The Strong Dollar and U.S. Inflation

U S. inflation has changed remarkably little during the present recovery Consumer prices rose at a 3 8 percent annual rate during the first half of 1985, barely different from the 3 7 percent increase posted for the first year of expansion.

The steadiness of the inflation rate over the past two and one-half years is somewhat surprising in view of several factors that might have reduced it further. Oil and several other key commodity prices have fallen sharply since 1982 (Table 1), while significant slack remains in labor markets, as indicated by an unemployment rate still above (according to most analysts) the "full-employment" level. In addition, the dollar has appreciated nearly 17 percent (trade-weighted average basis) over the same period (Chart 1). In the past, these conditions have often been associated with falling inflation—so why not during this recovery?

This article focuses on the dollar's impact on U S inflation over the last several years The dollar's rise since 1982 has not led to the fall in aggregate import prices that past experience would have suggested, perhaps helping to explain why inflation has not moderated further. Much of the surprising relative strength of import prices can be attributed to the sharp recovery in domestic real growth, which led to increases in import demand that substantially offset the downward pressure on import prices from the dollar appreciation. This experience suggests that the dollar depreciation since February may not add much if at all to domestic inflation unless domestic demand picks up markedly from the sluggish pace of the first half of 1985.

Experience

The recent pattern of a strong dollar with virtually unchanged domestic inflation differs considerably from 1980 to 1982, when the dollar rose by 20 percent while the inflation rate fell nearly eight percentage points It differs as well from the late 1970s experience of dollar depreciation accompanied by rising inflation. Of course, other factors, notably substantial differences in government policies, were primarily responsible for this contrast. Still, the impression persists that inflation has not responded to the dollar as much in the last two years as it did in the past.

Statistical estimates of the response of domestic prices to changes in the dollar, most derived from data drawn largely from the 1970s, reinforce this impression Though estimates vary substantially, depending on the model and period of estimation (appendix), the consensus is that a 10 percent rise in the dollar's value will reduce the Consumer Price Index (CPI) inflation rate by about 0.6 percent in each of the following two years On this basis, the dollar's appreciation since the last cyclical trough should have reduced the CPI by nearly 1 5 percent below the level it would otherwise have reached. But such a dampening effect on inflation from the rising dollar is not obvious from the actual data.[1] This raises a natural question prompted by the substantial fall in the dollar since last February: will U.S inflation remain unaffected, or will it rise as the experience prior to 1982 might suggest?
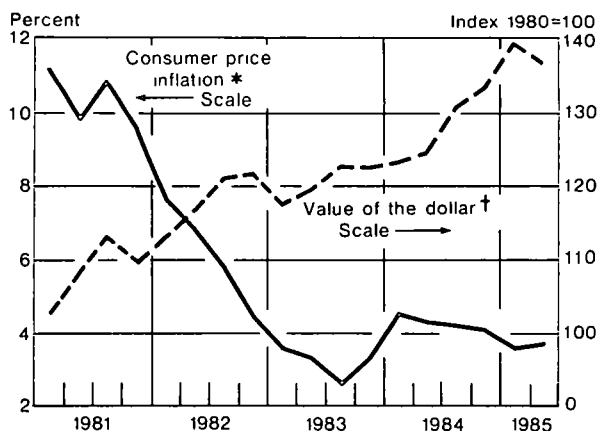
Import prices

That the relation between exchange rate movements and inflation seems to vary is not surprising since the two are linked through several channels.[2] Changes in

[1] This is not to say that inflation did *not* fall through 1984 Rather, the extent of that decline, 0 4 percentage point, was slight relative to the movements in factors generally thought to influence inflation

[2] By "linkage" we mean an association between the two endogenous variables (exchange rates and prices), not a statement about causation

Chart 1

Inflation and the Value of the Dollar

Percent   Index 1980=100

* Year-over-year annual rate

† Trade-weighted average of dollar s value vis à vis 12 industrial countries' currencies, weights are bilateral shares of U S trade

Chart 2

Price and Dollar Cost of Imports

U S dollar index, 1980=100

*Non-oil import unit value index

†Measured as the average of foreign export price indexes of 12 countries converted to dollars, weights are bilateral shares of U S trade

Sources International Monetary Fund, _International Financial Statistics,_ various years and U S Department of Commerce

the dollar directly affect import prices, which are components of the CPI and other domestic price level measures Dollar appreciation, for example, reduces the cost expressed in dollars of foreign produced goods, allowing import prices to fall without any reduction of foreign exporters' profit margins However, the extent to which this cost-reduction is "passed-through" to import prices may change with economic circumstances. Furthermore, the response of inflation to the dollar will also depend on how domestic product prices and wages are affected by import price changes, on the response of government policies, and possibly on other factors as well. Thus there are several potential explanations for the apparent change in the relation between the dollar and U S inflation in recent years.

Nonetheless, the following data suggest that a shift in the pass-through of dollar cost changes to import prices may be a significant part of the explanation The trade-weighted value of the dollar increased by nearly 17 percent from the first quarter of 1983 through the second quarter of 1985, while foreign export costs (as measured by local currency export prices) rose by an average of 8 percent Taken together, these suggest that the cost expressed in dollars ("dollar cost") of goods exported to the United States has declined by over 7 percent since the first quarter of 1983 [3] Since aggregate non-petroleum import prices have _risen_ by nearly 0 4 percent over the same period, there effectively has been no pass-through of this change in dollar cost to the average price paid for imports in the United States (Pass-through, _as defined here,_ is the ratio of the actual change in import price to the change in dollar import cost over a given period). In effect, foreign exporters' profit margins have widened significantly with dollar appreciation Note, however, that while nominal import prices have remained nearly flat, they have fallen substantially _relative_ to prices of domestically produced goods [4]
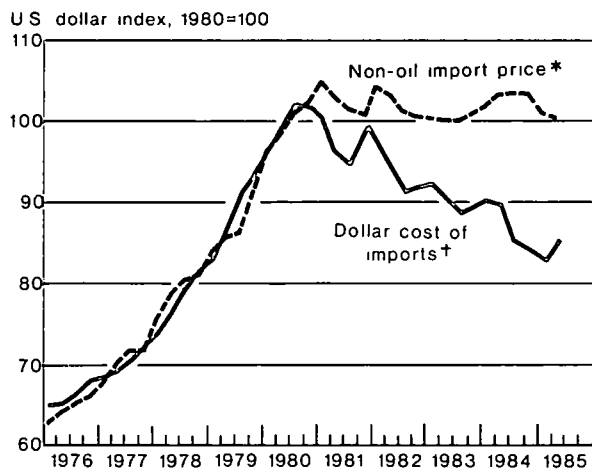
[3] The dollar cost of imports refers to their foreign production cost (in local currency) converted to dollars at prevailing exchange rates Thus, for example, a 10 percent rise in the dollar would, all other factors unchanged, lower the dollar cost of U S imports by the same amount Using aggregate foreign export price indexes to measure the local currency production cost clearly is only approximate (in part because the composition of aggregate foreign exports may differ from that of their exports to the United States) However some alternative measures (e g , foreign wholesale prices) lead to very similar conclusions

[4] Import prices have declined nearly 9 percent relative to the CPI since the first quarter of 1983, so that dollar appreciation has had a significant impact on the "real" price (i e , relative to prices of domestic substitutes) and volumes of imports Furthermore, the virtually zero pass-through (as defined here) does not mean that import prices necessarily would have remained unchanged had the dollar not appreciated Indeed, the arguments later in the text and in the box suggest that import prices would have risen significantly further had the dollar stayed at its first quarter 1983 level

The pass-through over the current recovery has been substantially lower than that seen in 1981-82, and strikingly lower than during the late 1970s (Table 2 and Chart 2). Indeed, the pass-through was more than complete over 1977-78, when the dollar was depreciating and U S inflation was rising, while it was about one-quarter over 1981-82, when inflation was declining.

Underlying the apparently low pass-through of the dollar appreciation to aggregate import prices is a fairly wide divergence among major product components (Table 3). The average price of imported automobiles (including parts) has increased nearly 10 percent since the cyclical trough, and over 30 percent since the end of 1980. Prices of imported capital goods have also risen over the recovery while imported consumer goods' prices have fallen only slightly. The price of industrial supplies (and of agricultural imports since 1980) has, by contrast, fallen considerably more. This divergence also differs from the 1977-78 period, when, except for autos, the increase in prices was significantly more uniform among categories.

The rise in auto prices after 1980 might be considered a special factor that has distorted the measured pass-through. This is because imports from Japan (which account for the bulk of total imports of finished autos) until recently were limited by an effective quota Because of this quota, the dollar's rise is unlikely to have affected auto import prices significantly over this period. The price of imports excluding autos *and* parts has fallen by nearly 2.5 percent during the recovery, and by nearly 9 percent since the end of 1980, but the implied pass-through is still well below that for 1977-78.

Possible explanation
The apparently low pass-through of the dollar's appreciation to import prices might seem to reflect "monopolistic" or other noncompetitive practices However, there is an alternative explanation that seems reasonably consistent with the actual record and is compatible with competitive behavior by exporting and importing firms.[5] This is based on changing relations among inflation, growth, and exchange rates since the 1970s, which have altered movements of import costs relative to the domestic demand for imports.

The dollar's depreciation over 1977-78 was substantially offset by differential U S -foreign inflation Consequently, the dollar cost of imports from abroad, U.S. import prices, and the prices of domestically-produced goods all rose together and by roughly the same amount. By contrast, the dollar's rise since 1980 has

[5]This explanation is not meant to exclude the possibility of oligopolistic or monopolistic practices, at least in some industries Furthermore, it does generally presume that U S import demand is a significant share of the world total

Table 1

Consumer Prices and the Exchange Rate

Percent change

Period	United States CPI (1)	Dollar exchange rate* (2)	Index of oil prices (3)	End of period level: Unemployment rate (4)
1985-II/1984-II	3 7	9 5	−1 9	7 3
1983-IV/1982-IV	3 3	0 8	−13 7	8 5
1982-IV/1981-IV	4 5	11 1	−5 0	10 6
1981-IV/1980-IV	9 6	9 4	8 6	8 2
1980-IV/1979-IV	12 5	−0 7	43 2	7 4
1985-II/1983-I	9 3	16 5	−13 4	7 3
1982-IV/1980-IV	14 4	21 5	3 2	10 6
1978-IV/1976-IV	16 2	−9 9	9 8	5 9

*Trade-weighted average value of the dollar vis-à-vis currencies of 12 foreign industrial countries

Table 2

Import Prices and the Exchange Rate

Percent change

Period	Foreign export cost* (1)	Dollar exchange rate (2)	Dollar import cost† (3)	Import price (4)
1985-II/1983-I	8 0	16 5	−7 3	0 4
1982-IV/1980-IV	9 8	21 5	−9 6	−2 3
1978-IV/1976-IV	7 9	−9 9	19 8	23 8

*Foreign export cost is measured as a trade-weighted average of export prices (in local currency) of 12 foreign industrial countries

†Change in foreign export cost.expressed in dollars (*approximately* equal to column 1 minus column 2)

Table 3

Components of Import Price Change

Category	Percent change unit value over: 1985-II/ 1983-I	1982-IV/ 1980-IV	1978-IV/ 1976-IV
Total non-oil	0 4	−2 3	23 8
Autos	9 7	17 5	34 7
Capital	7 3	−6 9	22 8
Consumer	−3 3	3 2	19 8
Industrial supplies	−8 2	−7 6	16 0
Food, feeds, and beverages	−0 3	−13 6	16 7
Import price excluding autos	−2 4	−5 3	21 2

greatly exceeded U.S. relative to foreign inflation[6] Thus the dollar cost of imports has fallen during the 1980s while domestic U.S prices have continued to rise, although more slowly than before In short, cost pressures reinforced domestic demand pressures to push import prices up during the late 1970s, but more recently these forces have tended to offset one another.

[6]This amounts to saying that the dollar's real value—its nominal value adjusted for U S -foreign inflation—has risen sharply since 1980, whereas it changed considerably less over 1977-78

Supply and Demand Explanation

The argument can be put in the familiar supply and demand framework The supply of imports typically increases with the ratio of the domestic selling price to the dollar cost of their production. This is represented by the upward-sloped supply schedule in Chart 3 Import supply also increases with foreign export capacity (which shifts the supply curve). Import demand declines as the domestic import price rises relative to the prices of domestically produced products, as shown by the downward-sloped schedule in Chart 3, and increases with domestic real income

An exchange rate depreciation amounts to a reduction of supply—an upward shift in the supply schedule With no change in demand, the extent of pass-through depends on the relative slopes of import supply and demand, and will generally be incomplete. The pass-through will be greater the more elastic is supply and inelastic is demand, and will be complete only if supply is perfectly elastic or demand inelastic. (More generally, the pass-through from an exchange rate change, given no change in domestic or foreign prices and incomes, is equal to the ratio of the supply price elasticity to the sum of the supply and demand price elasticities)

However, when exchange rate depreciation is accompanied by domestic price and income increases, the demand schedule also shifts up (Chart 4) In this case, domestic demand increases reinforce the impact of dollar depreciation in raising the dollar cost of imports (the shift in supply), leading to a higher pass-through than when supply alone is shifting The observed response of imports to the depreciation will thus be greater the more demand increases Indeed, if domestic prices increase (relative to abroad) by the same proportionate amount as the exchange rate depreciates, the observed pass-through will be complete, regardless of the elasticities of import supply and demand (unless real growth rates diverge considerably). This is essentially the environment that prevailed over 1977-78, during which the pass-through of the dollar's decline appeared virtually complete in nearly all major import categories

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This can be seen in terms of the specific contributions of changes in import costs and import demand to import prices To a foreign supplier sending goods into the U.S market, a dollar depreciation amounts effectively to a proportionate increase in the dollar cost of delivering a given amount But the extent to which this increase in cost is passed-through to the actual dollar import price also depends on what is happening to import demand. If demand is not growing, the foreign supplier can fully pass-through the increased cost to the price only by selling less than before For this reason, the price is apt to rise somewhat less than the cost, that is, the pass-through will be less than complete, and exporters' profit margins probably will fall. However, the pass-through is apt to be greater if demand is increasing, either because prices of domestically produced goods are rising, making imports more attractive, or because domestic real income is growing More generally, this implies that the apparent impact of exchange rate changes on domestic import prices is likely to be significantly greater when cost and demand pressures are reinforcing one another than when they are not (box)

In the general inflationary environment of 1977-78, the increasing dollar cost of imports associated with exchange depreciation was accompanied by increasing domestic prices and real income and hence increasing demand for imports The apparent pass-through would be expected to be relatively high under these circumstances This is because the effect of rising domestic prices and income on domestic demand for imports reinforced the exchange rate depreciation in pushing up import prices Furthermore, with costs and demand pressures moving so closely together, it is not surprising that the pass-through was virtually complete—and in all major categories.

Since 1980, however, the dollar's appreciation has led to a fairly steady decline in import dollar costs A significant portion of this cost decrease continued to be passed-through to prices over 1981-82, in large part because domestic demand growth also slowed markedly.[7] Subsequently, however, aggregate demand has grown fairly rapidly on average, so that the falling dollar cost of imports has been partially *offset* by the upward pressures on import demand from rising domestic prices and strong real income growth. This may largely explain why the pass-through of exchange rate changes to import prices now appears to be much lower than before (as well as why exporters' profit margins have widened). And with import prices varying with exchange rates less

[7]Pass-through *averaged* 25 percent over 1980-IV to 1982-IV although there was considerable variation within the interval Despite the dollar's appreciation, substantial pass-through would be expected during this period given that weakening domestic activity probably exerted little, if any, offsetting pressure on import prices

Chart 3
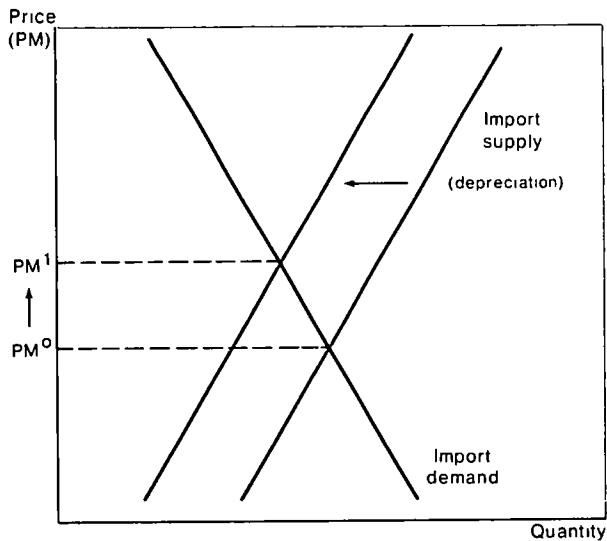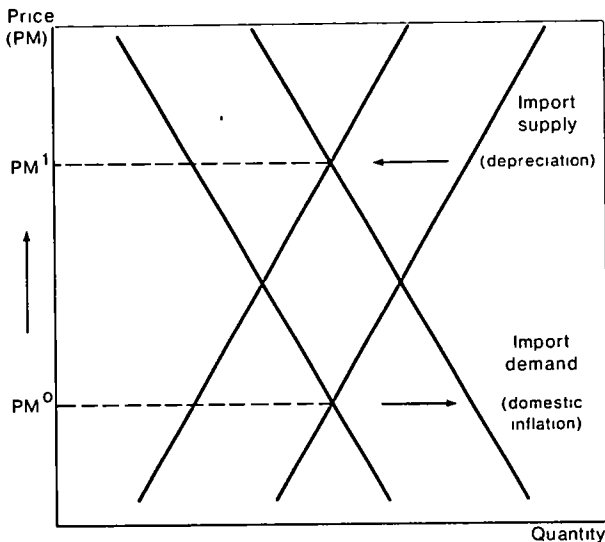### Determination of Import Price Under Depreciation

Price
(PM)

Import supply

(depreciation)

PM¹

PM⁰

Import demand

Quantity

Chart 4
Depreciation Accompanied by Domestic Price Inflation

Price
(PM)

Import supply

PM¹

(depreciation)

Import demand

PM⁰

(domestic inflation)

Quantity

than before, the seeming failure of inflation to respond to recent dollar appreciation is more understandable

The same patterns emerge in the data for major product categories Investment and, to a lesser extent, consumer spending have been unusually strong (on average) over the current recovery, suggesting that the domestic demand influence on the prices of these products has been expanding relatively rapidly These factors may help explain why the dollar's appreciation seems to have had especially little impact on prices of imported capital and consumer goods [8]

If the dollar falls

If the changing import pass-through over the past ten years is due to shifting import cost and domestic demand influences, then it could be misleading to extrapolate mechanically from recent behavior to assess the implications of future dollar movements Suppose, for example, that the dollar were to fall substantially from its present level over the coming year What would be the likely impact on inflation of this reversal?

The pass-through observed during the last two and one-half years might suggest no significant change in either import prices or domestic consumer prices However, this overlooks a fundamental change in import cost relative to demand movements that could occur with a dollar decline A substantial dollar depreciation would raise the dollar cost of imports considerably, reversing the pattern of the last two and one-half years The response of import prices again will largely depend on the course of domestic demand

If strong U S growth were to resume, the cost and demand influences would reinforce one another, leading to a higher pass-through than has been observed over the last several years Indeed, prior experience suggests that the pass-through to import prices could be as high as 50 to 70 percent This means that exporters' profit margins would absorb one-third to one-half of a substantial dollar depreciation, or perhaps even more given that these margins are now relatively high, with the remainder passed on to higher import prices On the other hand, if the economy were to expand sluggishly, the demand pressures on import prices would be much less, even absent In that case, shrinking profit margins probably would largely offset a dollar decline, leaving little if any impact on import prices

[8] As explained in the box, the pass-through would be expected to be lower the more elastic is demand Previous studies suggest that demand for imported capital and consumer goods is more price elastic than that for materials and agricultural imports. which also helps explain the contrast

Charles Pigott and Vincent Reinhart

Some Recent Evidence on the Dollar/Price Link

This appendix surveys the recent literature on the impact of dollar depreciation on domestic inflation These results are summarized in the table

Two main strategies have emerged in the work on the inflation consequences of exchange rate changes In the first, a "small-model" approach, an import price variable is included among the explanatory variables in a standard inflation-determination equation This is the approach taken in the small models summarized in the first portion of the table To estimate the impact of exchange rates on domestic prices, we must first gauge their impact on import prices In what follows we assumed that 60 percent of a change in the exchange rate is passed-through to import prices *

The second approach to judging the impact of the dollar appreciation is to consider the predictions generated by large scale macroeconometric models where the linkages between exchange rates and domestic prices are made explicit in a number of equations Such structural models often report the impact on both consumer prices and the GNP deflator, and typically it is the former that increases more This is because imports directly enter the CPI but enter the deflator only indirectly (through the prices of domestically produced goods)

*To replicate Gordon's results his basic inflation determination equation was re-estimated The coefficient estimates obtained, which are close to those Gordon reports, are used for the simulation results reported in the table

The Impact on Domestic Inflation of a 10 Percent Dollar Depreciation in One Quarter
Measured as percentage points added to average yearly rates

Study	Price index	First year	Second year	Remarks
		Small model results		
Dornbusch-Krugman (1976)	Consumer prices	0 8	0 5	• Import prices are included in a standard inflation determination equation • Elasticity of CPI inflation with respect to import price inflation is 0 14 in the short run, 0 42 in the long run • Estimates use annual data from 1957 to 1973 • We assumed a pass-through of 0 6
Kwack (1977)	Consumer prices	1 5	0 3	• The model specifies the price linkages for 12 countries, determining consumer, import, and export prices • Estimates from 1957 to 1973 use annual data • A 1 percent change in the exchange rate causes a more-than-complete pass-through of 1 23 • We simulated the U S sector in isolation
Spitaller (1978)	Consumer prices	0 5	0 5	• Estimates are derived from CPI inflation equation using money growth, industrial production relative to trend, and import price inflation • Elasticity of CPI inflation with respect to import price inflation is 0 04 in the short run and 0 27 in the long run • Estimates from 1958 to 1976 use four-quarter rates of change • We appended a pass-through equation
Gordon (1982 and 1983)	Fixed weight GNP deflator	1 1	0 8	• The model estimates an inflation determination equation using lagged inflation, exchange rate changes, the unemployment rate, and dummy variables • Gordon does not report enough coefficients to simulate the model so we re-estimated over the quarterly data from 1975 to 1984

Some Recent Evidence on the Dollar/Price Link, *continued*

The Impact on Domestic Inflation of a 10 Percent Dollar Depreciation in One Quarter
Measured as percentage points added to average yearly rates

Study	Price index	First year	Second year	Remarks
		Large model results		
Federal Reserve Board of Governors' Multi-Country Model	Consumer prices	0 5	0 5	• The model links domestic macro models for the United States, Germany, Japan, the United Kingdom, and the rest of the world • The equations, with a few exceptions, were estimated over the quarterly observations available from 1961 to 1975
IMF's Multilateral Exchange Rate Model	Consumer prices			• This is a mathematical simulation model with a complete microeconomic specification in which *a priori* judgment is used in the choice of parameters
Low feedback		1 4		• The MERM estimates the medium term (two to three
High feedback		4 4		years) effects of exchange rate changes
		(total impact)		• The low feedback case assumes that a 1 percent increase in the CPI raises wages by 0 5 percent • The high feedback case assumes that a 1 percent increase in the CPI raises wages by 0 85 percent
OECD interlink	Domestic demand deflator	1 0	0 4	• The model groups together medium-sized macro models (about 150 equations each) for 23 countries • Some of the coefficients are estimated with the rest assigned according to the judgment of the modelers
Federal Reserve Board of Governors' FMP Model	Consumer prices GNP deflator	0 8 0 5	0 5 0 3	• This is a quarterly model with approximately 500 equations • There is a complete modeling of capital flows, with exchange rates endogenous to the system
Data Resources	Consumer prices GNP deflator	0 4 0 1	0 3 0 4	• This is a quarterly model with approximately 1200 equations • The exchange rate is determined endogenously