade balance in response to the mid-1980s dollar depreciation This hypothesis predicts that the U.S trade balance will not return to its level of the late 1970s or early 1980s over time, despite the return of the dollar to its beginning 1980 level and the ultimate comparability of demand growth in the United States and abroad.

These two hypotheses are not totally independent of each other. Changes in relative capital stock levels could be one determinant of structural shifts in trade. Structural shifts in trade could also be one factor leading to shifts in relative capital stock levels Although we recognize this interrelationship, we have chosen to focus on narrowly defined versions of each hypothesis. This approach underscores the two theories' very different assessments of the future course of the U S. trade deficit.

The recent fall in the U.S. trade deficit highlights the importance of evaluating the different outlooks implied by the two narrowly defined hypotheses The U S recession has clearly played a significant role in reduc-

ing the trade deficit in 1991. However, if this decline in the deficit also partially reflects a readjustment of world capital stocks, a significant part of the recent trade balance improvement may be sustained after the recession ends But if capital stock developments have not played a prominent role in the deficit's tenacity in the late 1980s or in its more recent decline, the recent trade balance improvement is less likely to be sustained to any substantial degree as the U.S recovery takes hold.

Our analysis suggests that both the dollar's fall in the mid-1980s and the resurgence of foreign demand in the late 1980s have led to substantial adjustment in the U S. trade balance We find, however, that in 1989 the U S trade deficit still remained well above the level that exchange rate and demand conditions would have warranted in the past. We further find that the trade deficit's tenacity cannot be simply explained by shifts in world capital stocks in response to exchange rate movements, as the narrowly defined capital stock hypothesis would suggest. Shifts in the relative size of world capital stocks have been dominated by factors other than changes in the value of the dollar. Thus, there is little evidence that relative capital stock developments were moving in step with exchange rate developments in the 1980s or that the U S trade balance is currently changing in favor of the United States because of capital stock adjustments to the dollar's depreciation in the second half of the decade

This article finds that the factor most directly responsible for the relatively weak U S trade position in the late 1980s is structural change in world trade Structural change appears to have substantially hurt both U.S. export and import-competing capabilities in the 1980s In fact, it is estimated to have worsened the 1989 U.S. trade balance by roughly $65 billion As a consequence of structural shifts, the United States may now be expected to be in a significantly weaker trade balance position for any given set of exchange rates and demand conditions than would have been the case in the past.

The next section examines the evolution of the U.S trade balance deficit in the 1980s, underscoring the limited role played by exchange rate and demand developments in its net deterioration Following this, we briefly discuss the influence of the developing countries' debt repayment problems on U S. export sales and the trade deficit We then analyze the interrelated hypotheses concerning the trade balance impact of shifts in relative capital stocks and structural changes in trade relationships Our conclusions are compared with those of other recent studies examining the persistence of the U S. trade deficit—notably the studies of Lawrence and Cline. A final section considers the implications of our findings for future U.S. trade balance adjustment.

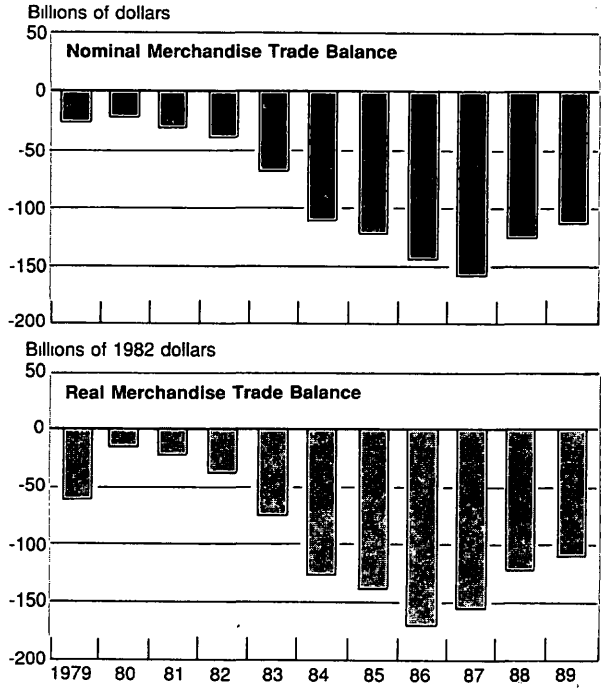
U.S. trade balance adjustment in the late 1980s

In 1989, the U S merchandise trade deficit rose to $116 billion, four times its level in 1979 (Chart 1) Although the 1989 deficit had come down $43 billion from a peak level of $159 billion in 1987, it was still much larger than many analysts had expected. To be sure, the trade deficit has declined substantially further over the last two years, falling to roughly $75 billion in 1991. However, trade elasticities from a variety of models suggest that this recent improvement has been due to the U S recession as well as the net fall in the dollar since 1989 [1] More difficult for economists to explain than the recent fall in the deficit is the failure of the trade deficit in the late 1980s to show significantly more improve-

[1]Calculations based on the income and price elasticities of six macroeconomic models suggest that relative price developments and, more important, relative demand growth developments during 1990 and 1991 basically "explain" all of the improvement in the U S non-oil, nonagricultural trade volume balance over these two years Elasticities are reported in Ralph Bryant, Gerald Holtham, Peter Hooper, eds , *External Deficits and the Dollar* (Washington, D C Brookings Institution, 1988)

Chart 1

U.S. Trade Balance



Source National Income and Product Accounts

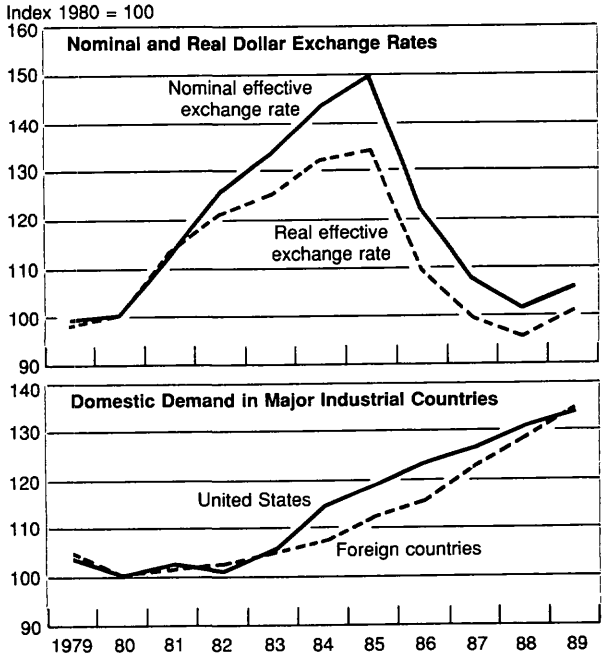
ment in response to exchange rate and demand developments. For instance, Hooper and Mann comment that "while the initial widening of the deficit [in the early 1980s] can be adequately explained by macroeconomic factors, the deficit has adjusted substantially more slowly (particularly in real terms) to the fall in the dollar since early 1985 than conventional macro trade equations would predict," while Krugman and Baldwin refer to "the puzzling persistence of the trade deficit."[2]

The gap between the deficit's size in 1979 and 1989 is particularly perplexing because the economic fundamentals that typically determine the size of the trade balance—the real effective value of the dollar and the level of U.S. real demand relative to the level of real demand in industrial countries abroad—were roughly equivalent in 1979 and 1989 (Chart 2). Of course, exchange rates and relative demand levels had shifted dramatically in the years between 1979 and 1989. The dollar rose 46 percent in the early 1980s before falling back in the mid-1980s. U.S. demand grew much more rapidly than foreign demand in 1983 and 1984, while foreign demand grew more rapidly than U.S. demand in the 1987-89 period. Nevertheless, measured in real terms, the dollar had returned to its 1979 level by 1987 and it remained there for the rest of the decade.[3] Moreover, by 1989 the level of foreign demand had regained its 1979 position relative to the level of U.S. demand.

[2]Peter Hooper and Catherine Mann, "The U S External Deficit· Its Causes and Persistence," Board of Governors of the Federal Reserve System, International Finance Discussion Papers, no 316, 1987, abstract; Paul R Krugman and Richard E Baldwin, "The Persistence of the U S. Trade Deficit," *Brookings Papers on Economic Activity*, 1 1987, p 1

Chart 2

Exchange Rates and Growth Developments



Notes: In the top panel, rates are computed using International Monetary Fund MERM weights. Real effective rates are calculated from the nominal exchange rates (foreign currency/dollar) adjusted for relative movements in wholesale prices. In the bottom panel, foreign domestic demand is a GNP-weighted geometric average. The foreign countries are Germany, Italy, France, the United Kingdom, Canada, and Japan.

The similarity in exchange rate and relative demand conditions in 1979 and 1989 suggests that other factors largely explain why the U.S. trade deficit was so high in the late 1980s. To be sure, the change in the dollar in the early 1980s and the rapid U.S. growth rate relative to growth abroad did lead to a much sharper increase in U.S. imports than in U.S. exports in the first half of the decade. It is possible that lingering adjustment to these early 1980s developments, along with differences in U.S. and foreign trade responses to income growth, explains some of the difference between the 1979 and 1989 U.S. trade balance levels. Nevertheless, a variety of estimates of trade volume elasticities indicate that these two macroeconomic factors do not account to any significant extent for the net deterioration in the U.S. trade volume balance between 1979 and 1989.[4] In fact, since exchange rate levels and demand conditions do not appear to be an important factor behind the difference in the trade balance in these two years, 1979 and 1989 are particularly useful reference years in which to examine other hypothesized causes.

Before considering the two most prominent hypotheses, it is important to note that the dramatic divergence between the 1979 and 1989 trade balances consisted primarily of a sharp difference in trade *volume* balances, measured in constant 1982 prices, for the two years (Chart 1). More particularly, the difference reflected a sharp change in the volume of non-oil imports relative to the volume of nonagricultural exports

[3]The dollar exchange rate index on which this calculation is based includes only the currencies of major industrialized countries However, a nominal trade-weighted dollar index based on the currencies of eighteen industrialized and newly industrializing economies in Asia also shows that the dollar was back at its 1979 level in 1988 and 1989 See Federal Reserve Bank of Atlanta, *Economic Review*, June-July 1986, Summer 1987, and September-October 1990 issues

[4]Calculations based on the income and price elasticities of six macroeconomic models suggest that relative price and income movements caused no net deterioration in the U S. trade volume balance between 1979 and 1989 Of course, these calculations are by nature imprecise Elasticities are reported in Bryant, Holtham, Hooper, eds , *External Deficits*

(Chart 3). In 1979 the U.S. non-oil, nonagricultural trade volume balance registered a positive $9 billion. In 1989 this balance was in deficit by $54 billion, a swing of $63 billion from its 1979 position. This difference in the non-oil, nonagricultural trade volume balance will be useful in evaluating the two competing hypotheses· the hypothesis that best explains these trade volume developments is the more plausible. But first we consider another factor often cited in discussions of the tenacity of the trade deficit.

Developing country problems

In the mid-1980s, the deterioration in the U.S. trade balance position was often linked to the debt crisis in the developing countries. Recognizing the attention this argument received in the past, we briefly reconsider it here. The debt crisis broke out in 1982 when Mexico announced that it was unable to meet its contractual loan obligations. Although many developing countries experienced severe debt repayment problems in the 1980s, the most pronounced regional debt problem was in Latin America. Some analysts felt that this regional concentration had a particularly sharp impact on U.S. trade because Latin America was a major market for U.S exports In this view, a drop in demand in Latin America could have significantly weakened the U.S. trade performance. These analysts further argued that U.S. trade forecasts would not have captured the effect of declining demand in Latin America because the econometric models behind many of the forecasts were driven by perceived growth prospects in industrialized, rather than developing, countries

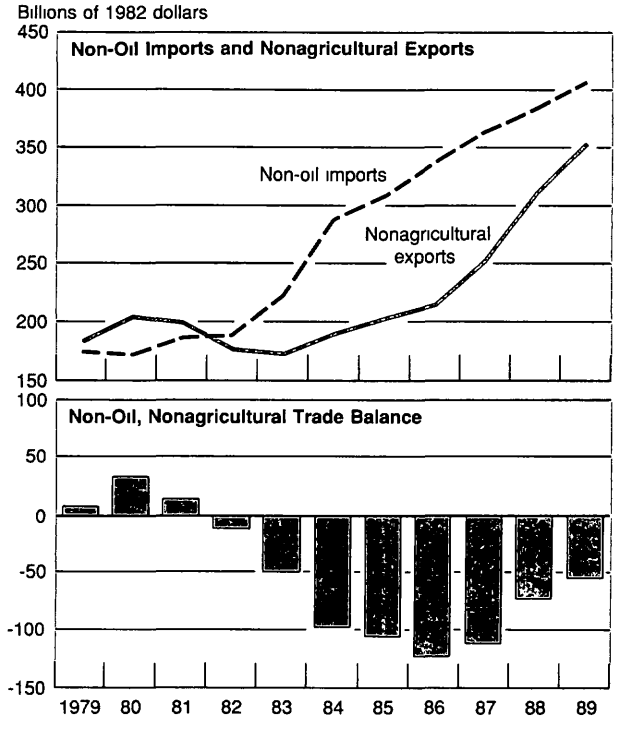
In assessing this argument, we note that Latin America's imports did drop sharply in response to financing problems in the 1980s In 1982 Latin America took 15½ percent of total U.S exports, already less than the share it had taken at the beginning of the 1980s (Chart 4) [5] In 1983 Latin America's share of U.S exports fell to 12½ percent and then hovered between 13 and 14 percent for the rest of the decade. This fall in Latin America's share of U.S. exports represented a significant loss of potential U.S. export sales. If U.S. exports to Latin America had grown at the same pace as U.S exports to the rest of the world during the 1980s (that is, if Latin America had maintained a constant share of U.S. exports), U.S export volume would have been $11 billion higher in 1989.

The analysis of the role played by developing countries in shaping U S. trade performance would not be

[5]The share of U S exports going to developing countries was unusually low in 1979 and unusually high in 1980 Consequently, shares given for the beginning of the 1980s refer to the average of 1979 and 1980 shares

Chart 3

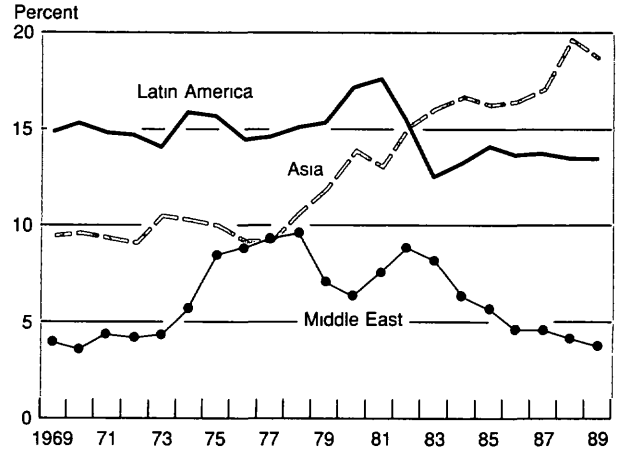
U.S. Trade Volume Developments



Source National Income and Product Accounts

Chart 4

Regional Shares of Nominal U.S. Exports



Source International Monetary Fund, Direction of Trade Statistics

complete, however, without considering other regions. U S. exports to Asian developing countries soared in the 1980s. Asian countries purchased 13 percent of U S. exports at the beginning of the 1980s; by the end of the decade, Asia's share had risen to 19 percent By contrast, the Middle East's share of U.S exports declined substantially—from 7 percent to 4 percent—during the course of the 1980s as the Middle East adjusted to a sharp decline in the price of petroleum. When these developments are taken into account, the overall share of U S exports going to developing countries in 1989 was about the same, roughly 38 percent, as it had been at the beginning of the 1980s Weakened developing country demand, consequently, does not appear to have been a significant factor explaining the large U S. trade deficit of the late 1980s [6]

The role of capital stock developments and structural shifts in trade

The first of the two prominent hypotheses explaining the persistence of the U.S. trade deficit centers on capital stock developments It argues that the rise in the dollar in the early 1980s discouraged U S investment and hence reduced the supply of U S. goods relative to the demand for U S goods, hurting the U S trade balance This capital stock hypothesis, which fits in with the increased attention economic analysis has devoted over the last decade to "supply side" factors, further argues that the fall in the dollar starting in 1985 should now be encouraging U.S investment and improving the U.S. trade position.[7]

The second hypothesis has several variants, but all contend that changes in the structure of world trade in the 1980s have affected the U.S. trade response to changes in exchange rates and income levels Specifically, this structural shift hypothesis argues that at any given exchange rate level and level of U S. demand relative to foreign demand, the United States will now export less and import more than it did in earlier years because of structural changes in trade relationships

As noted earlier, the capital stock and structural shift hypotheses are clearly interrelated According to standard international trade theory, a change in the size of a country's capital stock relative to the size of the capital stock in the rest of the world is likely to affect that country's trade composition. A change in trade composition would be one important example of a structural shift in trade that would affect a country's response to exchange rate changes Conversely, a structural shift in trade such as a change in purchaser sentiment toward a given country's products could alter investment plans and hence relative capital stock levels.

The cross effects of capital stock changes and structural shifts in trade are very difficult to separate econometrically, therefore, any separate empirical analysis of the two hypotheses must be conducted with care. However, by defining the two hypotheses narrowly and considering only the direct impact of each, we can obtain some interesting findings. Narrowly defined, the capital stock hypothesis would focus on changes in the relative size of capital stocks due solely to exchange rate changes, thereby excluding capital stock developments resulting from structural shifts in trade. The structural shift hypothesis would focus on the impact that structural shifts have had on trade adjustment beyond any direct supply considerations arising from a change in capital stock size. The remainder of this section presents fuller descriptions of these narrowly defined hypotheses and econometric evidence of the validity of each one.

Capital stock developments

The narrowly defined capital stock hypothesis, which we will call the exchange rate/capital stock hypothesis, may be divided into two arguments The first argument considers relative capital stock levels in the United States and abroad without regard to ownership questions This argument starts with the premise that a country's export supply and, more generally, its total supply of goods (sold domestically and exported) depend on its production capacity—specifically, the size of its capital stock. The size of a country's capital stock, in turn, depends in part on the level of the country's exchange rate. That is, as a country's currency appreciates, its goods become less competitive, discouraging investment At the same time, investment is encouraged abroad as foreign goods gain in competi-

[6]Developments in traditional macroeconomic factors—relative price developments and income growth—are consistent with the observation that developing countries did not grow in U S export share Growth in real GNP was only slightly faster in developing countries (registering 3 2 percent per year) than in foreign industrial countries (registering 2 8 percent per year) during the 1979-89 period The impetus from this small growth differential was likely to have been more than offset by the loss of purchasing power experienced by the developing countries as their terms of trade declined, notably in the oil sector Moreover, U S exports to developing countries generally compete more with exports from other industrialized countries than with goods produced in the developing countries themselves As noted, there was no net shift in the value of the dollar relative to the currencies of other industrial countries between 1979 and 1989 It might be argued that developing countries should have increased their share of U S exports to reflect a growing integration in world trade It is difficult, however, to choose a benchmark period in the past upon which to base expected share growth Although developing countries increased the share of U S exports they purchased by 6 percentage points between 1969 and 1975, the share they purchased fell by 1 percentage point between 1975 and 1979

[7]Ramon Moreno describes, but does not specifically endorse, this widely discussed capital stock hypothesis in "The Baffling Dollar," Federal Reserve Bank of San Francisco *Weekly Letter*, December 2, 1988

tiveness. Domestic production capacity, output, and exports fall relative to foreign production capacity, output, and exports Consequently, the trade balance of the appreciating country deteriorates.[8]

Applying this argument to U.S trade, proponents of the exchange rate/capital stock hypothesis contend that the large rise in the dollar in the early 1980s adversely affected U S. investment and hence depressed U.S exports relative to U S imports Indeed, in the early to mid-1980s the claim was often made that the strength of the dollar was causing U S. companies to move production offshore. Moreover, certain U S industries, most notably machine tools, sought protection by arguing that U.S. production of their goods was about to cease, making the United States totally dependent on imports to meet its needs According to the exchange rate/capital stock hypothesis, the fall in the dollar starting in 1985 should have led to a reversal of this U S. disinvestment process. However, this reversal would not have been completed by 1989 because investors were initially uncertain whether the lower dollar would persist. Even after investors became convinced that the dollar would not rebound, it would take time for investment to be set in place

The second argument of the exchange rate/capital stock hypothesis focuses on additional trade considerations arising from foreign direct investment Specifically, foreign direct investment is postulated to have a short-run positive influence on the host country's imports because foreign subsidiaries initially import a disproportionate amount of capital equipment and components from their parent firms. But in the longer run, because the subsidiaries often produce goods identical with those of their parent firms, production in the host country may actually directly displace imports of these goods (as opposed to competing with both imports and other domestically produced goods for domestic sales) Such a development would reduce host country imports even more than would the creation of new domestically owned enterprises. Mindful of these relationships, and assuming that exchange rate developments have significantly influenced foreign direct investment flows, some adherents of the exchange rate/capital stock hypothesis have argued that the rise in the dollar increased U.S. investment abroad in the early 1980s, causing a temporary positive boost to U.S. exports that turned to a depressant on U S exports in the late 1980s Similarly, they have argued that the fall in the dollar starting in 1985 increased foreign investment in the United States, temporarily boosting U S imports over the last few years.

Developments in relative capital stocks

Two observations from the 1980s have focused analysts' attention on the premise that a country's export level is correlated with the size of its capital stock First, the economies with the strongest capital stock growth, those of the Asian newly industrialized countries (NICs),[9] showed the strongest export growth over the last decade Second, anecdotal evidence in a few U S industries, notably chemicals and paper, suggests that export growth was slowed by capacity constraints in the 1987-88 period.[10]

On a more rigorous econometric level, proponents of the exchange rate/capital stock hypothesis have pointed to work by Helkie and Hooper that estimates a statistically significant relationship between the U S. trade performance and the size of the U S capital stock relative to the size of the aggregate capital stock abroad [11] (Helkie and Hooper's estimation focused on the direct effects of capital stock changes on trade through changes in supply capabilities, it did not include any indirect effects arising from capital stock developments that cause structural shifts in trade relationships.) These researchers found that U S. nonagricultural export volume increased roughly 1⅓ percent for every 1 percent increase in the ratio of the U S. capital stock to the aggregate capital stock of major foreign industrial countries. Their results also showed that U.S. nonpetroleum import volume fell about four-fifths of 1 percent for every 1 percent increase in the ratio of the U S capital stock to the capital stock abroad.

Helkie and Hooper's findings are corroborated by the econometric trade volume model described in the appendix This model, which specifically incorporates capital stock developments as well as other special trade factors discussed in this article, finds a statistically strong positive relationship between U.S. capital

[8]Investment only responds to what is perceived to be a sustained change in exchange rates, moreover, it takes a fairly long time to be put in place Consequently, proponents of the exchange rate/capital stock hypothesis argue that these capital stock developments are not captured in normal trade price elasticities, which typically assume that all trade adjustment to exchange rate changes is completed by the end of two years

[9]The group comprises Hong Kong, Singapore, South Korea, and Taiwan

[10]Whether capacity constraints significantly impeded overall U S export growth was frequently discussed during this period However, only selected industrial supplies industries actually reached their peak capacity levels during 1987-88, and capacity constraints had a minimal impact on overall export growth

[11]William L Helkie and Peter Hooper, "The U S External Deficit in the 1980s An Empirical Analysis," Brookings Institution, Brookings Discussion Papers, no 56, March 1987, Peter Hooper, "Exchange Rates and U S External Adjustment in the Short Run and the Long Run," Board of Governors of the Federal Reserve System, International Finance Discussion Papers, no 346, March 1989

stock growth and U.S. export growth. A 1 percent increase in the level of the real gross U S nonresidential capital stock is associated with a 3 percent increase in U.S. export volume growth. On the import side, the model finds a weaker but still statistically significant positive relationship between foreign capital stock growth and U.S. import growth. A 1 percent increase in the level of the real gross foreign capital stock[12] is associated with an increase of two-fifths of 1 percent in U S. import volume (Our estimated capital stock elasticities are not directly comparable with those of Helkie and Hooper because of differences in capital measurements and model specifications Nevertheless, both models indicate that capital stock developments in the industrialized countries had a very limited impact on the evolution of the U S. trade balance in the 1980s.[13]) The weaker import response to foreign capital stock growth may be due to problems in measuring the aggregate foreign capital stock. A second possibility is that foreign producers, viewing the United States as an integral part of their global market, consistently seek to meet demand regardless of the strain it puts on supply, while U.S producers view foreign countries more as a peripheral market to enter when supply conditions warrant Differences in the composition of U S. and foreign exports may also explain the divergence in response to capital stock changes.

These statistically significant relationships between capital stock growth and export and import growth explain one link of the exchange rate/capital stock hypothesis, that between capital stock developments and trade performance The other link is the relationship between exchange rate movements and capital stock developments. This second link did appear to hold in the late 1960s and 1970s (Chart 5). As the dollar became increasingly overvalued at the end of the 1960s, the real net U.S. manufacturing capital stock fell sharply relative to the real net capital stock in major U S. trading partners [14] The relative decline in the U.S. capital stock subsequently abated in the 1970s after the dollar depreciated following the demise of the Smithsonian Agreement.

A close examination of capital stock developments in both the early and late 1980s suggests that this straightforward mapping between exchange rate movements and relative capital stock developments broke down in the last decade. As the dollar rose in the early 1980s, the U.S. capital stock declined at only a slightly increased pace relative to the capital stock abroad. Relative capital stock changes then leveled off between 1983 and 1985 despite the continued rise in the dollar. Moreover, the U.S. capital stock began declining in relative terms at its early 1980s pace in the second half of the 1980s, well after the dollar had fallen. The U.S. capital stock continued declining relative to the foreign capital stock through 1989, four years after the dollar began its fall and after what most analysts would have considered sufficient time for the dollar's decline to have exerted its effect on capital stock growth In fact, on an annual average basis the U.S. capital stock fell more relative to the foreign capital stock during the 1986-89 period than it did during the 1980-85 period. Moreover, it fell at an even greater rate in 1989 than it did on average in 1986-88, a pattern strongly contradicting the expected relationship between exchange rate changes and relative capital stock movements.

These relative capital stock developments clearly show that factors other than exchange rate changes dominated U.S and foreign investment decisions in the 1980s Of course, income growth has traditionally been found to dominate all other considerations in investment planning. Beyond this, however, a very low U S. savings rate during the past decade was a prime factor behind weak U.S. investment.[15] Strong European investment in the late 1980s was in part tied to preparation for the Europe 1992 program. Strong Japanese investment was associated with a surge in the Japanese stock market in the mid-1980s, which substantially reduced the cost of capital in Japan [16] The overriding influence of these factors helps to explain some elementary empirical findings in a very simple regression equation for the log of the real gross U.S capital stock, the estimated sum of the coefficients on twelve lags of the nominal exchange

[12]This stock unfortunately includes residential construction because data excluding residential construction were not available for all of the countries covered See the appendix for a description of this aggregate

[13]A major difference in model specification is that Helkie and Hooper use the *ratio* of the U S capital stock to the foreign capital stock as a variable in their regressions whereas our model uses the actual *levels* of the capital stocks Our model is built from structural supply and demand relationships, in which capital stock levels set the basic amount of available supply

[14]Our comparisons are based on changes in the ratio of the real net U S nonresidential capital stock to the real net aggregate capital stock in ten major foreign industrial countries, although the comparisons also hold true for the ratio of the real net total U S capital stock to the real net aggregate capital stock in these countries Timely, comprehensive data excluding the residential capital stock abroad were not available However, data on real net

Footnote 14 continued
capital stocks in manufacturing for four major foreign countries and the United States through 1987 suggest a movement relatively similar to that of these broader capital stock measures

[15]Ethan S Harris and Charles Steindel, "The Decline in U S Savings and Its Implications for Economic Growth," this *Quarterly Review*, Winter 1991, pp 1-19

[16]Robert N McCauley and Stephen Zimmer, "Explaining International Differences in the Cost of Capital," this *Quarterly Review*, Summer 1989, pp 7-28

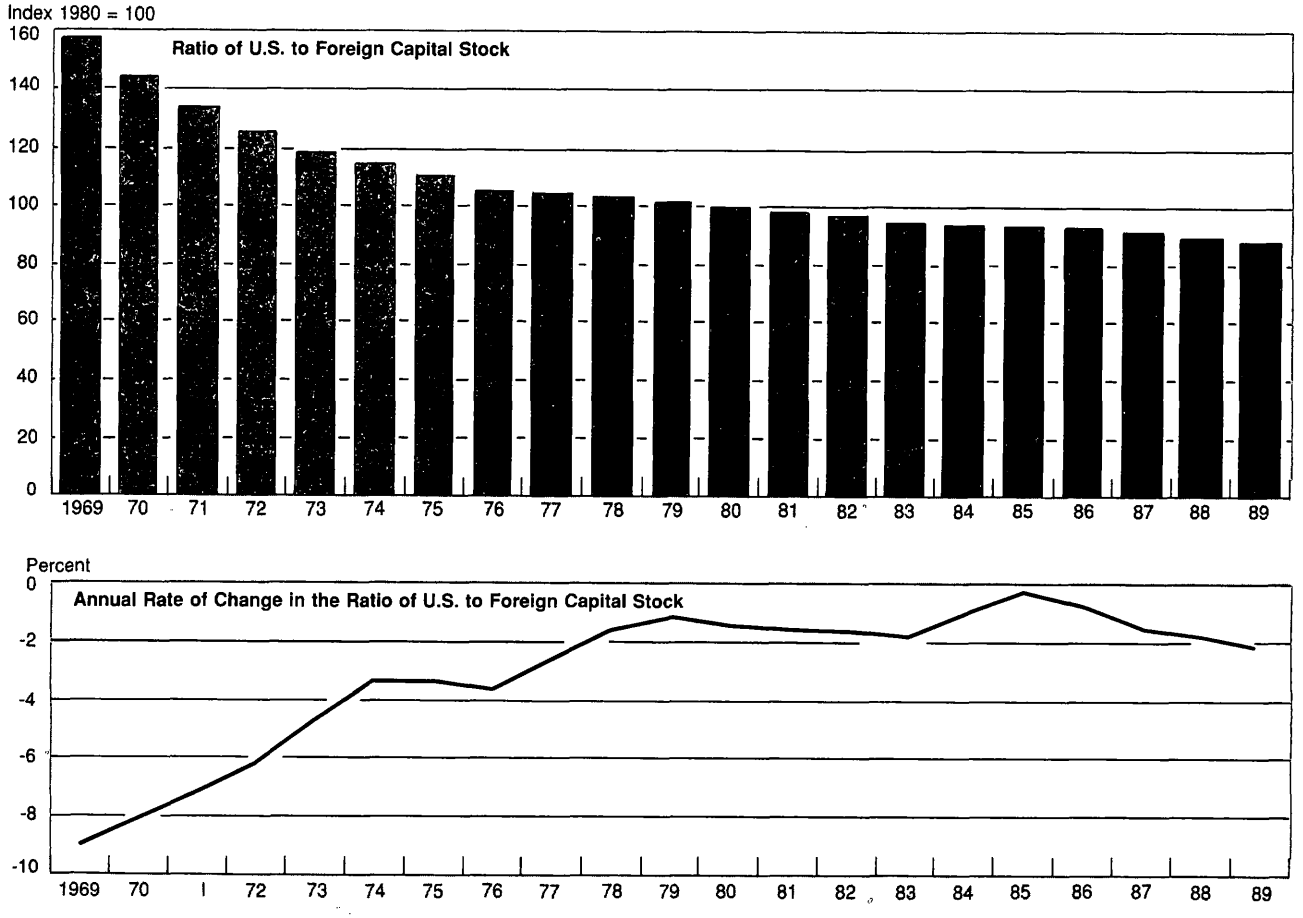
rate is statistically insignificant (t-statistic: −0.69); in a second regression for the U.S. capital stock, the sum of the coefficients on twelve lags of the real exchange rate is also statistically insignificant (t-statistic: 0.12) and of the wrong (unexpected) sign. Similarly, in comparable simple regressions for the real gross capital stock abroad, the sums of the coefficients of twelve lags of both the nominal and real exchange rates are also insignificant (t-statistics: −0.84 and −0.27, respectively) and of the wrong sign.[17]

[17]All regressions reported in this paragraph impose an Almon lag distribution on the impact of the lagged exchange rate terms. The regressions also include a constant term and the contemporaneous level of real U.S. or foreign GNP. All variables are entered in natural log form. The exchange rate terms are computed as explained in the model description in the appendix.

Of course, these regression specifications are extremely simple, and a more comprehensive regression exercise could give different results. Nevertheless, both the regression results and the observed U.S. and foreign capital stock growth rates in the 1980s do raise serious questions about one of the two key tenets of the exchange rate/capital stock hypothesis—that while the

Chart 5

Capital Stock Developments



Sources: National Income and Product Accounts; Organization for Economic Cooperation and Development, Flows and Stocks of Fixed Capital.

Notes: U.S. capital stock excludes the residential sector. Foreign capital stock is an import-weighted index of the real net fixed capital stock for the ten major industrial countries.

rise in the dollar in the early 1980s hurt U.S. relative capital stock developments, the fall in the dollar since 1985 is reversing the U.S. relative capital stock deterioration and will eventually lead to a substantial U.S. trade balance improvement in the beginning of the 1990s. Although the dollar's fall in the second half of the 1980s may have prevented even less favorable U.S. capital stock developments, one cannot easily point to any evidence of a significant exchange-rate-induced improvement in the U.S. capital stock in recent years that would signal a sustained improvement in the U.S. trade balance in the medium term. Other factors appear to have simply overwhelmed any exchange rate effects.

The second major tenet of the exchange rate/capital stock hypothesis—that a fall in the U.S. capital stock relative to the foreign capital stock will necessarily worsen the U.S. trade balance—is also called into question by the results of the model discussed in the appendix. The model's elasticities indicate that, in general, capital stock growth in the United States has had an impact on U.S. exports substantially exceeding that of capital stock growth abroad on U.S. imports. For the 1980s in particular, the model suggests that moderate U.S. capital stock growth raised U.S. exports much more than considerably stronger foreign capital stock growth raised U.S. imports, a finding that sharply rebuts the capital stock hypothesis. A more realistic appraisal of the role of capital stock developments in the 1980s would scale capital stock growth in each area by GNP growth because most investment typically goes to satisfy domestic rather than foreign demand. During the 1980s, the U.S. capital stock grew 2 percent faster than U.S. GNP. The foreign capital stock grew 15 percent faster than foreign GNP. The model's elasticities suggest that a growth rate for U.S. capital stock 2 percent beyond that necessary to maintain a constant U.S. capital/output ratio increased U.S. exports by about $23 billion, while a growth rate for foreign capital stock 15 percent beyond that necessary to maintain a constant foreign capital/output ratio increased U.S. imports by about $25 billion. In other words, the model suggests that even conservatively scaled by GNP growth, capital stock developments in the 1980s did not significantly contribute to the net increase in the U.S. trade balance deficit between 1979 and 1989.

Note that Helkie and Hooper's capital stock data and model generate essentially the same conclusion—that capital stock developments explain little of the difference between the 1979 and 1989 U.S. trade volume balances—despite the very different capital stock specifications employed by these authors. Helkie and Hooper's model specification based on the ratio of the U.S. manufacturing sector capital stock to the manufacturing sector capital stock of five major foreign industrial countries does show that capital stock developments can significantly affect U.S. trade. According to Helkie and Hooper's data, however, this capital stock ratio remained virtually constant during the 1979-89 period after having fallen substantially in earlier years. Consequently, capital stock developments as measured by this ratio would not explain any of the changes in the net U.S. trade balance over the 1980s. In fact, Hooper notes that relative capital stock developments in the United States and in major industrialized countries have been dominated by factors other than exchange rate changes in the 1980s.[18]

In another model specification, Helkie and Hooper add the capital stock of ten developing countries to their foreign capital stock aggregate. The U.S. capital stock did fall about 10 percent relative to the more comprehensive measure of foreign capital stock between 1979 and 1989. Hooper feels that this fall was a major factor behind the persistence of the U.S. trade deficit in the late 1980s. Most of the fall, however, is attributable to trend growth in the developing countries' production capacity rather than to an investment reaction to exchange rate changes, as the exchange rate/capital stock hypothesis would require. Trend growth in developing countries' production capacity, in fact, could be considered as one element in the structural shifts hypothesis.

Overall, it is difficult to conclude that relative capital stock movements driven by exchange rate changes directly explain much of the difference in the U.S. trade volume deficit between 1979 and 1989. It appears unlikely that the U.S. capital stock will soon rebound relative to the foreign capital stock in direct response to the mid-1980s dollar depreciation and thus lead to a substantial, sustained reduction in the U.S. trade deficit. In sum, the narrowly defined capital stock hypothesis finds little empirical support.

Developments in foreign direct investment

The second argument of the exchange rate/capital stock hypothesis concerns the additional effect capital stock increases financed by foreign direct investment are expected to have on a country's trade. As noted earlier, some economists have suggested that factories established through foreign direct investment are likely to increase a country's import level initially because these factories tend to purchase a disproportionate share of their capital equipment and components from their parent firms. In the longer run, these factories are expected to reduce imports as their production disproportionately displaces parent firm final sales. Studies of

[18]Peter Hooper, "Comment," in C. Fred Bergsten, *International Adjustment and Financing the Lessons of 1985-91* (Washington, D.C.: Institute for International Economics, 1991), pp. 103-12

recent Japanese direct investment in the United States by Orr and Suzuki show that for some industries these additional foreign direct investment effects can be significant in size.[19] However, an examination of total direct investment flows and their impact on U.S. trade in the 1980s suggests that the distinctive effects of foreign direct investment, beyond those implicit in overall capital stock developments, account for little of the U.S. trade balance deterioration during the 1980s.

The model described in the appendix estimates that U.S. direct investment abroad does have a statistically significant long-run impact lowering U.S. export growth, as this hypothesis would predict. But the contention that foreign direct investment, spurred by changes in the dollar in the 1980s, partly explains the large U.S. trade deficit in the late 1980s requires a positive correlation between the level of the real stock of U.S. investment abroad and the exchange rate value of the dollar. During the last decade, such a correlation did not exist. The real stock of U.S. direct investment abroad grew on average 2 percent a year in the early 1980s when the dollar was rising. However, the stock of U.S. investment abroad grew at an average annual rate of 7½ percent during the 1970s and 3½ percent during the late 1980s, periods when the dollar on net fell. In fact, simple regressions of the real stock of U.S. investment abroad against twelve lags of the nominal and real exchange rates of the dollar show no statistically significant correlations.[20]

An examination of direct investment flows into the United States and their impact on U.S. imports also raises questions about the foreign direct investment argument. Consistent with this argument, the real stock of foreign investment in the United States did grow at a dramatically rapid pace in the late 1980s, when the dollar was falling, relative to the early 1980s, when the dollar was rising (average annual growth rates of 144 percent and 16 percent, respectively). But our regressions and those reported by Orr show no statistically significant relationship during the last two decades between growth in the stock of foreign direct investment in the United States and U.S. import growth. Given the varying ages of foreign subsidiary operations in the United States, this lack of relationship may reflect a mixing of the positive initial import effects and the negative long-run import effects of foreign direct investment. According to Orr, it may also reflect the fact that foreign investment in the United States during much of the 1970s and 1980s was in industries subject to U.S. import restrictions, limiting any long-run trade displacement impact such as that found in our model for the export side. Orr does estimate, through a detailed analysis of industry data rather than regression techniques, that the surge in foreign direct investment (primarily the establishment of Japanese automobile subsidiaries) in the United States in the second half of the 1980s may have increased U.S. imports by about $5 billion in recent years because of capital equipment and components shipments.[21] This relatively small increase suggests that foreign direct investment in the United States did not make a substantial contribution to the net deterioration in the U.S. trade balance over the 1979-89 period.

Overall, the capital stock hypothesis, viewed narrowly as asserting that changes in the dollar's value determine relative capital stock levels, foreign direct investment flows, and ultimately trade balance levels, does not hold up very well as an explanation of the large and persistent U.S. trade deficit in the late 1980s or as a reason to expect a sustained improvement in the U.S. trade balance in the near future. Of course, capital stock developments have a number of indirect effects on trade dynamics. For instance, relative capital stock changes can affect the composition of trade and, consequently, trade elasticities. Moreover, capital stock changes may reflect or elicit changes in a producer's commitment to exporting or importing from a given country, an effect much discussed under the term "trade hysteresis." The impact of these and other structural shifts in trade is discussed below.

Structural changes in trade

The structural shift hypothesis focuses on all trade shifts affecting the level of U.S. exports or imports at any given exchange rate and relative demand level. These shifts include changes in trade composition across industry categories or across products within a given industry. Also included is a change in the perceived desirability of purchasing products from different regions (owing, perhaps, to the purchasers' increased familiarity with new products) or of supplying products for sale to different regions (a response to changes in producers' fixed cost considerations). The hypothesized result of all of these changes is that at any given exchange rate level and level of U.S. demand relative to foreign demand, the United States will now export less and import more than it did in earlier years.

Perhaps the best known variant of the structural shift hypothesis is the "beachhead" hysteresis model pro-

[19]James Orr, "The Trade Balance Effects of Foreign Direct Investment in U S Manufacturing," this *Quarterly Review*, Summer 1991, pp 63-76, Tsuyoshi Suzuki, "External Balance of Japan," Nomura Research Institute *Quarterly Economic Review*, May 1990, pp 26-28

[20]The regressions reported here follow the same format as the exchange rate/capital stock regressions described in the previous subsection

[21]Orr, "Trade Balance Effects "

posed by Baldwin.[22] This model deals with the last of the changes just mentioned, that of new fixed cost considerations. Baldwin proposes that when the dollar rose in the early 1980s, a group of new foreign producers started to sell goods in the U.S. market. Once some of these producers had met the fixed costs of setting up distribution networks (a development related to the previous capital stock hypothesis), gaining brand name recognition, and so forth, they were unwilling to stop exporting to the U.S. market when exchange rates returned to their initial levels.

A permanent change in the composition of market participants could have had several effects on the relationship between U.S. import level and relative prices. First, import supply would probably have been greater at any given exchange rate level than in the past. The sensitivity of both import supply and import demand to changes in exchange rates would also have been likely to change, because the new foreign producers probably sold a different type of product than did the traditional suppliers of U.S. imports. The increase in imports at any given exchange rate level would have helped to sustain the U.S. trade deficit in the late 1980s. Depending on how they shifted, changes in the sensitivity of import supply and demand to exchange rate shifts could also have contributed to the deficit by limiting the import reaction to the dollar's fall in the second half of the decade.

Counterpart hysteresis effects may have occurred on the U.S. export side. The sharp rise in the dollar in the early 1980s may have driven some U.S. exporters out of foreign markets while inducing foreign firms, perhaps from other exporting countries, to enter those same markets. As the dollar fell, the change in market participants abroad as well as the fixed cost considerations of, say, reestablishing distribution networks may have kept some U.S. firms from reentering foreign markets. U.S. export supply and demand relationships may have been altered by this change in U.S. export market participants, particularly if the change entailed a significant shift in U.S. export composition.

More generally, any substantial change in U.S. import and export composition during the 1980s, whether or not induced by changes in the value of the dollar, could have affected the level of U.S. imports and U.S. exports. Since the sensitivity of demand and supply to price changes differs significantly across products, a change in product composition may explain why U.S. imports and exports did not return to their previous levels (relative to each other) when the dollar moved back to its 1980 level. Moreover, if either U.S. or foreign trade compositions changed, the level of competition facing any product may have also changed, affecting the demand or supply of exports or imports at any given price. Consequently, substantial composition change could have been an important determinant of the difference in the 1979 and 1989 U.S. trade balances despite the similarity of exchange rate and relative aggregate demand levels in those two years.

The composition of U.S. trade did, in fact, change substantially between 1979 and 1989. Perhaps the most notable changes were an 8 percentage point rise in capital goods as a share of U.S. nonagricultural export volume and a much sharper 19 percentage point rise in capital goods as a share of U.S. nonpetroleum import volume (Chart 6). That capital goods rose more as a share of U.S. imports than as a share of U.S. exports was symptomatic of the growing convergence between the composition of U.S. exports, traditionally more oriented towards capital goods, and the composition of other countries' exports, traditionally less oriented toward capital goods. This convergence was in part the result of the capital stock developments highlighted in the previous section.[23] It may also reflect the inroads foreign capital goods producers made in the 1983-84 period when the dollar was high and U.S. demand buoyant, inroads that these producers retained in the late 1980s for the hysteresis reasons just discussed.

Products across the spectrum of capital goods showed a greater rise in import share than export share. Disaggregated by product type, data at the three-digit Standard Industrial Classification (SIC) level indicate that for thirteen out of sixteen industries, import share gain exceeded export share gain.[24] That this pattern held for such diverse capital goods categories as farm machinery and communications equipment suggests a fundamental shift in U.S. trade structure in the capital goods sector: the United States appears to have suffered a decline in competitiveness in many capital goods products.

Note that some of the rise in capital goods as a share of both U.S. exports and U.S. imports resulted from tremendous growth in the volume of world computer trade. Much of this recorded growth reflects technological progress; computer volume is measured in units of

[22]Richard Baldwin, "Hysteresis in Import Prices. The Beachhead Effect," *American Economic Review*, vol 78, no 4 (September 1988), pp 773-85

[23]Hickok argues that changes in the relative size of capital-to-labor ratios in the 1970s and 1980s were a major factor behind shifts in the composition of U S manufactured goods exports and imports over the course of the 1980s ("The Shifting Composition of U S Manufactured Goods Trade," this *Quarterly Review*, Spring 1991, pp 27-37)

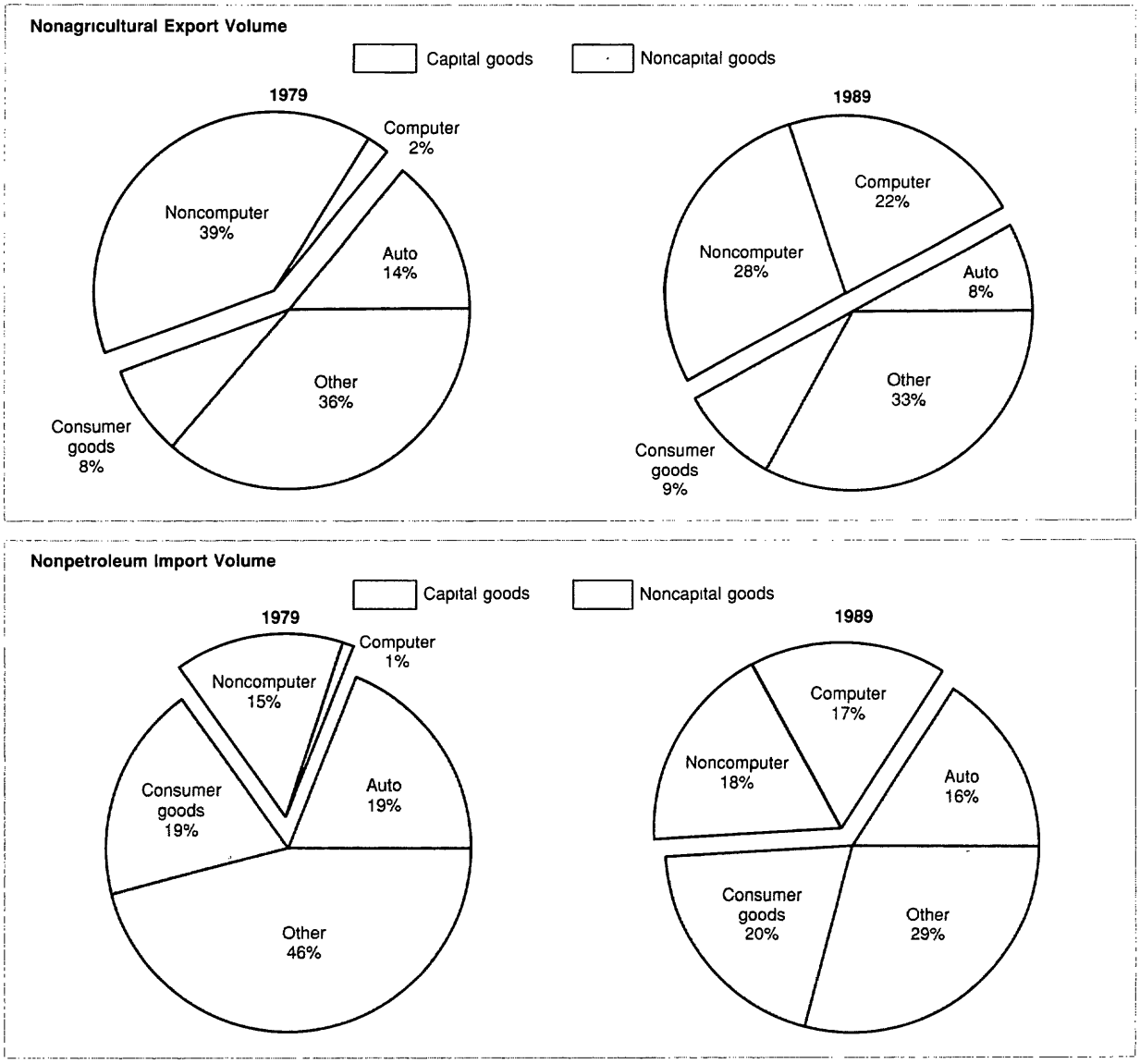
[24]Radio and television receivers, electronic components, and miscellaneous electric machinery are the exceptions Computed share gains are based on nominal data adjusted for a revision to the SIC classificiations starting with the 1983 data and the impact of the 1989 Boeing strike

computing power, and computers in 1989 were much more powerful than computers in 1979 Because the United States has been relatively competitive in the field of computers, rapid recorded growth in computer trade actually helped the U S trade volume balance in 1989

If in the 1979-89 period the recorded volume of computer exports and imports had grown at the same rate as the volume of other U S. manufactured goods exports and imports rather than growing many times as fast, the U.S trade volume deficit would have been

Chart 6

U.S. Trade Composition Developments



Source National Income and Product Accounts

Note Import and export volumes are measured in constant 1982 dollars

$5 billion higher in 1989.

That capital goods grew much faster as a share of U.S. imports than as a share of U.S. exports may be expected to have had an adverse effect on the U.S. trade balance, abstracting from computer trade. On the U.S. import side, the increased share of capital goods probably lowered the responsiveness of U.S. import demand to the fall in the dollar in the second half of the 1980s because capital goods purchases are generally less responsive to changes in relative price than are purchases of other products. On the U.S. export side, increased foreign competition in the typically oligopolistic capital goods area probably reduced the extent of foreign demand for U.S. capital goods exports, the United States' strongest export category, at any given exchange rate level. As a secondary effect, increased foreign competition also likely increased the foreign price sensitivity of demand for U.S. products.[25]

Results from the model in the appendix suggest that there have indeed been structural changes in U.S. trade conditions adversely affecting the U.S. trade balance during the 1980s. Specifically, the constant and price elasticity terms in the model show statistically significant shifts in the mid 1980s, shifts that taken together result in a substantial deterioration in the predicted U.S. trade balance. Quantitatively, the shifts (excluding the effect of increased computer trade) translate into a $67 billion deterioration in the net U.S. trade volume balance relative to what it would have been had these shifts not occurred. The model estimates that export volume has declined $22 billion and import volume has increased $45 billion as a result of these shifts.

Our estimate of $67 billion for the trade deterioration due to structural shifts should be viewed as suggestive rather than precise, given the econometric difficulties involved. Although the figure is based on a hypothesized long-run change in structural trade relationships, this shift has only been estimated over a short period of four and a half years. Nevertheless, the large size of the estimated impact, coupled with t-statistics indicating that statistically significant shifts did occur, does imply that these shifts probably had a very great impact on the U.S. trade balance. In fact, the magnitude of the estimated $67 billion deterioration due to structural shifts strongly suggests that the shifts were the primary factor behind the difference in the 1979 and 1989 U.S. trade balance levels. Importantly, the impact of these shifts is estimated to be long lasting; that is, it will not be reversed in the near to medium term without some specific change in U.S. trade conditions.

Given the large, albeit imprecise, magnitude of this estimated effect, it would be reassuring to have further evidence supporting the model's results. One observation substantiating the model's conclusions is that the noncomputer capital goods sector—the sector most clearly identified as showing a structural shift—does appear to account for the bulk of the deterioration in the U.S. trade volume balance between 1979 and 1989. If noncomputer capital goods imports and exports had grown at the same rate as other imports and exports, respectively, during those ten years, the U.S. trade volume deficit would have been $46 billion less in 1989. In other words, the poor trade performance of the noncomputer capital goods sector relative to that of other sectors accounts for about three-quarters of the net deterioration in the U.S. trade balance over the last decade.

Two other observations help to corroborate the model's results. First, the model estimates a rise in the foreign price sensitivity of demand for U.S. exports and a decline in the U.S. price sensitivity of demand for U.S. imports, developments that the observed change in U.S. export and import composition would lead one to expect. Second, other analysts have also found significant signs of structural shifts in trade: Baldwin presents a model showing indications of hysteresis,[26] and some recent studies provide implicit evidence of structural shifts. These studies will be discussed in the next section.

Overall, it appears that the hypothesis concerning structural shifts in U.S. trade best explains why the U.S. trade deficit remained so high in the late 1980s. This hypothesis is strongly supported by the observed shift in the composition of U.S. trade, which would seem to mandate a change in estimated trade relationships. Moreover, that capital goods increased much more sharply as a share of U.S. imports than of U.S. exports strongly suggests a secular decline in U.S. competitiveness. Consequently, it is not surprising to find that structural shifts seem to account for much of the tenacity of the U.S. trade deficit.

These structural shifts have several implications for future trade adjustment. First, U.S. exports now appear to face a much more competitive, price-sensitive foreign market, while U.S. imports are better able to maintain their competitive position in the face of a change in the value of the dollar. Structural shifts, therefore, imply that the United States trade balance is not likely to regain its

[25]This export price elasticity argument differs from the argument on the import side, which posits a decrease in the price sensitivity of demand due to an increased share of capital goods imports. Two factors account for the difference. First, capital goods increased significantly less in share on the export side than on the import side. Second, a rise in price sensitivity due to increased competition was less relevant on the U.S. import side because the U.S. market for capital goods was already very competitive.

[26]Baldwin, "Hysteresis."

position of the late 1970s or early 1980s unless the dollar moves substantially below its value at the start of the past decade or the ratio of U.S. demand to foreign demand falls permanently below its 1980 level Second, the shifts suggest that further changes in the U S. trade balance are likely to arise more from export developments and less from import developments than has been the case in the past In other words, if the United States wants further trade balance adjustment, it must compete more vigorously in world trade rather than expect foreign producers to shoulder their traditionally higher share of trade realignment

Comparison with other adjustment analyses

Several recent studies have examined the U.S. trade imbalance in the late 1980s. These studies have reached differing conclusions, most notably regarding the role they assign to exchange rate changes in the U S trade balance evolution. The studies, however, all implicitly support the conclusion that structural shifts in U.S trade relations in the 1980s have led to a deterioration in the U.S. trade balance position

A small group of economists have contended that the U.S. trade deficit remained large even after the dollar fell in the mid-1980s because exchange rate changes no longer had any significant impact on trade flows This group has offered little empirical evidence to support its contention. Rather, the group has advanced several arguments to explain why exchange rate movements are no longer important 1) foreign producers have cut prices to offset the fall in the dollar, 2) an increasing share of U.S trade has been with developing countries whose currencies have not appreciated against the dollar, and 3) an increased number of imported products, such as VCRs, are not produced in the United States.[27] Most economists, while conceding that these arguments may have some validity, firmly reject the group's assertion that exchange rate changes no longer have a significant impact on trade flows. Note, however, that these arguments, even if only partially true, do suggest that a structural shift has occurred in U.S. trade relationships

Recent studies by Cline and Lawrence represent more mainstream analyses of factors behind the tenacity of the U S. trade deficit in the late 1980s.[28] Both studies argue that traditional trade models, which incorporate a substantial trade response to exchange rate developments, work reasonably well once data peculiarities are resolved. Lawrence, whose study has been endorsed by Krugman,[29] emphasizes that U.S. trade volume equations estimated for the period from 1976 through the first half of 1984 forecast U.S. trade volumes in 1989 fairly well after adjustment for computer trade: the sharp deterioration in the U.S. trade balance between 1979 and 1989, according to Lawrence, is attributable to a much higher U.S income elasticity of demand for imports relative to the foreign income elasticity of demand for U S exports Cline also finds that a conventional set of equations accounts quite well for the U.S trade deficit in the late 1980s. In contrast to Lawrence, however, Cline estimates roughly similar U S. and foreign income elasticities. Cline attributes the large U.S. trade deficit in the late 1980s to the fact that the real level of the dollar, deflated by U S and foreign export unit values, was 15 percent higher in 1989 than it had been, on average, during 1978-80. He argues that if the real dollar had fully returned to its 1978-80 level based on the export unit value criterion, the U.S trade deficit would have been largely eliminated in 1989

This article shares the view of both Lawrence and Cline that exchange rate changes continue to have a significant impact on U S trade flows It argues, however, that structural shifts in U.S. trade relations have weakened the U.S trade response to the dollar's decline in the second half of the 1980s Closer examination of the Lawrence and Cline studies suggests that they, too, imply significant structural shifts in U S trade relationships in the 1980s.

Two elements of Lawrence's results indicate that structural shifts have occurred in U.S trade Lawrence estimates a much higher income elasticity of demand for U.S imports than for U.S. exports compared with the elasticities in models estimated over earlier periods In addition, when data are added to the Lawrence equations for the 1985-89 period, certain coefficient shifts imply structural breaks.[30] Cline's finding that the real

[27]Robert Kuttner, *The End of Laissez-Faire* (New York Knopf, 1991), pp 82-112

[28]William Cline, "United States External Adjustment Progress, Prognosis, and Interpretation," Institute for International Economics, 1990, mimeo, Robert Z Lawrence, "U S Current Account Adjustment An Appraisal," *Brookings Papers on Economic Activity*, 2 1990, pp 343-92

[29]Paul Krugman, "Has the Adjustment Process Worked?" Institute for International Economics, Policy Analysis in International Economics no 34, 1991

[30]The Lawrence equations are difficult to compare with other trade models because Lawrence excludes computers but includes services trade The gap between import and export income elasticities in the Lawrence equations is 1 0, about twice the size of the income elasticities found in regressions estimated in earlier periods See Morris Goldstein and Mohsin S Khan, "Income and Price Effects in Foreign Trade," in R W Jones and P B Kenen, eds , *Handbook of International Economics*, vol 2 (Elsevier Science Publishers, 1985), and Bryant, ed , *External Deficits*

These earlier regressions do have different specifications and activity variables Consequently, a comparison of their elasticities with those estimated by Lawrence offers suggestive rather than definitive evidence of structural changes As to coefficient shifts in Lawrence's regressions, when data are added for 1985-89, the Durbin-Watson statistic in the import equation drops from 2 2 to

value of the dollar, deflated by U.S. and foreign export unit values, was still 15 percent higher in 1989 than in 1978-80 also indicates a structural shift. By most other price measures, including unit labor costs in manufacturing or producer price indexes, the real dollar had returned to its 1978-80 level by 1989. This difference in behavior between the real dollar based on export unit values and the real dollar based on other price indexes was not present in the 1970s. The emergence of a substantial difference between these real dollar series in the 1980s suggests pronounced structural shift in export composition or pricing behavior on the part of U.S. or foreign producers over the past decade. This shift in turn indicates a pronounced change in trade relationships during these years.

Although a finding of structural shifts in trade relationships is implicit in all the recent studies, the studies disagree significantly on the outlook for the U.S. trade balance. The asymmetry of U.S. and foreign income elasticities leads Lawrence to a very pessimistic conclusion: "Rates of growth in the United States that are about 60 percent of those abroad [in countries belonging to the Organization for Economic Cooperation and Development] are required to keep exports and imports growing at similar rates."[31] For different reasons, the small group of analysts who contend that exchange rate changes no longer affect the U.S. trade balance have a similarly pessimistic view of the relative income changes necessary to achieve a sustained improvement in the U.S. trade balance. Cline is much more optimistic. He argues that only a 15 percent further depreciation of the dollar would have balanced U.S. trade in 1989 and that because of roughly similar U.S. and foreign income elasticities, the balance would have been relatively easy to maintain. This article agrees with Cline that U.S. and foreign income elasticities are roughly equal, but our model indicates that the dollar would have had to fall about double the amount suggested by Cline to have balanced trade in 1989. In other words, we find that the effort required to achieve a sustained U.S. trade balance improvement is considerably greater than Cline's analysis would indicate, but considerably less than Lawrence's analysis would suggest.

Footnote 30 continued
1 4 Lagged import price terms also become much more significant Moreover, when domestic demand is used as the activity variable, the long-run price elasticity shifts significantly in the 1985-89 period The constant term shifts in both the import and the export equations when the more recent data are included.

[31]Lawrence, "U S. Current Account Adjustment," p 366

Conclusion

This article investigates the persistence of the U.S. trade deficit in the late 1980s. It finds that changes in the composition of U.S. trade, affecting both commodity categories and foreign producers participating in trade, are primarily responsible for impeding U.S. trade balance adjustment in the late 1980s. These changes have made U.S. imports less responsive to the fall in the dollar since the beginning of 1985 while increasing the foreign competition facing U.S. exports. Exchange rate effects on the size of U.S. capital stock relative to the capital stock abroad do not appear to play a significant direct role in explaining the tenacity of the U.S. trade deficit, although they have undoubtedly contributed to the structural changes behind the deficit's endurance.

Several important implications may be drawn from these findings. First, the U.S. trade balance is not likely to regain its late 1970s position on a sustained basis without substantial further exchange rate movements or significantly slower U.S. growth relative to growth abroad. Second, with the growing similarity between U.S. import and U.S. export composition (a key element of the structural shifts), U.S. products are likely to face greater competition at any given exchange rate level. Finally, given the estimated rise in the foreign price sensitivity of demand for U.S. exports and the decrease in the U.S. price sensitivity of demand for imports, U.S. exports are likely to be more responsive, and imports less responsive, to exchange rate changes than they have been in the past.

Appendix: An Expanded, Cointegrated Model of U.S. Trade

Standard trade models do not capture any direct impact of capital stock or foreign direct investment developments on trade flows.† Nor do they allow structural shifts in trade relationships to have any effect on trade flows. To test the significance of these factors, we estimate an expanded trade volume model. This expanded trade model includes the U.S. capital stock and the stock of U.S. direct investment abroad as explanatory variables in the export volume equation. To assess the impact of structural changes that may have occurred around 1984, the model also allows the price elasticities of supply and demand for U.S. exports and the export constant term to shift. Comparable adjustments are made to the import volume equation.

Using ordinary least squares, we estimate the expanded export and import volume equations without any lagged terms. The residuals of the regressions are tested to ensure that both equations are cointegrated. Since the equations pass the cointegration test, their estimated coefficients may be viewed as expressing long-run "elasticities" linking changes in export and import volume with changes in the explanatory variables.

The long-run regressions, estimated over the period from the first quarter of 1967 to the fourth quarter of 1988, are:

(1)

$$X_t = \underset{(-2.80)}{-15.19} + \underset{(0.82)}{0.26}\,DC - \underset{(-3.95)}{0.022}\,Trend + \underset{(4.20)}{1.90}\,Y_t^* + \underset{(3.26)}{3.34}\,K_t - \underset{(-3.44)}{1.19}\,FDI_t - \underset{(-2.94)}{0.45}\,P_t^{XD} - \underset{(-2.20)}{0.38}\,DP_t^{XD} + \underset{(4.97)}{0.65}\,P_t^{XS} + \underset{(4.07)}{2.57}\,DP_t^{XS} + \varepsilon_t^X$$

adj. $R^2 = 0.98$ A.D.F. = −5.15

(2)

$$M_t = \underset{(-3.19)}{-10.77} + \underset{(1.84)}{0.05}\,DC + \underset{(1.02)}{0.01}\,Trend + \underset{(7.46)}{2.15}\,Y_t + \underset{(2.98)}{0.41}\,K_t^* - \underset{(-1.95)}{0.32}\,FDI_t^* - \underset{(-6.43)}{1.28}\,P_t^{MD} + \underset{(2.89)}{1.17}\,DP_t^{MD} - \underset{(-0.74)}{0.17}\,P_t^{MS} + \underset{(0.10)}{0.03}\,DP_t^{MS} + \varepsilon_t^M$$

adj. $R^2 = 0.99$ A.D.F. = −5.56

†Standard trade models are typically of the form

$$X^d = X^d(C, Trend, Y^*, P^x - eP)$$
$$M^d = M^d(C, Trend, Y, P^m - P),$$

where the variables are in natural log terms and X^d is demand for U.S. export volume, C is a constant, Trend is a time trend, Y is real foreign income, P^x is the price level for U.S. exports, e is the nominal exchange rate (dollar/foreign currency), P is the foreign price level, M^d is demand for U.S. import volume, Y is real U.S. income, P^m is the price level for U.S. imports, and P is the domestic price level in the United States.

where all variables are in natural log form, t-statistics are in parentheses, and

- X = the U.S. nonagricultural export volume
- M = the U.S. non-oil import volume
- C = a constant term
- DC = a dummy constant
- Trend = a time trend
- Y = real U.S. income
- Y^* = real foreign income (an aggregate income index of twenty-five major U.S. trading partners)
- P = the U.S. producer price index excluding capital goods
- P^* = the foreign price level (trade-weighted wholesale price index for the countries included in the International Monetary Fund's multilateral exchange rate model [MERM])
- e = the effective nominal exchange rate (dollar/foreign currency) between the U.S. dollar and MERM countries' currencies
- FDI = the real stock of U.S. direct investment abroad
- FDI^* = the real stock of foreign direct investment in the United States
- K = the real U.S. net nonresidential capital stock
- K^* = the real aggregate net capital stock of the major OECD countries
- P^{XD} = $(P^x - eP^*)$, the relative export price affecting demand, where P^x is the U.S. nonagricultural export price
- DP^{XD} = a slope dummy for P^{XD}
- P^{XS} = $(P^x - P)$, the relative export price affecting supply, where P^x is the U.S. nonagricultural export price excluding capital goods
- DP^{XS} = a slope dummy for P^{XS}
- P^{MD} = $(P^m - P)$, the relative import price affecting demand, where P^m is the U.S. non-oil import price excluding capital goods
- DP^{MD} = a slope dummy for P^{MD}
- P^{MS} = $(P^m - eP^*)$, the relative import price affecting supply, where P^m is the U.S. non-oil import price
- DP^{MS} = a slope dummy for P^{MS}

The export and import specifications in this two-equation model are basically symmetrical. Each includes a constant, a time trend, and the relevant trade partner's level of GNP. Unlike standard models, this model bases Y^* on an expanded list of twenty-five countries, including

Footnote † continued

Appendix: An Expanded, Cointegrated Model of U.S. Trade *(continued)*

developing countries.[‡] The export and import equations also include separate relative price terms to reflect both demand and supply considerations.[§] The relative price ratios affecting export demand (P^{XD}) and import demand (P^{MD}) capture the traded goods' price relative to the competing goods' price.[‖] The relative price ratios affecting export supply (P^{XS}) and import supply (P^{MS}) measure the traded goods' price relative to the price those goods command in their home market. Relative price slope dummies (DP^{XD}, DP^{XS}, DP^{MD}, DP^{MS}) and constant dummies (DC) are allowed to be operational in the third quarter of 1984 to capture any structural shifts. (Krugman and Baldwin suggest that this quarter is likely to be the earliest period in which measured hysteresis effects in response to the dollar's rise might have occurred.[††]) A final set of factors included in the export and import equations deals with investment. The export equation has variables measuring the U.S.-owned capital stock located at home and abroad. The import equation has analogous measures for capital owned by foreigners.

Short-run error-correction models (ECM), or dynamic adjustment regressions, of export and import volume are also estimated. For exports, ΔX_t (the first difference in exports) is regressed against lagged residuals from the long-run equilibrium export regression, along with lagged changes in the dependent and independent variables in the long-run regression. A comparable regression is estimated on the import side. After eliminating insignificant lag terms, we obtain a parsimonious ECM representation for ΔX_t and ΔM_t as follows:

(3)
$$\Delta X_t = \underset{(-3.36)}{-0.37\, RX_{t-1}} + \underset{(3.32)}{1.66\, \Delta K_{t-1}} - \underset{(-2.40)}{0.36\, \Delta P^{XD}_{t-3}} + \mu_t^X$$

adj $R^2 = 0.22$

(4)
$$\Delta M_t = \underset{(-5.55)}{-0.61\, \Delta RM_{t-1}} + \underset{(3.91)}{1.37\, \Delta Y_{t-1}} + \mu_t^M$$

adj $R^2 = 0.34$

Overall, the above four-equation model "fits" the trade data very well. In the long-run regressions, the adjusted R^2's are high and the coefficients on all variables are of the expected sign and are almost all statistically significant. In the short-run dynamic regressions, the adjusted R^2's are at acceptable levels and the coefficient estimates appear plausible.

Reestimation of the model under five variations also suggests that the expanded model is reasonably robust. That is, these five variations in explanatory variables or estimation period do not result in large changes in the estimated coefficients (see table below). Significantly, the major findings of the benchmark model hold true for all five variations. (1) there are large changes in the import and export price elasticities, strongly indicating a significant structural shift in trade, (2) capital stock developments have a much stronger impact on exports than on imports, and (3) the U.S. and foreign income elasticities of demand estimated for each variation are generally fairly close to each other.

In the text, we use the coefficients on the benchmark model's dummy variables to estimate the effect of changes in structural trade relationships. The impact of these dummy variables is to raise predicted U.S. export sales $24 billion, and predicted U.S. import purchases $84 billion, over what the model would have predicted in 1989 if the dummy terms had been suppressed. In other words, the statistically significant dummies suggest that structural shifts in world trade resulted in a substantial ($24 billion) rise in U.S. exports and a huge ($84 billion) rise in U.S. imports. On net, the dummies suggest that structural shifts led to a $63 billion deterioration in the U.S. trade balance.

The dummy variables result in a large rise in both export and import volume because they coincide with, and thus partly reflect, the sharp increase in the volume of world computer trade during the 1980s. The impact of the surging computer trade volume on the dummies may be estimated by calculating what the average annual

[‡]The countries are Australia, Belgium, Brazil, Canada, People's Republic of China, Denmark, France, Germany, Hong Kong, Israel, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, Norway, Saudi Arabia, Singapore, Spain, Sweden, Switzerland, Taiwan, the United Kingdom, and Venezuela.

[§]The simultaneous bias problem that would normally occur when traded goods' prices are included as independent variables in trade volume equations disappears in a cointegrated model when the sample size is sufficiently large.

[‖]Computer prices have moved very differently from other prices in recent years. Unfortunately, computer prices have a much higher weight in P^x and P^m than in P and eP^*, distorting relative price comparisons. For this reason, capital goods prices are removed from the indexes used to construct $P^x - P$ and $P^m - P$ for the actual model estimation. (It is impossible to remove only computer prices from these indexes.) Since capital goods prices cannot be removed from eP^*, they are not removed from any of the indexes used to construct $P^x - eP^*$ or $P^m - eP^*$.

[††]Krugman and Baldwin, "The Persistence"

Appendix: An Expanded, Cointegrated Model of U.S. Trade *(continued)*

levels for computer export and import volumes would have been in the period from the third quarter of 1984 to the fourth quarter of 1989 if these volumes had grown at the same rate as the volumes of other nonagricultural U S exports and nonpetroleum U S imports These calculated computer volumes would be $46 billion less than the actual average annual computer export volume and $39 billion less than the actual average annual computer import volume during the period The differences, $46 billion on the export side and $39 billion on the import side, may be assumed to be the increase in the dummies attributable to the effect of rapidly rising world computer trade on U.S. export and import flows

According to these calculations, the dummy variables suggest that structural shifts in world trade, excluding the rapid growth in computer trade volume, have led to a $22 billion fall in U S export volume (the difference between the $24 billion estimated overall dummy variable rise and the $46 billion rise attributed to computers) from what it would have been had these structural shifts not occurred. On the import side, the dummy variables suggest that structural shifts in world trade, again excluding the rapid growth in computer trade volume, have caused U S. import volume to increase $45 billion (the difference between the $84 billion estimated overall dummy variable rise and the $39 billion rise attributed to computers) over what it would have been had these shifts not occurred On net, structural shifts, excluding the rise in computer trade, are estimated to have caused a $67 billion deterioration in the U S. trade volume balance

Coefficient Estimates of the Expanded Trade Model under Five Variations

	Benchmark Model	Variations				
		No 1	No 2	No 3	No 4	No 5
Export Equation						
Constant	−15 19	−36 5	−11 0†	−15 02†	−27 3	−7 29†
DC	0 26†	0 014†	0 007†	0 26†	0 007†	−0 02†
Trend	−0 022	−0 03	−0 02	−0 023	−0 03	−0 02
Y*	1 9	1 60	2 2	2 12	3 03	2 76
K	3 34	5 87	2 38	3 09	4 35	2.37†
FDI	−1 19	−1 26	−1 0	−1.09	−1.19	−1 56
P^{XD}	−0 45	−0 20†	−0 16†	−0 37†	−0 04†	−0 37†
DP^{XD}	−0 38	−0 48	−0 94	−0 45	−0 40	−0 44
P^{XS}	0 65	0 47	0 84	0 66	0 44	0 75
DP^{XS}	2 57	2 54	2 54	2 47	2 12	1 82
Import Equation						
Constant	−10 77	−10 8	−12 3	−6 44†	−12 0	−11 2
DC	0 05†	0 05†	0 04†	0 03†	0 01†	0 05†
Trend	0 01†	0 01†	0 00†	0 21†	0 00†	0 00†
Y	2 15	2 15	2 24	2 00	2 16	2 17
K*	0 41	0 41	0 44	−0 26†	−0 01†	0 42
FDI*	−0 32†	−0 32†	−0 24†	−0 43	−0 03†	−0 30
P^{MD}	−1 28	−1 28	−1 28	−1 09	−1 07	−1 29
DP^{MD}	1 17	1 17	1 12	1 02	0 91	1 16
P^{MS}	−0 17†	−0 17†	−0 25†	−0 31†	−0 37†	−0 18†
DP^{MS}	0 03†	0 03†	0 011†	0 29†	0 41†	0 03†

Notes

Variation no 1 the model is estimated using total U S capital stock

Variation no 2 the model is estimated using the real value of the dollar measured against the currencies of six major foreign countries

Variation no 3 the model is estimated using data from 1970-I to 1988-IV

Variation no 4 the model is estimated from 1970-I to 1988-IV using the trade-weighted domestic demand levels of the United States and six major foreign countries

Variation no 5 the model is estimated using data from 1967-I to 1989-III Data of 1989-IV are excluded because the Boeing strike tainted fourth-quarter export numbers

†Indicates insignificant estimates