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Long-Run Effects of the Strong Dollar

Paul Krugman

The fall of the dollar has now brought the U.S. real exchange rate down to roughly its level of the late 1970s. Against the yen and the deutsche mark, the dollar is at record real lows. Yet monthly trade numbers continue to report near-record trade deficits. Although some improvement in the U.S. trade position over the next few quarters is widely expected, few who have studied the issue believe that the depreciation of the dollar so far is sufficient to bring about anything approaching a return to current account balance.

Why does current account balance seem so unattainable, when the United States ran a current account surplus as recently as 1981? Pronouncements by Paul Volcker and some other officials suggest that the problem is inadequate growth in U.S. export markets, but this factor seems quantitatively of insufficient importance (see Krugman and Baldwin 1987). Congressional sentiment would like to blame the persistence of the U.S. trade deficit on unfair foreign trade practices, but few economists believe that these have gotten sufficiently more damaging since 1981 to account for the inability of the United States to restore current account balance. Business observers place weight on a decline in U.S. "competitiveness," a blurry term that refers among other things to a declining U.S. technological and productivity advantage; as we will see, there is at least rough empirical evidence that indeed supports the view that declining relative U.S. productivity has contributed substantially to the size of dollar decline required to restore a sustainable external balance. Finally, we are beginning to see assertions that a

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large part of the U.S. current account deficit is “structural” and insensitive to dollar devaluation.

All of these explanations seem, however, somewhat like *ex post* rationalizations. It would be intellectually much more appealing to make the growth of the U.S. trade deficit in the first half of the 1980s and its persistence in the second half part of the same story. That is, one cannot help but suspect that the stubbornness of the U.S. trade deficit in the face of a falling dollar is related to longer-term effects of the same causes that led to the emergence of that deficit in the first place. Or to put it a different way: is there some way in which a large and sustained trade deficit gets built into an economy, making it difficult to return to trade balance?

Now the idea that under certain circumstances adverse shocks to an economy produce long-term structural change has recently become popular in macroeconomics under the name of “hysteresis.” (See Sachs 1986 and Blanchard and Summers 1986). It has been argued that hysteresis can occur in the unemployment rate if, for example, prolonged recession leads to a reduction in the capital stock, or if workers who have been long unemployed either come to be regarded as unemployable or are excluded from the wage bargain. It is not difficult to imagine several ways in which hysteresis might similarly arise in the current account balance. A prolonged trade deficit might lead to a large foreign debt, and restoration of the current account balance will then be made more difficult by the necessity of paying interest on that debt. A prolonged period during which a country’s tradable sectors are uncompetitive may lead to disinvestment in those sectors, which may in turn mean that capacity constraints block restoration of trade balance when normal relative prices are restored. Finally, a prolonged deviation of a currency from its steady-state value misalignment may induce foreign firms to make, and domestic firms to abandon, invisible investments in market position, such as distribution networks and long-term customer reputation.

The purpose of this paper is to provide both an overview of theoretical reasons why a sustained dollar appreciation might lead to a sustained problem of international competitiveness and some quantitative assessments and evidence that bear on the issue. The paper begins by offering a simple measure of the extent of sustained overvaluation, which shows that if there indeed are long-term effects of sustained misalignment, then they are potentially of large magnitude indeed. Three main sources of long-term effects of a strong dollar are then considered. First is the effect of the strong dollar on the U.S. international investment position, with the dramatic shift of the United States from the world’s largest creditor to its largest debtor. Second is the influence of dollar overvaluation on the allocation of capital between

internationally competing and noncompeting sectors. Third is the possibility that foreign firms may have invested (and U.S. firms disinvested) in invisible assets such as reputation and distribution networks, leading to a loss in U.S. market share that cannot be regained simply through a return of the dollar to its previous levels. A final section of the paper pulls the evidence together.

To preview the verdict: while there are a number of plausible reasons why a period during which a country's currency is extremely strong might require a subsequent period of compensating undervaluation, there is not much evidence that any of these arguments has in fact been operating very strongly. Despite the massive overvaluation of the dollar, U.S. debt accumulation will probably not be enough to pose substantial additional difficulties in restoring a sustainable U.S. external account; there is surprisingly little evidence of a reallocation of capital away from tradable sectors, and there is no solid evidence of the kind of disinvestment in invisible assets that would shift the U.S. trade balance adversely for any given real exchange rate.

This does not mean that the United States faces no threats from the dollar's prolonged overvaluation. The country has grown accustomed to living beyond its means, and the adjustment down to living within its means will be painful even if there are no complications. Furthermore, if international investors decide to reduce the amount of U.S. debt that they hold willingly to levels comparable to those of six years ago, the United States will be forced into running a string of current account surpluses comparable to the deficits it ran in the period 1982–86, greatly aggravating the medium-term adjustment problem. Finally, the United States does appear to have suffered a major loss in competitiveness due to its lagging productivity growth, requiring a weaker dollar and worse terms of trade to cope with foreign competition. However, clear-cut evidence that the strong dollar itself has done lasting damage to U.S. competitiveness is surprisingly absent.

10.1 The Extent of the Potential Problem

We will be considering several alternative stories about how the strength of the dollar may have done long-term damage to the U.S. competitive position. Even if these stories are true, this does not mean that the United States will never return to current account balance: there is always some real exchange rate at which current account balance can be achieved, and the budget constraint will insure that the dollar is sooner or later driven down enough that the United States begins to pay its way in international markets. The point is instead that if the strong dollar has had long-run adverse effects, these will show up in the future path of the exchange rate. Each of the stories we will

consider implies that a temporary period of dollar strength either permanently lowers the steady-state value of the dollar or requires that the dollar experience a period of compensating undervaluation to work off the effects of its initial overvaluation.

Figure 10.1 illustrates the possible senses in which a temporary deviation of the exchange rate from its steady-state value might be said to have long-run effects. The figure indicates the initial steady-state real exchange rate as \bar{E} . For some reason the exchange rate is pushed up temporarily. Most standard discussions have envisaged a subsequent path for the exchange rate like that illustrated as path (1): a gradual convergence of the exchange rate back to its long-run level. The concern of this paper is with possible reasons why the dollar might instead follow a path like (2) or (3). In case (2) the dollar depreciates below its original level, settling into a new steady state. In case (3) the dollar depreciates sharply below its original level, providing the compensating undervaluation needed eventually to restore the steady state.

Obviously it is crucial to specify the mechanism producing long-term effects of the strong dollar to determine both the nature of the path and the size of either the reduction in the steady-state exchange rate or the corrective undervaluation that will be necessary. All of the models suggested below, however, will relate the size of the long-term effect to the magnitude of the deviation from steady-state values that has occurred. As a preliminary step, it is therefore useful—and somewhat awe-inspiring—to contemplate the size of the deviation of the U.S. exchange rate from any likely estimate of its steady state during the 1980s to date. Figure 10.2 shows a comparison of the actual U.S. real exchange rate (Council of Economic Advisors estimate; the CEA series uses CPIs as price deflators) with a rough estimate of a steady-state value of the dollar from 1973 to 1986.¹ The difference between the two represents the cumulative deviation from the steady state since 1980: a total of 187 point-years of deviation. Some, though not all, stories about long-term effects of misalignment indicate that the dollar must go through a compensating undervaluation equal in extent to its initial

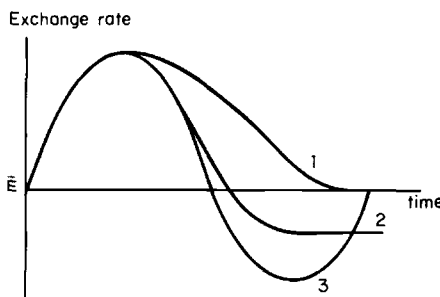


Fig. 10.1

Alternative paths for the dollar.

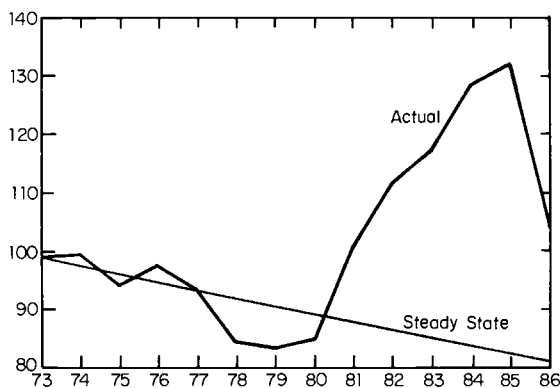


Fig. 10.2 Deviation of dollar from steady state.

point-years of misalignment. The extent of dollar weakness implied is startling.

10.2 The Debt Burden

The most easily measurable long-run effect of the strong dollar has been to transform the United States from a creditor to a debtor nation. The effect of debt accumulation in producing long-term effects of a temporary strong currency has been stressed by Branson (1985) in particular.

A reduced-form version of Branson's analysis may be given as follows. First, at any point in time the U.S. real exchange rate will depend negatively on U.S. net foreign indebtedness, because as foreign debt grows, foreign investors will perceive the United States as increasingly risky. On the assumption that it is foreign debt relative to U.S. GNP that matters, we may write this as

$$(1) \quad E = E(d, z) \quad \partial E / \partial d < 0,$$

where d is the ratio of foreign debt to GNP, and z is a vector of other factors.

Let r be the nominal interest rate, π the inflation rate, and g the growth rate of the U.S. economy. Then the growth of the U.S. debt-GNP ratio will be

$$(2) \quad \dot{d} = -b + (r - \pi - g)d$$

where b is the ratio of the noninterest current account to GNP.

Finally, the noninterest current account will depend on the real exchange rate. Linearizing, we can write this as

$$(3) \quad b = -\beta(E - \bar{E}).$$

Figure 10.3 illustrates how this small model works. On the vertical axis is the real exchange rate and on the horizontal axis the ratio of U.S. external debt to GNP. The line EE shows how the exchange rate depends at any point in time on the level of external debt. It is downward sloping because as U.S. debt grows, foreign investors will perceive greater risk and will demand a higher expected rate of return on U.S. assets. The line $d = 0$ shows how the exchange rate consistent with a constant debt-GNP ratio depends on the level of external debt. It is downward sloping because as long as the real interest rate exceeds the growth rate, an increase in the level of debt will require an increase in the trade surplus to avoid explosive debt growth.

Now suppose that for some reason there is an increase in the exchange rate consistent with any given level of foreign debt. This might result from any of the explanations currently offered for the dollar's rise: a fall in U.S. national saving that raised real interest rates, a rise in investment demand brought about by changes in tax law, an exogenous shift in portfolio preferences due to renewed confidence in America or political instability abroad, or a simple speculative bubble. Whatever the source, the initial effect will be to shift EE up, say to $E'E'$. If the exchange rate is initially in equilibrium at point R , it will now shift to point S . However, over time, debt accumulation will gradually push the dollar down, as indicated by the arrows.

What happens next depends crucially on whether the shift in EE is permanent. If it is, the system will gradually converge to a long-run equilibrium at point T —that is, to a new steady-state exchange rate that is below the original level. This would be a story corresponding to path (2) in figure 10.1. On the other hand, suppose that the shift in EE is reversed—the speculative bubble that made foreigners willing to enlarge their claims on the United States bursts, the U.S. savings rate rises, and so forth. Then the economy will return to point R . To get there, it will have to experience a period of low real exchange rates so

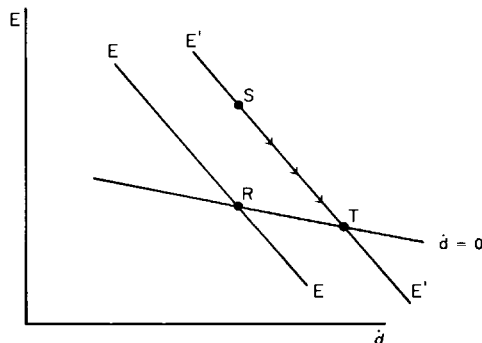


Fig. 10.3

Short- and long-run effects of portfolio shift.

as to run trade surpluses large enough to work off the debt. Specifically, if the initial shock comes at time O we must have²

$$(4) \quad \int_0^{\infty} \dot{d} dt = -\beta \int_0^{\infty} (E_t - \bar{E}) e^{-(r - \pi - g)t} dt = 0.$$

That is, the initial deviation of the exchange rate from its steady-state level, measured in point-years, must be offset by a subsequent deviation on the other side that, as long as $r - \pi > g$, actually contains even more point-years.

How important are the long-term implications of the accumulation of U.S. external debt? The answer depends crucially on whether international investors remain willing to hold the stock of claims on the United States they have accumulated so far, or whether there is a demand for a return to the debt position of 1980. If the debt position need only be stabilized, the debt accumulation, though huge in absolute terms, will produce only a small drag on the U.S. current account. If the debt must be worked off, however, the burden of doing so will be large indeed.

Figure 10.4 shows actual and projected values of the U.S. net international investment position as a share of GNP. From 1978 to 1986 the numbers are actual (within the generous uncertainty of the data). From 1987 onwards they are based on the assumption of a linear return of the United States to current account balance, together with a combination of 2.5% real GNP growth and 3% inflation.³ The United States can plausibly be expected to move from a net creditor position of almost 4% of GNP at the end of the 1970s to a net debtor position of 12% or more by the early 1990s—even if the current account does adjust steadily from this point onwards.

Viewed in absolute terms, the actual, and even more so the prospective, U.S. debt accumulation is daunting. (The nominal debt value

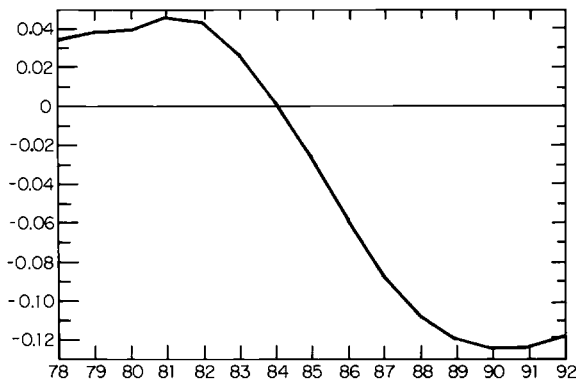


Fig. 10.4

U.S. external debt as percentage of GNP.

corresponding to the 1992 ratio of 12% of GNP is \$700 billion.) However, the United States is a huge country in an even-huger world. We need to be careful before getting alarmed about the size of even an apparently overwhelming debt accumulation. If foreign investors do not demand that the United States work off the debt it has run up and are content to allow the United States to stabilize its ratio of debt to GNP, then the debt buildup by itself will be relatively minor. On the other hand, if international investors decide not merely to end but to reverse the buildup of U.S. external debt, this would be a serious matter.

The relative ease with which the United States could stabilize the debt-GNP ratio despite the size of the debt accumulation is readily seen. To keep debt from rising faster than GNP, the United States must run a noninterest current surplus equal to $r - \pi - g$ times the value of the debt. The debt ratio d was approximately $-.04$ at the end of the 1970s, and may plausibly rise to $.12$ by the early 1990s; while the future of both the long-term real interest rate and the U.S. growth rate is uncertain, centrist guesses might be $.04$ and $.025$. This implies that the real resource transfer necessary to stabilize U.S. external debt would have been $-.06\%$ of GNP had there been no increase in the debt ratio since 1980, while it may have risen to $+.18\%$ of GNP by the early 1990s—a net swing of about $.25\%$ of GNP (about \$10 billion currently).⁴ This is not a negligible amount, but it is not very large. If this were the whole story, the U.S. plunge into external debt would have to be considered no more important a factor in external adjustment than, for example, the trade policies of foreign governments, which have been widely dismissed as of secondary importance by economists.

Now it is possible that the direct burden of the debt will in fact be somewhat larger than this. Not all international claims consist of interest-bearing securities, and the rate of return on other investments is significantly higher. In 1985 the United States, although it had a roughly zero net investment position, ran a surplus of \$25 billion on investment income. This was at least partly because direct investment made up a higher share of U.S. assets than of U.S. liabilities (23 vs. 15%). It also reflected the fact that U.S. banks accepted foreign deposits and lent the money at higher interest—which may represent a miscounting as investment income of services provided by the U.S. financial system. To the extent that the growing debtor position of the United States is financed in future by a reversal of the U.S. position as more of a home than a host country for foreign direct investment, the burden of servicing foreign claims may be larger than would be calculated based on real interest rates for securities.

Nonetheless, it seems clear that the direct burden of growing U.S. debt, in the sense that restoring a sustainable external position will become much harder because of the need to pay interest on the debt,

is in fact a relatively minor issue. This does not, however, mean that the growth in the debt is irrelevant. Similar calculations were made by many economists for less-developed debtors in the late 1970s and early 1980s, suggesting that LDC (less developed country) debt should not pose serious problems. These studies turned out to be wrong, because they failed to take into account the possibility that foreign investors would revise downward the quantity of debt they were willing to hold, forcing debtor nations into rapid shifts into trade surplus. If there is a major consequence of the accumulation of foreign debt by the United States, it must be the exposure of the United States to a similar risk.

Suppose that the willingness of foreigners to greatly increase their claims on the United States during the past five years turns out to have been a temporary aberration, and that starting sometime later in this decade the United States experiences capital outflows large enough to restore it to a positive net international investment position. The necessary concomitant of this restoration would be a very weak dollar. To work our way up to net debtor status took a massively strong dollar: from 1981 to 1986 the dollar was on average 31% above the level consistent with a stable net investment position. There is no reason why we might not now be faced with a period of comparable dollar weakness.

Now one might argue that such an extremely weak dollar will not happen because of the investment opportunities it would offer. A dollar so weak as to yield large current account surpluses would offer an opportunity to buy dollar-denominated assets with the expectation of large capital gains, and this would tend to mitigate the dollar's weakness. However, after the experience of the 1980s so far it is difficult to be so sanguine about financial markets. A cool appreciation of the long-run unsustainability of a very strong dollar did little to keep the dollar from rising to what in retrospect were thoroughly unjustified levels in 1984–85; there is no guarantee that the desire of investors to reduce claims on the United States will not lead to a similarly large undershooting of the dollar in the years ahead.

In summary, then, the growth in U.S. foreign debt does not pose a long-run problem for U.S. adjustment in the sense that the interest burden will make it difficult to achieve a sustainable balance of payments. Instead, the risk is that the run-up of debt in the 1980s will now be run in reverse, implying a dollar as weak relative to the steady-state level as the dollar of 1985 was strong.

10.3 Capital Reallocation

A second possible source of long-term effects of the dollar's overvaluation might be a reallocation of capital away from exporting and

import-competing sectors. Press reports surely suggest that many U.S. manufacturing industries have retrenched or shifted production abroad; one would expect to find that this has been associated with a decline in the capital stock in these industries. To restore U.S. trade balance may therefore require a period of rebuilding, thus requiring a compensatory period of undervaluation to induce the necessary investment movement. There is a good deal of journalistic evidence for major movement out of tradable sectors by U.S. firms in the first half of the eighties; not only were there numerous complaints about “deindustrialization” and the emergence of the “hollow corporation,” but stories about individual industries seem to fit the hypothesized pattern of shrinkage in the face of competition. Again and again, restoration of profitability in U.S. industries faced with foreign competition is said to have hinged crucially on closing of inefficient plants. Thus it seems plausible that capital reallocation should turn out to be a major long-term effect of the dollar’s strength.

10.3.1 A Model of Capital Reallocation

The simplest model one can set up of capital reallocation is one that draws on the specific factor models of Neary (1978) and Mussa (1974, 1978). In this model a given stock of capital must be allocated between two sectors; it is costly to reallocate capital, so that capital moves only gradually to the sector of highest profitability. It would be more realistic, of course, to model a capital stock that grows over time, so that the choice is one of the allocation of investment at the margin rather than an actual movement of existing capital from one sector to another; but the simple capital reallocation model is sufficient to make the point.

Consider, then, an economy consisting of two sectors, one producing tradables and the other producing nontradables. Output in each sector is a constant-returns function of capital and labor. Labor is instantaneously mobile between sectors, while capital can be reallocated between sectors only at a cost that is increasing in the rate of reallocation. In order to focus on the issue of capital reallocation, let us assume full employment. Finally, in order to focus on the supply side, the trade balance will be taken to be exogenously given by international investment decisions.

First we consider the static relationships. Let K be the economy’s total capital stock; it is divided at any point in time between the capital allocated to tradables, K_T , and that allocated to nontradables, K_N , so that

$$(5) \quad K_N = K - K_T.$$

Let P be the relative price of nontradables (which is one measure of the real exchange rate). Given our full-employment assumptions, this

price will move so as to clear the market for nontraded goods. The supply of nontraded goods depends on their relative price and on the allocation of capital. The demand for nontradables will depend on their relative price and on real domestic expenditure. However, domestic expenditure is by definition equal to national income minus the trade balance, while national income depends on the allocation of capital and on relative prices. Thus we can write a reduced-form equation for P as a function of K_T and the real trade balance B :

$$(6) \quad P = P(K_T, B) \quad \partial P / \partial K_T > 0, \quad \partial P / \partial B < 0.$$

Also, the rental rate on capital in each sector, measured in terms of the tradable good, depends on relative prices and the allocation of capital. Since relative prices in turn depend on the allocation of capital and the trade balance, we can write the reduced-form equations

$$(7) \quad \rho_T = \rho_T(B, K_T) \quad \partial \rho_T / \partial B > 0, \quad \partial \rho_T / \partial K_T < 0.$$

$$(8) \quad \rho_N = \rho_N(B, K_T) \quad \partial \rho_N / \partial B < 0, \quad \partial \rho_N / \partial K_T > 0.$$

Now consider the pricing of capital in each sector. Let us assume that there is a given world interest rate r in terms of the traded good, and that risk can be ignored. Then in each sector the rate of return on capital, including capital gains or losses, must be equal to r . Let q_T, q_N be the prices of capital in the two sectors. Then we must have

$$(9) \quad r = \rho_T / q_T + \dot{q}_T / q_T.$$

$$(10) \quad r = \rho_N / q_N + \dot{q}_N / q_N.$$

Define \tilde{q} as the difference between the value of capital in place in the two sectors, $q_T - q_N$. Then it is immediately apparent that \tilde{q} will obey the law of motion

$$(9) \quad d\tilde{q}/dt = H(\tilde{q}, K_T, B) \quad \text{with } H_1 > 0, H_2 > 0, H_3 < 0.$$

Capital will be reallocated to the sector with the higher price of capital. With convex costs of adjustment, the rate at which capital is reallocated will be an increasing function of the difference in prices of capital in place:

$$(10) \quad \dot{K}_T = G(\tilde{q}).$$

This defines the dynamic system illustrated in figure 10.5. In the absence of any anticipated shocks, the allocation of capital will converge along the indicated saddle path.

10.3.2 Effects of a Temporary Trade Deficit

Now suppose that for some reason our economy is temporarily induced to run a trade deficit, say for N years. Suppose for simplicity

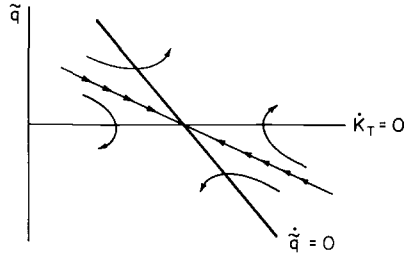


Fig. 10.5 Dynamics of capital reallocation.

that the length of time for which the deficit will persist is perfectly anticipated from the beginning. Then the dynamics will follow the path illustrated in figure 10.6. While the trade deficit persists, the line $d\tilde{q}/dt = 0$ will shift down, to the position indicated by the broken line. The capital stock allocated to tradables will therefore decline at first. Some time before the end of the trade deficit is anticipated, however, the capital in tradable industries will begin to rise again, so as to place the economy on the saddle path at the instant of transition.

If we look at the implied behavior of the relative price of nontradable goods, we will see that it first rises above its steady-state level, then falls below that level, before eventually returning to its original level. Thus the capital reallocation model implies that a temporary strong exchange rate must be followed by a corrective undervaluation along the lines of path (3) in figure 10.1.

Need this corrective undervaluation be equal in point-years to the original deviation from the steady-state exchange rate? The answer is no: because the reallocation of capital from tradables to nontradables tends to lower the relative rental in the nontradables sector even at a given real exchange rate, not all the incentive to return to the original allocation of capital need be supplied by the subsequent undervaluation. However, the effect of capital reallocation on the relative rental for a given relative price depends, as Neary has pointed out, on the difference in capital intensity in the two sectors. If the two sectors were of equal capital intensity, there would have to be a full corrective undervaluation. This suggests that the actual undervaluation would have to be fairly close to full compensation for the previous overvaluation.

The capital reallocation story thus seems to give a highly plausible reason why a strong dollar would have to be followed by a weak dollar before long-run equilibrium could be restored. However, the evidence on actual capital reallocation is puzzling and does not on the face of it support the view that the United States has in fact reallocated capital away from tradable production.

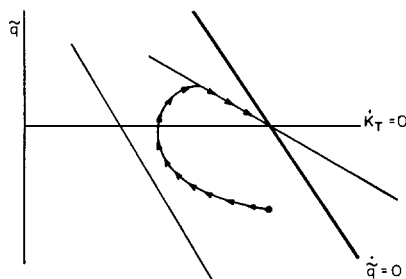


Fig. 10.6 Effects of a temporary trade deficit.

10.3.3 Capital Reallocation in the United States, 1979–85

It is a common approximation to treat tradables as equivalent to goods-producing industries, and nontradables as equivalent to services, on the grounds that goods are much more easily traded than services. Within the goods-producing sector, agriculture and mining have special problems that make it desirable to exclude them from the story. Thus the capital reallocation story should be apparent in a comparison of manufacturing with service sectors. Indeed, the rise of the U.S. trade deficit has been matched one-for-one by a rise in the manufacturing deficit, and there has been widespread concern that international competition has been undermining U.S. manufacturing.

Given these presumptions, it is surprising to discover that there is essentially no evidence of a reallocation of U.S. capital away from the manufacturing sector. Table 10.1 shows two measures of the allocation of U.S. investment between manufacturing and other sectors: the share of manufacturing investment in GNP and its share in total fixed investment. Neither measure shows any notable trend.

Table 10.1 Indicators of Capital Reallocation: Fixed Investment in Manufacturing as a Share of GNP and Total Fixed Investment

	GNP	Total Fixed Investment
1977	.034	.315
1978	.035	.303
1979	.038	.317
1980	.041	.348
1981	.041	.343
1982	.038	.329
1983	.034	.326
1984	.037	.333
1985	.038	.335
1986	.034	.316

This finding is part of the broader puzzle of what has been happening to U.S. manufacturing. The perception of massive deindustrialization does not arise purely from journalistic hype: employment in manufacturing has indeed been falling, with a 1.4% annual rate of decline from 1979 to 1985, compared with a 0.5% annual increase from 1973 to 1979. However, output growth has not slowed as much as one might have expected, given the surge in the manufacturing trade deficit: the growth rate dropped from 2.8 to 2.0% from 1973–79 to 1979–85. Correspondingly, productivity growth has accelerated, from 2.3 to 3.4% annually.⁵

It appears that the emergence of a manufacturing trade deficit has been accompanied by two other developments that blur the picture: a shift in the composition of domestic demand toward manufactures that has sustained the growth of manufacturing despite growing trade deficits, and a surge of capital deepening investment. The shift in domestic demand may be due in part to the military buildup, and the change in investment patterns to the incentives created by changes in the tax law. Whatever the reason, it is difficult to find any evidence of a shift of capital out of the manufacturing sector during the period of the strong dollar.

This does not, however, mean that capital shortage will not be an issue as the United States attempts to move back toward current account balance. If the shift of demand toward manufactures turns out to be permanent, then a reversal of the manufactures trade deficit will imply that manufactures output will have to grow substantially more rapidly than in either the seventies or the early eighties. One estimate puts the rate of growth over the next five years at 4.3% annually (Krugman and Hatsopoulos 1987). To grow this fast, manufacturing will need investment substantially above recent levels—and this will not be forthcoming unless the dollar falls sufficiently below its long-run level to make such an accelerated pace of manufacturing investment profitable. So there is still a case to be made that capital reallocation is an issue: if the dollar had not been so strong, there would have been a shift of investment toward manufacturing, and we may need a weak dollar to induce this investment in future. However, the clear-cut evidence that one might have expected of disinvestment in manufacturing is not there.

10.4 Invisible Assets

The market positions of firms do not depend simply on price and installed capacity. They also depend crucially on invisible assets of firms, such as distribution networks and customer loyalty. These invisible assets, like physical capital, can be built up through investment. It seems plausible to suppose that such invisible investment is an important factor in international trade flows.

At a fundamental level, invisible assets like reputation should be treated in the same way as more tangible investments. In practice, however, there are three reasons for treating them differently. First, invisible investment cannot easily be measured directly and thus must be inferred from its results. Second, since trade statistics measure flows of goods, while the invisible assets of firms tend to affect the perception of the value of these goods to consumers, invisible assets may show up as shifts in demand rather than supply. Finally, it seems plausible that in many cases investment in distribution, marketing, and so forth, has a strong fixed-cost aspect; a foreign firm must decide either to establish itself in the U.S. market, at substantial fixed cost, or not. These differing aspects suggest the need for a separate treatment of the possible long-term effects of the strong dollar that arise from foreign investment, and U.S. disinvestment, in the invisible aspects of international competitiveness.⁶

Recently Richard Baldwin and I (Baldwin and Krugman 1986) have offered a model that captures the fixed-cost aspect of investment in marketing and distribution. The most important conclusion of that model is that there should be a quantum effect: large and/or sustained deviations of the exchange rate from its historical norm will produce sustained effects on trade, where smaller deviations will not.

A crude test for the presence of such sustained effects is to ask whether trade equations show any adverse shift in U.S. exports and imports compared with what might otherwise have been expected given the trends in more conventional determinants of the trade flows. Table 10.2 presents some simple trade-flow equations for the United States, estimated for the period 1973–86. The equations are in log-linear form,

Table 10.2 Export and Import Equations

Dependent Variable	Export Volume	Export Volume	Import Volume	Import Volume
GNP	2.15 (2.52)	1.79 (2.23)	2.14 (6.61)	2.13 (6.56)
Relative productivity	-1.14 (1.32)	-0.91 (1.16)	0.64 (2.20)	0.62 (2.11)
Relative prices ^a	-0.65 (3.55)	-0.72 (4.23)	-0.98 (10.21)	-0.95 (8.27)
Dummy ^b	—	0.05 (1.97)	—	0.02 (0.49)
R^2	0.99	0.99	0.99	0.99
ρ	0.83	0.76	0.50	0.49

^aEight-quarter distributed lag.

^bFor period following 1984:II.

with the dependent variables being the volumes of U.S. nonagricultural exports and nonoil imports. The explanatory variables are GNP in the United States or the rest of the world, a distributed lag on the price of the traded good relative to either CPIs (in foreign markets) or the GNP deflator (in the United States), and—crucially—a measure of U.S. productivity in manufacturing relative to that of other industrial countries.⁷ This last index is necessary to account for the apparent secular decline in the U.S. real exchange rate consistent with current account balance during the 1970s; a theoretical justification for the role of relative productivity in the trade equation is given in Krugman and Baldwin (1987).

The basic equations turn out fairly plausible, with price and income elasticities of plausible magnitude and relative productivity having the expected sign. However, two of the equations also include dummy variables designed to capture any structural shift as a result of the strong dollar. These dummies are zero before the third quarter of 1984, one afterwards; this somewhat arbitrary choice was made because it was in mid-1984 that financial markets seem to have concluded that the dollar could defy the laws of gravity indefinitely, and the final surge in the value of the dollar took place. Thus it seems a reasonable guess that firms making investment decisions would have decided to give up on waiting for a lower dollar at about the same time.

The result is somewhat surprising: there is no evidence of an adverse structural shift. If anything, the equations suggest a favorable shift in export performance. Thus the worry that the strong dollar has permanently impaired U.S. market position does not seem to be supported.

If this is the case, why does the return of the dollar to its 1970s level not lead to expectations of a great surge in U.S. trade performance? The answer lies in the relative productivity term: according to these estimates, it is the long-term decline in the U.S. productivity edge, rather than the damage done by the strong dollar, that requires that the dollar fall well below its historical levels in order to reverse the deficits of the mid-1980s.

10.5 Conclusions

This paper has reviewed several reasons why the strength of the dollar in the period 1981–86 might have long-term adverse effects on U.S. competitiveness. While it is easy to construct stories in which sustained deviations of a currency from its long-run sustainable level do have long-term effects, the evidence for such effects in the case of the United States is surprisingly weak. The burden of stabilizing the debt-GNP ratio will not be greatly exacerbated by the rise in that ratio, because the real interest rate does not greatly exceed the U.S. growth rate. There has been no visible reallocation of capital out of the U.S.

manufacturing sector. And there is no evidence of adverse structural shifts in U.S. trade flow equations.

This does not mean that the United States will be able comfortably to return to the equilibrium of 1980. There may still be a shortage of capital in manufacturing as the United States attempts to restore capital account balance. The trade flow equations embody, through a relative productivity term, a secular decline in the equilibrium real exchange rate that has continued through the 1980s. Finally, stabilizing the debt-GNP ratio may not be enough: if international investors attempt to reverse their buildup of claims on the United States, the United States may be forced into a period of capital outflow and a correspondingly weak dollar—which would be our version of a Latin-style debt crisis. Nonetheless, the basic message of this paper is cautiously optimistic: on the basis of preliminary evidence, the long-term damage from the strong dollar is less than one might have feared.

Notes

1. This estimate was derived as follows: the actual exchange rate in 1973 was assumed to represent a steady-state value; the steady-state value in 1980 was assumed to be 5% logarithmic above the actual; this reflects the widespread belief that the 1980 dollar was if anything somewhat undervalued. The steady-state exchange rate in fourth quarter 1986 was assumed to be 20% below the actual, reflecting a conservative guess about how much further dollar depreciation would have been needed to stabilize the U.S. debt-GNP ratio. The intervening steady-state rates were then filled in by log-linear interpolation. The decline in the steady-state exchange rate from 1980 to 1986 presumably reflects a combination of slow growth of foreign demand and secular trends in U.S. competitiveness, as discussed later in the paper.

2. If the debt-GNP ratio is eventually to return to its original level, then the integral over time of changes in that ratio must equal zero.

3. The U.S. current account, which equals the increase in net debt, declines \$28 billion per year from \$140 billion in 1986 to zero in 1991. The nominal debt is simply the cumulative current account to each year's end; the debt ratio is calculated as this nominal debt divided by nominal GNP, extrapolated from the 1986 GNP using the assumed inflation and growth.

4. If long-term U.S. growth should turn out to be 2% and the real interest rate 5%, the required resource transfer would double; if the numbers were 1.5 and 6, it would triple; but even in this extremely pessimistic scenario the resource transfer required to stabilize debt would not be overwhelming.

5. A good example of what seems to have been the typical case for U.S. manufacturing is the case of the tire industry, described in the *US Industrial Outlook* for 1986. There import competition led to closing of many plants and a 35% decline in employment from the 1970s to 1985; yet the industry invested heavily in improving the remaining plants. Real output, which fell 20% from 1973 to 1979, was stable from 1979 to 1985. From the point of view of workers,

this was an industry in decline; to someone who looked at either capital investment or productivity, the industry was actually doing quite well.

6. The picture is complicated to some extent by multinational firms, for whom the problem is one of choosing a location of production rather than deciding whether or not to be in the market. However, location decisions also involve substantial invisible investment commitments, so that the qualitative behavior of trade flow originating from multinationals need not be very different from that originating from competing national firms.

7. The index is based on interpolation and extrapolation of the relative productivity numbers provided by Data Resources, Inc. (DRI) (1985), with foreign countries weighted by bilateral trade with the United States in 1984.

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Comment Kala Krishna

Krugman presents a number of models which cast light on the consequences of the strong dollar. As he rightly points out, it would be

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desirable to have the strong dollar of the recent past and the currently weak dollar to be part of the same story. The exogenous shift which caused the strong dollar should also be a reason for its current weakness. This is preferable to having both events be the result of unspecified exogenous shocks.

He examines three models which try to do this. The first one focuses on the role of debt on the long-run effects of a strong dollar. The second focuses on specific capital and movement of such capital across sectors in response to shocks. The third one focuses on the effects of entry and exit costs on the long-run effects of a strong dollar. I shall comment on each of these models and on the empirical evidence presented on the relevance of their insights.

The first model is similar to that presented by Branson, and since it aroused a number of comments, I will not dwell on it at length. The basic idea in this model is that an exogenous shock occurs which causes a strong dollar in the short run, which in turn creates an increase in debt over time. This increase in debt requires a weak dollar to service the debt in the long run if the shock is not reversed. If the shock is reversed, then a weak dollar will be required to run trade surpluses large enough to work off the debt. If the shock is not reversed, the increase in debt does call for a weaker dollar, but if the shock is reversed, the increase in debt calls for an even weaker dollar to pay off the debt. Krugman then argues that the former scenario should not cause much concern about the extent of dollar weakness required, while the latter should, on the basis of some simple calculations. This makes a good deal of sense. The question remains, however, as to which scenario is more appropriate in the current context, and the paper has less to say about this aspect of the dollar problem. Speculations on this would be a welcome addition to the paper. Another point which could be made clearer concerns the motivation for equation (1), which postulates that an increase in the debt-to-GNP ratio, d , lowers the real exchange rate, E , at any time. The motivation given is that an increase in d makes foreign investors perceive the United States to be increasingly risky. However, little is said about what the risk is. It could be a risk of repudiation—not only explicit repudiation, but implicit repudiation by inflation. It might also involve riskiness due to possible consequences of attempts by the holders of debt to use it strategically. For example, a decision by the Japanese banks not to hold T bills would probably have a large effect on the market today, and concern about Japanese actions could raise the perceived riskiness of U.S. investments. The model in the paper could be built upon to specify such a basis for such perceptions.

The second model focuses on the reallocation of capital between tradables and nontradables implied by a change in the real trade balance. The model suggests that an increase in the trade deficit will be

accompanied by an increase in demand for nontradables, which results in an increase in the relative price of nontradables—that is, an appreciation of the dollar. This causes a reallocation of specific capital towards nontradables. The shift in specific capital raises the supply of nontradables, reducing their price.

For this reason, an increase in the trade deficit which it is anticipated will disappear in the future would result in an initial increase in the price of nontradables, p , and cause a strong dollar. As capital moved across sectors to this nontraded sector, the price of nontradables would fall. The anticipated disappearance of the increase in the trade deficit would require that capital be moved back to the traded sector. This would require an increase in the price of tradables—that is, an even weaker dollar in the interim period before the relative price stabilized to the original level. The basic idea in this model is thus that the strong dollar and the weak dollar were caused by a temporary exogenous shock which raised the trade deficit. The strong dollar was the result of the increase in demand for nontradables implied by the trade deficit. This reallocated capital to nontradables. The weak dollar was the result of having too much capital in nontradables when the shock disappeared, which required a reallocation of capital back into tradables and a weak dollar.

Krugman studies whether we can see such a reallocation of capital between services (K_N) and manufacturing (K_T) in 1979–85. He does not find such a reallocation in the aggregate data he looks at. However, it would be surprising if the reallocation had been apparent in the aggregate. It is likely that such evidence would only be forthcoming in a more detailed study.

In addition, an implication of the model is that $\bar{q} = q_T - q_N$, the difference in the valuation of capital in the two sectors, falls and then rises to fall again. Do such differences in the valuation of capital in the two sectors arise in the data?

In order to be convincing empirically, a more careful industry-level study which identifies “open” industries, is needed. It would also be a good idea to omit military industries from the sample, since the growth of defense expenditure in this period could bias the results, and to examine both movements in capital stock across sectors and movements in the valuation of assets in the two sectors.

The third model focuses on the effect of entry and exit costs faced by firms, on the long-run effects of a strong dollar. The basic idea is that once Japanese firms are in the U.S. market, a large dollar depreciation is needed to drive them out. Hence, if a strong dollar caused entry of Japanese firms, we should expect to see a structural change in the import-export performance equations. Krugman tests whether a dummy variable, which is zero before the third quarter of 1984 and

1 after this, is significant. He finds that there is little evidence of such a structural shift. Once again, it seems unlikely that one would see such a shift in aggregate data, and one should look for such evidence at the industry level, focusing on industries where such costs are likely to be significant and which have foreign competition.

The drawback of using aggregate data in a country such as the United States which is not as open to trade as are a number of smaller countries is that the effects of trade shocks tend to be less obvious in the data.¹ This makes it important that aggregate evidence not be the only kind analyzed.

Another reason that long-run effects of the strong dollar may exist might be related to recent work on pass-through or pricing to market, mentioned by Johnson and Loopesko in this conference. Imports may adjust slowly to a depreciating dollar if the price of imports on foreign exchange also changes so as to keep the dollar price stable—that is, a pass-through of zero. The obvious point about the extent of pass-through is that a pass-through of unity is not necessary in any market structure, since exchange rate changes act like ad valorem taxes/subsidies, and it is well understood that the incidence of such taxes rarely falls on only one side of the market.² However, this does not have much to say about the long-run consequences of a strong dollar.

The presence of adjustment costs—such as costs of hiring and firing labor—do give long-run effects of a strong dollar. Such adjustment costs tend to have two implications. First, they tend to stabilize employment by making firms choose to employ fewer workers in good states and more in bad states. This stabilizes output, and if most output is exported to the United States, this stabilizes the dollar price. In addition, adjustment costs make employment and output decisions contingent on both expectations about the future and on previous employment levels, which of course depend on the entire history of previous states. They tend to create large regions of inertia in the choice of employment. Thus, if a strong dollar raised the employment and output of firms exporting to the United States, only a very weak dollar which is expected to remain weak would induce such firms to cut employment and exports. For smaller depreciations of the dollar, employment, output, and exports by such firms would be maintained. Thus, a strong dollar, by adjusting upwards the existing labor force in firms exporting to the United States, would have long-run consequences by requiring very large depreciations to combat low pass-through. While simple models of such phenomena exist, work in this area is at a relatively

1. The ratio of exports to GNP in the United States is only about 10%.

2. A number of such models are constructed in Krugman 1986, which also has several references to recent work in the area.

immature state, and testable predictions of models with adjustment costs are only beginning to emerge.³ This seems like a very promising area for future research.

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3. A simple model of such labor market dynamics can be found in Caplin and Krishna (1986).