

EXCHANGE RATES AND FOREIGN DIRECT INVESTMENT: AN IMPERFECT CAPITAL MARKETS APPROACH*

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We examine the connection between exchange rates and foreign direct investment that arises when globally integrated capital markets are subject to informational imperfections. These imperfections cause external financing to be more expensive than internal financing, so that changes in wealth translate into changes in the demand for direct investment. By systematically lowering the relative wealth of domestic agents, a depreciation of the domestic currency can lead to foreign acquisitions of certain domestic assets. We develop a simple model of this phenomenon and test for its relevance in determining international capital flows.

I. INTRODUCTION

The recent depreciation of the dollar has been accompanied by a dramatic increase in foreign direct investment (FDI) in the United States. According to many business people and members of the press, the link between these two phenomena is an obvious one: a weak dollar makes certain U. S. assets seem cheap to foreigners, who hold their wealth in other currencies. This story is often told with either an implicit or explicit warning about the unfavorable welfare effects involved in such a "fire sale" of U. S. assets.

Most international economists dismiss the possibility of a relationship between foreign acquisitions and exchange rates. The typical counterargument notes that in a world with mobile capital (which, increasingly, is the world we live in) risk-adjusted expected returns on *all* international assets will be equalized. As the dollar declines relative to its long-run equilibrium value, the returns on all dollar assets will fall as well, and hence the prices of these assets will rise. There are no "steals" to be had by foreigners. An economist might ask, "if a German has an advantage purchasing a particular U. S. asset with marks, why can't an American with access to global capital markets borrow marks (at the same

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opportunity cost as the German) and avail himself of the same advantage?"

The usual implication drawn from a model with perfect capital mobility is that the individual components of the capital account are not connected to the exchange rate. Of course, *total net* foreign investment is tied down by the current balance; we must import exactly enough capital to offset our current account deficit. But the makeup of this capital account surplus—the relative magnitudes of gross inflows or outflows, or of portfolio versus direct investment—is not affected by the exchange rate. Thus, for example, the value of the dollar does not tell us whether a \$100 billion current account deficit will be financed by foreign purchases of \$100 billion of Treasury bonds, by purchases of \$50 billion of bonds and \$50 billion of real estate, or by foreign *sales* of \$50 billion of U. S. bonds and *repurchases* of \$150 billion of *foreign* assets held by Americans. According to the modern view of international capital markets (which dates back to Mundell [1968]), this indeterminacy arises because exchange rate movements cannot impart a systematic cost-of-capital advantage to either domestic or foreign investors. This is true for any type of investment, be it a passive portfolio investment in Treasury securities or a direct investment in an office building.

In keeping with this view, the modern theory of FDI since Hymer [1960], Kindleberger [1969], and Vernon [1966] stresses that FDI occurs not because of cost-of-capital differences but because certain domestic assets are worth more under foreign control.¹ A German auto manufacturer, for example, may be able to manage an existing plant more efficiently than his U. S. counterpart, and would be willing to pay a price that exceeds the American's valuation. Under this *industrial organization* view of FDI, it makes no difference how the acquisition is financed, since both the American and the German have access to the same international capital market. And once again, there is no real role for the exchange rate: when the dollar depreciates, the United States becomes a cheaper place for *any* firm to produce. Depreciation does not alter foreigners' opportunities relative to those of Americans.

In spite of its logical appeal, the view that exchange rates are irrelevant to FDI is at odds with more than just casual empiricism. As an example, Figure I shows detrended inflows of FDI into the United States since 1973, along with a measure of the real value of

1. See also Caves [1982] for a discussion of these views.

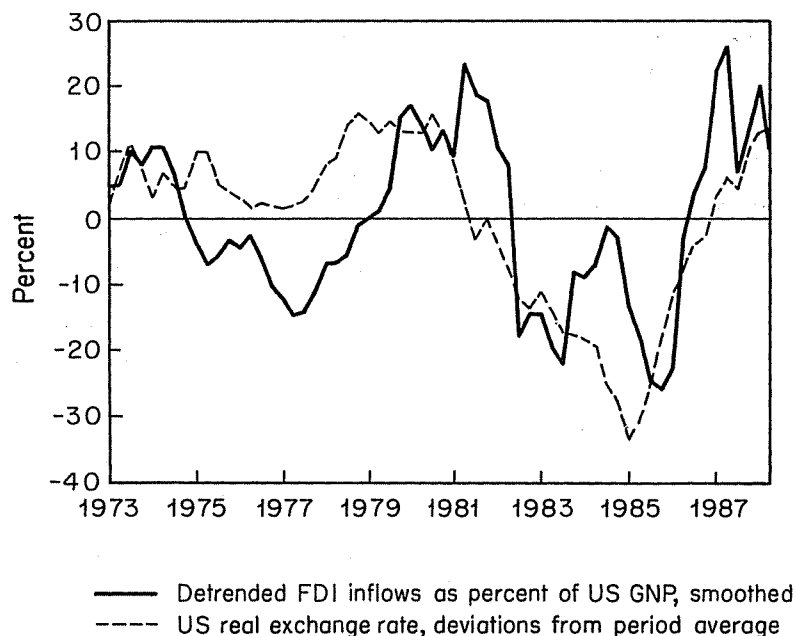


FIGURE I
U. S. Foreign Direct Investment Inflows and the Real Exchange Rate

the dollar. The relationship is visually striking, and a simple statistical test confirms this observation—a regression of detrended FDI (as a percentage of U. S. GNP) against the exchange rate implies that a 10 percent dollar depreciation is associated with additional FDI inflows of about \$5 billion (with a standard error of less than \$2 billion). Moreover, the correlation is not just a recent development. If the 1980s are excluded from the sample, the regression coefficient actually increases. As discussed later in the paper, these results are not extraordinary. Indeed, other researchers have produced similar results using a variety of data sets.²

In this paper we offer a model of FDI which is capable of explaining the observed importance of exchange rates for direct investment. Our model has the commonsensical feature that increases in wealth stimulate agents' demand for investment. This effect is familiar in other contexts; indeed, it occupies a central

2. Caves [1988], for example, examines a panel of investment inflows into the United States from fifteen individual source countries. He finds that the strength of a country's currency relative to the dollar is an important explanatory variable for that country's direct investment in the United States. See also Ray [1988].

position in some economists' explanations of important macro- and microeconomic phenomena.³

More specifically, we build on the idea that when there are informational asymmetries about an asset's payoffs, it will be costly or impossible for entrepreneurs to finance that asset solely with externally obtained funds. The more net wealth an entrepreneur can bring to such an "information-intensive" investment, the lower will be his total cost of capital. The basic economic principles that generate costly external finance have been developed in a variety of specific formulations.⁴ Several authors have underscored the macroeconomic importance of these imperfections in a closed-economy setting.⁵

Once one accepts that there is a link between wealth positions and investment, the relationship between exchange rates and FDI follows immediately. To the extent that foreigners hold more of their wealth in nondollar-denominated form, a depreciation of the dollar increases the relative wealth position of foreigners and hence lowers their relative cost of capital. This allows them to bid more aggressively for assets.

The effect can be seen most easily using a stylized example. Imagine first that both a U. S. and a Japanese investor are bidding to buy an American office building. The building will produce an expected \$100 million of rental revenues next year, and be worthless thereafter. Either investor can go to the same bank and get a mortgage loan on the same terms: the bank will lend at an interest rate of 10 percent, but for only up to 90 percent of the purchase price.⁶ The U. S. investor has \$7 million in cash available, and the Japanese investor has 1,000 million yen. The exchange rate is 200 yen/dollar. Under this scenario the U. S. investor wins the bidding, because he can make a \$7 million downpayment and thus pay as high as \$70 million for the building. The Japanese investor, on the other hand, has wealth of only \$5 million, and so can bid just \$50 million.

3. The idea goes back at least as far as Irving Fisher [1933], who attributes much of the decline in investment during the great depression to wealth effects.

4. These include the adverse selection models of Jaffee and Russell [1976]; Stiglitz and Weiss [1981]; Greenwald, Stiglitz, and Weiss [1984]; and Myers and Majluf [1984], as well as the costly-state-verification models of Townsend [1979], Gale and Hellwig [1985], and Williamson [1986, 1987].

5. See Bernanke and Gertler [1989, 1990] and Greenwald and Stiglitz [1986]. The conclusion that wealth matters for investment has been supported in tests using aggregate data [Abel and Blanchard, 1986], micro data [Fazzari, Hubbard, and Petersen, 1988; Hoshi, Kashyap, and Scharfstein, 1991], and in the field study research of Donaldson [1984].

6. The model of the next section shows how loan supply schedules that involve credit rationing of this sort emerge endogenously from informational imperfections.

Now suppose that the dollar depreciates to a value of 100 yen. The Japanese investor's dollar wealth increases to \$10 million, and he wins the bidding. Thus, the depreciation of the dollar has increased the relative wealth of the Japanese, and changed the outcome of the auction.

It should be emphasized that the "imperfection" that drives this result is an informational one, related to the nature of the asset being purchased. In the above example, capital is still perfectly mobile in the usual sense: the Japanese investor has access to the same external borrowing facilities as the U. S. investor. Furthermore, the imperfection will not be of the same significance for all types of assets. A passive investment portfolio of stocks and bonds is not "information intensive" and thus can be readily financed almost exclusively with external funds. As a consequence, we would expect gross portfolio flows to be insensitive to exchange rates. This would not be true, however, for certain direct investments, where there are likely to be significant asymmetries of information.

The plausibility of our theory can be checked by noting that the effect of exchange rate changes on relative wealth positions is likely to be substantial compared with the effects of other shocks. For example, previous empirical work has found that corporate profits are a significant determinant of investment. Presumably, this is because such profits enhance corporate wealth and thereby improve companies' ability to finance their investments.⁷ Yet over the period 1974–1986, return on net worth for U. S. manufacturing corporations had a standard deviation of only 2.3 percent per year. In contrast, the annual standard deviation of the real dollar exchange rate over the same period was 13.5 percent. Thus, even if the typical foreign company holds only a fraction of its net worth in nondollar form, the effect of currency shocks on the relative wealth of domestic and foreign companies can be much greater than the effect of profitability shocks.⁸

The remainder of the paper is organized as follows. In Section

7. See Abel and Blanchard [1986].

8. The model below is vague about the precise interpretation of a company's existing "wealth." To be clearer, one needs to specify the informational attributes of assets already owned by the company. For example, if all a company's existing assets are free of informational asymmetries—it might own only Treasury bonds—then its wealth for our purposes is simply the difference between the market value of its assets and liabilities. More realistically, a company's existing assets will also be subject to some informational problems. Therefore, it will be unable to readily convert all its net worth into cash: its collateralizable wealth, or "financial slack," will be less than the value of its equity.

II we develop and then interpret a formal model that connects exchange rates, wealth positions, and FDI. The welfare properties of this model are briefly discussed in Section III. Section IV examines a number of alternative hypotheses that have been offered to explain the relationship shown in Figure I. In Section V we turn to the data and argue that they provide support for our view. Section VI concludes.

II. THE MODEL

The model features an information asymmetry with regard to assets under an entrepreneur's direct control. We adopt Townsend's [1979] costly-state-verification approach, in which the asymmetry is *ex post*, rather than *ex ante* as in an adverse selection model: once the profit from the asset is realized, it is costlessly seen only by the asset's owners. External creditors must pay an amount c if they want to observe the profit. This monitoring cost is what causes external finance to be more expensive than internal finance.

When $c > 0$, the optimal contract between creditors and borrowers will be a straight debt contract, with a required repayment of D . In those states of the world where profits exceed D , borrowers keep the difference. When profits fall below D , the creditors pay the monitoring cost, discover what profits are, and keep all of them. This can be interpreted as bankruptcy.⁹

Costly state verification is more literally applicable to small, privately owned companies. Larger companies often issue public equity, which is inconsistent with the model. Nonetheless, we choose this approach for two reasons: first, it is extremely simple, and allows for an intuitive exposition of our basic ideas; and second, because a more complex adverse selection model would lead to the same qualitative results.¹⁰ The model is therefore best thought of

9. We assume that monitoring is a deterministic function of the state. If stochastic monitoring were possible, most of our results would still hold: only our welfare analysis would be affected. See also footnotes 14 and 20 below. To see that debt contracts are optimal under deterministic monitoring, note that payments can be linked to profits only in states where there is monitoring. (Without monitoring, the entrepreneur would claim the lowest possible level of profits, regardless of his return.) Intuitively, debt contracts conserve on monitoring costs; an equity contract, for example, would involve monitoring in all states.

10. A comparison of Bernanke and Gertler's two papers [1989, 1990] makes this clear. In the latter they show how the conclusion that "wealth matters" carries over from the costly-state-verification model they use in the former to a more complicated adverse selection model.

as a metaphor for a variety of informational and incentive problems that may cause firms to prefer internal sources of finance.

IIA. Investment Opportunities

In our two-period model, agents are risk neutral, and they can allocate their first-period wealth across three types of investments. The first two investments are riskless one-period bonds available to all agents. There is a domestic asset that pays an interest rate r in the domestic currency, and a foreign asset that pays r^* in the foreign currency. We assume that capital is perfectly mobile internationally. Because agents are risk neutral, uncovered interest parity holds:

$$(1) \quad r - r^* = (E_1(e_2) - e_1)/e_1,$$

where e_1 and e_2 are the period 1 and 2 exchange rates, respectively. In order to tie down the model and simplify the notation, we assume that $E_1(e_2)$ is exogenous and equal to one, and that r^* is exogenous and equal to zero. Thus, we have $(1 + r) = 1/e$ as our simplified parity condition, where the unsubscripted e refers to e_1 .¹¹

The final type of investment is an indivisible risky direct investment in the domestic country.¹² There are a large number of risky assets available, indexed by i . The i th asset can be managed by either a single domestic entrepreneur, who will realize a random profit (in the domestic currency) of x_i^d , or by a single foreign entrepreneur, whose profit in the domestic currency is x_i^f . An entrepreneur sees the realization of x_i ex post, but an external supplier of funds can observe it only at a cost of c .

Ex ante, it is common knowledge that both x_i^d and x_i^f are distributed uniformly on $[0, X_i]$, where X_i is publicly observable. Thus, for simplicity, we are assuming that the domestic and foreign entrepreneurs have identical expected gross profits. That is, we disregard the differences in managerial abilities that characterize the *industrial organization* view of FDI mentioned above. It would be easy, however, to include such differences in ability in our analysis.¹³

11. In the analysis that follows, we hold e_2 constant, so all current exchange-rate changes are purely temporary. Unless otherwise mentioned, all our results continue to hold if we were instead to study exchange-rate changes with permanent components.

12. We could easily obtain a model of two-way FDI by adding risky direct investment opportunities in the foreign country.

13. See the NBER Working Paper version for such an extension.

Finally, note that the existence of the riskless assets allows us to divorce our study of risky direct investment from the current account. Once FDI and the current account are determined, portfolio investment in the riskless assets will absorb any difference between the current account deficit and FDI. This partial-equilibrium focus makes the model simpler to work with, but entails no significant loss of generality. A wide variety of models that endogenize both the exchange rate and current account would lead to similar results. (See the end of this section for a sketch of one such model.)

IIB. The Supply of Loans for Direct Investment

In a globally integrated capital market, both domestic and foreign entrepreneurs have access to the same loan opportunities when seeking to finance the risky investments. As noted above, the optimal financing contract will involve a loan amount L , and a required debt repayment D . In those states of the world where the payoff $x > D$, the lender receives D . When $x < D$, the lender pays the monitoring cost and keeps all the profit, for a net of $x - c$. Given our assumption about the uniform distribution of x , the expected return to the lender for a given contracted D , denoted R_D^L , is

$$(2) \quad R_D^L = D - \frac{D^2}{2X} - \frac{cD}{X}.$$

In order for the lender to receive an adequate return, it must be that $R_D^L = (1 + r)L$. Figure II graphs the loan supply schedule that arises from this condition. As the figure shows, entrepreneurs can be credit rationed: they can never obtain a loan for more than $L_{\max} = ((X - c)^2)/(2X(1 + r))$. When $c = 0$, there is effectively no rationing, since the maximum loan amount equals $X/2(1 + r)$, which is the entire expected present value of the asset. But for $c > 0$, an entrepreneur cannot finance the whole present value of the asset externally. If his wealth is sufficiently low, the credit constraint will bind. And even if the desired loan amount is less than L_{\max} , the implicit interest cost to the entrepreneur will exceed r , due to the deadweight costs associated with monitoring.

IIC. An Entrepreneur's Reservation Price

What is the price P that can be offered by a representative entrepreneur (domestic or foreign) with "ability" X and domestic-currency wealth w ? First, note that under no circumstances can P ever exceed $L_{\max} + w$. Second, when an entrepreneur is not at this

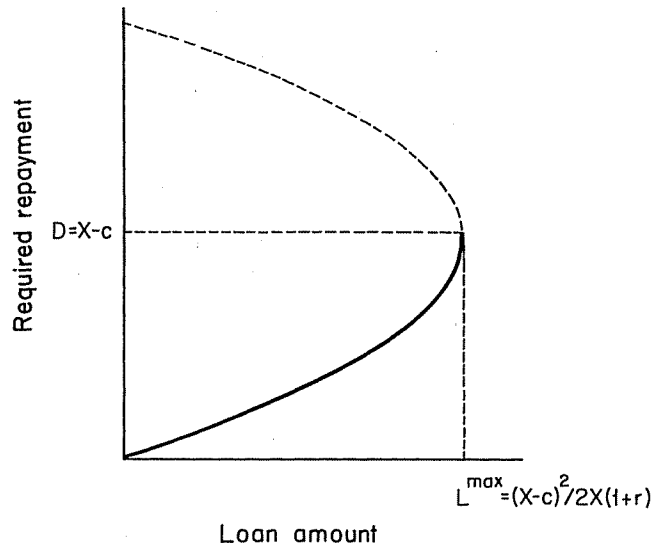


FIGURE II
Loan Supply Schedule

credit-rationed corner solution, he will be willing to pay any price such that his net expected return equals what he could get by investing his wealth in the safe asset, $w(1 + r)$.

Given the distributional assumptions, the return to an entrepreneur who agrees to a contractual repayment of D , denoted by R_D^E , is given by

$$(3) \quad R_D^E = D^2/2X - D + X/2.$$

When the entrepreneur is not credit rationed, he will be willing to bid to the point where $R_D^E = (1 + r)w$. Adding equations (2) and (3) together, and assuming that the entrepreneur is not rationed, we obtain

$$(4) \quad X/2 - cD/X = (1 + r)(L + w).$$

Since the reservation bid price P is simply equal to $(L + w)$, we have

$$(5) \quad P = (1 + r)^{-1}(X/2 - cD/X).$$

This is the price offered by a nonrationed entrepreneur. It has an intuitive interpretation. The first term, $X/(2(1 + r))$, is simply the present value of the asset under the entrepreneur's management,

and the second, $cD/(X(1+r))$, is the deadweight cost associated with the informational asymmetry. Equation (5) is not a reduced form, because of the endogeneity of D . However, D can be substituted out by using (3), along with the fact that $R_D^E = (1+r)w$. This leads to

$$(6) \quad P = (1+r)^{-1}(X/2 - c(1 - (2w(1+r)/X)^{1/2})).$$

Note that this solution is valid only when the entrepreneur is not credit constrained. The overall solution is of the following form:

PROPOSITION. An entrepreneur with dollar wealth w and ability X has a reservation bid price:

$$(7) \quad P(X,w,c) = \begin{cases} L_{\max} + w = \frac{(X-c)^2}{2X(1+r)} + w, \\ \quad \text{if } 0 \leq w \leq \frac{c^2}{2X(1+r)} \text{ (Region 1);} \\ (1+r)^{-1} \left(\frac{X}{2} - c \left(1 - \left(\frac{2w(1+r)}{X} \right)^{1/2} \right) \right), \\ \quad \text{if } \frac{c^2}{2X(1+r)} < w \leq \frac{X}{2(1+r)} \text{ (Region 2);} \\ \frac{X}{2(1+r)}, \quad \text{if } \frac{X}{2(1+r)} < w \text{ (Region 3).} \end{cases}$$

The Proposition implies that the entrepreneur's reservation price is a decreasing function of the cost of state verification, and an increasing function of both wealth and ability:

$$(8) \quad \frac{dP(X,w,c)}{dc} \leq 0, \quad \frac{dP(X,w,c)}{dw} \geq 0, \quad \frac{dP(X,w,c)}{dX} > 0.$$

In the special case in which there are no agency costs, $c = 0$, the reservation price in (7) reduces to the expected present value of the asset,

$$(9) \quad P = X/(2(1+r)),$$

which is independent of the entrepreneur's wealth.

Figure III illustrates the dependence of the entrepreneur's reservation price on his wealth in (7). In Region 1, when $w \leq c^2/(2X(1+r))$, the entrepreneur is at a credit-rationed corner

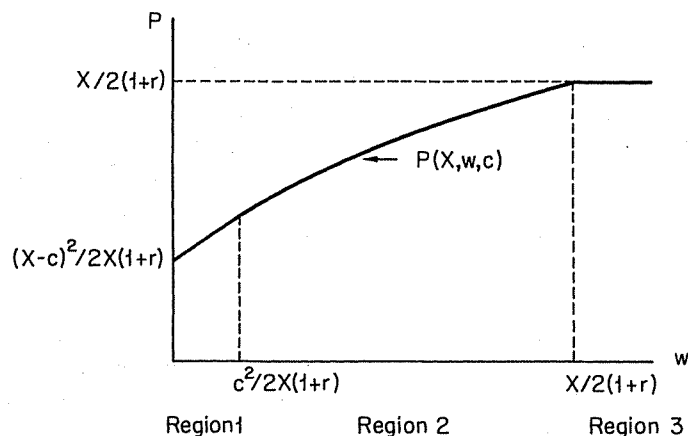


FIGURE III
Entrepreneur's Reservation Price as a Function of Wealth

solution, borrowing the maximum amount possible.¹⁴ In this region, his reservation bid price increases one-for-one with his wealth. In Region 2, when $c^2/(2X(1+r)) < w \leq X/(2(1+r))$, the entrepreneur's reservation price still increases with his wealth, but at a slower rate. In this region incremental internal funds are used partially to raise the price, but also partially to reduce the dependence on external funds and thereby lower the deadweight costs associated with them. Finally, in Region 3 the entrepreneur can pay for the whole value of the asset himself, so further increases in wealth do not affect his reservation price.

IID. Aggregate Foreign Direct Investment

In order to understand how the exchange rate affects aggregate FDI, consider the following scenario in which the i th asset is up for sale. The domestic entrepreneur is endowed with domestic-currency wealth w^d . Analogously, the foreign entrepreneur is endowed with foreign-currency wealth W^f . Thus, the domestic-currency value of foreign wealth is given by $w^f = eW^f$.¹⁵

14. If stochastic monitoring were possible, Region 1 would effectively disappear: entrepreneurs would always be able to borrow the value of the project net of agency costs.

15. It is not necessary that foreign wealth be held exclusively in the foreign currency. As long as foreigners hold more of their wealth in the foreign currency than do domestic agents, our results will continue to apply.

Assume that the asset will be acquired by the (foreign or domestic) entrepreneur with the higher reservation price.¹⁶ Then it is clear from Figure III that the entrepreneur with the higher domestic-currency value of wealth wins the auction, provided that both entrepreneurs are not so wealthy as to be in Region 3.¹⁷ (If that is the case, neither requires any external financing, and the results of the auction are indeterminate.)

The link from exchange rates to FDI is now obvious. As the domestic currency depreciates (e rises), the wealth of foreign entrepreneurs rises relative to that of domestic entrepreneurs, so that (all else equal) more foreign entrepreneurs win auctions.¹⁸

Provided that there is some initial heterogeneity across the i assets (e.g., the endowments w^d and W^f vary over i), the aggregate amount of FDI will increase smoothly as the value of the domestic currency falls. Moreover, the relationship between exchange rates and FDI will be more pronounced for more information-intensive assets—those with higher monitoring costs c .¹⁹ Figure IV illustrates. Note that for assets which are not subject to informational asymmetries ($c = 0$), there is no relationship between exchange rates and FDI. This follows immediately from equation (9), which holds that with $c = 0$, reservation prices are independent of wealth.

It should be emphasized that our partial-equilibrium setup is readily included within many general-equilibrium models of the exchange rate and current account. As a simple example, suppose

16. Implicitly, we are assuming that the asset is initially owned by a third party, who no longer values it highly. This is equivalent to having the domestic entrepreneur owning it initially, and owing a debt D against it such that $w^d = (1+r)^{-1}(X/2 + D^2/2X - D)$. An alternative approach is that the asset does not yet exist, and that a start-up cost must be sunk to create it. Our qualitative conclusions in this section do not depend on which approach we take. This distinction does, however, have implications for the welfare results we discuss in the next section.

17. Another detail that is unimportant in this section (but which may matter for the welfare analysis to follow) is the acquisition price, which will depend on the particular auction mechanism chosen. For example, in a second-price auction, the transaction price will be the second-highest reservation price. Our results on the relationship between the exchange rate and FDI, however, hold as long as the asset is acquired by the bidder with the highest reservation price.

18. As we have specified the experiment, all that matters for this result is that *domestic* entrepreneurs have limited wealth. With a purely temporary depreciation foreigners' reservation prices increase proportionately with the exchange rate regardless of how much wealth they have initially. Alternatively, if the dollar depreciation were purely permanent, interest rates in both currencies would remain the same. Thus, the domestic entrepreneur's reservation price would be unchanged. In that case, in order for a depreciation to have any effect on foreign reservation prices (and, hence, for our results to go through), foreign wealth must not be unlimited.

19. In the NBER Working Paper version, we model such heterogeneity explicitly and demonstrate these claims formally.

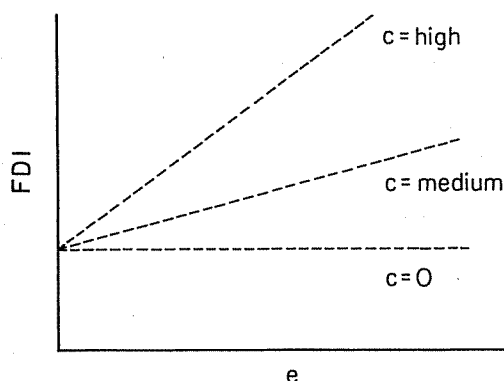


FIGURE IV
FDI Inflows as a Function of The Exchange Rate

that the two “currencies” are actually goods, hot dogs and sushi, and that domestic residents are initially endowed with hot dogs and foreign residents with sushi. Suppose also that consumption takes place in period 2, at which time the goods are perfect substitutes. The period 2 exchange rate is therefore equal to one. In period 1, investment (but no consumption) takes place: sushi can be transformed into period 2 consumption through a riskless storage technology with return r^* ; hot dogs can be transformed into period 2 consumption either through a riskless storage technology with return r , or through risky direct investments with returns x . An improvement in the relative efficiency of the riskless sushi technology (an increase in r^* or decrease in r) leads to a temporary depreciation in the period 1 equilibrium exchange rate (i.e., the period 1 price of sushi in terms of hot dogs rises). Because there is no trade for consumption purposes in period 1, the domestic country’s current account must be zero. The resulting increase in period 1 FDI is therefore financed in equilibrium by greater portfolio flows from domestic residents to foreigners.

III. WELFARE

While our results regarding the exchange-rate-FDI link are robust to variations in the model’s assumptions, any welfare conclusions we might draw are less so. Still, the model can provide a useful starting point for thinking about the welfare consequences

of FDI. It serves as a specific reminder of the theory of the second best: given that the economy suffers from one type of distortion, it is not necessarily true that removing all others improves welfare. Thus, it is at least theoretically possible that banning or impeding FDI could lead to higher domestic (and aggregate) welfare than a policy of *laissez-faire*.

Recall that entrepreneurs with sufficiently low wealth as to be in Region 1 are credit constrained. That is, they are unable to bid an amount equal to the value of the asset (net of monitoring costs) under their control. It is this divergence between an entrepreneur's maximum bid and the private/social value of the asset that creates the possibility of welfare-reducing FDI.

To see how exchange rate movements can lead to FDI that lowers domestic welfare, it is useful to consider a specific example.²⁰ First, suppose that $X = 10$, $c = 3$, $w^d = 0.30$, and $W^f = 0.25$. Suppose also that $e = 1$ initially, so that $r = 0$. Then according to equation (7), the low wealth of both entrepreneurs places them in Region 1, where they are credit constrained. The maximum loan either can obtain is 2.45.

With wealth of 0.30, the domestic entrepreneur can bid at most 2.75 for the asset, while his foreign counterpart can bid only 2.70. Thus, at initial exchange rates the domestic entrepreneur wins the auction. Note that the value of the asset under either entrepreneurs' management is the same: both receive a surplus net of agency costs of 2.90. Because of the credit rationing, this surplus exceeds both bids.

Now suppose that the domestic currency depreciates, so that $e = 2$. The maximum loan obtainable by the domestic entrepreneur doubles to 4.90, while his dollar wealth remains unchanged at 0.30. Thus, he can bid only 5.20, even though the asset now generates a surplus of 5.80 under his management. Since the foreign entrepreneur holds his wealth in the foreign currency, the domestic-currency value of his wealth doubles. His maximal bid therefore also doubles, to 5.40. At the higher exchange rate, the foreign entrepreneur wins the bidding, at a price less than 5.40. This lowers domestic welfare: an asset worth 5.80 in domestic hands is

20. As the example illustrates, welfare reduction cannot occur when the domestic entrepreneur is outside of Region 1, and therefore is able to bid the full social value of the project. Stochastic monitoring (see footnote 14) would therefore preclude welfare-reducing FDI. Note, however, that alternative formulations of the information asymmetry (such as adverse selection) give rise to credit-rationing, and hence could lead to welfare results similar to those in the example below.

sold "too cheap." Only the foreign country benefits from the currency depreciation and the ensuing FDI.²¹

Clearly, this example of welfare reduction is special. It can easily be reversed in a number of ways. First, if the wealth of the domestic entrepreneur is sufficient to place him in Regions 2 or 3, he will always be able to make a bid that equals the value of the asset (net of agency costs) under his control. This alone prevents welfare-reducing FDI, since to win an auction, a foreign investor will have to top the domestic bid, thereby paying more than the asset is worth under domestic control.

Another way to generate more optimistic welfare conclusions for the domestic country is to introduce multiple foreign bidders. Competition among these bidders makes it more likely that any increases in foreign reservation values due to exchange rate movements will be passed along to domestic sellers of the asset. This suggests that even if one is concerned about the possibility that FDI might reduce domestic welfare, the best response may actually be to encourage, rather than discourage, the participation of foreign investors.

Finally, it should be noted that our model disregards two important features of FDI that may have welfare consequences. First, our model is really only about foreign acquisitions of existing assets, and not about new capital formation initiated by foreigners. A model that allows foreign demand to create new assets in the domestic country might yield more positive welfare results, particularly if the beneficial spillovers associated with these new assets were properly accounted for. A second potentially rich area for welfare analysis concerns the implications of FDI for product-market behavior. If reduced capital costs make it cheaper for foreigners to undertake strategic investments, the terms of oligopolistic competition can be altered.²²

IV. OTHER EXPLANATIONS FOR THE OBSERVED EXCHANGE RATE-FDI RELATIONSHIP

Several other explanations have been offered to explain the pattern in Figure I. We briefly mention several of these competing

21. In this example, FDI leaves aggregate welfare unchanged. However, if we were to assume that domestic and foreign entrepreneurs had different abilities, we could easily construct examples in which aggregate as well as domestic welfare falls. See our NBER Working paper for one such example.

22. This possibility is raised in Kester and Luehrman [1989].

hypotheses here and will return to evaluate some of them empirically.

1. Tax code changes can affect the relative amounts of domestic versus foreign investment. In 1981, just as the dollar began its upward surge, more favorable depreciation allowances gave domestic investors an edge over foreign investors in purchasing certain depreciable assets. Similarly, the dollar's fall in 1986 closely coincided with the enactment of the 1986 Tax Reform Act. At that time the most rapid depreciation schedules were eliminated, so domestic investors lost any edge they had gained over their foreign counterparts.²³ Although there is probably some truth to the tax hypothesis, we are not aware of any tax effects that can explain why the exchange-rate-FDI relationship was as strong before 1980 as after. Furthermore, in recent work Swenson [1990] and Klein and Rosengren [1990] control explicitly for tax effects across a panel of countries investing in the United States and still find a significant correlation between exchange rates and FDI.²⁴

2. A second alternative hypothesis holds that FDI should be a roughly fixed proportion of the overall gross capital inflow, which itself may be correlated with exchange rates. Suppose, for example, that Japanese investors wish to invest a fixed number of yen in the United States, and that, for purposes of diversification, they put half into direct investments, and half into portfolio investments. When the dollar falls, the resulting valuation effects cause the *dollar* amount of *both types* of inflow to rise proportionately. In contrast, our model predicts that FDI should behave fundamentally differently than portfolio investment: only the former should be negatively correlated with the value of the dollar. We test this implication of the model below.

3. A third argument holds that some assets (e.g., real estate) may have "sticky" prices in the face of exchange rate changes, and that this somehow creates a temporary window of opportunity for foreign buyers. Two points should be made with regard to the sticky-price argument. First, if capital markets are globally integrated, such price sluggishness would indeed represent an opportunity, but one equally attractive to domestic as well as foreign investors. Second, and perhaps more significantly, the imperfect-capital-markets model presented above *implies* sluggish asset-price

23. For a discussion how U. S. tax changes affect the relative valuation of U. S. real assets by foreign and domestic investors, see Scholes and Wolfson [1988].

24. See also Slemrod [1989] for an empirical evaluation of these tax effects.

responses: in the presence of informational asymmetries, real estate prices should indeed move less than those of bonds in response to an exchange rate change. Because domestic bidders cannot up their reservation prices one-for-one with the exchange rate, foreign investors can acquire some assets at prices that foreigners view as bargains.

4. According to the "tariff-jumping" explanation for FDI, trade barriers are a likely outcome of an increased trade deficit. FDI allows foreign firms to avoid these barriers, in a way that investments in export capacity would not. If trade deficits tend to precede currency depreciations, the FDI increase may coincidentally happen at about the same time that the currency falls in value. This view suffers from the fact that protection, while potentially raising the rate of return on investment in recipient sectors, does not benefit foreign firms *more* than domestic firms. So, while it might explain FDI increasing as a share of foreign-held assets, it does not easily explain foreigners acquiring a larger share of total assets located in the domestic country.

5. A final explanation, closely related to that of tariff-jumping, is the "sectoral-growth" hypothesis. It notes that dollar depreciation makes U. S.-based production cheaper, increasing foreign producers' incentives to locate capacity in the United States. However, as with tariff-jumping, this story offers no clear explanation of why the share of domestic assets held by foreign investors ought to respond to dollar depreciation: both U. S. and foreign producers should benefit equally from the increase in U. S. competitiveness.

V. EMPIRICAL RESULTS

The strong relationship between FDI and the dollar seen in Figure I is consistent both with our model and with several of the alternative hypotheses discussed above. In this section we look more closely at the data to see whether we can better distinguish our imperfect-capital markets hypothesis from competing alternatives.

As a first step, we compare the behavior of other forms of capital inflows into the United States with that of FDI. In Tables I and II, we break down total foreign capital inflows into the United States into their constituent parts: foreign official and foreign private inflows, the latter being also further subdivided into direct investment, foreign investment in U. S. Treasury securities, and

TABLE I
REGRESSIONS OF CHANGES IN FOREIGN ASSETS IN THE UNITED STATES ON THE
VALUE OF THE DOLLAR (QUARTERLY DATA, 1973-1988)

Form of gross capital inflow into the United States	Coefficients on		DW	R ²	DF
	1/e	t			
Total foreign assets	-0.0962 (0.1501)	0.4141 (0.1020)***	1.79	0.21	59
Foreign official assets	-0.1783 (0.1153)	0.0150 (0.0820)	1.66	0.01	59
Foreign private assets	0.0821 0.1517	0.3994 (0.1080)***	1.81	0.32	59
Direct investment	-0.0671 (0.0262)**	0.1336 (0.0190)***	1.92	0.45	59
U. S. Treasury securities	0.0943 (0.0330)***	0.0090 (0.0250)	1.63	0.19	59
Corporate stocks and bonds and other bonds	0.0575 (0.0541)	0.1580 (0.0460)***	0.59	0.31	59

Note. Standard errors in parentheses are the larger of those estimated allowing for both autocorrelation and (i) homoskedasticity and (ii) heteroskedasticity. *, **, *** represent statistical significance at the 10, 5, and 1 percent levels, respectively. Regressions were estimated with constant terms, which are not reported. Legend: 1/e—index of IMF merm real value of the dollar (1980 = 100); t—time trend. Dependent variable is expressed in percent of U. S. GNP.

foreign (portfolio) investment in corporate stocks and bonds.²⁵ Each of these (deflated by U. S. GNP) is regressed on the real value of the dollar and a time trend.²⁶

The regressions on quarterly data from 1973 to 1988 are presented in Table I. The first column reports the dependent variable—the type of capital inflow. These range from the most aggregated to the most disaggregated available. Each regression was estimated using OLS, and standard errors were calculated both in the usual way and to allow for conditional heteroskedasticity [White, 1980] in the regression residuals. Although we frequently found evidence of heteroskedasticity in the data, the heteroskedasticity-consistent covariance matrix estimator is downward-biased in finite samples, while the usual OLS covariance

25. In the Balance-of-Payments data, an investment in a U. S. company is considered direct if a single foreign entity owns or acquires more than 10 percent of that company. Ownership of less than 10 percent is treated as portfolio investment.

26. To measure the real exchange rate, we used the log of the IMF's merm rate. The time trend was included because of the overwhelming evidence that the United States has increasingly become a host for foreign investment. We also included constant terms in the regressions, which we do not report to save space.

TABLE II
REGRESSIONS OF CHANGES IN FOREIGN ASSETS IN THE UNITED STATES ON THE
VALUE OF THE DOLLAR (ANNUAL DATA, 1973-1987)

Form of gross capital inflow into the United States	Coefficients on		DW	R ²	DF
	1/e	t			
Total foreign assets	-0.0619 (0.1816)	1.6460 (0.5170)***	1.57	0.45	12
Foreign official assets	-0.0117 (0.0114)	0.0060 (0.0320)	1.54	0.00	12
Foreign private assets	0.0798 (0.1236)	1.7274 (0.3520)***	1.94	0.74	12
Direct investment	-0.0832 (0.0339)**	0.5685 (0.0960)***	2.13	0.71	12
U. S. Treasury securities	0.1331 (0.0371)***	-0.0870 (0.1000)	1.22	0.55	12
Corporate stocks and bonds and other bonds	0.0289 (0.0965)	0.7280 (0.2750)	0.97	0.41	12

Note. Standard errors in parentheses are the larger of those estimated allowing for both autocorrelation and (i) homoskedasticity and (ii) heteroskedasticity. *, **, *** represent statistical significance at the 10, 5, and 1 percent levels, respectively. Regressions were estimated with constant terms, which are not reported. Legend: 1/e—index of IMF term real value of the dollar (1980 = 100); t—time trend. Dependent variable is expressed in percent of U. S. GNP.

matrix (under homoskedasticity) is not. To be careful, we should weigh the downward bias more heavily than the loss in power, and therefore in each case we report only the larger of the two standard errors.

There are several striking features of the estimates reported in Table I. First, FDI is the only type of capital inflow that is statistically negatively correlated with the value of the dollar. (Foreign official assets, which for the most part are determined directly by foreign monetary authorities, also have negative, albeit not statistically significant, coefficients.) The point estimate for portfolio inflows into corporate stocks and bonds is positive and not statistically different from zero. Interpreted in terms of Figure IV, these portfolio investments correspond to the flat line with low monitoring costs. Our theory predicts that since the agency costs associated with passive investments are small, these investments should be uncorrelated with exchange rates. This seems to be borne out in the data.

A second feature of the estimates in Table I is that they appear robust. We tried estimating the same regressions on annual

(instead of quarterly) data to see whether the correlation between exchange rates and FDI was purely a high-frequency phenomenon. Table II reports estimates from these regressions; the results are almost identical to those of Table I. Indeed, the point estimates are somewhat larger in absolute value (although, as one might expect, the standard errors are higher as well).

The next set of tables further disaggregates U. S. FDI inflows.

TABLE III
REGRESSIONS OF FDI INFLOWS BY INDUSTRY (BALANCE OF PAYMENTS DATA,
ANNUAL 1974-1987)

Industry	Coefficients on		DW	R ²	DF
	1/e	t			
All industries	-0.0876 (0.0320)**	0.6872 (0.1219)***	1.88	0.70	11
Petroleum	-0.0020 (0.0112)	0.0626 (0.0431)	2.46	0.05	11
Manufacturing	-0.0516 (0.0160)***	0.2792 (0.0604)***	1.81	0.61	11
Food	-0.0064 (0.0044)	0.0553 (0.0173)***	2.90	0.39	11
Chemicals	-0.0216 (0.0068)***	0.1156 (0.0263)***	2.10	0.58	11
Fabricated metals	-0.0016 (0.0032)	0.0082 (0.0120)	2.69	0.00	11
Machinery	-0.0144 (0.0052)**	0.0497 (0.0193)**	1.54	0.37	11
Other manufacturing	-0.0088 (0.0040)**	0.0600 (0.0147)***	1.78	0.53	11
Trade	-0.0020 (0.0060)	0.0644 (0.0224)**	2.03	0.40	11
Finance	-0.0088 (0.0088)	0.0643 (0.0337)*	3.11	0.11	11
Insurance	-0.0032 (0.0064)	0.0389 (0.0239)	1.72	0.07	11
Real estate	-0.0048 (0.0060)	0.0641 (0.0229)**	2.11	0.34	11
Other industries	-0.0128 (0.0080)	0.0927 (0.0301)***	2.17	0.37	11

Note. Standard errors in parentheses are the larger of those estimated allowing for both autocorrelation and (i) homoskedasticity and (ii) heteroskedasticity. *, **, *** represent statistical significance at the 10, 5, and 1 percent levels, respectively. Regressions were estimated with constant terms, which are not reported. Legend: 1/e—index of IMF mercur real value of the dollar (1980 = 100); t—time trend. Dependent variable is in percent of the U. S. GNP.

Table III uses detailed data from the Balance-of-Payments Accounts to break total FDI inflows into thirteen separate industries.²⁷ The results show that the aggregate data in Figure I are not hiding great diversity across industries. All of the thirteen coefficients on the exchange rate in Table III are negative, and five of these are statistically so. Interestingly, the strongest exchange rate effects appear in manufacturing industries, particularly chemicals.

The first three tables above use inflow data from the Balance-of-Payments Accounts. These data do not discriminate among a wide variety of types of transactions; for example, they lump together wholesale acquisitions of firms, new greenfield investments, additions to existing facilities. Since our theory implies a relationship between the exchange rate and each of these components, further insight can be gained by disaggregating the data by type of transaction. Fortunately, the International Trade Administration (ITA) collects individual FDI transactions and sorts them by type. Using these data, we can now look not only across industries, but also across different types of investment.

Table IV presents estimates of the sensitivity to exchange rates of the eight types of FDI transactions recognized by the ITA.²⁸ The inflow measure is either the recorded value of transactions (divided by U. S. GNP) or the number of transactions.²⁹ Once again, all the coefficients are negative (many significantly so), suggesting that the correlation with the exchange rate is broadly based. Of the eight types Mergers and Acquisitions are by far the largest in magnitude, accounting for 51 percent of total FDI in 1987. Both the number and dollar value of M&A transactions show statistically significant relationships with the real exchange rate. So too do the number and dollar value of New Plant as well as Joint Venture transactions.

The evidence presented thus far is consistent with our theory, but does not clearly distinguish it from alternatives such as the

27. Because the *merm* exchange rate gives weight only to the industrialized countries' currencies, the FDI inflows in Table III are from industrialized countries only. The results remain essentially unchanged if we were to report instead U. S. inflows from all countries.

28. These data are for investments originating in fifteen countries: Austria, Australia, Belgium, Canada, Denmark, France, West Germany, Italy, Japan, Netherlands, Norway, Spain, Sweden, Switzerland, and the United Kingdom. The data include some types of transactions that may or may not fit closely with our theory. For example, "equity increases" may primarily reflect intra-company transfers that are driven by factors other than those stressed by our model.

29. Most transactions did not report the value of the investment. We followed Caves [1988] by replacing missing values with the average investment value for those investments where value was recorded.

TABLE IV
REGRESSIONS OF FOREIGN DIRECT INVESTMENTS PURCHASED (INTERNATIONAL
TRADE ADMINISTRATION DATA, ANNUAL 1977-1987)

Type of investment	Coefficients on		DW	R ²	DF	
	1/e	t				
All types:	value	-0.1094 (0.0344)***	1.1135 (0.1813)***	2.70	0.78	8
	number	-4.9442 (1.6214)***	38.2377 (8.5642)***	1.05	0.65	8
Mergers and acquisitions:	value	-0.057 (0.0168)***	0.5621 (0.0893)***	2.14	0.79	8
	number	-1.8996 (0.5068)***	12.62895 (2.6766)***	2.35	0.83	8
Equity increases:	value	-0.0092 (0.0064)	0.1277 (0.0341)	2.39	0.56	8
	number	-0.1224 (0.0462)**	1.4494 (0.2437)***	2.39	0.77	8
Real estate:	value	-0.009 (0.0184)	0.04025 (0.0968)	1.00	0.00	8
	number	-0.8512 (1.0958)	-0.3084 (5.7884)	0.64	0.00	8
New plant:	value	-0.0098 (0.0028)***	0.0817 (0.0143)***	2.58	0.76	8
	number	-0.8124 (0.2180)***	5.32375 (1.1514)***	1.81	0.68	8
Joint ventures:	value	-0.0056 (0.0024)**	0.0651 (0.0126)***	2.28	0.72	8
	number	-0.2422 (0.1002)**	3.8512 (0.5291)***	2.27	0.82	8
Plant expansion:	value	-0.004 (0.0010)***	0.046 (0.0051)***	2.07	0.89	8
	number	-0.2186 (0.1666)	2.6582 (0.8796)***	1.80	0.42	8
Other expansion:	value	-0.0066 (0.0056)	0.221 (0.0304)***	2.39	0.86	8
	number	-0.052 (0.3050)	9.4884 (1.6113)***	2.52	0.82	8
No type listed:	value	-0.0078 (0.0088)	-0.03035 (0.0468)	2.24	0.06	8
	number	-0.7458 (0.8630)	-3.03925 (4.5580)	2.24	0.06	8

Note. Standard errors in parentheses are the larger of those estimated allowing for both autocorrelation and (i) homoskedasticity and (ii) heteroskedasticity. *, **, *** represent statistical significance at the 10, 5, and 1 percent levels, respectively. Regressions were estimated with constant terms, which are not reported. Legend: 1/e—index of IMF merin real value of the dollar (1980 = 100); t—time trend. Dependent variable is in percent of U. S. GNP.

sectoral-growth hypothesis. In order to better discriminate, one might check to see whether measures of relative wealth other than the exchange rate have predictive power for FDI flows. Our theory suggests that even increases in foreign wealth that are independent of the exchange rate ought to generate increases in FDI. For example, if wealth matters, a surge in the foreign-currency value of the foreign stock market should raise FDI, even if exchange rates remain fixed. On the other hand, alternative theories such as tariff-jumping and sectoral-growth make no specific predictions about the correlation between stock market values and FDI.

Since this paper was first written, Klein and Rosengren [1990] have performed tests designed to distinguish between wealth-based theories of FDI (such as ours) and a sectoral-growth alternative. They run a multiple regression of U. S. FDI on three variables, all in logs: (i) the real value of the dollar; (ii) the ratio of foreign stock-market capitalization (expressed in foreign currency) to that of the United States (expressed in dollars); (iii) and the ratio of foreign hourly wages (expressed in foreign currency) to U. S. hourly wages (expressed in dollars). If the sectoral-growth hypothesis explained all of FDI, the first and third variables should be significant, and the second—relative stock-market values—should not. However, Klein and Rosengren find that, even after controlling for relative wages, a 1 percent increase in the foreign-currency value of foreign stocks has roughly the same (statistically significant) impact on U. S. FDI inflows as a 1 percent depreciation of the dollar. This is consistent with our wealth-effects model but not with the alternatives discussed above.

Finally, it would be interesting to know whether the U. S. experience is typical of other countries. Unfortunately, data limitations hamper such tests in several ways. First, most other developed countries—unlike the U. S.—long ago became hosts to substantial foreign FDI. This means that aggregate Balance-of-Payments data are dominated not by acquisitions and establishments of *new* affiliates as in the U. S. inflows, but by transfers between existing entities, which might be expected to have different characteristics. The data we would ideally like to have—acquisition and establishment inflows—are not available for countries other than the United States.

Second, trade-weighted exchange rates (such as those used above) may be poor measures of the relative wealth of potential foreign investors. In general, the measurement error will bias the

TABLE V
COUNTRY REGRESSIONS OF DIRECT INVESTMENT INFLOWS ON EXCHANGE RATES
(ANNUAL DATA, 1972-1987)

Country	Coefficients on		DW	R ²	DF
	1/e	t			
United States	-0.0948 (0.0357)**	0.6564 (0.0969)***	2.14	0.75	13
United Kingdom	-0.0050 (0.0165)		1.57	0.00	14
West Germany	-0.0103 (0.0030)***		1.22	0.52	14
Canada	0.0084 (0.0287)		1.52	0.00	14
Japan	-0.0006 (0.0027)		2.40	0.00	14

Note. Standard errors in parentheses are the larger of those allowing for both autocorrelation and (i) homoskedasticity and (ii) heteroskedasticity. *, **, *** represent statistical significance at the 10, 5, and 1 percent levels, respectively. Regressions were estimated with constant terms, which are not reported. Legend: 1/e—index of IMF's real value of the dollar (1980 = 100); t—time trend. Dependent variables are country FDI inflows in percent of country GNP.

exchange-rate coefficient toward zero. For some countries this may be more of a problem than for others.

Data problems notwithstanding, Table V examines Balance-of-Payments FDI inflows into the United States, United Kingdom, West Germany, Canada, and Japan.³⁰ All of the coefficients are negative, except that for Canada. However, if the Canadian regression is rerun using the real Canadian-U. S. dollar exchange rate (in place of a multilateral exchange rate) the coefficient becomes negative, and quite large, at -0.2877. Since most Canadian affiliates are U. S.-based, the bilateral exchange rate may be a better measure of the relative wealth of foreign direct investors.

Other than that for the United States, only the coefficient for Germany is statistically significant at conventional levels. Thus, Table V does not offer much additional positive support for our hypothesis. However, in view of the data problems and the shortness of the time series samples, the lack of statistical signifi-

30. The data in this table are from the IMF Balance of Payments Yearbooks, and do not correspond precisely to the data in earlier tables. Because none of the other countries had significant time trends, we excluded the time trend from the specifications in Table V.

cance should probably not be interpreted too strongly as indicating an absence of exchange rate effects in other countries.³¹

VI. CONCLUSIONS

We have presented a simple model in which relative wealth—and therefore the exchange rate—has a systematic effect on FDI. The correlation of FDI with the exchange rate is very different from that observed for other forms of capital inflows, including passive portfolio investments. Even disaggregated to the level of individual industries and types of direct investments, exchange rate effects appear to be pervasive. Furthermore, additional support for our model over competing alternatives comes from the finding that shocks to wealth other than the exchange rate also help to explain U. S. FDI inflows.

A good example is that of Japan, now one of the world's largest foreign direct investors. Between the end of 1987 and early 1991, the real value of the yen did not change importantly; yet the rate of Japanese net FDI outflows increased until the end of 1989 (nearly doubling during those two years), and then fell. By early 1991 outflows stood at one half of the late 1989 peak. These developments support our approach, insofar as relative wealth is altered by the relative value of Japanese stocks, which rose dramatically between end-1987 and end-1989, and fell rapidly thereafter.

Our model and empirical results lend some credence to popular claims that a depreciated currency can give foreigners an edge in buying control of productive corporate assets. Indeed, the reasoning behind the model closely parallels that given in less formal accounts: exchange rate changes have important impacts on international wealth, and wealthier buyers find it easier to acquire assets. However, our welfare analysis does caution against the kinds of knee-jerk protectionist sentiments that are often aroused by these accounts. While the welfare consequences of FDI can theoretically be adverse, they depend on a number of subtle effects that may be difficult to measure in any given instance.

31. Note that we have not examined data on *outflows* from any country. This is because such data are effectively measured in the wrong currency, and therefore are contaminated by valuation effects pertaining to existing asset stocks. For example, suppose that a U. S. firm owns pound-denominated assets in its U. K. subsidiary. When the dollar depreciates, it may mark up the dollar value of those assets, and the increase could be counted as a U. S. direct investment outflow.

We should stress that we have not attempted to provide a comprehensive theory of FDI. Although the exchange rate adds some explanatory power to the experience of the United States (and perhaps that of West Germany), there are obviously many other forces at work. In the United States this can be seen in the presence of an upward trend in the share of assets owned by foreigners, which has more than tripled over the last decade. Our model sheds no light on this general trend, which has recently made the United States an important host for world FDI.

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REFERENCES

- Abel, Andrew B., and Olivier J. Blanchard, "The Present Value of Profits and Cyclical Movements in Investment," *Econometrica*, LIV (March 1986), 249-73.
- Bernanke, Ben S., and Mark Gertler, "Agency Costs, Net Worth, and Business Fluctuations," *American Economic Review*, LXXIX (March 1989), 14-31.
- , and —, "Financial Fragility and Economic Performance," *Quarterly Journal of Economics*, CV (February 1990), 87-114.
- Caves, Richard E., *Multinational Enterprise and Economic Analysis* (Cambridge: Cambridge University Press, 1982).
- , "Exchange-Rate Movements and Foreign Direct Investment in the United States," Harvard Institute of Economic Research, May 1988.
- Donaldson, Gordon, *Managing Corporate Wealth* (Boston: Division of Research, Graduate School of Business Administration, Harvard University, 1984).
- Fazzari, Steven M., R. Glenn Hubbard, and Bruce C. Petersen, "Financing Constraints and Corporate Investment," *Brookings Papers on Economic Activity* (1988:2), 141-206.
- Fisher, Irving, "The Debt-Deflation Theory of Great Depressions," *Econometrica*, I (October 1933), 337-57.
- Gale, Douglas, and Martin Hellwig, "Incentive-Compatible Debt Contracts I: The One-Period Problem," *Review of Economic Studies*, LII (October 1985), 647-64.
- Greenwald, Bruce, Joseph Stiglitz, and Andrew Weiss, "Informational Imperfections in the Capital Market and Macroeconomic Fluctuations," *American Economic Review*, LXXIV (May 1984), 194-200.
- Greenwald, Bruce, and Joseph Stiglitz, "Information, Finance Constraints, and Business Fluctuations," mimeo, Princeton University, 1986.
- Hoshi, Takeo, Anil Kashyap, and David Scharfstein, "Corporate Structure, Liquidity, and Investment: Evidence from Japanese Panel Data," *Quarterly Journal of Economics*, CVI (1991), 33-60.
- Hymer, S. H., "The International Operations of Multinational Firms: A Study of Direct Foreign Investment," Ph.D. thesis, M.I.T. 1990.
- Jaffee, Dwight, and Thomas Russell, "Imperfect Information, Uncertainty, and Credit Rationing," *Quarterly Journal of Economics*, XC (November 1976), 651-66.
- Kester, W. Carl, and Timothy Luehrman, "Are We Feeling More Competitive Yet? The Exchange Rate Gambit," *Sloan Management Review*, XXX (Winter 1989), 19-28.
- Kindleberger, Charles, *American Business Abroad: Six Lectures on Direct Investment*, (New Haven: Yale University Press, 1969).
- Klein, Michael W., and Eric Rosengren, "Determinants of Foreign Direct Investment in the United States," Clark University, March 1990.
- Mundell, Robert A., *International Economics*, (New York: Macmillan, 1968).

- Myers, Stewart C., and N. S. Majluf, "Corporate Financing and Investment Decisions When Firms Have Information That Investors Do Not Have," *Journal of Financial Economics*, XIII (June 1984), 187-221.
- Ray, Edward J., "The Determinants of Foreign Direct Investment in the United States: 1979-85," Ohio State University, 1988.
- Scholes, M., and M. Wolfson, "The Effects of Changes in Tax Laws on Corporate Reorganization Activity," Stanford University, 1988.
- Slemrod, Joel, "The Impact of the Tax Reform Act of 1986 on Foreign Direct Investment to and from the United States," University of Michigan, September 1989.
- Stiglitz, Joseph, and Andrew Weiss, "Credit Rationing in Markets with Imperfect Information," *American Economic Review*, LXXI (June 1981), 393-410.
- Swenson, Deborah, "The Impact of U. S. Tax Reform on Foreign Direct Investment in the United States," M.I.T., May 1990.
- Townsend, Robert M., "Optimal Contracts and Competitive Markets with Costly State Verification," *Journal of Economic Theory*, XXI (October 1979), 265-93.
- Vernon, Raymond, "International Investment and International Trade in the Product Cycle," *Quarterly Journal of Economics*, LXXX (May 1966), 190-207.
- White, Halbert, "A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity," *Econometrica*, XLVIII (1980), 817-38.
- Williamson, Stephen D., "Costly Monitoring, Financial Intermediation, and Equilibrium Credit Rationing," *Journal of Monetary Economics*, XVIII (September 1986), 159-79.
- , "Costly Monitoring, Optimal Contracts, and Equilibrium Credit Rationing," *Quarterly Journal of Economics*, CII (February 1987), 135-45.