CAPITAL MOBILITY AND THE INTERNATIONAL FIRM

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1 INTRODUCTION

THE explanation and prediction of the capital flows associated with the international firm is a timely and long-neglected undertaking. Direct foreign investment by corporations from the United States has long been a part of our program to encourage foreign economic development and, more recently, the object of progressively more stringent regulation in the name of protecting the balance of payments, yet the theoretical and empirical study of the relations between capital flows and the activities of the international firm has barely begun. Symptomatic of this state of affairs is the fact that, after five years of government controls on direct investment, we have yet to have any econometrically defensible estimates of the impact of these controls.

This paper has three goals:

1. to develop a theoretical model, consistent with the maximization of the market value of the firm, in order to explain some important capital flows associated with the international firm—those flows financing asset accumulations abroad;

2. to test the above model and an alternative suggested by the Department of Commerce against aggregate data for direct investment in manufacturing, the one sector for which minimally adequate data are available; and

3. to estimate the impact of the voluntary and mandatory balance-of-payments programs on asset accumulations and their financing by foreign manufacturing affiliates of firms in the United States.[1]

[1] The author gratefully acknowledges the comments and constructive criticism of Michael Adler, Phillip Berlin, Edward Ettin, George Kopits, Peter Tinsley, Walter Salant, and the discussants Sidney Robbins and Robert Stobaugh. His thanks go to the Federal Reserve Board and the Brookings Institution for supporting this research. Needless to say, none of the above individuals or institutions are responsible for the author's opinions or the paper's remaining errors.

CAPITAL FLOWS TO BE CONSIDERED

The capital flows this paper will seek to explain are the flows popularly called "direct investment," its components, and the borrowing by foreign affiliates from foreign sources.

The flow of direct investment, as that term is used in this paper (and as defined by the U.S. Department of Commerce), is a measure of the change in the ownership position of the United States—or the change in net worth of the United States—in the foreign affiliates of American firms; the stock corresponding to this flow will be called the stock of direct investments or, as named by the Commerce Department, the value of direct investments abroad (V).[2] The flow of direct investment (ΔV) is broken up by the Department of Commerce into the U.S. share of retained earnings of foreign affiliates (RE) and the net capital outflow from the United States (NKO).[3] The first of these, of course, is the difference between the American share of the subsidiaries' earnings (E) and repatriated dividends (DIV).

Capital flows, and particularly the flow of direct investment, have been, and should be, of major policy interest. In measuring the net flow of financial resources from the United States to the host country, the flow of direct investment is an important indicator of the contribution of foreign affiliates to the development of the host country, the oldest goal of direct-investment policy. Currently, the regulation of the flow of direct investment is a major part of our balance-of-payments policy. The immediate alternative cost for the balance of payments of a given flow of direct investment is precisely equal to the value of that flow—although only a part of it directly enters the balance of payments as officially reported. This observed balance-of-payments effect is equal to the net capital outflow minus repatriated dividends.

[2] Unfortunately there seems to be no unambiguous reference to the official definition of "the flow of direct investment" or the "value of direct investments." See, however, U.S. Department of Commerce, *U.S. Business Investments in Foreign Countries*. Washington, D.C., 1960, pp. 77–78.

[3] The net capital outflow consists of changes in American claims on all liability accounts of foreign affiliates (with the exception of bank loans from the United States and certain commercial claims reported elsewhere in the balance of payments) *plus* all changes in the share of net worth and surplus accounts of the United States which are unaccounted for by the American share of retentions.

2 THEORETICAL CONSIDERATIONS

THE SCOPE OF PREVIOUS ADVANCES

Starting in the very recent past, there has been a slow accumulation of theoretical and empirical findings about the foreign operations of American firms.[4] These studies have demonstrated that theoretical ideas successful in explaining domestic business operations—especially investment activity—can be applied to the activities of foreign affiliates. However, none of these studies, including one by this author, has fully incorporated the implications of recent advances in the theory of corporate finance for the explanation of capital flows associated with the international firm.

Further, probably because of the paucity of time-series data, most of the empirical work so far completed has been limited to the analysis of cross sections, thus circumscribing its applicability to forecasting and policy problems. Of previous empirical studies, only one has been used for the purpose of explaining and predicting the aggregate capital flows associated with international firms. That study was developed, appropriately enough, by the Department of Commerce, the government agency in charge of the various balance-of-payments programs as they affect direct investment.[5] Although little publicized, the model

[4] Here is a partial list of recent contributions: Gary C. Hufbauer and F. M. Adler, *Overseas Manufacturing Investment and the Balance of Payments*, Washington, D.C., 1968; Stephen Hymer, *The International Operation of National Firms: A Study in Direct Foreign Investment*, unpublished Ph.D. dissertation, MIT, 1960; Samuel Morley, *American Corporate Investment Abroad Since 1919*, unpublished Ph.D. dissertation, University of California, Berkeley, 1966; Joel Popkin, *Inter-Firm Differences in Direct Investment Behavior of U.S. Manufacturers*, unpublished Ph.D. dissertation, University of Pennsylvania, 1965; Alan K. Severn, "Investment and Financial Behavior of American Direct Investors in Manufacturing," this conference, 1970; James Moose, *U.S. Direct Investment Abroad in Manufacturing and Petroleum—A Recursive Model*, unpublished Ph.D. dissertation, Harvard, 1968; Guy V. G. Stevens, "Fixed Investment Expenditures of Foreign Manufacturing Affiliates of U.S. Firms: Theoretical Models and Empirical Evidence," *Yale Economic Essays*, Spring, 1969.

[5] This model is partially described in Andrew F. Brimmer, "Direct Investment and Corporate Adjustment Techniques Under the Voluntary U.S. Balance of Payments Program," *Journal of Finance* (May, 1966), pp. 266–282. Details have been supplied to the author in conversations with members of the Balance of Payments Division, Office of Business Economics, Department of Commerce.

has special importance, having been put to forecasting use, and thereby becoming instrumental in the formulation of the balance-of-payments programs of 1965–67. The model, however, has serious deficiencies. As is argued below, it is not complete enough to allow any estimation of the impact of economic policies like the balance-of-payments programs on the capital flows considered in this paper. Moreover, in my opinion, it is completely without theoretical justification.

AN AGGREGATIVE TIME-SERIES MODEL

The flow of direct investment and its components, which we have singled out for explanation, constitute a subset of the numerous alternative methods for financing the asset changes of foreign affiliates. We shall argue here for some causal relationships between the changes in assets and the accompanying financial flows. In addition, we propose an accounting identity linking the changes in the value of asset accumulations (ΔA) to changes (flows) in the various liability (ΔL) and net-worth (ΔNW) accounts of foreign affiliates:

$$\sum_i \Delta A_i = \sum_i \Delta L_i + \sum_i \Delta NW_i. \tag{1}$$

We shall construct a model, simple enough to be estimated, using aggregate time-series data, which breaks down the asset and liability sides of the above identity into five variables:

(a) the change in current assets (ΔCA);
(b) the change in net fixed assets (ΔNK), which, in turn, equals plant and equipment expenditure (PE) minus depreciation (DEP);
(c) the flow of direct investment, that is, the change in liabilities and net worth owed to the parent company (ΔV);
(d) the change in liabilities and net worth owed to foreigners (ΔF), i.e., non-U.S. residents; and
(e) a residual flow of liabilities (u_0), small in magnitude and here hypothesized to be essentially random, made up of changes in certain commercial claims and bank loans to foreign subsidiaries.[6]

[6] See Appendix B for the estimated size of this residual, 1957–65.

As indicated above, the flow of direct investment can be broken down into its component parts if such a breakdown is desired.

At the minimum, then, we have four endogenous variables and a random residual, linked by an accounting identity:

$$\Delta CA + \Delta NK = \Delta V + \Delta F + u_0. \tag{2}$$

To close the system we need three additional independent equations.

Financial Equations and the Modigliani-Miller Theorem

Any attempt to construct equations that explain financial flows must deal immediately with the now famous propositions of Modigliani and Miller, the first of which states that, given certain assumptions, the financing mix of the firm as between equity and liabilities is indeterminate.[7] In a Modigliani-Miller world, any financial plan chosen by the firm is as good as any other in maximizing the market value of the firm. In particular, it does not matter how the firm divides the financing of its foreign assets (ΔA) between capital flows from the United States (ΔV) and foreign sources (ΔF).

The implication is that, given the goal of maximizing the market value of the firm, we can derive equations for the optimal level of each asset, but we can derive none for the liabilities and equity in our model, the primary variables of interest.

If one wishes to derive equations for foreign funds and/or the flow of direct investment, he must choose one of the following courses:

1. reject the Modigliani-Miller theorem, either (*a*) by rejecting the maximization of the market value of the firm or (*b*) by rejecting one or more of the assumptions on which its rests (identical supply curves of finance for investors and firms; no transactions costs or bankruptcy costs; no interest deductions for the purpose of company taxation, and so on); or

2. accept the Modigliani-Miller theorem and the maximization of the present value of the firm, but use the extra degrees of freedom presented by financial indeterminacy to impose additional constraints or goals on the firm—constraints that will lead to financial determinacy

[7] Franco Modigliani and M. H. Miller, "The Cost of Capital, Corporation Finance and the Theory of Investment." *American Economic Review*, Vol. XLVIII, No. 3 (June, 1958), pp. 261–297.

but that are not inconsistent with the maximization of the present value of the firm.

Here I am going to take the second course. The financial indeterminacy implied by the acceptance of the Modigliani-Miller theorem will be overcome by postulating a secondary goal of the firm, the minimization of the risk of losses due to exchange-rate fluctuations. The empirical results presented later in this paper indicate that this hypothesis is broadly consistent with the available data. It should be emphasized, however, that this consistency does not imply that the data necessarily are inconsistent with models based on a rejection of the Modigliani-Miller theorem or their assumptions. That question is still open—one of many in this field on which much more research should be done.

Minimization of Exchange-Rate Losses and the Determination of Financial Flows

In the normative literature on financing international operations, there has been considerable emphasis on self-protection against capital losses caused by devaluations.[8] Major emphasis is frequently put on borrowing in the same currency in which assets are denominated.

According to the Modigliani-Miller propositions, such hedging activity should not lead to any increase in the market value of the firm, because the corporation has no advantage in this sort of financial operation over ordinary investors—or some investors. However, given the degrees of freedom the firm has in its financial policy, a goal of minimizing exchange-rate losses is quite compatible with maximizing the market value of the firm.

In Appendix A, I shall formalize this model and derive specific equations for the optimal value of borrowings in a given foreign currency. I postulate that the measure of risk the company uses is the variance of its worldwide profits—operating profits plus capital gains. The hypothesis is that the company tries to minimize this variance subject to its balance-sheet constraint.

In this simplest of risk models, the firm borrows in each currency

[8] See, e.g., William D. Falcon, ed., *Financing International Operations*. New York, American Management Association, 1965.

up to the point where foreign borrowings are equal to the sum of net profits (after interest payments) earned in the foreign currency and the value of capital *denominated in that currency*. Thus, we have the following equation for borrowings (D_i) in a given foreign currency:[9]

$$D_i = \frac{GP_i}{1 + r_i} + \frac{qK_i}{1 + r_i}, \tag{3}$$

where GP_i is profit exclusive of interest costs in a given currency i; qK_i is the value of assets denominated in currency i; r_i is the interest rate in market i.

Given rapid adjustment of actual borrowings to the equilibrium levels, we would expect the flow of foreign-currency borrowings to be a function of *changes* in the level of foreign-denominated assets and profits.

In the empirical section of this paper, I shall identify the changes in borrowings in foreign currencies with the observed magnitude (ΔF), the change in liabilities and net worth owed to foreign residents. The latter is an imperfect measure, since it contains some borrowings in dollars—e.g., Eurodollar borrowings for subsidiaries.[10] However, there is no way to correct for this deficiency. I shall assume further that the change in the value of assets denominated in foreign currencies is proportional to the change in the value of total assets (ΔA).

Asset Equations

What *does* matter for the maximization of value of the firm is the proper policy for the investment in real assets. As set out in Appendix A (and in more detail by others, for example, Jorgenson and Siebert),[11] the firm should invest in any asset, foreign or domestic, fixed or current, up to the point where the marginal-revenue product of each type of capital is equal to its shadow price—the latter a function of the

[9] The value of assets, qK_i, and the level of profits exclusive of interest costs, GP_i, are both determined by the process of maximizing the market value of the firm; therefore, they are predetermined with respect to borrowings.

[10] But it does not include the recent great quantities of Eurodollar borrowings by the U.S. *parent firm*.

[11] Dale W. Jorgenson and Calvin Siebert, "Optimal Capital Accumulation and Corporate Investment Behavior." *Journal of Political Economy*, Vol. 76, No. 6 (November/December, 1968), pp. 1123–1151.

firm's discount rate, the depreciation rate on the asset, and the prices of the capital goods and output. Assuming a Cobb-Douglas production function and some of the other simplifying assumptions proposed by Jorgenson, we get the following equations for the desired (equilibrium) levels of fixed (NK^*) and current assets (CA^*):

$$NK^* = \frac{a_1 pQ}{s + d_1},$$

and

$$CA^* = \frac{a_2 pQ}{s + d_2}, \tag{4}$$

where Q, p, and s are the firm's output and its price and discount rate; a_1 and a_2 are the elasticities of output with respect to fixed and current assets; d_1 and d_2 are the respective rates of depreciation.

Capital need not adjust instantaneously to its new equilibrium level. If it does not, observed investment may be a distributed lag of past changes of the independent variables.

COMPARISON WITH THE COMMERCE DEPARTMENT MODEL

The one direct-investment model so far put to practical use, the above-mentioned model by the Department of Commerce, has been described in print only once—and then only partially—in a 1966 article by Andrew Brimmer, then Assistant Secretary of Commerce.[12] This article makes it clear that the Commerce model, particularly its equation for net capital outflow, played a role in determining the form of the voluntary restraint programs for direct investment in 1965 and 1966.[13]

When described in its entirety, the Commerce model is sufficient to explain the flow of direct investment and of all its components—i.e., virtually all the capital flows from the United States associated with the international firm.[14]

The construction of the model is markedly different, however, from the one presented above. There are three equations, one each for

[12] Andrew F. Brimmer, *op. cit.*, pp. 262–282.
[13] *Ibid.*, Section VI, pp. 278–79.
[14] See footnote 5, above.

the three components of the flow of direct investment: net capital outflow, dividends repatriated to the United States, and the American share of the foreign subsidiaries' earnings. The explanation or prediction of direct investment is built up constructively as the sum of the three component variables.

The key causal equation in the Commerce model is one explaining net capital outflow (*NKO*) as an approximately constant proportion of the level of plant and equipment expenditures by foreign affiliates. A second equation explains repatriated dividends as a linear function of the American share of foreign subsidiaries' earnings. Finally, in an admittedly rough approximation, for forecasting purposes the American share of the subsidiaries' earnings was assumed to be a constant function of the stock of direct investments (or, perhaps, net fixed capital abroad).

To my knowledge, no theoretical justification has ever been offered for the model; nor can any be provided here. The preceding section discussed the hurdles that must be surmounted in order to derive capital-flow equations within the general framework of the maximization of the present value of the firm. These problems were not faced in the Commerce model. Moreover, it seems to me impossible to relate the key equations in the model—the equations for net capital outflow and repatriated dividends—to *any* reasonable goals that might be pursued by an international firm. Rather, the equations seem to be an arbitrary matching of financial and real flows. The equation for net capital outflow, for example, fails to indicate why, in financing plant and equipment expenditure, the firm discriminates among the seemingly perfect financial substitutes: net capital outflow, depreciation, and the retained earnings of subsidiaries. With respect to the dividend equation, again it is not clear why such a relationship should hold between two parts of the same business organization—even if it is operative between the firm and its stockholders.

Besides having these theoretical defects, the model is not complete enough to allow us to estimate the impact of recent balance-of-payments programs. No equation for plant and equipment expenditure appears in the Commerce model; the Department obtained its plant and equipment forecast directly from the major foreign investors. Hence there can be no estimate within the model of the impact of actual or proposed policies on plant and equipment expenditure. Without such an estimate, there can be no estimate of the total effect of a policy on net capital outflow or the flow of direct investment, even if the proposed equations are valid.

3 EMPIRICAL RESULTS

ANNUAL DATA AND SAMPLE[15]

The models developed in the previous section are tested below against data for the aggregate international operations of the manufacturing sector. Where possible, the official data collected by the Office of Business Economics have been used. Since some of the important independent variables are unavailable for the period after 1965, these official data were augmented by those collected by the McGraw-Hill Company.[16] The period of fit varies, depending on data availability, from 1957–65 to 1957–68.

RESULTS FOR THE PROPOSED MODEL

Plant and Equipment Expenditures

The maximization of the present value of the firm, as formulated in Appendix A, leads to an equation for desired fixed capital in current dollars (NK^*) in terms of expected output (Q), the elasticity of output with respect to capital (a), the firm's discount rate (s), the rate of depreciation (d), and the price of output (p):

$$NK^* = \frac{apQ}{s + d}. \qquad (5)$$

Alternatively, we might assume that there is a fixed (desired) ratio of

[15] For a list of the data used, see Appendix B.

[16] McGraw-Hill Department of Economics, *Survey of Foreign Operations*, annual surveys, 1959 to present.

output to capital, due to fixed coefficients in production or lack of variation in the ratio of factor costs.[17]

The firm may not adjust completely to its level of desired capital within our period of observation, one year. Hence, in testing alternative investment functions, I have allowed for simple forms of lagged adjustment – due to building lags, costs dependent on the rate of investment, or differences between expected output and observed output.

Models with fixed or variable desired capital/output ratios performed about equally well. The time series is too short, the price data are too deficient, and the performance of the models is too similar, to permit a choice of one as clearly superior to the others.

The Jorgenson model, coupled with a distributed lag which is geometrical after the second year, led to the following estimated results: [18]

$$
\begin{aligned}
(PE_t - dNK_{t-1}) = -161.2 &+ \underset{(2.54)}{0.015}(NK_t^* - NK_{t-1}^*) \\
&+ \underset{(4.59)}{0.031}(NK_{t-1}^* - NK_{t-2}^*) + \underset{(8.26)}{0.58}(PE_{t-1} - dNK_{t-2}). \quad (6)
\end{aligned}
$$

$$R^2 = .98 \qquad SEE = 158.3 \qquad \text{No. Obs.} = 10$$

This function implies that a unit change in desired capital leads to $.015/a$ units of investment in the first year, $.031/a + .58(.015/a)$ in the second and, thereafter, 58 per cent of the previous year's change. Using realistic values for a, the elasticity of output with respect to capital, this rate of adjustment seems very low.

[17] Since the data on foreign capital-goods prices, actual rates of depreciation, and so forth are questionable or nonexistent, it will be important to test this kind of alternative model – for comparison purposes, at least.

[18] This functional form was first suggested to me by Sung Y. Kwack in some research he has done for the Brookings Econometric Model on the determinants of direct investment (preliminary manuscript, June, 1969).

In this and all subsequent equations, the t-ratios are presented in parentheses under each estimated coefficient. R^2 is the coefficient of determination; SEE is the standard error of the estimate; No. Obs. is the number of observations. Durbin-Watson statistics were calculated, but because of insufficient degrees of freedom, no tests could be performed. All asset regressions were done using undeflated value figures for the dependent variable. Bias in the estimated coefficients can therefore be introduced, especially in the NK terms, because additions to the existing capital stock were valued at prices of capital different from $q(t)$.

A simpler flexible accelerator with a constant output/capital ratio does just as well, or better.[19]

$$PE = -1111.0 + \underset{(10.82)}{0.42S_{t-1}} + \underset{(2.62)}{0.081(S_t - S_{t-1})} - \underset{(8.44)}{0.92NK_{t-1}}. \quad (7)$$

$R^2 = .99 \qquad SEE = 120.5 \qquad$ No. Obs. = 11

The coefficient of the net-capital variable is the estimate of the depreciation rate minus the speed of adjustment. The estimated coefficient of $-.92$ indicates that the speed of adjustment of expected sales to actual sales is quite fast; expected sales during period t equal approximately $.19S(t) + .81S(t-1)$.[20]

Although this equation fits the data very well for the whole period 1958–68—and, in fact, for all subperiods—it has its share of drawbacks. The intercept is unexplainably large in absolute value. The estimated coefficients, particularly the speed of adjustment, vary widely, though not in sign, when the regression is fitted on subperiods.

A final comment is in order concerning estimates of the impact of the various balance-of-payments programs that have constrained direct-investment activities in the past four years. To preview the evidence presented in the final section, virtually no impact of the various balance-of-payments programs on plant and equipment expenditures in manufacturing is shown. This conclusion was also reached for all of the other dependent variables in this model—but not, of course, for some important flows not covered here, especially parent company borrowing in foreign money markets.

Investment in Current Assets

Explanation of changes in the current assets of foreign manufacturing affiliates is hampered by the unusual shortness of the time se-

[19] This distributed lag was conceived as the result, not of building lags, but of lags created by expectations. Here we assume that the firm's expected sales at time t is a function of sales at times t and preceding periods. After the first term, the weights decline geometrically. See Zvi Griliches, "Distributed Lags: A Survey." *Econometrica,* Vol. 35, No. 1 (January, 1967), p. 24.

[20] $S^*(t) = aS_t + wS_{t-1} + wzS_{t-2} + wz^2S_{t-3} + \cdots + wz^nS_{t-n-1} + \cdots$. Here are the coefficients of the various terms: the coefficient of ΔS is ba, where b is the desired capital/output ratio; the coefficient of S_{t-1} is $bw + ba(1-z)$; the coefficient of NK_{t-1} is $-(1 - z - d)$, where d is the rate of replacement of the capital stock. We assumed that $d = .08$ for the calculation in the text; then $z = 0$, $a = .19$. We assume that $a + w = 1$, so $w = .81$.

ries and the impossibility of breaking down the series into its component parts. The data on the level and changes in current assets are available from 1957 to 1965 only.

It is standard practice to assume that the desired level of each component of current assets—and, thus, the sum—is some function of expected output or sales. In Appendix A, I shall derive one such function in rather unsophisticated fashion. As far as the adjustment process is concerned, I would expect no building lags but admit the possibility of a degree of lagged adjustment due to expectational considerations.[21]

In fact, we can explain current-asset changes fairly well as a linear function of the change in sales—assuming no lags in adjustment and a constant capital/output ratio:

$$\Delta CA = 280.7 + \underset{(6.32)}{0.46\Delta S}.$$

$$R^2 = .87 \qquad SEE = 317.7 \qquad \text{No. Obs.} = 8$$

The fit can be improved somewhat by allowing for lagged adjustment:

$$\Delta CA = -478.9 + \underset{(2.79)}{0.29S_t} - \underset{(1.88)}{0.47CA_{t-1}}. \tag{8}$$

$$R^2 = .95 \qquad SEE = 208.4 \qquad \text{No. Obs.} = 8$$

The Financial Flow Equations

One more behavior equation permits us to close our four-variable model. As detailed above and in Appendix A, we can obtain this equation by assuming that, in addition to attempting to maximize the firm's present value, the managers of the firm also seek to minimize the risk of losses due to devaluation. If all hedging against devaluation is done by borrowing in foreign currencies, we obtain the following equation for finance raised from foreign sources:[22]

[21] There is no term for unintended accumulations in the current-asset equation, even though such is normal when fitting equations for the individual current assets, taken alone. The reason is that the positive and negative unintended accumulations of the component current assets can be shown to cancel out.

[22] Funds borrowed from foreign sources is an imperfect measure of funds raised by subsidiaries in foreign currencies; some of the former can include dollar borrowings from foreigners or other foreign affiliates of American companies. This is, however, our only measure of foreign currency borrowings.

$$\Delta F = a\Delta A + \Delta E,$$

where a is the percentage of total asset changes denominated in foreign currencies, and ΔE is the change in foreign earnings or profits.

The results strongly support the role of asset changes in explaining borrowing from foreign sources, but reject that of earnings changes:

$$\underset{}{\Delta F = -292.1 + \underset{(7.52)}{0.58\Delta A} - \underset{(0.54)}{0.47\Delta E}.}$$

$R^2 = .94 \qquad SEE = 209.6 \qquad$ No. Obs. = 9

Dropping the earnings-change variable, we obtain:

$$\Delta F = -281.3 + \underset{(10.04)}{0.55\Delta A}. \tag{9}$$

$R^2 = .94 \qquad SEE = 198.7 \qquad$ No. Obs. = 9

The empirical results only partly confirm the hypothesized risk-reduction theory of finance. Two reasons can be offered to explain the total insignificance of the change in earnings. It may be that other techniques, such as operations in the forward market, are used to protect the dollar value of profits denominated in foreign currencies. A further consideration, suggested by Robert Stobaugh, one of the discussants of this paper, is that the change in total assets may already measure the effect we are trying to capture by the use of the change in earnings. If, for example, earnings are accumulated and held in liquid balances abroad until the beginning of the new year before being transferred to the United States, the value of the change in total assets, measured as it is at year-end, would already incorporate the change in earnings. It can be shown, also, that this implication holds when profits are transferred to the United States more than once a year. In any case, whatever the significance of the poor result for the earnings-change variable, we have discovered a very strong regularity between funds raised from foreign sources and asset changes.[23]

Given the behavior equations for fixed and current assets and for

[23] While the discussants do not seem to attack the theoretical hypothesis that some debt denominated in foreign currency is raised to hedge losses on assets held abroad, they do object to the *empirical measure* for the change in assets denominated in foreign currencies: a constant proportion of the change in the value of total assets. In particular,

funds from foreign sources, if we make use of the approximate identity (2), $\Delta A = \Delta F + \Delta V + u_0$, the flow of direct investment (ΔV) is determined as a function of the other three variables and u_0. In view of our primary interest in ΔV and the unknown nature of u_0, we can go further and fit the implied equation for ΔV. Using the approximate identity and the final equation for ΔF, the following equation is implied:

$$\Delta V = a + (1 - b)\Delta A - u_0 - u_1, \tag{10}$$

where $\Delta F = -a + b\Delta A + u_1$. If the residual sources of finance, u_0, are indeed random with zero mean and, further, if u_0 is independent of the change in total assets, then the estimated coefficients of the two financial equations should be related to each other, as indicated in equations (10) above.

The fitted equation for the flow of direct investment shows a very close dependence on changes in total assets abroad:

$$\underset{}{\Delta V = 244.9 +} \underset{(22.3)}{0.45\Delta A}. \tag{11}$$

$R^2 = .98$ SEE = 72.0 No. Obs. = 9

The size of the estimated coefficients in relation to those from the equation for funds raised from foreign sources is strong evidence for

the discussants hypothesize that no fixed assets, and only a part of current assets, are affected by changes in exchange rates.

Theoretically, their argument is plausible. The model developed in Appendix A of this paper is a one-period model, which implicitly assumes that all capital gains and losses are realized at the end of each period. If a fixed asset is to be held with certainty until it falls apart, then, contrary to the implications of the above model, no capital losses will be realized. However, where there is the *possibility* of the sale of the fixed asset for foreign currency, then exchange-rate hedging makes sense.

In fact, despite the results presented by the discussants, the data that we all used indicate that a part of fixed-asset changes *is* hedged. Breaking down the change in total assets into the change in fixed assets (ΔNK) and current assets (ΔCA), we find upon rerunning equation (9) above that funds from non-U.S. sources (ΔF) are significantly related to changes in *both* current and fixed assets:

$$\Delta F = -339.9 + \underset{(6.49)}{0.76\Delta NK} + \underset{(6.85)}{0.47\Delta CA}$$

$R^2 = .99$ SEE = 76.0 No. Obs. = 9

One surprise in the above material is that the coefficient on the fixed-asset term is larger than that for the current-asset term. All I can venture on this point is the statement that it is a surprise and a suitable question for further research.

our hypotheses about the nature of the residual sources of finance, u_0.[24]

Up to this point there has been no attempt to explain individually the three components of the flow of direct investment: net capital outflow, repatriated dividends, and foreign profits. In terms of the devaluation-risk-avoidance theory of finance, there is no warrant to do so and no implication that it can be done. However, it does seem justifiable to break out foreign profits and derive an equation for net capital outflow minus repatriated dividends ($NKO - DIV$), the part of the flow of direct investment that directly affects the balance of payments.[25] Subtracting E, the U.S. share of foreign earnings, from both sides of equation (11) above, we derive an equation for $NKO - DIV$. Estimating its coefficients, we get:

$$NKO - DIV = 290.3 + \underset{(5.05)}{0.47\Delta A} - \underset{(3.61)}{1.08E}. \tag{12}$$

$R^2 = .91 \qquad SEE = 77.3 \qquad \text{No. Obs.} = 9$

PERFORMANCE OF THE DEPARTMENT OF COMMERCE MODEL

Despite our strong theoretical objections to the model used by the Department of Commerce, and its incompleteness, it will be of interest to see how this model performs relative to the model suggested above.

The two main equations of the Commerce model are those for net capital outflow (as a function of plant and equipment expenditure) and repatriated dividends (as a function of the American share of subsidiaries' earnings). The results show that for the period for which the requisite data are available, 1958–67, the ability of the Commerce equations to explain the variations in the dependent variables is at least fair to good:

$$DIV_t = 113.7 + \underset{(4.07)}{0.41E_t} + \underset{(1.84)}{0.083(E \times DV65\text{–}67)};$$

$R^2 = .94 \qquad SEE = 76.2 \qquad \text{No. Obs.} = 10$

[24] Additional evidence is provided in the table for u_0 in Appendix B.

[25] Once the change in assets is determined, the level of affiliate earnings would seem dependent on market conditions abroad and quite insensitive to any random variables that might affect the flow of direct investment. Hence the error term in (11) must affect mainly NKO and DIV.

$$NKO_t = \underset{}{108.8} + \underset{(2.30)}{0.30 PE_t} + \underset{(0.30)}{0.022 (PE_t \times DV65\text{-}67)}.$$

$R^2 = .84$ SEE = 212.7 No. Obs. = 10

The last term in each equation is a dummy variable multiplied by the independent variable in each equation; as such, the coefficient of the term tests for a change in relationship during the years of the voluntary balance-of-payments program. The estimated coefficients indicate that there was no effect on net capital outflow, but that there seemed to be an increase in the dividend/payout ratio; this latter change just misses significance at the 5 per cent level.

The above equations do not permit a direct comparison of the explanatory ability of the two alternative models. However, since there seems to be no reason why one cannot assume that the two independent variables above are independent of the error term in *both* of the equations under discussion, we can construct the Commerce equations for the flow of direct investment (ΔV) and the part of that flow that passes through the balance of payments ($NKO - DIV$). Subtracting the first equation above from the second leads to the Commerce equation for $NKO - DIV$. The equation is fitted for the period 1957–65, so the results will be comparable to those for the alternative model. Comparison of the coefficient of determination and the statistical significance of the estimated coefficients of equation (13), below, with those of equation (12), shows that the alternative model is clearly superior for this equation and period:

$$NKO - DIV_t = -396.8 + \underset{(0.82)}{0.45 E_t} - \underset{(0.38)}{0.095 PE_t} + \underset{(1.04)}{285.3 DV65}. \qquad (13)$$

$R^2 = .59$ SEE = 175.9 No. Obs. = 9

Adding the value of foreign earnings to both sides of equation (13) gives the Commerce equation for direct investment. The Commerce results are again inferior to the alternative model's—equation (11) above:

$$\Delta V = -396.8 + \underset{(2.64)}{1.45 E_t} - \underset{(0.38)}{0.095 PE_t} + \underset{(1.04)}{285.3 DV65}. \qquad (14)$$

$R^2 = .94$ SEE = 175.9 No. Obs. = 9

4 THE IMPACT OF THE VOLUNTARY AND MANDATORY BALANCE-OF-PAYMENTS PROGRAMS OF 1965–68

FOR the most part, the balance-of-payments programs for direct investment have sought to regulate only the financing of the asset accumulations of foreign affiliates. Except for some secondary exhortations about postponing marginal fixed-investment projects and reducing working capital abroad, no direct controls were put on affiliates' investment in real assets.[26] The voluntary programs attempted to work primarily through the attainment of targets (limits) for the flow of direct investment—or, rather, the flow of direct investment as defined above *minus* the value of securities placed on international markets by the parent companies.[27] More stringent versions of the voluntary targets were made mandatory in 1968 and form the foundation of the program since that year.

Theoretically, one should not expect this type of restraint program to have any effect on asset changes. As long as the program leaves unaffected such variables as the firm's discount rate, and sales and price expectations in foreign markets, one can appeal again to the Modigliani-Miller propositions and from them conclude that a program which hits financing directly—and only financing—will not affect the market value of the firm or its investment strategy. Theoretically, the effect of such a program should be exactly the amount by which it shifts the financing of a given level of asset changes from the (net) flow of direct investment to funds from foreign sources (including the value of the parent company's securities placed abroad). Although limited to the manufacturing sector, almost all of the empirical results of the present study support this conclusion.

[26] See A. F. Brimmer, *op. cit.*; also, annual releases from the Office of the Secretary, U.S. Department of Commerce, on the Balance of Payments Program for the following year, December, 1965; December, 1966.

[27] The published figures for net capital outflow do not net out the value of foreign funds raised by the foreign borrowing of the parent firm. These are treated as foreign purchases of American liabilities and appear elsewhere in the balance of payments.

EXPENDITURES FOR PLANT AND EQUIPMENT

A preliminary indication of the programs' lack of effect on the plant and equipment spending of foreign manufacturing affiliates is given by the residuals from the best-fitting equation (7) discussed above:

$$PE = -1111.0 + 0.42S_{t-1} + 0.081(S_t - S_{t-1}) - 0.92\check{N}K_{t-1}.$$

$$R^2 = .99 \qquad SEE = 120.5 \qquad \text{No. Obs.} = 11$$

The unexplained fixed investment residuals for 1965–68, in millions of dollars, are as follows:

1965	−140.7	1967	+31.4
1966	+196.5	1968	−84.0

All of the residuals are easily less in absolute value than two times the standard error of the estimate (120.5), and thus could have arisen purely by chance. Further, the negative and positive residuals for the four years of balance-of-payments programs just about cancel each other out. With one exception, more formal tests confirm this negative result.

If it is hypothesized that each of the respective programs had a constant impact on plant and equipment spending for each year of its existence, then the effect should be estimated by a dummy variable. The following is the best-fitting equation for plant and equipment, with dummy variables added for the voluntary restraint program (DV_V) and for the first year of the mandatory program (DV_M). As suggested by the above table of residuals, neither coefficient is significantly different from zero, but the coefficient for the effect of the mandatory program is close:

$$PE = -963.47 + \underset{(3.32)}{0.25S_{t-1}} + \underset{(4.35)}{0.12\Delta S} - \underset{(2.15)}{0.44NK_{t-1}}$$

$$+ \underset{(1.26)}{244.7DV_V} - \underset{(1.85)}{413.5DV_M}. \quad (15)$$

$$R^2 = .99 \qquad SEE = 95.3 \qquad \text{No. Obs.} = 11$$

However, when the insignificant dummy variable for the voluntary program years is suppressed, the effect of the mandatory program becomes, statistically, significantly different from zero. The estimate of the effect is $511 million, equal to an 11 per cent decrease in plant and equipment expenditures. Although this result is plausible, it must be accepted with caution. The plant and equipment expenditure equations have a tendency to overpredict in the later years of the sample period and beyond; hence, we see negative residuals for the last year in the sample period in almost every case. Thus, the dummy variable for the mandatory program may just be picking up this tendency to overpredict. On the other hand, such an effect is plausible, especially in light of the suddenness with which this stringent mandatory program was instituted at the beginning of 1968; it could well be that parent firms were unable to arrange alternative foreign financing for all previously planned foreign investment expenditures. One would then expect some postponement of 1968 plant and equipment expenditures, and higher levels of such spending in 1969. A pattern of residuals consistent with this explanation was observed for the first two years of the voluntary program: a negative effect in 1965, more than offset by a positive effect in 1966.

Concerning the effect of the voluntary program, it could be argued that the effect should not be measured as a constant for each year of the program, but as some function of the level of desired plant and equipment expenditures. In particular, the program could affect either the desired capital/output ratio or the adjustment process, or both. A number of different tests were run along these lines, the results of each supporting a rejection of any significant differences between program and nonprogram years. As an example, there being independent evidence that the desired capital/output ratio did not change,[28] the desired capital/output ratio was constrained at its pre-1965 level (.455) and a simple, flexible accelerator investment equation was estimated, allowing for different speeds of adjustment in program and nonprogram years. The coefficient of the term $[DV(.455S_{t-1} - NK_{t-1})]$ in equation (16) is the estimate of the *difference* between speeds of adjustment in program and nonprogram years. The coefficient is insignificantly different

[28] See Appendix B, Part 3.

from zero, indicating no effect of the voluntary restraint program on the speed at which actual fixed capital is adjusted to the desired level.

$$\begin{aligned} PE = -1380.1 &+ \underset{(3.64)}{0.95}(.455S_{t-1} - NK_{t-1}) \\ &- \underset{(0.50)}{0.032}[DV(.455S_{t-1} - NK_{t-1})] + \underset{(0.67)}{0.053}NK_{t-1}. \quad (16) \end{aligned}$$

$R^2 = .98 \quad SEE = 188.1 \quad$ No. Obs. = 10

CURRENT ASSETS AND FINANCIAL FLOWS

The series for current-asset changes, total-asset changes, and funds raised from foreign sources go up to 1965 only. So, at best, we can get a direct measure of the effect of the balance-of-payments program for only the first year of the voluntary program, 1965. As the following equations show, when a dummy variable for 1965 ($DV65$) was added to the best-fitting equation for current-asset changes, for funds from foreign sources, and for the flow of direct investment, no significant effect for 1965 was detected.

$$\Delta CA = -270.3 + \underset{(2.67)}{0.29}S_t - \underset{(1.86)}{0.47}CA_{t-1} + \underset{(0.89)}{278.5}DV65. \quad (17)$$

$R^2 = .96 \quad SEE = 213.0 \quad$ No. Obs. = 8

$$\Delta F = -200.0 + \underset{(6.07)}{0.51}\Delta A + \underset{(0.67)}{215.0}DV65. \quad (18)$$

$R^2 = .94 \quad SEE = 207.0 \quad$ No. Obs. = 9

$$\Delta V = 217.2 + \underset{(14.84)}{0.46}\Delta A - \underset{(0.63)}{73.3}DV65. \quad (19)$$

$R^2 = .99 \quad SEE = 75.3 \quad$ No. Obs. = 9

The above results are of limited usefulness. We can, however, take another tack and get a picture of the effect of the balance-of-payments programs after 1965 by predicting from the model for 1966–68 and comparing the predictions to realized values for those variables for which post-1965 data are available. In particular, the data for the flow of direct investment[29] are available for 1965–68. The predictions for the flow of direct investment come from equation (11): $\Delta V = 244.9 + 0.4453\Delta A$. Using the reported values for plant and equipment expenditures, and predicted values for changes in current assets and for depreciation, the change in total assets ($\Delta\hat{A}$) is predicted. This is all we need to apply equation (11) and derive a forecast for the flow of direct investment. The various forecasts and the comparision of actual and predicted flows of direct investment for manufacturing are presented in the following table:

Predicted ($\Delta\hat{V}$) and Actual (ΔV) Direct Investment in Manufacturing
(*millions of dollars*)

	$\Delta\hat{A}$	$\Delta\hat{V}$	ΔV	$\Delta V - \Delta\hat{V}$
1966	5672	2770	2720	−50
1967	4443	2223	2069	−154
1968	4256	2140	2144	+4

SOURCES: *Survey of Current Business;* equations (11), (8).

The above forecasts are remarkably close to the observed values for the flow of direct investment, even for three years beyond the sample period. Given that estimated values are used for the independent variable in equation (11), the largest deviation (for 1967) is well within the range of chance variation.

The implication of the above exercise is that the flow of direct investment has not been affected by the restraint programs of 1965–68. The pre-1965 relationship between direct investment and asset changes holds up very well for the years of the various balance-of-payments programs. If the above relationship is unchanged, then so is that between the subsidiaries' borrowing from foreign sources and changes in total assets.

The final and most important implication is that, for foreign affil-

[29] Frederick Cutler *et al.*, "The International Investment Position of the United States in ——." *Survey of Current Business* (October usually), Vol. 47–49 (1967–69).

iates in manufacturing, the major—if not the only—impact of the recent balance-of-payments programs has been in the stimulation of borrowings abroad by the parent companies and their domestic finance subsidiaries (incorporated in the United States). Since the restraint programs strongly encouraged such borrowing, and since pre-1965 levels were virtually zero, it is probably correct to attribute all such borrowing since 1965 to the balance-of-payments programs. The total impact of the programs in this field would then be the manufacturing share of the total of such borrowings—i.e., the manufacturing share of: \$191 million in 1965; \$594 million in 1966; \$446 million in 1967; and \$2129 million in 1968.[30] If the above conclusions can be shown to hold for foreign investors in *all* industries, then the direct effect of the balance-of-payments programs would be equal to the totals shown.

As has been noted, there is the possibility of an additional effect of the 1968 mandatory program on plant and equipment expenditure (\$−511 million). The net reduction of the flow of direct investment attributable to such an effect would be \$230 million—.45(511), the estimated plant and equipment reduction times the proportion of that financed by the flow of direct investment. However, a number of reasons were noted why such an effect may be spurious or, if not spurious, subject to reversal in the near future.

5 CONCLUSIONS

A THEORETICAL model has been constructed to explain four real and financial capital flows associated with the international firm: spending for plant and equipment abroad; the change in current assets held abroad; the flow of direct investment; and the flow of funds raised abroad by foreign affiliates. Equations for the first two variables were derived from considerations related to the maximization of the market value of the firm. Equations for the financial flows were derived from a theory of minimization of devaluation risk, subsidiary to, and consistent with, the maximization of the market value of the firm.

[30] David T. Devlin and Frederick Cutler, "The International Investment Position of the United States: Developments in 1968," *Survey of Current Business*, Vol. 49, No. 10 (October, 1969), Table 4, p. 27.

The equations were estimated for aggregate data for foreign affiliates in manufacturing. They explain past data well and do so significantly better than the major existing alternative model developed by the Department of Commerce.

An application of the model developed here is the estimation of the impact of recent balance-of-payments programs on the capital flows associated with the international firm. No significant effects of recent programs were detected for any of the four dependent variables, with the possible exception of plant and equipment spending in 1968. The implication of this finding is that, for the manufacturing sector, the major impact of recent programs has been the stimulation of large foreign borrowings by the parent firms. Further, the impact of this development on the balance of payments does not seem to have been weakened by a lessening of foreign borrowing by the foreign subsidiaries themselves.

APPENDIX A: THEORETICAL MODELS

1. TABLE OF FREQUENTLY USED SYMBOLS

Variables

Q = quantity produced
L, K = inputs of labor and capital services, respectively
D = level of debt
M = Lagrangian multiplier
I = investment in capital services or goods

Parameters

p, w, q = prices of output, labor services, investment goods, respectively
s = firm's discount rate
x = exchange rate ($ per unit of foreign currency)
r = interest rate on debt
d = depreciation rate of capital goods
a = the elasticity of output with respect to capital

2. DETERMINATION OF THE DESIRED LEVEL OF CURRENT AND FIXED ASSETS

We assume that the firm chooses the level of capital services and labor services in each location with the goal of maximizing the market value or wealth of the firm. The treatment below follows that of D. W. Jorgenson in "Anticipations and Investment Behavior," *The Brookings Quarterly Econometric Model of the United States*.[31] The reader should refer to the Jorgenson article for a detailed discussion of the various mathematical derivations. Below we discuss only those points where our treatment differs from Jorgenson's.

We assume that the firm operates in n locations throughout the world. Net revenue at any time in a given location is (assuming no taxes):

$$x[pQ(K_1, K_2, L) - wL - q_1I_1 - q_2I_2],$$

where K_1 is the level of services from fixed capital and K_2 is the level of services from current assets. Current assets are assumed to provide services that enter the production function in a way similar to fixed assets; this, of course, is a simplistic view of the role of current assets. In all locations but the United States, profits are realized originally in foreign currencies; multiplication by the exchange rate, x, transforms these into U.S. dollars.

The firm attempts to maximize its market value, i.e., the present value of all future net revenues:

$$\int e^{-st}\left\{\sum_i x_i[p_iQ_i(K_{1i}, K_{2i}, L_i) - w_iL_i - q_{1i}I_{1i} - q_{2i}I_{2i}]\right\} dt.$$

Each of the above variables has an implied time subscript. The above maximization is constrained by a Cobb-Douglas production function for each location, and by the relationship between the rate of change of capital and investment. Following Jorgenson, this expression for the optimal level of real capital service j (1 or 2) in location i can be deduced:

$$K_{ji}^* = a_{ji}p_iQ_i/q_{ji}(s + d_{ji} - \dot{x}_i/x_i - \dot{q}_{ji}/q_{ji}),$$

[31] Chicago, Rand McNally, 1965, pp. 43–47.

where a_{ji} is the elasticity of output with respect to capital service j. The only difference between the above expression for desired capital and Jorgenson's is the presence of the percentage rate of change of the exchange rate, $\dot{x}/x$, which, in addition to changes in the price of capital goods, leads to speculative gains or losses from the holding of assets. To obtain the level of desired capital *in current dollars* one multiplies both sides of the equation by q_{ji}.

3. MINIMIZATION OF THE RISK OF DEVALUATION LOSSES AND THE DETERMINATION OF THE LEVEL OF BORROWING IN FOREIGN CURRENCIES

We assume that the firm has already chosen its optimal level of current and fixed assets, labor, and output so as to maximize its market value. Subject to these predetermined variables, we assume that the firm determines its financing arrangements so as to minimize the risk of losses due to devaluation.

To simplify matters we make the following further assumptions:

1. The only random variable the firm faces is the exchange rate in each market, x_i. The U.S. market is numbered 0, and $x_0 = 1$.

2. The firm need look only one period ahead and minimizes its risk by taking actions at the beginning of each period.

The firm reaps two kinds of return in each market: operating profits (OP) and capital gains (CG). Since the only random variable is the exchange rate, capital gains cannot be reaped in the U.S. market. We will define operating profits inclusive of interest costs on debt:

$$OP = \sum_i x(pQ - wL - dqK - rD),$$

where each variable has a location subscript. Without loss of generality, we now neglect to differentiate current and fixed assets. We also implicitly assume that all assets held in a foreign location are valued in foreign-currency units; this, too, can be easily relaxed.

Capital gains result when the value of capital goods and/or debt changes because of price changes; since we assume that only the exchange-rate changes, capital gains in any foreign location, $i = 1, \ldots, n$, equals:

$$CG = [x(t) - x(t-1)](qK - D),$$

where $x(t-1)$ is the value of the exchange rate at the beginning of the period, and $x(t)$ is the rate at the end.

Total profits in any period is the sum of operating profits and capital gains in each location. Total profits contains n random variables, $x_1, \ldots, x_n$; $x_0 = 1$.

The firm wishes to minimize the risk of the dollar value of total profits. We assume that the variance is the measure the firm chooses as the indicator of risk. Assuming, for simplicity, that the firm expects no correlations among exchange-rate changes in different locations, the over-all variance, or risk, of total profits is

$$VAR = \sum_{i=0}^{i=n} var(x_i)(p_iQ_i - w_iL_i - dq_iK_i - r_iD_i + q_iK_i - D_i)^2.$$

This expression is to be minimized subject to the firm's balance sheet:

$$\sum_i q_iK_i = \sum_i D_i + \text{net worth},$$

where net worth is constant.

The marginal equations for D_i, $i \neq 0$ are:

$$-2var(x_i)(p_iQ_i - w_iL_i - dq_iK_i - r_iD_i + q_iK_i - D_i)(1 + r_i) - Mx_i(t-1) = 0,$$

where all variables have t subscripts unless otherwise noted. The Lagrangian multiplier, M, equals 0, since $dV/dD_0 = 0 - M(1) = 0$, for debt in the United States. We thus arrive at the following for D_i:

$$D_i = (1/1 + r_i)(p_iQ_i - w_iL_i - dq_iK_i) + (1/1 + r_i)q_iK_i.$$

This is equation (3), appearing in Section 2.

APPENDIX B: DATA SOURCES AND ESTIMATES: FOREIGN MANUFACTURING AFFILIATES

1. CURRENT ASSETS (CA), FINANCIAL FLOWS (ΔF, ΔV, u_0), AND TOTAL ASSET CHANGES (ΔA)

Year	$NKO - DIV$ [a]	CA [b]	ΔA [c]	ΔA [c] (unadjusted)	ΔF [d]	ΔV [e]	u_0 [f]
1957	−10	9180	1526	1526	567	865	94
1958	−190	9822	1168	1302	472	730	100
1959	−79	11073	1828	1703	575	1050	78
1960	251	12410	2332	1955	717	1427	−189
1961	−260	13553	1638	2036	977	943	116
1962	−34	14771	2327	2200	933	1273	−6
1963	118	16690	2998	2942	1273	1659	10
1964	141	19227	4039	3957	1973	1993	−9
1965	431	22336	5027	5137	2437	2453	247

NOTE: Figures in millions of dollars.

SOURCES: Data for 1957 and earlier: U.S. Department of Commerce, *U.S. Business Investments in Foreign Countries*, Washington, D.C., 1960; data for 1958–68 from annual articles in the *Survey of Current Business* entitled (1) "The International Investment Position of the United States in . . . ," (2) "Plant and Equipment Expenditures of Foreign Affiliates . . . ," and (3) "Financing and Sales of Foreign Affiliates . . . ." Where possible the latest published revised data were used.

[a] Source: article (1), above, in the *Survey of Current Business*. For DIV, I took the figure "Income" from direct investments. Although this item includes some interest income, it was used in preference to the alternative item "Income Paid Out" in (3) because of its availability for recent years, and because of the more complete sample of firms from which it is constructed.

[b] Source: for recent years, article (3) in the *Survey*. The *change* in current assets can be constructed from the data reported in annual articles (3). It was constructed as the sum of the following items reported annually: the change in inventories, receivables and other assets. The latter was included because it was assumed to reflect largely changes in the holdings of cash and securities. The *level* of current assets is available for 1957 in *U.S. Business Investments in Foreign Countries*, Table 16, p. 104. The level figure for 1957 of 9180

(million dollars) is the sum of 8207 for current assets plus 322 for "Investments in Affiliates" and 651 for "Other Assets." These last two items were included (1) for completeness, so that the sum of current and net fixed assets would equal total assets, and (2) for consistency, because changes in these categories are probably reflected in the annual figures for changes in other assets. If the second reason should be invalid, the regression results reported above would not be affected by this procedure for 1957; the addition of this constant amount to reported current assets for 1957 (and all later years) does not change the correlations between current assets and the other variables. The levels for years later than 1957 were constructed by adding current-asset changes to the previous year's level figure, starting in 1957.

[c] Source: article (3) in the *Survey*. The unadjusted figure (ΔA unadjusted) is the sum of changes in current assets and net fixed assets. Using this figure for total asset changes omits the value of purchases of existing enterprises or take-overs. For only part of the period 1957–65, the Commerce Department has constructed a measure of this latter item (see, e.g., the table on "Reconciliation of Data on Capital Flows and Earnings," *Survey*, October, 1964, p. 11). By inspecting this "Reconciliation" table, one finds that the value of take-overs is approximately equal to Net Capital Outflows (NKO) *minus* Total Funds from the United States (from the Sources and "Uses of Funds" table in (3)) *plus* U.S. financing from sources other than the parent firm (e.g., U.S. bank loans, also from (3), where available). Only the first two of these items are available throughout our period. The difference of the two available items has been used above, of necessity, as an estimate of the value of take-overs. This estimate, therefore, is probably an underestimate. The adjusted figure (ΔA) was used as the measure of asset changes in the equations presented in the paper; however, the fitted equations for ΔF and ΔV and the predictions for ΔV change little if the unadjusted figure for asset changes is used. One set of results is considerably inferior if the unadjusted figure is used: that for $NKO - DIV$, equation (12).

[d] Source: article (3), above. The figure for our estimate for funds raised from non-U.S. sources is the sum of the Commerce items "Funds Obtained Abroad" and "Miscellaneous Sources." The latter item was included for consistency; in some years this item was lumped with funds obtained abroad, and in some it was not.

[e] Source: article (1), above. These figures are equal to $NKO + E - INC$ as reported in the *Survey*, rather than the first-difference of reported level figures. The latter procedure is unsatisfactory because of periodic adjustments in the levels to reflect previous exchange losses, expropriations, and so on. Thus, the difference between the above measures for ΔV and $NKO - DIV$ is E (the U.S. share of foreign-affiliate earnings).

[f] By its construction, our estimate of u_0 also includes errors and omissions.

2. SALES AND INVESTMENT DATA, 1957–68

Year	PE	DEP	NK_{t-1}	S_{COMM} [a]	$S_{McG\text{-}H}$ [b]	$CU_{McG\text{-}H}$ [c]
1957	1347	539	5009	18331		
1958	1300	640	5817	19384 [e]	19693	
1959	1147	695	6477	20634	21071	
1960	1397	779	6929	23315	22927	88
1961	1782	889	7547	25111	25493	84
1962	2042	1060	8440	27923	27745	
1963	2251	1228	9422	31769	32296	88
1964	3007	1587	10445	37270	34721	90
1965	3893	1864	11865	42377	41502	87
1966	4583	2209 [d]	13893	48408 [e]		85
1967	4513	2681	16267 [f]	51325		81
1968	4178	3046	18099	57227	58533	85

NOTE: Figures in columns 2–6 in millions of dollars; column 7, data in per cent.

SOURCES: For Commerce Department data, see the first footnote to the previous table; for McGraw-Hill data: McGraw-Hill annual *Survey of Foreign Operations* (see footnote 16).

[a] Sales: Commerce Department; official figures except for 1958 and 1966–68; these figures are used as S_t in regressions.

[b] Sales: McGraw-Hill.

[c] CU: capacity utilization from McGraw-Hill.

[d] Depreciation estimated, 1966–68.

[e] Sales estimated 1958, 1966–68.

[f] Net capital estimated, 1967–68.

(For estimation methods, see below.)

3. ESTIMATING SALES AND DEPRECIATION FOR FOREIGN AFFILIATES IN MANUFACTURING

For depreciation, it was found that there is a very high correlation between depreciation expense in period t and the value of the net capital stock (NK) in period $t-1$:

$$DEP_t = -556.0 + 0.199 NK_{t-1}.$$

$R^2 = .98$

Thus it was possible to estimate *DEP* for 1966 and, along with the reported value for *PE* in 1966, to construct $NK_{66} = NK_{65} + PE_{66} - DEP_{66}$, and so on for successive years.

The McGraw-Hill sales and capacity-utilization figures were used to construct estimates of total foreign sales for manufacturing affiliates in those years for which no official figures are available: 1958, 1966–68.

First, it was observed that there was a very high correspondence between the two sales series where both figures were available:

$$S_{COMM} = -1774.19 + \underset{(19.4)}{1.075} S_{McG\text{-}Hill}.$$

$$R^2 = .99$$

Given this close relationship, I felt it permissible to interpolate the same change in the Commerce data as in the McGraw-Hill data for the one year, 1958, where the latter was available, but not the former.

For the estimates of Commerce sales for 1966–68, the McGraw-Hill capacity-utilization data were used. Capacity utilization is defined as actual sales or output divided by optimal sales for the present plant: i.e., $CU = S/Smax$. $Smax$ is also related to the firm's desired capital/output ratio for a particular period: $Smax = c^*(t) \times NK(t)$. (Our only measure of actual capacity is the Commerce Department net-capital figure.) We assumed that $c^* = a + bt$. Then we can get the following equation:

$$CU = S/Smax = S/(a + bt)NK.$$

These equations, in turn, imply: $S = CU(a + bt)NK$, which is a linear equation in the variables, $CU \cdot NK$ and $tCU \cdot NK$.

In fitting this equation for years when each variable was available, the coefficient of the second independent variable proved insignificant. The best fitting equation:

$$S = \underset{(125.8)}{3.508} CU \cdot NK.$$

$$R^2 = .99$$

Thus, given CU and NK, one can estimate S, as was done for 1966–68.

COMMENTS

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Stevens has combined an elaborate network of theory into a series of models that he has tested empirically. Through this methodology he has concluded that neither the voluntary nor mandatory restraint program of the United States has exerted much effect on the flow of foreign direct investment or on plant and equipment expenditures by foreign subsidiaries, but that these programs did stimulate substantial borrowings abroad by the American parents and their domestic financial subsidiaries.

Our own investigations corroborate these conclusions.[1] The consensus of the financial managers of multinational enterprises in the United States whom we interviewed clearly indicated that they were able to consummate their overseas investment plans. Although there was some doubt on this score in the early days of the voluntary program, it is now well known that their ability to do so stemmed from the very substantial borrowings undertaken abroad, especially in the Eurodollar markets.

Moreover, Stevens is correct in asserting that prior studies have not focused adequately on the multinational firm in assessing international capital movements. Analysts have been discouraged from such undertakings by the admitted absence of suitable data. Stevens does not share this timidity, probably because of his talent at making imaginative use of the statistics that are available. We admire this quality and endorse his efforts to combine theory and empiricism, as applied to the firm, in explaining capital movements. With this judgment rendered, we should like to concentrate on what appear to be gaps in the

[1] The results of our research will be published in 1972 under the title *Money in the Multinational Enterprise: A Study of Financial Management*, as part of a joint Ford Foundation–Harvard University study of multinational enterprises coordinated by Professor Raymond Vernon.

presentation, feeling that while in some instances the queries may represent oversights or misunderstandings on our part, in others, they may have significance. In either case, it is only by concentrating on such apparent, or real, shortcomings that ideas can be sharpened and further avenues of exploration opened. With this thought in mind, we have allowed differences rather than agreements to predominate in our review.

IMPLICATIONS FOR THE INTERNATIONAL AREA OF THE FIRST MODIGLIANI-MILLER THEOREM

At the outset, let us examine Stevens' theoretical concatenation. His initial point of reference is the first of the Modigliani-Miller propositions, according to which the market value of any firm is independent of its capital structure, or put another way, the average cost of capital to any firm is completely independent of its capital structure. Underlying the Modigliani-Miller thesis is the assumption of perfect markets where rational investors offset, through self-created leverage, the effects of corporate leverage on the market price of equities. Stevens relies on this thesis to justify his statement that it does not matter how the firm divides the financing of its foreign operations between capital flows from the United States and foreign sources.

At best, there is no unanimity with respect to the validity of the Modigliani-Miller proposition,[2] while in the international area its application is even less relevant. For example, it is not uncommon for multinational enterprises to have subsidiaries which borrow heavily without parent-company guarantees, but which are not included in the consolidated statement; this added leverage, therefore, ordinarily does not come to the attention of the investment community despite the fact that it influences both the company's capital structure and earnings. Indeed, the art of international reporting is still so primitive that the parent firm, itself, may not be fully aware of the total amount of over-all system borrowing. Moreover, the assumption of perfect markets, when applied to the confines of a single country, is a bold one;

[2] Joseph E. Stiglitz, "A Reexamination of the Modigliani-Miller Theorem." *The American Economic Review*, Vol. LIX, No. 5 (December, 1969), pp. 784–93.

when stretched to cover the whole world, the assumption becomes daring to the point where its credibility is taxed. For example, the differential interest rate fully covered for exchange risk has sometimes exceeded 1 per cent between New York and London—and these represent two major money markets with excellent communication links.[3]

The Modigliani-Miller logic used by Stevens presupposes a tax-free world, a limitation, of course, that these authors later acknowledged.[4] In the international arena, where a multinational firm operates in many different countries with a variety of tax structures, some above and others below the average level in the United States, taxation very clearly enters the picture. As a matter of fact, we know that the more adroit financial managers of firms active in this field have been able to save their firms considerable sums through effective tax-minimization programs. Accordingly, our feeling is that in the very real world of the multinational firm, the distribution of the subsidiaries' capital structures has a very real influence on the level of after-tax earnings. Along these lines, we have calculated that in certain cases the parent company will have substantially higher after-tax earnings if it invests both debt and equity in a subsidiary, instead of just equity, despite the fact that the consolidated balance sheet at the time of the investment will be the same.[5] In the light of these conditions, it becomes important for the international firm to select the appropriate policy for the liability side as well as the asset side of its subsidiaries' balance sheets.

MINIMIZATION OF EXCHANGE-RATE LOSSES

In accordance with Stevens' interpretation of the Modigliani-Miller theorem, the parent company in the multinational system may select any debt/equity ratio for its foreign subsidiaries without affect-

[3] For a discussion of the reasons for this lack of a perfect equilibrium, see Raymond Vernon, *Manager in the International Economy*. Englewood Cliffs, New Jersey. Prentice-Hall, Inc., 1968, pp. 47–48.

[4] Franco Modigliani and Merton H. Miller, "Corporate Income Taxes and the Cost of Capital: A Correction." *American Economic Review*, Vol. LIII, No. 3 (June, 1963), pp. 433–43.

[5] Robert Stobaugh, "Financing Foreign Subsidiaries of U.S.-Controlled Multinational Enterprises." *Journal of International Business Studies*, Vol. I (Summer, 1970), pp. 43–64.

ing the system's cost of capital or market value. Accordingly, he hypothesizes that the firm will establish as its goal the minimizing of exchange losses. To meet this goal, the firm, in turn, borrows in each foreign currency a sum approximately *equal* to the subsidiary's net profits and total assets denominated in the foreign currency. While in his theory Stevens does not specify the length of time over which profits should be protected, in his empirical tests he uses one year. Since these empirical results show that profits have little significance in explaining the level of borrowing, he discards the profit variable, devoting his final equation to relating foreign borrowings to total assets. We question the theoretical implications of this relationship on several grounds. For one thing, the equivalent dollar value of fixed assets often remains constant in spite of a devaluation of the local currency; and therefore, it is not usually necessary for the firm to protect itself against exchange losses due to changes in the dollar value of these assets. This fact is recognized by the accounting profession, which, for the parent company's statement, values fixed assets at historical exchange rates, i.e., those existing at the time the fixed assets were obtained. Then again, the value of certain current assets, such as imported inventory, also often remains constant in terms of dollars, a fact that has led many companies to value such inventories at historical exchange rates. For these reasons, one might theorize that foreign borrowing will be some function of current assets, rather than equal to total assets. To some extent, this conclusion is corroborated by Stevens' regression equation, which indicates that annual changes in foreign borrowings were about 55 per cent of annual changes in total assets.

In accordance with his hypothesis, however, a much higher percentage than 55 per cent should prevail, because the firm wants to borrow 100 per cent; and, of course, it is possible for the foreign subsidiaries of multinational firms to borrow a substantially higher portion of their total assets than 55 per cent should the parent company so desire. While his regression coefficient is statistically significant, we suspect that this may have been true because of the significant correlation which prevailed during this period between total and current assets ($R^2 = .97$).[6] Such a relationship cannot be assumed to continue

[6] The equation, using data in Stevens' paper, with the t-ratios presented in parentheses under the estimated constant and coefficient, is:

invariably, and therefore, a more accurate predictor could probably be obtained by employing the more appropriate causal variable. In this connection, using data in Stevens' paper, we performed a regression which shows that annual changes in foreign borrowing equal approximately 80 per cent of annual changes in current assets; this relationship is not only significant but is also consistent with our hypothesis.[7] We recognize that the factors determining subsidiary borrowing are much more complicated, because many firms hedge externally, as well as borrow, and also take into account the perceived weakness of an individual currency in deciding whether protection against exchange risk is desirable.

Another variable that might be important is time. It is plausible to believe that firms in the United States might have financed abroad a greater percentage of their foreign subsidiaries' assets in the mid-1960's than in the late 1950's because of improvements in local money and capital markets abroad and an increasing awareness of foreign sources of finance on the part of the firm. That this was so is indicated by the data used by Stevens, which show an increase in foreign borrowing from the 34–37 per cent range in the late 1950's up to the 43–50 per cent range in the mid-1960's; as our regression model indicates that this trend is statistically significant at an annual increase of about 1.8 per cent,[8] a model incorporating the trend would be more realistic than a model based on the hypothesis that subsidiary foreign borrowing is a constant percentage (55 per cent) of total assets for all years.

$$\Delta CA = \underset{(.62)}{-78} + \underset{(14)}{.64\Delta A}; \quad R^2 = .97 \qquad SEE = 160 \qquad \text{No. Obs.} = 9$$

where ΔCA = annual change in current assets; ΔA = annual change in total assets.

[7] The equation is:

$$\Delta F = \underset{(.96)}{-129} + \underset{(10)}{.80\Delta CA}; \quad R^2 = .94 \qquad SEE = 183 \qquad \text{No. Obs.} = 9$$

where ΔF = annual change in liabilities and net worth owed to foreigners; ΔCA = annual change in current assets.

[8] The equation is:

$$\frac{\Delta F}{\Delta A} = \underset{(13)}{+33} + \underset{(3.8)}{1.8\,TIME}; \quad R^2 = .67 \qquad SEE = 3.6 \qquad \text{No. Obs.} = 9$$

where $\frac{\Delta F}{\Delta A}$ = percentage of annual change in total assets financed by annual change in liabilities and net worth owed to foreigners.

$TIME$ = years, with 1957 = 1

Despite the significant correlation between annual changes in current assets and annual changes in total assets ($R^2 = .97$), there is some doubt about the existence of an upward trend in changes in foreign subsidiaries' borrowing as a percentage of changes in current assets; the fact that the t value of the regression coefficient is less than one creates this doubt.[9]

FOREIGN DIRECT INVESTMENT

Stevens employs the relationship between changes in total assets and changes in foreign borrowing to derive an equation for predicting flows of direct investment. Because the actual flows of direct investment during the years of the restraint program are close to his estimated flows (which were calculated from an estimate of changes in total assets during this period), he concludes that the restraint program has had little influence on direct-investment flows.

In assessing the effect of the restraint program by predicting from his model for the years 1966–68 and comparing the predictions with actual values for the same period, Stevens encounters a common problem in the international area—absence of data. While he has actual statistics for direct investment, his predictive equation requires total-asset figures, which are not available for the 1966–68 period. Accordingly, he estimates sales, depreciation, and current assets and uses these data, along with reported values for plant and equipment, to derive estimates for total assets. He then inserts these estimates of total assets into his predictive equation to derive the forecasts of direct investment that he compares with reported data. His forecasts of direct investment, therefore, depend not only upon the reliability of the predictive equation but also upon the reliability of his estimate of sales, current assets, and depreciation. It seems to us that this series of es-

[9] The equation is:

$$\frac{\Delta F}{\Delta CA} = \underset{(6.4)}{+65} + \underset{(0.70)}{1.3}\,TIME; \quad R^2 = .066 \qquad SEE = 14 \qquad \text{No. Obs.} = 9$$

where $\frac{\Delta F}{\Delta CA}$ = percentage of annual change in current assets financed by annual change in liabilities and net worth owed to foreigners.

$TIME$ = years, with 1957 = 1

timates strung together to provide a predictive figure is carrying empiricism beyond the call of duty—particularly when one realizes that even reported data in the international area must be employed with extreme caution. As a result, our net reaction is that his models related to flow of foreign direct investment are interesting more because of the adroit handling of the underlying statistics than for their usefulness as predictive devices.

EXPENDITURES FOR PLANT AND EQUIPMENT

It is well recognized that the determinants of the investment decision represent a controversial area of economic theory. Although Stevens initially uses the neoclassical model which Jorgenson and Siebert found superior to a number of alternatives, including the accelerator,[10] he eventually abandons it in favor of a simpler accelerator with a constant capital/output ratio.

In this model he relates total net fixed assets in time t to sales in time t and $t-1$. The premise underlying this relationship is that the firm's expected sales may, in turn, be gauged by the sales in the current and preceding periods. While we realize that this approach has been used for tests of data derived essentially for domestic operations, we are skeptical about its usefulness in the international area. There are various reasons for this opinion.

Changes in the sales of companies in the international area are characterized by abrupt and discontinuous increases as know-how available in the United States is used abroad to add new product lines or to extend the degree of integration in the production process. International investment decisions are often the outcome of governmental political determinations that are in no way related to prior subsidiary sales. As a matter of fact, we have found that in the budgeting process such factors as these, plus marketing strategies and expected environmental changes, are characteristically given mcre weight than changes

[10] Dale W. Jorgenson and Calvin D. Siebert, "Optimal Capital Accumulation and Corporate Investment Behavior." *Journal of Political Economy* (November/December 1968), pp. 1123–1151.

Also, *idem*. "A Comparison of Alternate Theories of Corporate Investment Behavior." *The American Economic Review* (September, 1968), pp. 681–712.

in prior sales. Therefore, in developing a model based upon historical data to be applied for testing purposes to a period when sales are also known, it might have been more logical to employ a relationship between capital expenditures in one period and sales in future periods. Still, we must keep in mind that because of the difficulty companies have in adjusting for risk in the international environment,[11] the international investment decision is even more likely than a domestic investment decision to be dependent on strategy considerations, rather than on a single number such as calculated return on investment or estimated future sales.[12]

Besides these theoretical shortcomings, Stevens' equations for plant and equipment do not consistently confirm his own conclusions. For example, he mentions the problem of explaining a very large intercept and the tendency for the model to overestimate in the terminal years of the sample. As a result, he cannot affirm that the model is necessarily correct in its indication of a significant effect of the mandatory restraint program on foreign investment in 1968.

QUESTION OF ACCOUNTING

Another problem area in Stevens' paper is accounting. Since his analysis must be based upon reported data, which, in turn, are used to deduce the estimates necessary for his equation, it is important to recognize the precariousness of these reported figures.

As an illustration, Stevens obtains various estimates based on the assumption that change in net fixed assets during a period equals plant and equipment expenditures of the current period minus depreciation of the current period. While this relationship is often true, it could be significantly affected by the accounting policies of the companies involved. To test for this contingency, we applied Stevens' reasoning to a single company, IBM, a major participant in the international area.

The midyear of Stevens' study was chosen arbitrarily for this cal-

[11] Robert Stobaugh, "How to Analyze Foreign Investment Climates." *Harvard Business Review*, Vol. 45, No. 5 (September/October 1969), pp. 100–108.

[12] This process is described in Yair Aharoni, *The Foreign Investment Decision Process*. Boston, Division of Research, Graduate School of Business Administration, Harvard University, 1966.

culation, but similar results would be obtained for other years. According to Stevens' method of calculation, the net fixed assets of IBM should have increased between the end of 1960 and the end of 1961 by $137,345,655, or the difference between IBM's reported capital expenditures of $386,526,082 and reported annual depreciation of $249,180,427. However, according to the IBM Annual Report, net fixed assets rose by only $87,214,072 during this period. The reason for this discrepancy between the estimate made using Stevens' method and the IBM reported figures is that IBM follows a policy of charging partly to cost of sales and partly to its accumulated depreciation allowance the substantial amounts of dismantled and obsolete equipment which it retires annually. Accordingly, to obtain the change in net fixed assets reported by IBM, there would have to be deducted from the $137,345,655 figure indicated above (representing the difference between capital expenditures and depreciation) an additional $50,131,583 representing the amount of dismantled or obsolete assets that was written off during the year and charged to cost of sales rather than accumulated depreciation. This calculation is shown with data from Appendix B of Stevens' paper.

Since this $50,131,583 difference is more than half of the actual change in IBM's net fixed assets for that year, it is significant and cannot be readily dismissed from any analysis of the company's reported data. The company, in turn, has considerable control over this figure, which can have an important effect on reported earnings and the market value of its shares. Moreover, this policy is followed by other computer companies. Consequently, mixing their reported results with those of companies in other areas that do not follow this policy could produce a nonhomogeneous set of statistics as the analytic base.

THE HOMOGENEITY OF THE SAMPLE

This comment leads to what may be our major concern, and that is the danger of employing aggregate statistics that are not homogeneous. Our own studies have revealed that all firms do not respond in the same way to similar events, but that there are certain major characteristics which may be employed as variables to obtain more homo-

Calculations for Net Fixed Assets

Accounting Procedure	All Foreign Manufacturing Affiliates of U.S. Firms (Appendix B of Stevens' paper) (1)	Expected Results for IBM Calculated by Stevens' Method (2)	Actual Results Shown in IBM Annual Report (3)
Net fixed assets, end of 1960	7,547 [a]	849,690,933 [b]	849,690,933 [b]
Add plant and equipment expenditures in 1961	1,782	386,526,082	386,526,082
Subtotal	9,329	1,236,217,015	–
Subtract depreciation in 1961	889	249,180,427	–
Net fixed assets, end of 1961	8,440	987,036,588	936,905,005
Difference between totals of columns (2) and (3) equals retirements charged to cost of sales rather than depreciation			50,131,583

[a] In millions of dollars.
[b] In dollars.

geneous groupings. Therefore, in any major effort to identify the effect of national policies on corporate practices in the international area, it is important to recognize the need to disaggregate the statistics into more meaningful combinations.

Along these lines, Stevens, in developing his model, takes the firm's objective to be maximization of its market value, which, in turn, he identifies with the present value of future earnings. We recognize that this is an accepted approach. At the same time, we think it desirable to point out that in the international area, particularly, objectives may not be so clear-cut and may vary. For example, when devaluation occurs, managers often are much more concerned about unrealized exchange losses than about changes in the earning power of their subsidiaries. This concern with reported book-values suggests that many managers may be more interested in the appearance of their current financial statement than in their long-run cash flows.

Even if we assume that all firms have the same maximizing objective, the policies adopted to reach this objective differ substantially. We now know that managers of very large firms tend to adopt rule-of-thumb procedures, such as the remission of a specified portion of earnings to the parent company, because they find their corporate system so complex that they doubt their ability to reach an over-all optimum. The relatively small firms, on the other hand, follow to a much greater extent the policy of "every tub on its own bottom." As a result, they give considerable freedom to managers overseas because the headquarters personnel do not have the experience to develop decision rules or a central staff at their disposal to control overseas activities. We believe that financial flows developed from the group of large companies would differ substantially from those of small companies; to mix them into a single aggregate produces an odd statistical brew.

CONCLUSION

Empirical evidence that a program aimed directly at financing does not affect investment strategy appears eminently reasonable, as the firms have been able to raise funds through alternative methods. That the program did cause a substantial stimulation of borrowings in the Eurocapital markets is evident from these reported amounts, and it is equally clear that such borrowings would lead to capital expenditures, since the companies would hardly have kept the funds idle for any substantial length of time; although, as Stevens points out, there may be an adjustment lag. We are much less sure that the program had no effect on market value of the firms, as Stevens states; we have seen no empirical evidence to demonstrate that conclusion. Indeed, to the extent that the program produced changes in the cost of capital and in tax payments, or resulted in even temporary postponement of an expansion, there might very well have been an effect on the market price. In short, we are much more respectful of the liability side of the balance sheet than is Stevens. Accordingly, despite the reasonableness of his conclusions, we are not sanguine about the reliability of his models in providing consistently useful results.

ROBERT E. LIPSEY

QUEENS COLLEGE AND NATIONAL BUREAU OF ECONOMIC RESEARCH

Stevens suggests that a firm can be expected to borrow in each currency up to the point where foreign borrowings are equal to the sum of net profits earned in that foreign currency and the value of capital denominated in that currency, in order to protect itself against the risk of devaluation. Such a policy might be both definable and sensible with respect to monetary assets, but really has no meaning as applied to direct investments. Direct investments are not denominated in any currency and the earnings from the affiliate are not necessarily in the currency of the host country.

In the case of a foreign monetary asset, the face value would not increase as a result of an inflation, and the value in the home country's currency would fall as a result of a devaluation. It is these characteristics that make protection against devaluation losses desirable. An equity asset, however, would tend to rise in price in inflation, and a corresponding devaluation would only offset the rise in price. It is not even clear that the value of a direct investment is reduced by devaluation, especially if the affiliate is producing for export. A devaluation might increase the value of the investment by making complementary local resources cheaper. Would we expect an American oil company in Saudi Arabia to borrow in Saudi currency to protect itself against a devaluation?

Another curious feature of the Stevens model is the explanation of plant and equipment expenditure of an affiliate by the affiliate's sales growth, lagged sales, and desired capital stock. The implication of the equation is that no firm not already established abroad would ever begin foreign investment. If this reasoning were applied to investments in individual countries, as would seem logical, it would imply that no American firm not already established in that country would ever begin to invest there. We can say that the equation performs well if we judge by the R^2 and the significance of the coefficients, but it presumably does so because of the aggregation of all foreign countries. This aggregation means that we often explain investment in one country by the growth of sales in another country, a relationship that is not very appealing in theoretical terms.