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THE MULTINATIONAL FIRM AND THE
DETERMINANTS OF INVESTMENT

by

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Guy V.G. Stevens*

I. INTRODUCTION

In 1970 fixed investment spending of U.S. foreign affiliates reached 20 percent of the domestic total for manufacturing and 16 percent for all industry. For specific industries the 1970 figures are even more dramatic: chemicals, 38 percent; transportations equipment, 45 percent.^{1/}

Moreover, the faster growth of foreign operations of U.S. firms implies higher percentages in the future. Since 1957, when the figures were first collected, foreign plant and equipment expenditures in manufacturing have increased from 1.3 billion dollars and an 8 percent share to its 1970 level of 6.5 billion and 20 percent; for all industry the figures are 4.9 billion and 12 percent in 1957, to 13.1 billion and 16 percent in 1970.

In view of the rapid growth and present importance of the foreign component of U.S. fixed-investment spending, it is fitting to ask what, if anything, this implies for the determinants of corporate investment. Do studies of the multinational corporation provide new evidence on the theoretical or empirical determinants of investment?^{2/} Might such findings affect studies of domestic investment, as well as foreign? As it turns out, these are not idle questions; as we will see below, many unusual hypotheses have been offered to explain the investment spending of multinational corporations.

Closely related to the answer of the primary question is an evaluation of the state of theoretical and empirical research into

the determinants of multinational investment. Where do we stand? Are researchers at the frontiers of investment theory? Are they making adequate use of the available empirical data? Do we have moderately bright chances to solve the important questions before us? -- such as the reasonably accurate explanation and forecasting of foreign investment, both real investment and the financial flows that are so important to the balance of payments; such as the estimation of the effects of past and, especially, proposed policies to influence the flow of foreign investment for the purposes of balance-of-payments equilibrium or economic development.

In this essay, "the determinants of investment" will be interpreted broadly, to include both investment in real assets and the concomitant financial investment. Real investment and its financing are related in any case, but in the study of the multinational firm financial investment has an extraordinary importance. Most of the worries about the effect of the multinational firm on the balance of payments are worries about financial investment. Talk about the "flow of direct investment", or "the net capital outflow", is talk about financial flows -- in the first case the change in a country's net worth or ownership position in foreign-based business firms; in the second, the major financial flow (along with repatriated dividends) that enters the balance of payments.^{3/} These important questions cannot be answered by studying real investment alone.

This essay is divided into five parts. Following this introduction, the second section briefly surveys the present state of the theoretical and empirical analysis of investment; both real and financial investment are covered, but research into the determinants of plant and equipment is emphasized -- mainly because most of the progress has been in that field. The third section attempts to assess the implications of research on the multinational firm for the determinants of real investment. In much less comprehensive fashion, in the fourth section the same is attempted for financial investment. The final section is concerned with the suggestions for future research which come out of this analysis: research to test more adequately some of the hypotheses discussed in the previous two sections and research which, in my estimation, is necessary in order to achieve the most important goals in the study of the investment of the multinational firm.

II. FIRM INVESTMENT: A VIEW OF THE STATE OF THE SCIENCE

Looking at the current state of theoretical and empirical knowledge of corporate investment, one is presented with a paradoxical picture. In some respects, it is a picture of vigorous, steady progress; in others, one of controversy reaching to the very foundations of the science. The theory of real or fixed investment and the theory of corporate finance are deductions from an underlying theory of the firm. There is considerable dispute today over what this underlying theory should be. At the same time, however, there has been dramatic progress both in refining the traditional theory -- based on the neo-classical model of profit maximization -- and in empirically estimating investment functions.

A. Controversies Over the Firm's Objective Function^{4/}

For 40 years -- at least since Berle and Means (1932) argued that the firm's owners do not control its managers -- there has been a more-or-less continuous debate over the model that really describes business behavior. Do managers really attempt to maximize the market value of the firm -- or its equivalent under certainty, profits -- as the traditional owner-oriented theory says? Or does the separation of ownership and control allow managers to do something else? Or, as hypothesized more recently, does operation in an uncertain environment force them to do something else? Clearly the answers imply much

for the theory of capital and investment.

As far as its application to the empirical analysis of investment is concerned, the traditional theory has had its fullest development in the work of Jorgenson and his associates and Bischoff.^{5/} So far the theory has been fully developed only under conditions of certainty or certainty-equivalence; under these conditions, the objective of the managers of the firm is to maximize the discounted sum of present and future net cash flows.^{6/} Out of this maximization comes, among other things, the firm's optimal plan for capital and investment. As molded by Jorgenson, the theory is neoclassical -- in the sense that the firm's investment policy is assumed to respond to all the product prices, factor prices, interest rates, and tax rates that affect profits. As will be discussed in more detail below, much empirical work has been devoted to confirming and measuring the impact of these variables on domestic plant and equipment expenditure.

Competing, non-profit-maximization theories, have arisen for a number of different reasons. The assumption that managers are at least partially independent of stockholder control is the groundwork of a class of theories that state that what is maximized is the utility functions of the managers. Specifically, much has been made of the possible fact that managers' remuneration is more closely correlated with the size of the firm than with firm profits.^{7/} This suggests that it is rational for managers to sacrifice profits to achieve greater firm size and growth. For this reason, a major challenger to the

traditional theory is some form of growth maximization, a theory associated with the names of Marris (1964), Baumol (1962) and Galbraith (1967). The managers choose to maximize the corporate growth rate, subject to some constraint on profits or dividend payments -- this latter to placate the stockholders and avoid takeovers. What does this theory say about the firm's capital and investment? First, with respect to ^{the} choice of factors to produce any given level of output, John Williamson (1966) has shown that the solution under growth maximization and profit maximization will be the same: because of the profit or dividend constraint, profits will not be sacrificed unless they contribute to growth. However, it is easily shown that under growth maximization the firm's optimal capital stock is larger at any point in time than that under profit maximization. At the margin, investment and related variables such as R and D and advertising are pushed beyond the point where net returns are equal to the market-determined cost of capital.

Although sometimes linked with the foregoing, there are separate causes for the espousal of non-profit-maximization theories of the firm. The difficulties connected with working in an uncertain environment have been emphasized by the "behavioral school" as causes of firm behavior that is inconsistent with profit maximization.^{8/} Cyert and March (1963) set up a model which consists of: (1) the existence of established firm goals or rules of thumb in every relevant area of firm decision ; (2) a rule of choice among alternative actions

which calls for the selection of the first solution perceived that satisfies the goal; (3) a search procedure for discovering alternative solutions to be activated only if no "satisficing" solution can be found. It is an open question whether this system always is inconsistent with profit maximization under uncertainty, especially if firm goals are adjusted over time.^{9/}

With respect to their implications for investment functions, behavioral theories seem to make investment choices the vehicle for satisfying simple firm goals such as a constant or growing market share.^{10/}

B. The State of Empirical Research on the Determinants of Investment

If we were to limit our attention to the existing state of empirical research on corporate investment, we would hardly be aware of the controversy raging around its theoretical foundations. For example, in a recent compendium containing papers by most of the major contributors to empirical investment analysis, there is not a mention of growth maximization or behavioral theories.^{11/}

All investment equations were based directly or indirectly on the foundation of profit maximization. This is not meant as an indictment -- although it is intellectually unsettling to be in a situation where the foundations of a discipline are seriously questioned. Rather, the continued ascendancy of the neoclassical model can be defended by

noting that: (1) by using it, significant progress has been made in the last 10 years in explaining and predicting investment; (2) alternative theories have been very slow in throwing up testable hypotheses that could be substituted for the neoclassical investment functions. And when, in the very recent past, alternatives have been suggested, they have proved to be empirically indistinguishable from the neoclassical functions.

Concerning the second point, to my knowledge the first attempt to derive and test an investment function from a non-traditional set of postulates -- in this case growth maximization -- is a very recent one, published last year by Grabowski and Mueller (1972). Moreover, the empirical results obtained by Grabowski and Mueller made it impossible for them to accept the growth maximization investment function and reject the neoclassical. In particular, in their tests of a "managerial variant" of the investment function, the significant variables explaining investment were a series of sales change and cash flow terms; both of these variables are frequently part of neoclassical investment functions. Although Grabowski and Mueller did not successfully supplant neoclassical investment functions, their results cannot be interpreted as a blow for the traditional theory of the firm: in testing equations for the other decision variables in their model -- dividends and research and development -- they found considerably more evidence for the managerial model.

On the other hand, there has been the appearance and, probably, the reality of steady progress in estimating investment functions based on the neoclassical model. In the first place, resulting mainly from the pioneering work of Jorgenson, there has been a link forged between the theory of profit maximization and empirically estimated investment functions. In Jorgenson's theory, as in some of its predecessors, investment occurs as the firm attempts to adjust its actual capital stock to its desired level. Jorgenson's major theoretical contribution was to deduce from the profit-maximizing conditions a precise functional form for the desired stock of capital and its precise dependence on factor prices, the rate of depreciation and tax rates. In most of Jorgenson's articles desired capital, K_t^* , is equal to:

$$K_t^* = \frac{a p_t Q_t}{c_t},$$

where p_t is the product price (at time t), Q_t is expected output, c_t is the "rental price of capital" and "a" is a constant derived from the assumed Cobb-Douglas production function, the elasticity of output with respect to capital. The rental price of capital, c_t , is in turn a function of the price of capital goods and its rate of change, the cost of capital or the rate of interest, the depreciation rate and various tax rates.

Given the desired stock of capital, investment is viewed as a gradual adjustment of actual capital to that desired level --

a modified version of the flexible accelerator introduced by Chenery (1952).^{12/} A second source of progress has been the development of more sophisticated procedures for estimating the above adjustment process -- the polynomial and rational distributed lag estimation procedures of Almon (1965) and Jorgenson (1966).

These developments have improved the explanatory and forecasting ability of investment functions. Bischoff (1971a), Jorgenson and Siebert (1968) and Jorgenson, Hunter and Nadiri (1970) have compared the neoclassical investment functions in various ways with the existing alternatives and have concluded that the neoclassical function outperforms its competitors. In particular, the neoclassical model has been tested against the simple accelerator model (where desired capital is assumed to be a constant times expected output), liquidity and cash flow models first suggested by Meyer and Kuh (1957), securities valuation models where desired capital is assumed to be proportional to the market value of the firm, and combinations of the three. Many types of tests have been performed: comparison of standard errors of the residuals and multiple correlation coefficients within the sample period; comparison of the sign and significance of estimated coefficients with those predicted; the relative ability to predict turning points; and the relative forecasting ability outside the sample period. In virtually every case some form of the neoclassical model outperformed the alternatives.

C. Controversies and Unsettled Questions Concerning the Neoclassical Investment Function

Despite the empirical successes of investment functions derived from the neoclassical model, much controversy and many unsettled questions remain.

Most of the advocates of growth maximization, behavioral theories, and other non-tradition approaches are still unconvinced by the evidence supporting the neoclassical investment function. For one thing, none of the empirical results specifically reject the alternative of growth maximization; as we discussed above, the article of Williamson (1966) implies that it will be difficult to distinguish between these two alternatives on the basis of tests of investment behavior alone.^{13/} Moreover, there are enough arbitrary elements in the present formulation of the neoclassical investment model that it is easily argued that the supporting empirical evidence is slight confirmation of profit maximization. The use of output or sales as an independent variable in most neoclassical investment functions is hard to justify and raises the complaint that the new functions are really little different from the old flexible accelerator. The failure to relate the distributed lag structure of the model to profit maximization is a second fundamental objection. Finally, the obvious unreality of the assumptions of perfect competition and perfect certainty provide an easy mark for critics maintaining that the neoclassical model says little about firm behavior in the real world.

The validity of these objections is acknowledged by many of the supporters of the neoclassical model. Undoubtedly they hope --

not without evidentiary support -- that the relaxation of the arbitrary assumptions will be possible without the jettisoning of the underlying theory of profit maximization.^{14/} In any case, these and other questions are as much the subject of debate and research within the neoclassical school as without.

One of the most important unsettled questions, and an area where future research on the multinational firm is most likely to make a contribution, is the place of liquidity or cash flow variables in the investment function -- in addition to the other neoclassical variables. This is intimately related to the basic question of whether there is any simultaneity in the determination of real investment, the cost of capital and the financial plan of the firm.^{15/} In a recent survey, Jorgenson (1971) concludes that there is no evidence that supply-of-funds variables have any marginal impact on investment. The evidence he cites suggests at best a small impact of such factors relative to sales and price variables, but it is claiming too much, I think, to say no impact.^{16/} In any case, Jorgenson concludes that all the evidence supports the proposition first stated by Modigliani and Miller (1958) that the firm's cost of capital and investment are independent of sources of finance. However, two types of evidence call this conclusion into question. First, a number of other, recent, studies by Coen (1971) and Klein and Taubman (1971) support both empirically and, to some extent, theoretically the dependence of investment on the supply of internally-generated funds. Second, it seems to be the general opinion in the financial field that the real world is not a Modigliani-Miller world. All agree -- including Modigliani and

Miller (1966) -- that the deductability of interest for tax purposes should imply a preference for debt over equity or retained earnings. On the other hand, other costs, such as those that may be associated with bankruptcy or the flotation of external sources of finance may push the corporation away from debt finance. These considerations imply that the value of the firm is not independent of the sources of finance.

Although few seem to accept the original Modigliani-Miller propositions, entirely open questions are the precise determinants of the firm's optimal financial plan, its relation to the cost of capital, and the interdependence between the optimal financial plan, the cost of capital, and investment in fixed and other assets.

All of this of course affects the choice of investment function for plant and equipment. It also affects the explanation and prediction of the firm's sources of finance. This latter is a relatively neglected area of the theory of the firm but one, which we will see below, is extremely important for studies of the multinational corporation.

In summary, the present state of investment theory seems to be one where considerable progress has been made in the past decade on linking empirical work to theory and improving the explanatory and forecasting ability of empirical investment functions. However, the reigning champion, the neoclassical theory, is under attack from all directions, both from without and within, from those who feel the whole idea of value or profit maximization is wrong and from those

who object to particular parts of any given neoclassical model. This is not just an academic debate, devoid of practical consequences.

Although it might be argued that we are getting fairly adequate short run forecasts of investment,^{17/} empirical investment functions are not developed to a level where we can adequately predict the impact of new or proposed policies.^{18/}

III. IMPLICATIONS OF THE GROWTH OF THE MULTINATIONAL FIRM FOR THE DETERMINANTS OF FIXED INVESTMENT

The purpose of this section is to determine what the growing importance the multinational firm implies, if anything, for the theory or empirical analysis of investment.

Until now, the analysis of domestic investment has progressed in isolation from considerations of the internationalization of production. What interaction there has been, has, in fact, been one way: international researchers borrowing from the domestic. However, there has been much done on the multinational firm which is quite independent of any domestic influence.

Do any of our results concerned with the international operations of the firm compel changes in investment theory or its applications? My conclusion from what follows below is: no, not yet. The reason is the same as that used to defend, in the preceding section, the continued reliance on the neoclassical investment model: in order to replace a theory you have to demonstrate that you can do its job better with something else. If the goal is explaining past data or forecasting, no alternatives or additions to the neoclassical model suggested by studying the multinational enterprise have been proved superior to what we already have. This assertion holds for data at all levels of aggregation. Further, I would argue that no other goals have been seriously defended.

However, I also feel that there are some findings based on the study of foreign investment that may, with further verification, prove important. Some of these findings suggest new factors to be taken into account, generally, in investment functions; others support one side or the other in important debates discussed in section II above.

In this section, the discussion will be organized around the following questions:

- (1) the implications of research on the real and financial investment of the multinational firm for the firm's objective function;
- (2) the application of standard neoclassical models to the multinational firm;
- (3) the incorporation of variables specific to international activities into the neoclassical model;
- (4) the possibility of interactions between domestic and foreign real investment expenditures;
- (5) the explanation of investment in new subsidiaries, in addition to the explanation of the expansion of existing subsidiaries;
- (6) the possibility of oligopolistic interdependencies.

The succeeding section will cover, in less detail, the implications of multinational operations for the theory of corporate finance.

A. The Objective Function of the Multinational Firm

The argument of section II was that, despite considerable controversy over the basic objectives of the firm, virtually all empirically verified investment functions (that have been deduced from any theory of the firm) have, in fact, come from the neoclassical theory. Many, many researchers on the international operations of the firm have had something to say on the firm's objective function and, therefore, directly or by implication on the theory of investment. Some of these findings give quite unusual pictures of how multinational firms behave -- differing, not only from the neoclassical profit-maximization theory, but also from all the other theories discussed above. It is time, I think, to attempt to catalog these disparate theories, to try to assess their significance and their implications for the theory of investment.

Table 1 is my attempt to categorize the most important studies I have read that say something about the multinational firm's objective function or investment policies. My general interpretation is that both the majority of researchers and the weight of the evidence support the maintenance of the profit-maximization theory. But that is the conclusion to a long story. In what follows the focus will be on the dissenters from profit maximization. These are the ones to concentrate on, it seems to me, if we are to determine whether research on the multinational firm tells us anything new.

TABLE 1

STUDIES ON THE INVESTMENT AND FINANCING
DECISIONS OF THE MULTINATIONAL FIRM

Name	Theories Supported ^{2/}	Decisions Studied	Type of Evidence
Aharoni (1966)	Behavioral	Location	Interviews
Aliber (1971)	Profit Maximization	Location	Relies on Other Studies and General Knowledge (O.S.+G.K.)
Balassa (1966)	Profit Max.;	Location	O.S. and G.K. ^{1/}
Bandera and White (1968)	Profit Max.	Flow of Direct Investment (financial)	Regression: macro data
Barlow and Wender (1955)	Behavioral and "Gambler's" Earnings	Location; Finance	Interviews
Behrman (1962)	Profit Max.; Growth	Finance	Interviews
Behrman (1969)	Growth; Profit Max.	Real Investment, Finance: location	Interviews; macro and micro data
Berlin (1971)	Profit Max.;	Finance; Real Investment	Regression: micro (Office of Foreign Direct Investments)
Billsborrow (1968)	Profit Max.;	Plant and equipment	Regression: micro (Colombian Subsidiaries)
Brash (1966)	Profit Max.;	Location; finance	Interviews and micro data (Australia)
Carlson (1969)	Profit Max. - subject to risk constraints	Finance	O.S. and G.K. ^{1/}
Caves (1971)	Profit Max. - oligopoly factors emphasized	Location	O.S. and G.K. ^{1/}
Horst (1972a)	Profit Max.	Location	Regression: macro
Horst (1972b)	Profit Max.	Location	Regression: macro

TABLE 1
(cont.)

Name	Theories Supported	Decisions Studied	Type of Evidence
Horst (1972b)	Profit Max.	Location	Regression: micro (Harvard project and Compustat)
Hymer (1960)	Profit Max.-oligopoly factors emphasized	Location	Macro and micro data (company reports)
Hymer and Rowthorn (1971)	Market Share and growth	Comparative growth of U.S. and European Multinationals	Micro: Regressions and other tests (Fortune Magazine)
Johns (1967)	Profit Max.	Flow of direct investment (financial)	Macro by industry (Australia)
Kindleberger (1969)	Profit Max.	Location and other decisions	O.S. and G.K. ^{1/}
Knickerbocker (1972)	Oligopolistic Matching of Investments	Location	Micro: Regression and other tests (Harvard project)
Kopits (1972)	Profit Max.	Repatriated Dividends	Regression: Macro
Kwack (1971)	Profit Max. and Risk Minimization	Flow of Direct Investment; other financial and real flows	Regression: Macro
Miller and Weigel (1971)	Behavioral and Profit Max.	Location	Discriminant Analysis: Macro (Brazil)
Moose (1968)	Profit Max.	Plant and equipment, Dividends, net capital outflow	Regression: Macro
Morley (1966)	Profit Max.	Flow of direct investment (financial)	Regression: macro
Penrose (1956)	Elements of Behavioral, profit max., growth	Real and Financial Investment	General knowledge and Australian data

TABLE 1
(cont.)

Name	Theories Supported	Decisions Studied	Type of Evidence
Polk, Meister and Veit (1966)	Profit Max.	Location; expansion	Interviews; macro
Popkin (1965)	Profit Max.-under uncertainty	Location	Regression: micro (company reports)
Prachowny (1969)	Profit Max.	Flow of Direct Investment (financial)	Regression: macro
Prachowny (1972)	Portfolio theory	Ratio of Value of Direct Investment to Value of U.S. shares	Regression: macro
Reuber (1973)	Profit Max.	Location; other decisions	Interviews; micro data
Rhomberg (1968)	Profit Max.	Balance-of-payments flows	Regression: macro
Richardson (1971)	Profit Max.	Location and expansion	O.S. and G.K. $\frac{1}{/}$
Rolf (1969)	Profit Max.	Location; finance, etc.	O.S. and G.K. $\frac{1}{/}$
Ruckdeschel (1971)	Profit Max.?	Net capital outflow	Regression: macro
Scaperlanda and Mauer (1969)	Profit Max.	Flow of direct investment	Regression: macro
Severn (1972)	Profit Max.	Finance: net financial flow; plant and equip. abroad and in U.S.	Regression: micro (Office of Business Economics)
Spitaller (1971)	Profit Max.	Financial and Real Investment	Relied on Other Studies
Stevens (1969a)	Profit Max.	Plant and Equipment	Regression: micro (Office of Business Economics)
Stevens (1969b)	Portfolio Theory and Profit Max.	Flow of direct investment	Regression: macro

TABLE 1
(cont.)

Name	Theories Supported	Decisions Studied	Type of Evidence
Stevens (1972)	Profit Max. and Risk Minimization	Plant and equipment; balance-of-payments flows	Regression: macro
Stobaugh (1970)	Profit Max.	Finance	Interview; micro data and statistical tests
Stonehill (1965)	Profit Max.	Flow of direct investment	Interview; micro and macro data (Norway)
Stubenitsky (1970)	Growth or Sales Max.	Location; others	Interview; micro (Netherlands)
Vernon (1971)	Profit Max. ?	Location	Macro; micro (Harvard project)
Wolf (1971)	Profit Max. ?	Location	Regression: macro

1/ "O.S. and G.K." means; relies on data provided in other studies and on general knowledge.

2/ Appearing in the column "Theory(ies) supported" is my interpretation of what the author claimed; if the former is not explicit, I have entered my interpretation of what his data or discussion implied.

The evidence presented by the authors listed in Table 1 is of many different kinds, and directed to a variety of questions. Much of the evidence is based on interviews with the officials of multinational corporations. Some of the interviews are supplemented with statistical data from company records;^{19/} but this is relatively rare.^{20/} An increasing number of studies rely wholly on statistical data and statistical techniques such as multiple regression analysis -- therefore similar in method to the majority of studies of domestic investment. A perusal of the results shows that this type of study has been hampered by the great difficulties experienced in obtaining suitable statistical data. I will have more to say on this problem in section V.

Evidence on the international firm's objective function comes from studies whose goals vary as widely as the sources of evidence they use. A very few attempted to study directly the plant and equipment expenditures of foreign subsidiaries or the multinational firm as a whole.^{21/} Others were interested not so much in real investment, but in financial flows such as the flow of direct investment or the net capital outflow and repatriated dividends that affect the balance of payments.^{22/} Still others have not concentrated on any particular dependent variables, but rather the location of investment.^{23/} As such, they have focused not so much on the determination of the firm's optimal capital stock abroad or its change through time, but on how this capital stock is to be divided between production operations

at home and abroad. Of primary interest for most of these studies were differences in costs or returns, which, because of factor markets or market structure, make it more profitable to locate abroad in one form or another. The distinction between location and other studies is significant in another sense; as we saw above, the two major contending theories of the firm, profit-maximization and growth maximization, both imply that a given level of output should be produced at a minimum cost. Therefore, the above locational evidence cannot be used to distinguish between these two theories -- although it can be used to distinguish them from other alternatives.

The few remaining studies included in Table 1 cover a wide range of subjects, including the many effects of foreign direct investment on the host country. Some of these comment on the objective function of the multinational firm only in passing.

1. Non-Profit Maximization Theories: Growth and Market Shares.

Of those who seem to reject profit maximization, six studies fall into a class distinguished by the hypothesis that the firm's objective function is different from that of the standard neoclassical firm. This class can be distinguished from another, similar, one where profits are maximized subject to constraints imposed by the internationalization of production. In the first class we put theories suggested in Behrman (1969), Hymer and Rowthorn (1970), Stubenitsky (1970), Aharoni (1966), Stevens (1969a) and Prachowny (1972). The first four

are based on ideas that already have been at least suggested by the growth maximizers and the behaviorists. The last two strike a somewhat new note by applying the theory of portfolio selection to the international firm.

Behrman (1969), in his most recent study, arrives at a theory of international investment that is founded on the growth maximization hypothesis discussed in the domestic literature. He concludes: "In sum, the primary stimulus that causes business to expand abroad is the desire for growth."^{24/} Stubenitsky (1970), in a similar vein, opts for the goal of growth or sales maximization subject to a profit constraint.^{25/}

Both authors arrive at their conclusions by means of two types of evidence. The first is derived from interviews of business executives. The second is empirical evidence that they claim disproves the profit maximization hypothesis: the refutation of the oft-state theory that the flow of direct investment is a function of the difference between rates of return in alternative locations. Both of these arguments come up time after time in the literature, so their careful consideration is important.

What can be said about the impact of the interview data? I consider it slight. First, for every corporate executive responding "growth," there is at least one other saying "profits:" Behrman's earlier interview work (1962) demonstrates that. Second, in reaching his conclusion that growth motives predominate, Behrman misinterpretes the thrust of some of his responses. What several companies do, he

states, is "pay little attention to differences in potential rates of profit among domestic and foreign opportunities; if the foreign project is likely to earn above a given percentage, we consider it; if it is below, we do not."^{26/} If the given percentage mentioned is equal to the firm's market-determined cost of capital, this is the profit-maximization theory. Third, the motivational testimony for growth maximization is unsupported by any corroborating empirical evidence. We will see below that virtually all the empirical evidence on international investment, like that on domestic investment, supports the traditional neoclassical model. Such evidence does not refute growth maximization, but, being derived from the assumption of profit maximization, certainly cannot be used to disprove this latter.

The second line of argument used by Behrman and Stubenitsky against the theory of profit maximization is that there is much empirical evidence against the interest-differential theory of direct investment. This is true,^{27/} but it is a fact long known in international research. The interest or profit-differential theory is a carry-over from the theory of portfolio capital movements^{28/} and is by means identical to the profit-maximization theory of investment developed by Jorgenson and others. In this latter formulation, the flow of real or (possibly) financial investment is hypothesized to be positively related to the difference between the desired capital stock and actual capital; but it is not always or usually possible to express this as a function of the difference in observed profit rates abroad and at home. The simplest counter-example is the case where the foreign profit rate is

higher than the domestic while both are less than the firm's opportunity cost of capital. The neoclassical theory would say that no investment should occur in either location, whereas the profit-differential theory would say a positive flow of foreign investment should be the result. A major reason why the profit-differential theory may fail, as the example shows, is that observed profit rates need not equal required or expected rates. This is particularly likely for international investment, where Hymer (1960), Vernon (1971) and others have argued persuasively that many investors possess technological or other monopolistic advantages which make their expected returns quite different from any observed average.^{29/}

In sum, it is my conclusion that the evidence adduced in support of growth maximization as the primary impetus for international investment is weak. It is, in fact, much weaker than that produced by Marris (1964) and Grabowski and Mueller (1972) for domestic investment; so it is inconceivable that, as the situation stands today, the evidence from international operations could compel any change in the general theory of investment.^{30/}

2. Non-Profit Maximization Theories: Behavioral Theories

Aharoni (1966) argues against the profit maximization model and, further, maintains that the cause of the failure of profit maximization is closely related to the internationalization of the firm. More recently, Weigel (1967) and Miller and Weigel (1971) have

developed and tested a related model, linking it more closely to the behavioral theory of Cyert and March (1963).

Here I shall argue against the position that the Aharoni study establishes any novel relationships between firm investment and the internationalization of production. My position is that (1) much of his evidence is consistent with profit maximization under uncertainty and (2) although some evidence may not be, the behavior uncovered is not peculiar to international operations.^{31/} Rather, as stated by Miller and Weigel and even Aharoni near the end of his book, the Aharoni evidence falls well within the behavioral model of Cyert and March. Under this interpretation, no new hypotheses are needed to explain or predict the behavior of the multinational firm. What are needed are adequate tests of the behavioral model against the neoclassical -- a problem that has faced investment theory for at least a decade.

Aharoni's hypotheses relate to the decision to make a new investment, not the expansion of existing operations. He stresses at least three phenomena in this process which he finds are contrary to profit maximization:

(1) The search for new foreign investments seems biased. Many firms don't scan the environment, looking for profitable opportunities. Rather, they tend to investigate an opportunity only when some outside forces impels them to -- e.g. an adverse action taken by a foreign government against existing export operations or an unsolicited proposal from a respected source.^{32/}

(2) When search is undertaken, the result of the company's investigation is almost always that the risks are less than previously anticipated. Aharoni suggests that this happens mainly because the highest executives, lacking information about conditions in foreign countries have a tendency toward pessimism -- over-estimating risks and under-estimating expected returns from foreign investment.^{33/}

(3) Great emphasis is put on what is called the process of commitment. By this Aharoni maintains that past expenditures of time and money are improperly considered in answering the question: Will it be profitable to proceed? Sunk costs are improperly considered in calculations of marginal profitability. In addition, some people push certain undesirable projects, because their goals are different from the firm's.^{34/}

As Aharoni himself recognizes, and Miller and Weigel elaborate, much of what he says fits in nicely with the behavioral theories of Simon (1957) and Cyert and March (1963). This is true for the first point and the last part of the third.

Further, it is possible to interpret much of the substance of these three points as consistent with the maximization of the value of the firm under uncertainty -- and thus, conclude that, the behavioral theory isn't really that different from profit maximization under uncertainty. If the risk-adjusted expected returns from search are

less than the costs, then it does not pay to invest in search. Costs of search may be particularly high for small companies, who do not have access to established and low-cost sources of information; this may be especially true for proposed projects in foreign countries. Also, there are likely to be decreasing costs of search per unit of investment, as the proposed scale of the investment increases. Thus it may be profitable for all but the largest firms to eschew the search for foreign investments unless some favorable information arises without cost, such as from an unsolicited proposal. This may explain the findings of Horst (1972) and Wolf (1971) that, all other things equal, firm size is strongly related to whether a firm has foreign subsidiaries. Miller and Weigel (1971) have made the only attempt to test a model incorporating the behavioral hypothesis that there are biases against search. In their study of U.S. direct investment projects in Brazil, they found no evidence to support their biased-search hypotheses.

Finally, with respect to his third point, Aharoni may have missed the possibility that many of his interviewees were merely saying that previous fixed costs have substantially lowered the proposed investment's marginal costs, making it profitable on the margin. One of Aharoni's examples, that he claims shows an irrational commitment, is a company's decision to invest abroad to protect an export market, even though the country was a place where it would not invest "under normal conditions". But -- assuming that the past export activities

had built up a following for the company's product -- an investment given this "good will" might be profitable, even though an investment in the country without this prior history of exporting would be rejected as unprofitable. Throughout his discussion, I think Aharoni forgets that past costs may reduce present and future costs.

However, it would be intellectually dishonest to argue that all of Aharoni's findings are more-probably-than-not the result of profit-maximizing behavior. His statements and examples about employee utility functions differing from the firm's sometimes seem plausible and fit in with evidence from domestic studies. His finding that management's expectations of returns and risks before search are biased away from investment, is hard to reconcile with a profit theory. This suggests, I might add, a theory implying under-investment relative to profit maximization: the opposite to the case of growth maximization. There might be some relation between this over-estimation of risks and the internationalization of production; the foreign location of the proposed operation, where little prior information may be available, seems to be an important factor. This might be a fruitful line for further research. However, the finding certainly is not well enough grounded in observed fact or well enough developed theoretically to compel us to dispense with the neoclassical theory.^{35/}

It also should be noted that bizarre behavior in the selection of new investment projects is fairly well documented in the domestic sphere.^{36/} But this sort of evidence -- again

mainly from interviews -- has not led to a reformulation of the domestic investment models, because the new models have not beaten the traditional ones in explaining and predicting investment spending.

3. Non-Profit Maximization Theories: Portfolio Theory and Risk.

Recently, at least two researchers, Prachowny (1972) and Stevens (1969b), have attempted to make the theory of direct investment more realistic by adopting a model which explicitly incorporates uncertainty. Both authors used the Markowitz-Tobin portfolio model to suggest the form of the firm's objective function.^{37/} In so doing, they assumed that the multinational firm chooses investments so as to maximize a utility function positively related to the expected return and negatively related to the variance of the firm's portfolio of investments. Such a theory leads to relationships of the following kind: in equilibrium, the optimal ratio of capital in any two locations (K_i/K_j) will be equal to the following expression in the expected returns of the two assets (e_i, e_j), their variances or risks (v_i, v_j) and the riskless rate of interest, r^* : ^{38/}

$$\frac{K_i}{K_j} = \frac{(e_i - r^*)v_j}{(e_j - r^*)v_i}$$

Both authors attempted to test the theory empirically. The results were decidedly mixed. Prachowny claimed vindication for his model, but, in fact, the significance of the crucial risk terms as explanatory variables of direct investment was questionable: when

appearing alone (without being multiplied by other variables) the risk variables were always insignificant; when appearing in combination with other variables the risk variables were occasionally part of significant products, but here it is unclear whether the risk factors contributed to this significance. In empirical work limited to direct investment to Latin America, Stevens found aggregate investment to Latin America significantly (negatively) related to the variance of past profits, as the theory implies; however, when regressions were disaggregated by country, the portfolio model was outperformed by a simple flexible accelerator model.

What neither author did was consider the relationship, if any, between their portfolio models and profit-maximization models under uncertainty. As applied in these papers, the portfolio model represents another example of a non-profit-maximization theory. The managers of the firm are assumed to maximize a utility function of a specific kind, but no link is forged between the managerial goals, represented by the utility function, and stockholder desires. The natural inference is that the managers are running the firm for their own benefit. Under such an interpretation, it is natural for managers to want to avoid risk: in order to avoid bankruptcy and the loss of their jobs.^{39/}

It turns out, however, that a modified version of the above model can be made consistent with the maximization of the market value of the firm. Lintner (1965) and Sharpe (1964) have shown that the

behavior of individual investors according to the portfolio model implies, through the equations for market equilibrium, an equation for the value of each firm. Managers following the neoclassical goal of maximizing the value of the firm should choose their investments so as to maximize that equation. The Lintner-Sharpe equation indicates that the value of every firm is an increasing function of the expected return of its assets and a negative function -- via the market price of risk -- of the total risk of the return; this total risk is the sum of the variances and covariances of the returns from the firm's investment plus the sum of the covariances between the returns of the firm's assets and all other assets in the market. This approach introduces risk explicitly into the firm's objective function, preserves all the other benefits of a direct application of portfolio theory, and maintains its consistency with the neoclassical theory of the firm.

The incorporation of risk into investment functions is in its infancy, both domestically and internationally. No conclusions, firm or tentative, can be ventured as to its importance for positive economics: However, this is an area that will see considerable work in the next few years, and, because risk seems particularly important in international operations, we might expect researchers on the international aspects of investment to be close to the theoretical and empirical frontiers.

4. Do International Operations Cause Constraints on the Firm's Objective Function?

Perhaps the multinational firm does try to maximize its market value, but, because of peculiarities introduced by international operations, this maximization is subjected to constraints. A series of constraints, particularly related to sources of funds, has been hypothesized by Barlow and Wender (1955), Penrose (1956), and Behrman (1969). In general these studies pose the important question of whether finance moves more-or-less without friction within the multinational firm or whether, because of psychological inertia or real costs such as taxes, certain locations are given preference over others.

On one extreme, Barlow and Wender (1955) postulated that the expansion of already-established subsidiaries is financed exclusively out of these subsidiaries' retained earnings.^{40/} Their explanation was that the foreign earnings of the multinational firm were looked at as "gambling earnings" -- you kept playing until you won big or completely lost your stake.^{41/}

If this hypothesis were true, it would indeed suggest that the multinationalization of the firm's operations changes its investment behavior. However, we do have some independent tests of the hypothesis and every one rejects the idea that a subsidiary's expansion is limited to its retained earnings. First, all empirical test of investment functions using disaggregated or aggregated data support some form of the traditional neoclassical or flexible accelerator model and not the Barlow-Wender thesis.^{42/}

Further, Stevens (1969a) examined the behavior of a sample of firms that corresponded exactly to the population for which the Barlow-Wender hypothesis is supposed to hold: a sample of 71 well-established subsidiaries. In no sense was it true that the expansion of these subsidiaries was financed only by retained earnings. For a large percentage of the subsidiaries in any given year (1959-62) there were large capital outflows from the U.S. parent. Using the value of the subsidiary's plant and equipment expenditure as a rough measure of its financial needs for expansion, outflows from the United States averaged, depending on the year, from 6 percent to 24 percent of total expansion requirements, an average of 14 percent for the whole period. Moreover, for more than 20 percent of the observations, capital outflows from the United States were greater than the reverse flow of dividends from the subsidiary to the parent.

In addition, it was not possible to detect any tendency for the subsidiaries' fixed investment expenditures to be determined by its own retained earnings -- as, for example, Penrose (1956) has hypothesized.

Stobaugh (1970) has suggested that the type of thesis advanced by Barlow and Wender, Penrose and others may not be totally wrong: it may hold for small subsidiaries where it is presumably quite costly to have coordination of parent and subsidiary activities. In his detailed interviews, Stobaugh found that parent companies with total worldwide sales of 50 million dollars or less were significantly (but not totally) less willing to invest additional funds once a subsidiary

had been started. Such a distinction might save part of the gambler's earnings hypothesis, although (1) its quantitative significance is agreed to be virtually nil and (2) as revised by Stobaugh, it is perfectly compatible with profit maximization; costs of decision-making are so high that it is optimal for the multinational firm to operate with the picturesque decision rule: "every tub on its own botton."

In Behrman's book (1969) we find a different financial constraint. Foreign investment opportunities are supposedly accepted "only if there are sufficient funds for these and all attractive domestic projects."^{43/} This suggests a step-wise maximization model of some kind, with total investment, foreign plus domestic, subject to some kind of a financial constraint, and domestic projects getting the first slice of the pie.

A number of empirical studies have assumed some sort of financial constraints on the international firm;^{44/} however, none have found that domestic investment was predetermined with respect to foreign. On the micro level, Severn (1972) came closest to testing the Behrman idea directly, including the value of domestic investment in some of his foreign plant and equipment equations; the sign of the variable was positive and significant -- contrary to that hypothesized by Behrman. Stevens (1967) did not test the hypothesis directly, but rejected other "partial" maximization models concluding that, at the micro level, a supply constraint did exist, but that no location was given precedence.

With respect to the general question of financial constraints, a number of recent empirical studies with data at the firm or subsidiary level, have found that variables reflecting the internal financial resources of the firm are significantly related to some form of foreign investment expenditure.^{45/} This suggests the existence of some sort of financial constraint or its near-equivalent: a cost-of-capital function which increases as the firm moves from internal to external sources of funds.

B. Neoclassical Investment Models and the Multinational Firm:
Alternative Assumptions and Variables

One conclusion of the last section must be that research on the multinational firm has not substantially supported theories of investment that reject profit maximization. Although certain results that seem inconsistent with profit maximization were discussed, it was argued that they certainly do not compel a reformulation of the standard neoclassical theory of investment.

What about the studies of the multinational firm that assume the traditional model, that the firm maximizes its profit or market value? Do they support one particular version of neoclassical investment function, and thus throw some light on the controversies discussed in section II? Do they suggest a change in the set of independent variables to explain real investment? Do they suggest

changes in certain assumptions, while still remaining within the class of neoclassical investment functions?

1. Standard Investment Functions Applied to Plant and Equipment Investment of Foreign Subsidiaries and/or the Flow of Direct Investment,

The great majority of the studies that have empirically tested investment models of foreign investment have attempted to apply directly Jorgenson's neoclassical model or simpler models related to early versions of the flexible accelerator. In this category fall the works of Bandera and White (1968), Billsborrow (1968), Kopits (1972), Kwack (1971), Moose (1968), Morley (1966), Scaperlanda and Mauer (1969), Severn (1972), Stevens (1967, 1969a, 1972). Let us reiterate that, as discussed in section II, the important independent variables in the neoclassical model have been:

- (1) a series of contemporaneous and lagged output or sales terms.
- (2) the rental price of capital, composed of the price of capital goods and its rate of change, the cost of capital (some interest rate or stock yield), the rate of depreciation of the capital stock, and various tax rates.
- (3) measures of the real capital stock.
- (4) more controversially, measures of internal funds, capacity utilization and measures of future profits.

In applying this model without conceptual alteration to international investment, most studies have adopted as the dependent

variable some fairly aggregative measure of foreign plant and equipment expenditure by U.S. subsidiaries or the financial flow, the flow of direct investment. The degree of aggregation has frequently been at the level of the country or higher -- often a region or the whole world outside the United States. But there have been some studies at the micro level: Severn (1972), Stevens (1969a).

By far the strongest result has been the discovery that both of the above dependent variables are highly correlated with either the sales of U.S. foreign subsidiaries or some measure of total output for the area and industry in question. Unquestionably, the importance of the first set of factors in the neoclassical model has been confirmed. The sales term has proved statistically significant in every study that has used it. (See the list at the beginning of this section). When the models correctly incorporated the lagged capital stock term, this usually showed up with a significant (negative) coefficient, confirming the applicability of the early Chenery version of the flexible accelerator model.^{46/}

The independent variables which distinguish Jorgenson's neoclassical model from the early flexible accelerator are the price terms under (1) and (2) above. Some progress has been achieved in incorporating these terms into functions for foreign investment, notably by Kwack (1971) and Kopits (1972) -- although no tests have been presented by these authors that conclusively establish that

these price terms significantly contribute to the explanation of the dependent variable.^{47/} Kwack has incorporated the U.S. long term rate, a measure of capital gains, and the depreciation rate into the term for the rental cost of capital. The former was his measure of the U.S.-based firm's cost of capital. And Kopits, in a study explaining subsidiary dividends but based on the neoclassical investment model, has added U.S. and foreign corporate tax rates.

With respect to the more controversial variables in domestic investment functions, direct investment studies have frequently found that variables measuring the supply of external and internal funds are significant.^{48/} This is contrary to the conclusion recently reached by Jorgenson (1971), but, as mentioned above, is still a topic of debate.^{49/}

The conclusion to be drawn from these studies is, I think, that standard investment models and, to some extent, the neoclassical model of Jorgenson have been found to be the best explainers of plant and equipment expenditures abroad by multinational firms. As well, when linked to financial flows by simple assumptions, the standard investment models are the main part of the theory used to explain the flow of direct investment. This has been particularly true of studies done at the aggregative level. In the majority of cases, researchers have followed the developments in domestic theory and applications; because of this and data limitations, their work has been on a level

more elementary than the most recent domestic studies. Below we will consider some aspects of the work of foreign investment that has been less derivative in nature.

2. Additional Independent Variables

The studies cited in the preceding section in the main followed a very simple, albeit fruitful, strategy: take a domestic investment function; substitute an appropriate foreign variable for the domestic one and estimate the coefficients. We will see below that there should be and, probably, is more to it than that. However, most of our statistical results have come from following the above strategy.

In the process, a number of potentially important factors have so far been neglected by the empiricists. These are all factors which can affect foreign profits via costs or returns and can be worked fairly easily into the neoclassical investment model. As such they do not change the basic profit-maximization model, only the independent variables. No mention was made in the previous section of tariffs, exchange rates or "investment climate"; and only brief mention was made of foreign tax systems. It is tempting to assert that these are the variables that capture the essence of the distinction between foreign and domestic investment. In some sense, by definition, the two types of investment are different only because the foreign location is under the jurisdiction of a different political authority; a different government plus the often concomitant differences in legal,

commercial and cultural relations is what investors call a different "investment climate." In almost all cases political differences are combined with a different currency system.

All our interview evidence tells us that tariffs, the exchange-rate system (its stability and the degree of exchange control) and the investment climate are of paramount importance in the determination of foreign investment.^{50/} So far, however, we have very little statistical evidence of the impact on the multinational firm of exchange rates and political factors and conflicting evidence on the impact of tariffs.^{51/}

Given a neoclassical model, especially one incorporating uncertainty, it is quite possible to show theoretically how the expected values and risks attached to exchange rates and well-defined political factors affect the market value of the multinational firm.^{52/} However, it does seem difficult to relate the theoretical constructs to usable empirical data. This is partly a problem of data inadequacy, but also the old problem of capturing an ex ante concept with data that are necessarily ex post. Consider, for example, how one should go about measuring the market's assessment of the expected value and variance of a devaluation in any recent exchange crisis.

Testing for the impact of foreign tax systems, and, even, foreign wages, interest rates, and capital goods prices are similarly neglected projects. Kopits (1972) has made a start on taxes, but

little has been done on the other variables.

3. Interactions Between Domestic and Foreign Investment?

In testing their versions of profit-maximization theories, Severn (1972) and Stevens (1969a) found that foreign plant and equipment expenditures were a function of domestic profits and depreciation flows. This is just one example of an empirically verified interdependence between domestic and foreign variables. If foreign investment is affected by domestic variables, then it is natural to expect the same with respect to domestic investment. So far, in domestic investment studies, no such interactions have been considered.

Under what theoretical conditions might we expect such interactions, and what evidence do we have of their significance? There are a number of theoretical possibilities -- some of which cut in different directions. In general, interdependencies require that certain marginal costs or returns are affected by firm decision variables (such as investment).

On the financial side, if the firm's cost of capital is constant -- independent of the sources of funds -- then the interdependencies observed above cannot exist. When, however, the firm puts a lower opportunity cost on internal as opposed to external funds, or the cost of capital becomes a function of the debt-equity ratio, then an additional unit of investment in one location tends to raise the cost of capital and, thereby, lower investment in other locations.

Production interrelations can cause the opposite effect. If foreign subsidiaries use components manufactured in the United States, then increases in foreign demand stimulate both foreign investment and domestic investment for the production of components. However, if the increase in demand causes the establishment of a new plant abroad to produce the components, domestic investment will be lowered.

A third type of interdependence can occur when risk is introduced into the theory of the firm, as was the case in Prachowny (1972) and Stevens (1969b) above. Where variance is used as the measure of risk, each new unit of investment affects the marginal risk of every other unit of investment. This is because of the covariance terms which form an important part of the overall risk of the firm's portfolio of investments. A new unit of investment in one location adds to the overall variance both its own variance and the sum of its covariances with every other investment; these added covariance terms also change the marginal contribution of each other investment to the overall variance. Depending on whether the added covariances are positive or negative, the new investment will tend to decrease or increase the level of old investments.

Empirical evidence on these interdependencies is just beginning to come in. Severn and Stevens^{53/} have shown that foreign investment decisions are affected by the following domestic variables: domestic cash flow (both), domestic sales (Stevens), the overall debt/equity ratio (Severn) and domestic plant and equipment expenditure

(Severn). Severn has gone farther and attempted to test whether domestic investment is indeed affected by foreign operations. He found that foreign profits definitely affected domestic investment, but foreign demand or observed investment seemed to have little effect. These interdependencies seemed to result from financial causes, and were observed using firm-level data. No work has been completed that estimates the macro-economic significance, if any, of the financial interdependence. Nor has any empirical work explored the significance of production or risk interdependencies.

4. New Versus Expansionary Investment

In lifting models from studies of domestic investment, researchers have also managed to forget or submerge important distinctions between types of foreign investment. One important distinction is between expenditures for plant and equipment for new subsidiaries and for the expansion of established subsidiaries.

In all empirical studies of domestic investment the firm is assumed to have one production function and one price at which it can buy each factor of production. For a significant, although not precisely known, percentage of direct investment expenditures such assumptions do not hold -- expenditures on the assets of newly established subsidiaries. In many, if not all, cases of investment in new subsidiaries, the decision is the result of the maximization of profits given the opportunity to produce in at least two locations, the United States and one or more countries abroad. Clearly, in

a neoclassical model, the choice of production at home or abroad will be determined by a comparison of alternative costs of producing relevant levels of output. Depending on whether there are increasing, constant or decreasing marginal costs of production, the optimal solution may be to divide production for both markets between the two areas or produce everything in one. Given the production function, the optimal amount of capital located abroad will be a positive (non-negative) function of U.S. costs of production, transportation costs, foreign import tariffs and a negative (non-positive) function of foreign costs of production.^{54/} At some point foreign production may dominate U.S. production for all relevant levels of demand in the foreign (and/or U.S.) market; in this case the problem simplifies to the application of the standard neoclassical model, using only the foreign production function and factor costs.^{55/}

So far no one has incorporated this locational choice problem into any of the empirical models meant to explain aggregative investment. Much theoretical and interview work has been done on the various determinants for this location choice.^{56/} A small amount of cross-section work by Horst (1972a, 1972b) and Wolf (1971) and time series by Miller and Weigel (1971) has attempted to empirically verify some of the theoretical hypotheses.

Of the statistical studies both Horst and Wolf found that the choice between foreign production and exporting in an industry was affected by firm size: the larger the firm the more likely it is to produce abroad. This is probably the result of the large set-up

costs necessary to start a foreign subsidiary. Wolf also found the decision to be related positively to industry profitability.

Only Horst, Miller and Weigel, and Scaperlanda and Mauer have attempted to test for factors related to costs and the production function. Horst (1972a) found that the level of tariff rates for Canada and the United Kingdom was significantly related to the share of exports in the total of U.S. sales to those markets. However, in a separate study at the firm level (1972b), he found no relationship between tariffs and industries that are important foreign investors. Miller and Weigel (1971) found that tariff rates did not explain industry difference in the frequency of new investments for Brazil, 1956-61. Scaperlanda and Mauer (1969) found that their proxy for barriers to trade had no effect on the flow of direct investment to the E.E.C.

Horst (1972b) also found that the size of the market tends to encourage foreign investment relative to exports and that the average plant size tends to discourage it -- both factors attempting to measure the impact of economies of scale on the choice of location.

Most economists think that cost and production function variables are important determinants of the choice of exporting from the United States or producing abroad. If the annual investment flows caused by the shift from exporting to foreign production are quantitatively important, then these variables should be included in investment functions: at least those functions explaining foreign investment and, possibly, also those explaining domestic investment.

5. Oligopolistic Interdependencies

Studies of domestic investment have generally ignored the market structure of the sectors, industries or firms whose investment they have sought to explain.^{57/} Even when the industry has had very few sellers, all empirical models have assumed no interdependence between the investment decisions of rival firms.

Monopoly and oligopoly factors have frequently been emphasized as determinants of foreign investment behavior. Can we say that these factors should be taken into account as determinants of investment?

Following Hymer (1960), many authors have asserted that foreign investment presupposes some degree of monopoly advantage; firms entering a new foreign market, it is argued, must have some advantages over local firms in order to overcome the disadvantages that they have in being forced to operate in a new environment. Such advantages do not necessarily imply oligopolistic interdependencies, however. The advantages could be related to anything from the possession of technical knowledge to the services of an especially good manager, neither of which need be related to a particular market structure. However, the fact that most foreign investment is done by large firms in concentrated industries suggests that such interdependencies might be important.

Hymer (1960) has argued that the phenomenon of cross investment -- firms in the same industry, but headquartered in different

countries, investing in each other's country -- can be explained as a reaction in an oligopolistic market. Further, it has been widely suggested that firms in a given industry often match each other's foreign investment decisions. Finally, Caves (1971) has argued that much foreign investment that serves to vertically integrate a firm is often the result of oligopolistic market structure.

The first two of these arguments, in particular, might be important in explaining investment over time, in addition to the equilibrium composition of investment at a moment of time.

Little work has been done to verify these hypothesis or measure their quantitative significance for foreign investment. Recently, however, in an imaginative Ph.D. thesis, F.T. Knickerbocker (1972) has attempted to test the importance of the second hypothesis mentioned above: that oligopolists imitate each other in entering new foreign markets. Knickerbocker found evidence that entries by U.S. firms into foreign markets were bunched in time -- more so than could be expected by chance. He found that his measures of bunching were significantly correlated with U.S. industry concentration indices, suggesting a relation to oligopolistic interdependence. However, he also found that the bunching measures were strongly correlated with the profitability of foreign investment in the industry in question. It seems to me, therefore, that it is too early to rule out the hypothesis that the bunching was merely the result of businesses responding -- independently -- to profitable opportunities.^{58/} Horst

(1972b) provides some empirical support to Cave's hypothesis about the causes of vertical integration. In his cross-section study he found that for natural resource industries, differences in foreign investment potential were positively affected by the level of concentration.

IV. THE MULTINATIONAL FIRM AND THE FINANCIAL THEORY OF THE FIRM

The gist of the argument in section II was that, despite the advances sparked by Modigliani and Miller (1958), little is really known, theoretically or empirically, about the determinants of the firm's financial structure. Theoretically, work has really just begun on trying to explain the determinants of the firm's optimal financial structure, while at the same time preserving the theoretical rigor introduced by Modigliani and Miller.^{59/} Empirically, we have little tested knowledge. Two of the better known empirical studies are Anderson (1964) and Goldfeld (1969). Although definite steps forward, these are primitive when compared to recent work in the field of fixed investment. Theoretically, both are built on shaky, if not non-existent, foundations; neither, in fact, incorporates the prevalent belief that there exists an optimal financial structure for the profit-maximizing firm.

The fact of the existence of an optimal financial plan for the neoclassical firm -- if it is indeed a fact -- should be good news for the students of multinational business. Many of the variables that policy-makers find most important to explain and forecast are financial flows: all of those that affect the balance of payments -- notably the flow of direct investment and the net capital outflow -- fall into this class. That these financial flows may be determined by profit-maximization considerations is good news and, we might note, quite contrary to Modigliani and Miller's original position.

Given the importance of the above financial flows, one might have expected research on the multinational firm to have contributed much to the solution of the general problems in the theory and empirical study of corporate finance. Once again, however, the contribution has been fairly small.

There has been considerable work describing what firms do and some telling what firms should do.^{60/} As far as I can tell, almost all of the descriptive work is based on interviews and anecdotes; without more, they possess the serious flaws that we have no way of telling whether the behavior documented is widespread or isolated or whether the hypotheses suggested serve to explain the statistical data available at the macro and micro levels. As far as I can tell, the theoretical work is even less sophisticated than that in the domestic field, most of it not even showing an awareness of the problems posed by Modigliani and Miller.

A few studies have begun to appear which attempt to explain observed data on the financial flows of the multinational corporation.^{61/} They have made some headway in a number of areas: (1) sorting out the relationships among the various financial and real flows that affect the multinational firm -- primarily definitional ones and those caused by the firm's balance sheet identity; (2) obtaining fairly good statistical results in

explaining some financial flows. Ruckdeschel (1971) has linked total net capital outflow (for all industries) with total corporate cash flow of U.S. corporations. Severn (1972) explores a model which makes the net financial flow to foreign subsidiaries a function of foreign and domestic variables (profits and fixed investment expenditures). Stevens (1972), indirectly, deduced an equation for the flow of direct investment from a model for foreign borrowing; it was hypothesized that foreign subsidiaries borrow funds denominated in foreign currencies primarily to minimize the risk of losses caused by exchange rate changes. This hypothesis was tested further by Kwack (1971) and Berlin (1971) with successful results.

Although these studies have been steps forward in the study of the multinational firm, it would be impossible to claim that they compel any changes in the general area of corporate finance. None of the above studies attacks the problem of the firm's optimal capital structure in any systematic way. Some of them do identify possibly fruitful hypotheses concerning the determinants of international financial flows, but, in all cases, I would say that the hypotheses are tentative at best and await much more extensive testing and theoretical development.

V. SUMMARY AND RECOMMENDATIONS

A. Summary

My conclusion is that the growing importance of the multinational firm does not yet compel any changes in the way we now conduct the theoretical or empirical analysis of investment. Although no changes are imperative at present, in a number of areas the results of further research may require some modifications of the financial and real investment functions we now use.

In the past twenty years a number of studies have concluded that the investment behavior of the multinational firm cannot be described by the profit-maximization model. This paper has examined studies suggesting that the objectives and behavior of such firms correspond to: (1) growth maximization; (2) the realm of so-called behavioral theories; (3) profit maximization or other behavior subjected to financial constraints; (4) portfolio theories of the Markowitz variety. After considering the evidence for and against these theories, my conclusion was that there was not sufficient evidence to support the jettisoning of profit-maximization; in fact, very little evidence supports the alternatives. It is my conclusion that less convincing evidence has been raised against profit-maximization in studies of the multinational firm than already has been raised in purely domestic studies; yet, we saw in section II, that, for a number of good reasons, profit-maximization theories continue to be in the ascendancy in the study of domestic investment.

Most progress in the explanation of the fixed investment of foreign subsidiaries has come from applying to international operations investment functions borrowed from studies of domestic investment. It is quite possible that future research on the multinational firm will suggest the addition of new variables to these functions, variables such as exchange-rate changes and risks, that serve to capture the essence of the distinction between domestic and foreign operations. It is also possible that research on the multinational firm will suggest changes in domestic investment functions, while retaining the underlying rationale of profit-maximization; it was suggested that we may have to build in interaction effects between domestic and foreign investment, effects caused by common financial constraints and/or the shift of production from the United States to foreign subsidiaries.

In a brief discussion of studies of the financial, as opposed to the real, aspects of foreign investment, I concluded that not enough had been done either theoretically or empirically to suggest any implications for the theory of corporate finance.

B. Research and Data Requirements

If nothing more, the preceding discussion has established that there are innumerable questions remaining to be answered concerning the impact of the multinational firm on the theory and

empirical analysis of investment. Here I will try to say what is required in the way of research to answer them. But two other questions are probably more important: Is it possible to do the required research? If so, is it a worthwhile thing to do?

The last question asks us to stop a moment and put this field of inquiry into perspective. I think it is worthwhile to further test hypotheses on the relationship between the multinational firm and the determinants of real and financial investment, because this is a necessary step toward the achievement of the most important goals in the study of the multinational firm. Because we are sure that the activities of multinational firms affect many of the most important goals of every nation--for example, economic growth and distribution, balance-of-payments equilibrium, national independence--we want to be able to explain, predict and control the key variables associated with these activities. As was at least adumbrated in preceding sections, some of the problems preventing this are theoretical. It is my feeling, however, that the major roadblocks will be empirical--in the realm of data availability.

1. Required Research

Assuming for the moment that data limitations will be overcome, what will be the most fruitful research in order to develop the required equations for the investment of multinational firms?

The evidence reviewed in section III implied to me that past advances in the explanation of real investment have come primarily by applying domestic investment models, especially those related to the neoclassical theory, to international investment. I cautioned that there are special problems with international investment that cannot be solved with the application of purely domestic models; but, despite these limitations, there is much that should be done in perfecting the application of the domestic model.

For openers, we should begin to test the forecasting records of the models that seem to explain past flows well. The shortness of existing time series limited this in the past, but in the fairly near future this problem should be partly remedied as far as U.S. data are concerned. This step should help us to rank the models that all tend to explain the past data well.

Next, within the neoclassical model, much remains to be done theoretically and empirically on testing for the impact of cost, price and tax factors. A theoretical question that has not been adequately solved is: just what should we use as the cost of capital for a multinational firm, borrowing and lending in many markets, that may be owned by shareholders residing in many different countries?

Assuming the data become available, much remains to be done in estimating the structure of the distributed lags between multinational investment flows and the independent variables causing them;

this seems to have had a big payoff in explaining and predicting domestic investment.

The above, traditional questions of domestic investment analysis are fairly easy to handle conceptually, because we can follow the lead of domestic researchers. Somewhat more difficult will be the solving of problems that are unique to studies of international investment. But when I survey the problems discussed in section III, the solution of the theoretical problem, at least, should not be impossible to come by. We have discussed the problem of incorporating factors that are peculiar to international operations. Some are just added costs such as tariffs and transportation costs, that can be easily incorporated into the firm's profit function. Others such as exchange-rate changes and certain political factors can likewise be incorporated, but the proper consideration of these factors may also require the explicit introduction of decision-making under uncertainty. But this is no cause for gloom; much progress has been and will be made in this field.

Other important questions take us farther away from the traditional theory. The problems with the theory of corporate finance were discussed at length in section II and IV; theoretical and empirical breakthroughs are necessary if we are to properly understand the determination of the important flows that finance asset changes. But there is such interest in this area, by researchers interested in both domestic and international applications,

that I expect major progress on the questions in the next five years.

Related to both financial theory and cost theory, are the questions concerning the possible interactions between domestic and foreign investment. The development of the theory of corporate finance is necessary to the explanation of those interactions that have already been detected on the financial side. A standard application of cost minimization may provide all the theory we need to explain the shift from producing at home for export to producing abroad, another possible cause of interaction between domestic and foreign investment. If so, there may still be imposing problems in actually predicting and explaining such shifts, but they will probably be related to more empirical questions such as the timing of such shifts.

2. Data Problems

If our problems were only theoretical, I would confidently predict that the gap in the level of sophistication and predictive accuracy between studies of domestic and international investment would be eliminated in five years. In fact I am rather pessimistic about rapid progress in explaining, predicting and controlling direct investment. The inadequacy of the data base has been the major reason for the slow progress in the past; although there have been signs of improvement, there are many reasons for continued pessimism.

There are three major types of data that can be used in studies of foreign investment: data on the foreign operations of multinational firms; data on the domestic operations of these firms; data on conditions within the home and host countries. There are fundamental problems in the quality of the data and its availability in each of these areas. It would take and would merit an essay to do justice to this subject. What follows is only a sketch of some of the problems.

Data on Foreign Operations. For multinational firms based in the United States a fairly wide range of data is collected on the operations of U.S. foreign subsidiaries; for the purposes of explaining real and financial investment important data are: sales by subsidiary, fixed investment spending, sources and uses of finance, trade flows, and balance sheet and income statement data. One problem is that, except for the flows that enter the balance of payments, these variables have been collected only since 1957 and only on an annual basis.

I think it was a rare act of foresight to begin collecting data such as the sources and uses of funds of foreign subsidiaries fifteen years ago. However, fifteen observations is just getting to be a series of decent length for any purpose. Unfortunately, some important variables, such as borrowing from foreign financial institutions, have been adequately reported only for the last few years. And some, such as accounts payable, has never been broken out.

Although we can expect improvement in our results based on these longer annual time series, it should be noted that most of the recent advances in the field of domestic investment have been made using quarterly data. Domestic studies of plant and equipment spending have usually found that from 12 to 15 or more independent variables are required to explain the dependent variable satisfactorily,^{62/} It is questionable if we can ever predict plant and equipment spending as well using annual data as we can using quarterly. This is due partly to the number of observations available with quarterly data and partly to the choice of a period of observation that corresponds in length to the period over which investment plans are left unchanged. I am not now advocating a move to quarterly data collection; but I think that the question should be seriously studied -- along with the more general one of choosing the optimal period of observation for each important variable.

However, there are institutional reasons that suggest that it will be difficult to obtain important variables more frequently than at present. Except during an infrequent Census of Foreign Direct Investments, the data on plant and equipment spending and sources and uses of funds are reported on a voluntary basis. Such voluntary reporting probably causes unnecessary and unknown errors in the aggregates because, frequently, firms -- often important ones -- drop in and out of the sample. More important, it would probably be impossible to get quarterly or more often reporting, and still run the sampling on

a voluntary basis. However, it is not a simple step to collect these data on a mandatory basis; the existing statutory mandate -- the Bretton Woods Agreement -- permits mandatory reporting for balance-of-payments purposes; some people, at least, doubt that plant and equipment spending, sources and uses of funds and the like can fit under this rubric. But without these data there will be no explaining of the balance-of-payments flows.

In addition to these problems, there are omissions in the data base that make it inferior to domestic data. All the data collected is in value terms; there is no direct way to separate real from money changes in sales, plant and equipment spending, etc. For financial decisions, we have no data on the interest rates or terms being paid by foreign subsidiaries; we have no knowledge of the currencies in which the subsidiaries' liquid balances or other assets are denominated.

Domestic Data. In order to study the interaction between foreign and domestic operations, we need data corresponding to both of these divisions of the firms activities. On the aggregative level, at the 2-digit S.I.C. industry level data on purely domestic variables probably can be obtained from diverse sources, although these have never yet been used in direct investment research. But because the data are aggregates they are limited by the 15 or fewer observations obtainable for foreign activities.

Very little data on U.S. domestic operations are available at the level of the firm. Even with the use of the confidential foreign

operations data collected by the Department of Commerce, domestic data can only be obtained as a residual after a laborious process of eliminating foreign data from company consolidated figures.^{63/}

Thus the study of interactions is hampered on both levels: on the aggregate by the lack of observations; and on the micro level by the lack of usable domestic data.

Foreign Country Data. Much of the discussion of section III was devoted to subjects that linked conditions in the host country to foreign investment. Prices, factor costs, tariffs, transportation costs, taxes, exchange rates, and political factors all affect the location of investment and its growth. Some, but surprisingly little, of this sort of data is available in an accurate form on a time-series basis. A few examples from my own experience serve to show the difficulties. Although the obvious source of data on wage rates in foreign countries is the International Labor Office's Yearbook of Labour Statistics, I have been frequently warned that such data are no good; in fact the U.S. Bureau of Labor Statistics has expended considerable time and money creating what they think are accurate time series of wage rates -- for just a few European countries and for total manufacturing alone; if you want accurate wage rate data by industry or for any non-European countries, the problem seems insurmountable.

A second example relates to the availability of data on foreign tax rates. As far as I can tell, although a number of U.S. accounting firms keep track of foreign tax systems, there is no way to easily get a time-series of the important characteristics of foreign tax systems; I assume the countries, themselves, have the data; but to obtain it a major data collection effort is required. Finally, concerning the "investment climate", as far as I know, there is no government agency that keeps historical records on expropriations and other official actions against U.S. foreign investment.

If my assessment of the situation is correct, it will take a major effort of data collection to assemble the data required to study the impact of conditions in the host country in the activities of multinational firms.

For the above reasons, related exclusively to the unavailability of relevant data, I am pessimistic about achieving the satisfactory explanation and prediction of foreign investment flows in the near future. That is not to say things are not improving; they are: the time series are getting longer and some other positive steps have been taken. ^{64/} But all of the data problems discussed above remain; and they are not being solved.

Footnotes

- */ My thanks go to all the participants at the Bellagio Conference on the Multinational Firm (September, 1972) for their reading and discussion of this paper; my special thanks to George Borts and Sune Carlson, the principle discussants at the conference, John Dunning, Michael Adler, George Kopits, Grant Reuber, J. David Richardson, Alan Severn, Anthony Scaperlanda, Peter Tinsley, Louis Wells, and Dale Weigel, all of whom shared their detailed comments with me. The errors remaining are my responsibility alone, as are the opinions expressed. A version of this paper will appear in The Multinational Firm and Economic Analysis, edited by John Dunning.
- 1/ These figures are derived from a comparison of domestic plant and equipment spending from the OBE-SEC survey (see Survey of Current Business, January and February, 1970, and June 1972) with the figures for "plant and equipment expenditures by foreign affiliates of U.S. Corporations." (see Survey of Current Business, September 1970 and U.S. Department of Commerce, U.S. Business Investments in Foreign Countries, Washington, D.C.: U.S. Government Printing Office, 1960).
- 2/ In this essay I shall use the words "multinational firm" and "international firm" interchangeably; by the use of "international firm" I will mean only a firm with fixed assets in more than one country. In what follows I have not needed to distinguish among international firms according to their outlooks or the nature of their shareholders.
- 3/ For a detailed discussion of the definitions of these and other financial and real flows, see Stevens (1972).
- 4/ See Thomas Horst's chapter in this volume for a more detailed discussion of the issues raised in this section.
- 5/ See Jorgenson (1963), Jorgenson and Stephenson (1967), Jorgenson and Siebert (1968) and Bishoff (1971a, 1971b).
- 6/ That is to say the firm should maximize: $\int_0^{\infty} CF(t)e^{-rt} dt$. A typical expression for cash flow (CF) at time t, where taxes are neglected, is: $CF(t) = pQ - wL - qI$, where pQ is total revenues, wL is labor payments, qI is payments for new capital goods; r is the firm's discount rate.
- 7/ See, for example, Marris (1964) or O. Williamson (1964).
- 8/ This theory is usually associated with the names of Simon (1957) and Cyert and March (1963). For a good description of a representative model, see Cohen and Cyert (1965).

9/ See, e.g., Baumol and Stewart (1971).

10/ For example, Cohen and Cyert (1965), pp. 335-338.

11/ See Fromm (1971).

12/ In Jorgenson's work the lagged adjustment of actual capital to the desired level has not been justified with the same rigor as the determinants of the desired stock of capital. Jorgenson justified the lagged adjustment as the result of technologically determined lags between plans, appropriations, and construction. However, following Eisner and Strotz (1963), it has been quite possible to justify lagged adjustment within the profit maximization framework.

13/ It is my opinion that the burden of proof should be on the advocates of the non-traditional theories; no science allows a currently accepted theory to be replaced without substantial evidence that the replacement is superior.

14/ In a recent paper Gould and Waud (1970) have, with seeming success, substituted for the output term in the investment function its determinants in terms of output and factor prices. Vigorous research is also progressing on the subject of the lag structure between investment and its determinants; building on the work of Eisner and Strotz (1963), there has been considerable theoretical progress made in relating the lag structure to internal and external costs and, thus, to profit maximization. [See Nerlove (1972)]. Work is also going forward on the effects of uncertainty on the lag structure [Tinsley (1970b)] as well as the general study of the incorporation of uncertainty into the theory of the firm. [See Sandmo (1971) and Stevens (1973)].

15/ Related and equally important is the question of the simultaneity of the determination of fixed investment and the firm's investment in other assets: cash, inventories, receivables and so forth. For recent work in this area see Nadiri and Rosen (1969) and Craine (1971).

16/ See, e.g., his Table 1.

17/ See, e.g., Bishoff (1971a).

18/ This is clearly demonstrated in Fromm (1971).

19/ See, e.g., Brash (1966) and Reuber (1973).

20/ In assessing the worth of interview studies, I am mindful of the critical arguments made by Machlup (1946) and Eisner (1956) against this type of evidence. Although I share those authors' s skepticism about the usefulness of much interview evidence, no one, I think, can convincingly argue that it is always useless. In this essay I have tried to take all evidence, from whatever source, at face value -- disputing findings only on the basis of counter-evidence or logical inconsistency. This, of course, means that all conflicts will not be resolved.

21/ See Berlin (1971), Billsborrow (1968), Moose (1968), Severn (1972), Stevens (1967, 1969a, 1972).

22/ Before giving the list of references of those who have studied the above mentioned variables, it may be useful to reiterate what is meant by the terms "flow of direct investment" and "net capital outflow." By the flow of direct I mean the change in the U.S. ownership position -- or the change in the U.S. net worth -- in U.S.-controlled foreign branches and affiliates; the stock corresponding to this flow is called by the U.S. Department of Commerce the value of direct investments abroad. The flow of direct investment is broken up by the U.S. Department of Commerce into the U.S. share of retained earnings of foreign affiliates and the net capital outflow; only the last of these enters the U.S. balance of payments. For a more detailed discussion, see Stevens (1972).

For studies of the above and related financial flows see Aliber (1971), Bandera and White (1968), Kopits (1972), Kwack (1971), Morley (1966), Moose (1968), Prachowny (1972), Rhomberg (1968), Ruckdeschel (1971), Scaperlanda and Mauer (1969), Stevens (1972).

23/ See Aliber (1971), Aharoni (1966), Barlow and Wender (1955), Brash (1966), Caves (1971), Horst (1972a, 1972b), Hymer (1960), Kindleberger (1969), Knickerbocker (1972), Vernon (1971), Wolf (1971), Miller and Weigel (1971).

24/ Behrman (1969), p. 9.

25/ Stubenitsky (1970), p. 8.

26/ Behrman (1969), p. 8.

27/ See Hymer (1960), Morley (1966) and Spitaller (1971).

28/ See, e.g., Iverson (1935).

29/ I do think it would be useful to try to establish just why it is that profit-rate specifications of the investment function do not work as well as forms related to the accelerator or neoclassical model.

30/ Hymer and Rowthorn (1971) suggest, probably just in passing, that the primary firm objective is the maintenance of its market share (pp. 72, 80). This does not form an important part of their argument and no empirical evidence is offered in its support. In any case, the hypothesis again is not new, being prominent in the domestic behavioral literature. [See Cohen and Cyert (1965)].

31/ One should also not forget that Aharoni is generalizing from a very limited and probably unrepresentative sample -- 38 firms who had considered an investment in Israel. My argument in the text does not take up this point, but I also feel that it would be folly to make any decisions on the basis of this theory without much more work to formulate its testable implications and to carry out these tests on a more representative sample.

32/ See, Aharoni (1966), Chapter 3.

33/ Ibid., p. 99

34/ See Chapter 5.

- 35/ Even if the lack of knowledge of foreign countries was an important deterrent in the past, we would expect this condition to be progressively less important in the future. On this, see Aharoni's discussion of the institutionalization of data gathering on foreign investment opportunities caused by the wide-spread creation of international divisions.
- 36/ See, e.g., Cannon (1968).
- 37/ See Markowitz (1959) and Tobin (1958).
- 38/ See, e.g. Hicks (1962), Appendix. The formula in the text assumes that the covariances between returns in all areas are zero; non-zero covariances complicate the formula somewhat, but leave all principles unchanged.
- 39/ The avoidance of risk is not of course generally synonymous with the avoidance of bankruptcy; there must be a one-to-one relationship between increasing risk (say, variance) and an increasing probability of negative returns below a certain critical point; if the probability distribution of profits is normal, as is assumed by the Markowitz-Tobin model, the necessary relationship exists.
- 40/ At one time, (Stevens 1969a), I identified Mrs. Penrose's position in her 1965 article with Barlow and Wender's thesis of exclusive financing by retained earnings. After talking with her on this point and rereading her article, I see now that she did not take such an extreme position. To explain the phenomena she was interested in, such as the possibility that the expansion of a foreign subsidiary will continue even after the rate of return of the affiliate falls below the rate of return in the home country, only a tendency to finance out of retained earnings is required, not exclusive financing out of retained earnings. Of course, it is much harder to test this sort of hypothesis than it is to test Barlow and Wender's. Up to the present time I do not think we have established empirically whether multinational firms have a lower cost of capital for expansion out of subsidiary retained earnings than for expansion financed by capital flows from the home country.

41/ Barlow and Wender (1955), p. xxlv.

42/ See Kwack (1971), Moose (1968), Severn (1972) and Stevens (1972).

43/ Behrman (1969), p. 4.

44/ Stevens (1967) and (1969a), Severn (1972).

45/ Stevens (1969a) and Severn (1972). For aggregate evidence see Kwack (1971).

46/ Kopits (1972), Kwack (1971), Stevens (1972).

47/ This is a problem that has beset researchers applying the model to domestic investment; since price and output terms almost always appear in combination, it is difficult to test for the significance of each separately. See Eisner and Nadiri (1968).

48/ See Kwack (1971), Moose (1968), Ruckdeschel (1971), Severn (1972) and Stevens (1967, 1969a).

49/ Consider, for example the arguments of Klein and Taubman (1971).

50/ See, e.g., Barlow and Wender (1955), p. 132 and Aharoni (1966), p. 93.

51/ See Billsborrow (1968), Stevens (1969b), Horst (1972a, 1972b), Miller and Weigel (1971), and Scaperlanda and Mauer (1969).

52/ Stevens (1969b, 1971).

53/ Severn (1972), Stevens (1967, 1969a).

54/ Here, I am implicitly assuming that there will be no foreign production for the U.S. market. If that is allowed then U.S. tariffs will be an additional independent variable and the sign of the effect of transportation costs may change.

55/ The distinction between the usual one-location model and the more general one can, I think, be expressed mathematically as follows: For normal investment and production decisions (without any inter-temporal effects) we maximize one-period profits ($pQ - cK - wL$) in the following framework:

Max: $pQ - cK - wL$, with respect to Q, K, L ;

subject to: $Q = f(K, L)$

$$Q \geq 0; K \geq 0; L \geq 0.$$

As usual: p = product price, Q = output, K = the input of capital services, L = labor input, c = the rental price of capital, w = the wage rate, $f(\)$ = the production function.

Since sales and production are in one location in the previous, normal problem, there is no need for locational subscripts. However, in the international location problem, we have i and j subscripts for each variable, to denote whether it refers to the home or foreign location. The problem becomes:

$$\text{Max: } p_i Q_i + p_j Q_j - c_i K_i - w_i L_i - c_j K_j - w_j L_j,$$

with respect to $Q_i, Q_j, K_i, K_j, L_i, L_j$;

$$\text{subject to } Q_i + Q_j = f_i(K_i, L_i) + f_j(K_j, L_j)$$

$$Q_i, Q_j, f_i(\), f_j(\) \geq 0$$

$$L_i, L_j, K_i, K_j \geq 0$$

Note: no longer must production in any area be equal to output sold in that area.

56/ See Barlow and Wender (1955), Caves (1971), Horst (1972b), Richardson (1972), Wilkins (1970).

57/ For an exception see Scherer (1969).

58/ In a recent conversation, Professor Knickerbocher suggests that he pretty well covers this objection on pp. 162-163 of the published version of his thesis.

59/ See, e.g., Baumol and Malkiel (1967) and Tinsley (1970a).

60/ See e.g., Brash (1966), Carlson (1969), Falcon (1965), Stobaugh (1970).

61/ Berlin (1971), Hui and Hawkins (1972), Krainer (1972), Ladenson (1972), Moose (1968), Ruckdeschel (1972), Severn (1972), Stevens (1972).

62/ See, e.g., Bishoff (1971b).

63/ See, on this, Stevens (1967), Appendix B. The situation has been improved somewhat by the collection in the 1966 and 1970 Censuses of Direct Investments of a limited amount of data on the U.S. operations of the parent firms. This is a real step forward.

64/ The Bureau of Economic Analysis (formerly called the Office of Business Economics) is in the process of establishing a computerized data system, the goal of which is to permit outside and inside researchers to have rapid access to the macro and micro-economic data on the operations of U.S. foreign affiliates -- while at the same time maintaining the confidentiality of the micro-economic data.

The Office of Foreign Direct Investments, set up within the Department of Commerce primarily to administer the U.S. balance-of-payments program, has collected data since its birth on a wide range of activities of our multinational firms. The Office has sought to stimulate research on the explanation and prediction of the capital flows associated with the foreign operations of U.S. firms, and has cooperated with outside researchers in providing the necessary data.

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