FOREIGN OPERATIONS AND THE STABILITY OF U.S. CORPORATE EARNINGS: RISK REDUCTION BY INTERNATIONAL DIVERSIFICATION

by

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ABSTRACT

FOREIGN OPERATIONS AND THE STABILITY OF U.S. CORPORATE EARNINGS: RISK REDUCTION BY INTERNATIONAL DIVERSIFICATION

The theory of portfolio selection under conditions of uncertainty as developed by Tobin and Markowitz has been applied to the international sector in recent years. It has been demonstrated on both theoretical and empirical grounds that it is possible for individual asset holders to reduce risk by holding a portfolio of internationally diversified assets. This thesis extends such work by considering the benefits from international diversification through foreign operations of firms, rather than portfolio investment by individuals.

On a theoretical level it is shown that a multinational firm will provide greater benefits to its shareholders than will a comparable firm which has few foreign operations. This is because individual investors are concerned about the risk of their earnings as well as the expected rate of return. In an international setting it may not be possible for investors to achieve portfolio diversification themselves, especially if there are institutional, or other, barriers to the free flow of financial capital. Instead, such investors can purchase the shares of multinational corporations and thereby enjoy the benefits of international diversification.

The theoretical model develops the argument that the stability of a firm's earnings is an increasing function of the degree of foreign operations, ceteris paribus. Foreign operations are defined as sales by overseas subsidiaries plus exports from the parent corporation. The benefits from international diversification originate from sales of goods to, or within, foreign countries whose economic fluctuations are less than perfectly positively correlated with the fluctuations in the home country.

The empirical investigation uses the theoretically specified model to test the hypothesis that variance of earnings is inversely related to foreign operations (F/T). Other independent variables are size of the firm and dummies for industry classification. Data on alternative measures of size, and on industry classification, for the five hundred largest mining and manufacturing corporations in the United States in 1965 are recorded from Fortune listings. The (F/T) variable in 1965 for each of these firms has been calculated in studies by Bruck and Lees, and their data are used in the tests. Rates of return for each corporation are recorded for the 1960-69 period, and variances of these profit rates are calculated in order to provide a risk measure, used as the dependent variable in the regressions. The regression results support the hypothesis that (F/T) is negatively related to variance of profits, and this relationship is statist-

ically significant. The other specified independent variables perform as expected.

Several implications arise from these results. First, the portfolio theory and capital asset pricing models can be modified successfully to take account of direct investment. Second, the (F/T) ratio is an important new analytical variable affecting risk in an international context. Third, as the benefits of international diversification are enjoyed by multinational firms and their shareholders, national governments in both the home and host countries may wish to take notice of this previously unrealized gain from international trade. Finally, recognition of the role of multinational corporations as international diversifiers, along with their increasing importance, may eventually lead to greater integration of world capital markets.

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CHAPTER ONE - INTRODUCTION

This thesis analyzes the foreign operations of firms in a setting of uncertainty. The importance of this contribution stems from the fact that today foreign investment is a major political and economic issue. An inflow of foreign capital is no longer unquestionably regarded as a beneficial contributor to growth of a country's gross national product. Instead individuals and political parties are adopting increasingly nationalistic stands which are critical of foreign investment. Direct foreign investment involves control over the capital invested and fears arise as to the political power which may be exerted by large multinational firms with foreign subsidiaries in many countries.

It has been argued[1] that modern economic growth is dependent upon technological innovations which are usually undertaken by large corporations because of their ability to accumulate capital and management skills. These large corporations are frequently multinational in character. In the post-war world the United States increased its importance mainly because of the rapid growth of such large corporations.

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1. Especially by J.J. Servan-Schreiber, Le Défi Américain, (Paris: Editions de Noël, 1967) and The American Challenge, (London: Hamish Hamilton. 1968).

There is a danger that Europe may be reduced to a secondary role unless measures are taken to create bigger European corporations using advanced technology. [2]

As the political debate over foreign investment is concerned with control it is important to distinguish between portfolio and direct investment. Portfolio investment involves a financial capital flow between countries, for example, in the form of a bond with the investor retaining no control over the use of his funds. On the other hand direct investment allows the investor to retain control over the asset and is therefore usually in the form of equity holdings. While the distinction between portfolio and direct investment is made on the basis of control, the definition of control itself is somewhat arbitrary. The Canadian practice is that if the majority of a firm's voting shares are foreign owned then the purchase of a share by a non-resident would be classified as long-term portfolio investment. In the United States the critical figure for control is ten per cent of the outstanding stocks of the firm, rather than fifty-one per cent.

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2. The argument that large size implies faster growth has been questioned by Rowthorn and Hymer. They show that in the post-war period the rate of growth of European and Japanese firms has been as good as, if not better than, American corporations. See Robert Rowthorn and Stephen Hymer, International Big Business 1957-1967: A Study of Comparative Growth, (Cambridge University Press, England, 1971).

In Canada and other countries public concern has increased because of a change from net long-term portfolio investment to direct investment. As the latter involves foreign ownership, it is more of a problem.[3] Many writers have been concerned with direct investment itself and the excessive percentage of foreign ownership in manufacturing and resource industries.[4] In Canada concern over foreign investment was expressed at an earlier stage, before the Servan-Schreiber book. The vital importance of foreign investment in Canada, and the policy recommendations of recent years, are reviewed in the Appendix to this chapter entitled "The Foreign Ownership Debate in Canada".

Direct investment is rather a new phenomenon because historically most international capital flows were in the form of portfolio investment. For example, British investment which helped finance early Canadian development was mostly in portfolio form.[5] Dunning reports that in 1914

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3. Statistics on the change from portfolio to direct investment can be found in Canada, Statistics Canada, Canada's International Investment Position 1926-1967 (Ottawa: Information Canada, 1971).

4. Kari Levitt, Silent Surrender (Toronto: Macmillan of Canada, 1970); Abraham Rotstein and Gary Lax (eds.), Independence: The Canadian Challenge(The Committee for an Independent Canada, Toronto, Ontario, 1972).

5. Brinley Thomas, "The Historical Record of International Capital Movements to 1913", in Capital Movements and Economic Development, edited by John H. Adler (London: Macmillan, 1967).

ninety per cent of all international capital movements were in portfolio form, but in the depression of the 1930's this proportion fell and although there has been a revival[6] of the international bond market in the 1960's by the end of that decade private portfolio investment accounted for only twenty per cent of all international capital movements. Most of the remaining eighty per cent was in the form of direct investment.[7] Classical trade theory explained international capital movements as being due to interest rate differentials. In the 1930's many nations repatriated their foreign investment and since then there has never been a free international capital market,[8] which would permit classical theory to explain capital flows. The multinational enterprise has therefore increased in importance since the 1930's sometimes relying on local financing but always demanding a specific type of investment involving control rather than the more general financial portfolio investment.

Given the widespread public concern over direct investment the problem is to analyze the motives for such foreign investment and to reconcile such economic analysis with the

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6. Richard N. Cooper "Towards an International Capital Market?", in C. P. Kindleberger and A. Schonfield (eds.), North American and Western European Economic Policies (Macmillan , 1971.

7. John H. Dunning, Studies in International Investment (London: Allan and Unwin 1970) pp. 1-4.

8. " Since 1930 there has never been a free international capital market, nor have interest rates been solely the outcome of market forces". See John H. Dunning ibid. p. 3.

political and economic views frequently expressed. In this respect this thesis introduces uncertainty as a new variable in the explanation of the determinants of direct investment by United States corporations.

This thesis:

(a) Offers an introduction to the topic and places the hypothesis in perspective (Chapter One).

(b) Reviews existing theories of the motivating of foreign investment, suggests a synthesis of these, and links the modern theory of foreign investment (which emphasized market imperfections) to a portfolio theory explanation of the operations of multinational firms (Chapter Two).

(c) Formally introduces uncertainty as a motive for direct investment and develops equations suitable for empirical testing (Chapter Three).

(d) Tests empirically the relevance of uncertainty as a motive for the foreign operations of large U.S. corporations, while giving attention to other factors influencing instability of the stream of profits of such firms (Chapter Four and Five).

(e) Summarizes the findings and advances policy implications (Chapter Six).

The main argument of the thesis is briefly presented in the remainder of this introductory chapter. It rests for the most part on the theory of portfolio selection under conditions of uncertainty as developed by Tobin and Markowitz. Their powerful explanatory model was first applied to the international sector by Herbert G. Grubel.[9] His work demonstrates that it is possible for individual asset holders to reduce risk by holding a portfolio of efficiently diversified international assets, a conclusion which has been confirmed by later writers.[10] While the analysis by Grubel considers financial capital flows it is possible to extend the portfolio theory model to a consideration of non-financial capital flows, that is direct investment.

It is hypothesized that American firms with a large proportion of foreign operations will experience more stable

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9. Herbert G. Grubel, "Internationally Diversified Portfolios: Welfare Gains and Capital Flows," American Economic Review, (December 1968) pp. 1299-1314.

10. Norman C. Miller and Marina V.N. Whitman, "A Mean-Variance Analysis of United States Long-Term Portfolio Foreign Investment, "Quarterly Journal of Economics (May 1970), pp. 175-196; Haim Levy and Marshall Sarnat, "International Diversification of Investment Portfolios," American Economic Review, (September 1970),pp.668-675; Herbert G. Grubel and Kenneth Fadner, "The Interdependence of International Equity Markets," Journal of Finance, (March 1971), pp. 89-94.

earnings than comparable firms selling mostly on the domestic market. More specifically, stability of earnings through time is hypothesized to be an increasing function of the ratio of foreign to total operations. Foreign operations are defined as sales by overseas subsidiaries plus exports from the United States parent company. Diversification takes place by selling goods abroad or by producing and selling goods within foreign countries. The economies of such foreign countries must be less than perfectly positively correlated with economic fluctuations of the United States economy. The valuation of a firm's shares depends not only on the level of profits but also on the stability of profits, indicating that if international diversification increases stability then the firm is better off. This may explain that although foreign investment may appear to yield similar (or even identical) returns to home investment, there remains an incentive for firms to engage in overseas investment.

Even writers on the large corporation, such as Galbraith, have ignored uncertainty.[11] His argument that the techno-structure and the military industrial complex are making decisions on a different basis from that indicated by

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11. John Kenneth Galbraith, The New Industrial Site (Boston: Houghton Mifflin, 1967).

competitive economic theory can be strengthened when consideration is given to the ability of corporations to reduce risk by diversified operations. These corporations also reduce risk by product diversification, and through their large size. They are still subject to the fluctuations of the domestic economy and the appropriate way to stabilize their profits is through area diversification.[12]

The hypothesis advanced is only one of many possible explanations of foreign investment. In the current literature there is no one theory on the determinants of foreign investment, although there are two main approaches.[13] The variable of major importance in the traditional financial theory is the interest rate while in the newer theory of non-financial direct investment the emphasis is upon monopoly elements and other market imperfections. Income is a measure of the market size in the host economy and is another determinant of direct investment. Such real variables are

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12. A recent book issued by the Harvard Business School multinational team reports on an intensive investigation of strategies of product and area diversification. See John M. Stopford and Louis T. Wells, Jr., Managing the Multinational Enterprise (New York: Basic Books, 1972).

13. See the contributions by Aliber, Pavitt and Dunning in John H. Dunning (ed) The Multinational Enterprise (New York: Praeger, 1972).

relevant as well as financial ones. Both approaches indicate that the profit rate is the major determinant of direct investment. A third explanation of foreign investment builds upon the theory of portfolio selection. Risk diversification has usually been ignored when considering foreign investment, but it is a factor which is worthy of attention.

The two-way movement of capital flows shows that firms (such as large American corporations) are concerned about the stability of their profits as well as the level of profits. Therefore there may be an incentive for these firms to invest in overseas markets in order to diversify and reduce such instability. A particular aspect of this theory is that at the same time firms in Europe, Canada, Japan and other countries may be simultaneously investing abroad (in the United States) for the same risk diversification reason. Therefore it is possible to explain the crossover of investment between countries - an important real world event which previous theories cannot fully explain.

Furthermore the reasons for foreign investment in ventures yielding the same rate of return as domestic investment can be explained. When there are approximately similar rates of return on home and overseas investment,[14] some other factor than profit level alone must be responsible for private foreign investment. This thesis argues that the motivation of foreign

investment is the ability of American firms to enjoy more stable profits.

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14. Returns may differ between countries. For example Safarian found that United States subsidiaries in Canada earned about the same profit rate as comparable domestic firms. See A. E. Safarian, Foreign Ownership of Canadian Industry (McGraw-Hill, Canada, 1966). On the other hand, Moyer found that the average profit of United States subsidiaries in Britain from 1950-1966 was 14.9 per cent, whereas the average profit of comparable British firms was 8.7 per cent. Although substantial, the American advantage was falling over the period examined and was less than in the early 1950's when American subsidiaries were earning double the profits of British firms. By the 1960's they were only earning one-third more. See Reed Moyer "The Performance of United States Operations in Britain" Journal of International Business Studies (Fall 1971) pp. 29-40. This has also been confirmed by John H. Dunning American Investment in the British Economy, p. 131.

CHAPTER TWO - MOTIVES FOR FOREIGN INVESTMENT

At the highest level of abstraction, foreign investment is motivated by an increase in the net worth of a firm by achieving a higher rate of return from marginal foreign investment than from domestic investment alone. This explanation of the motive for foreign investment assumes the existence of perfect competition, but such an assumption needs to be relaxed. In the real world there are many market imperfections, and managerial and technical advantages are available to foreign firms operating in the host economy. Furthermore the model cannot explain the two-way flow of investment. There must be some reason for both the inflow and outflow of capital observed between advanced industrial countries other than the traditional view that rates of return are higher abroad than at home. To understand the motivation of direct foreign investment a more realistic theory is required.

Why does foreign investment take place in the form of direct investment rather than as a flow of capital in the international capital market? One reason suggested is that direct investment can be better explained by the theory of industrial organization rather than by the pure theory of international trade. According to this approach direct investment is motivated by market imperfections which permit the multinational firm to exploit in foreign markets a monopoly advantage which it has acquired in its domestic

environment. Kindleberger[1] has summarized this point as follows:

> "For direct investment to thrive there must be some imperfection in markets for goods or factors including among the latter technology, or some interference in competition by government or by firms, which separates markets."

The monopoly advantage may be one of four types. First, there may be an advantage in the goods market, such as product differentiation, unique marketing skills, or some collusion in pricing. Secondly, the advantage may be in the factor market, such as a technique protected by patents, special management skills, or discrimination in access to capital markets. Thirdly, there may be internal and/or external economies of scale available to the multinational firm. The latter can involve either vertical integration or horizontal integration, where horizontal integration takes place in order to sell goods in the host country market. Fourthly, government policy itself may bring about an imperfect market, for example, government regulations may limit output of the firm or entry to an industry. Taxation policies may influence costs of production and either encourage or discourage multinational firms.

Direct investment will not occur simply due to

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1. Charles P. Kindleberger, American Business Abroad: Six Lectures on Direct Investment (Yale University Press, Newhaven and London, 1969) p. 13

lower costs of production abroad, such as has been suggested by Krause and Dam.[2] The advantage possessed by the multinational firm must be a true monopoly advantage, that is, one which cannot be acquired by host country firms. Otherwise local entrepreneurs would undertake the investment instead of a multinational firm. The multinational firm has the difficulty and expense of being far removed from the local market, with corresponding information costs of distance between foreign subsidiary and head office decision-making. To summarize, if there were perfect competition in the market for goods and factors there would be no such thing as direct investment. It only occurs due to imperfections in these markets.

As the modern theory of foreign investment is based on the explicit recognition that there are market imperfections two major types are now discussed more fully. First, there may be externalities involved in horizontal integration . Caves[3] has suggested that one of the reasons the parent company establishes subsidiaries abroad is to produce a similar product and benefit from managerial and tech-

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2. Lawrence B. Krause and Kenneth W. Dam, Federal Tax Treatment of Foreign Incomes (Washington, D.C., The Brookings Institution, 1964).

3. Richard E. Caves, "International Corporations: The Industrial Economics of Foreign Investment," Economica, 1971.

nical advantages acquired in the original development of that product. Selling in the host economy market offers further local advantages but the host country plant is in many ways "a miniature replica" of the parent country plant. Examples are the oil, copper and aluminium industries.

Secondly, Johnson and others have argued that the firm internalizes services which are of a public good nature.[4] An analogy is made to the concept that a research discovery, once made, should sell at a zero social cost, and that such research should consequently be subsidized by the government. A firm may privately develop new production, marketing or management techniques which should be generally at zero social cost. However, the firm protects these new discoveries either by patent rights or by keeping them secret. The firm wishes to exploit this monopoly abroad, and so internalizes its advantage in the form of an overseas subsidiary. This phenomenon is related to but is not synonymous with internal scale economies. The marginal cost of foreign use of the firm's knowledge advantage is very low, if not zero. Therefore the firm enjoys excess profits due to its

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4. Harry G. Johnson, "The Efficiency and Welfare Implications of the International corporation," in C.P. Kindleberger (ed.), The International Corporation (Cambridge, M.I.T. Press, 1969).

monopoly.[5]

An extra incentive for foreign direct investment of this form is a lack of an effective domestic market which sets prices for such knowledge. The research developments are internal to the firm, but once protected in the form of patents and licences could conceivably be sold. Two problems arise: firstly there are some institutional constraints within the United States such as anti-trust laws which prevent the exploitation of monopoly knowledge, and secondly the knowledge is specific to a firm often in an oligopoly type of market structure, which prevents separate sale. In a dynamic context knowledge is an integral factor in the development and maintenance of worldwide oligopolies.[6] Many types of industry rely on the expansion of foreign subsidiaries to reap excess profits which could not otherwise be made in the domestic market. Examples are in the areas of automobiles, chemicals, computers and drugs.

Another class of explanation of foreign direct investment has been advanced by researchers working in business schools, looking at the behavior of the managers themselves.[7]

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5. If the excess profits are used to do more research this will lead to a further knowledge advantage in the future, and hence to the persistence of excess profits, even in a dynamic system.

6. Raymond Vernon, Soverignity at Bay: The Multinational Spread of United States Enterprises, (New York Basic Books, 1971).

7. Louis T. Wells and John M. Stopford, Managing the Multinational Enterprise, (Basic Books, New York, 1972).

The subjective motivation of managers may be important motives in the establishment and expansion of foreign subsidiaries. Managers seek prestige and are empire builders. The motivation of managers is discussed more fully below in the section on the firm's maximization of profits or maximization of utility.[8] These may be important for individuals but would not suffice if real economic benefits were not available. Managers cannot survive if they do not produce profits, and therefore while taking account of this argument we shall anticipate a later discussion in this work by assuming that profit maximization is the appropriate criterion.

Knickerbocker,[9] shows that the expansion of American enterprises abroad has been determined by micro level decisions in which foreign subsidiaries are established in response to initial direct investment by rival firms. It is assumed that the relevant market structure is characterized by oligopoly rather than a situation of perfect competition, leading to the implication that direct investment has to be explained by market imperfections rather than by differences in real or monetary rates of return. Coupled with the assumption of oligoploy is the hypothesis that American exports follow a product cycle in which product-

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8. See below pp. 24-25 (Chapter II).

9. Frederick T. Knickerbocker, Oligopolisitc Reaction and Multinational Enterprise (Boston, 1973).

pioneering American firms generate successive advantages in production of goods by innovations in manufacturing, marketing, management, and technology. These market advantages are specific to the firm, and it is clearly in the firm's own interests to exploit its innovation not only in the domestic market, but also by extending sales abroad through exports and/or foreign subsidiaries.

Such an argument has been advanced previously by Vernon, Kindleberger, Johnson, Caves, and others. Knickerbocker extends the argument with his emphasis on oligopolitic reaction. Once one firm in an oligopolistic market situation has engaged in direct investment, there is an incentive for rival firms to respond in order to defend their market share. Thus, in Knickerbocker's view, most direct investment is defensive in nature, and is governed by the interdependency of firms in such a market structure.[10]

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10. The concept of oligopolistic reaction is tested with the help of "an entry concentration index" (ECI), derived from information on the foreign subsidiaries of the 187 American corporations in the Harvard multinational data bank. The ECI for each industry indicates how closely foreign subsidiaries are bunched together in their establishment, and is a proxy for oligopolistic reaction. A major finding is that almost half of the 2,000 foreign subsidiaries founded in the period from 1948 to 1967 were started up within three year peak clusters, and about three quarters were started within seven year peak clusters. This evidence is used to support the concept of defensive foreign direct investment. Such a follow-the-leader strategy of direct investment is measured by the ECI's, and very detailed testing is undertaken to find the relationship between ECIs and firm, industry and country characteristics.

Knickerbocker does not attempt to test the motivation of a firm's initial foreign investment (which he terms aggresive) to which oligopolistic rivals react as part of a defense strategy. Instead he relies on the notion of the product cycle theory, and considers it to be a sufficient reason for aggressive foreign expansion. Work on the motivation of such initial direct investment decisions remains to be done and can be advanced by the application of portfolio theory and capital asset pricing models in an international context. It is shown in this thesis that a firm can benefit from international diversification of sales as it enjoys a more stable stream of profits over time.

Summary of the Market Imperfections Hypothesis

Direct investment is generally undertaken by large multinational corporations. The behavior of such corporations is better explained by a theory of imperfect competition rather than one which assumes perfect competition. The costs of factors of production such as labour, capital, and management for a multinational firm result in high fixed costs and low variable costs. This provides a substantial barrier to entry, resulting in a market structure of oligopoly. Foreign investment by large firms in this type of market structure can be explained by a theory of oligopolistic rivalry, in which on an international level each firm seeks to maintain its share of the market. Foreign operations

of multinational corporations can take the form of either exports or direct investment, or both. Here attention is confined to direct investment. The establishment of foreign subsidiaries involves a fairly low variable cost once the parent firm has established an advantage in knowledge, research, or management skills. This advantage is specific to the firm, and is often protected by a patent. There may be similar barriers to entry due to a firm specializing in advanced technology, with such research often financed by government budgeting, as in the aerospace industry.

In a situation of oligopolistic rivalry direct investment is often undertaken for reasons which are not consistent with basic economic theory. For example many foreign subsidiaries are established as a defensive measure in response to an initial direct investment by a rival firm. There is a "follow-the-leader" effect in which firms seek to retain their market share.

Another reason on the same lines is that the firms engage in an "exchange of hostages", in which subsidiaries are set up in the territories of rival firms. One result of this is that competition is increased on a world-wide basis, at least competition amongst the firms in the oligopoly assuming that there is not perfect collusion. The concentration ratio in any industry will also be reduced by such a process of world-wide subsidiary diversification. The result of this process is that a new global oligopoly is established

in which the multinational firms attempt to retain their market shares.

There are various types of risk involved in direct investment. These are due to information costs concerning the special factors in the host economy such as institutional, political, and special national attitudes. There is also the risk of changes in the foreign exchange rate and the possibility of confiscation.

Within the United States anti-trust policy has attempted to reduce the extent of industrial concentration and oligopoly. It is clearly more difficult to believe that similar regulation can be forthcoming at the international level. However individual national governments have the power to counteract multinational corporations and this in itself may serve to limit the growth of global oligopoly.

Direct investment is motivated by market imperfections and is associated with monopoly power. Once foreign subsidiaries are established the multinational firm has erected an additional barrier to entry, and thereby consolidated its special advantage. International diversification allows the multinational firm to increase the base for its operations and to spread new innovations into a wider market. It also reduces the overall risk of earnings for the corporation and allows the firm to overcome a recession in one or more of the overseas markets, provided such recessions are not perfectly positively correlated.

Risk and Direct Investment

There has been a recent explosion of knowledge about asset holding and pricing in a world of uncertainty. This is based on developments in the fields of business finance and in monetary economics, especially in the area of portfolio theory. Some of the concepts of this approach have been applied to the explanation of foreign asset holdings,[11] and the entire econometric literature on capital flows.[12] The literature deals with financial investment. So far there has been no treatment of direct investment.

Aliber[13] tried to explain direct investment by emphasizing benefits from the diversification of assets and liabilities of multinational corporations, including real

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11. The pioneering work in this field is by Herbert G. Grubel ibid.

12. For example, see William H. Branson, Financial Capital Flows in the United States Balance of Payments (North-Holland, 1968); N.C. Miller and M.V.N. Whitman, "A Mean-Variance Analysis of United States Long-Term Portfolio Foreign Investment," Quarterly Journal of Economics, May 1970.

13. Robert Z. Aliber, "A Theory of Direct Foreign Investment," in C.P. Kindleberger, ed., The International Corporation (Cambridge, M.I.T. Press, 1970).

investments, in regions of the world with different exchange rates. The law of large numbers and the world-wide distribution of disturbances, natural and government caused, increase stability of earnings and assets of multinational corporations. The capital market will take into account this stability and lend more funds at lower rates to internationally diversified than to non-diversified companies. This explains the growth of multinationals and direct investment. The problem with Aliber's paper is that there is no empirical evidence and he claims other theories are irrelevant. In the real world probably all factors operate together.

This thesis test directly the hypothesis that foreign activities reduce the instability of earnings by large corporations. This reduction of earnings instability will increase the net worth of the firm and thus provide an additional motive for either exports or direct foreign investment. When this basic hypothesis was formulated the author was unaware of any other work in the area. Recently a related argument has been made by Benjamin Cohen in an unpublished paper.[14] Cohen did not attempt to specify a model for foreign investment, but merely made an appeal to the portfolio theory principle. In his empirical work he

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14. Benjamin I. Cohen, "Foreign Investment by United States Corporations as a Way of Reducing Risk," Yale University Economic Growth Centre, Discussion Paper No. 151, September 1972.

formulated several equations in which risk is hypothesized to be inversely related to the following independent variables: foreign operations, size of the firm, number of products produced; and also depends on the industry classification (as shown by the SIC code for each firm.)

Two alternative measures of overseas operations are used. First the (F/T) ratio as calculated by Bruck and Lees (1968), and secondly a measure of the number of foreign countries in which there was a manufacturing subsidiary of one of the Fortune Five Hundred Corporations. This subsidiary index was supplied by the Harvard Multinational Enterprise Project.

As the dependent variable he alternates two risk measures: first, the coefficient of variation, and second, the standard error (which is "the standard deviation of the deviations around a fitted trend line"). Cohen does not consider the question of choosing an appropriate rate of return for the operations of the firm, and does not specify a portfolio theory model. Instead he states that:

> "Finding inconclusive the discussion on whether management maximizes sales or profits after taxes, I examine both."

Regressions are run for two periods, from 1961-69 and from 1963-67. There is little difference between the regressions for these periods. Due to data limitations, the number of observations is reduced from about 500 to 233. In the sixteen regressions run the explained variation is about

20 to 30 percent. In most equations the product diversification variable is unsatisfactory, with insignificant values for the coefficients. The size variable performs in an ambiguous manner, being inversely related to risk when profits are used as the measure of size, but being positively related when sales are used. The subsidiary country diversification index performs better than (F/T), with the latter only being significant in half of the equations in which it is used.

In conclusion Cohen's empirical work is ambiguous at best and is not a well formulated test of international diversification. In this thesis alternative empirical tests are undertaken, with both the dependent and independent variables used being defended on theoretical grounds. The subject of international diversification is examined in greater detail, and additional policy conclusions are derived.

The Objective Function of the Multinational Firm

The above discussion of the motives of foreign investment has drawn attention to several new variables. However, while these variables are based on a priori theoretical exposition and are significant in empirical testing, they can be reconciled as arguments in the objective function of a firm. The success of a firm basically depends on maximization of profits, and both the traditional and modern variables outlined above suggest methods of doing so. The objective function of a multinational firm will be conceptually similar to that of a domestic firm, but may place different emphasis on

foreign trade and host economy variables.

The massive literature on investment theory as it applies to the multinational firm has been recently summarized by Guy Stevens.[15] His work will not be duplicated here but in the following few pages some of his major conclusions are reported because of their relevance for this thesis. In his approach to the analysis of direct investment Stevens examines the variables which determine domestic investment as well as special variables unique to the multinational firm.

The controversy over the appropriate objective function for the firm has raged since 1932 when Berle and Means[16] demonstrated that there was a separation between ownership and control whereby the shareholders of the firm do not necessarily control the operations of the managers. The controversy has set two opposing theories against each other, and these must be outlined in order to understand their implication for direct investment.

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15. Guy V. G. Stevens, "The Multinational Firm and the Determinants of Investment," (mimeo, prepared for the Conference on the Multinational Firm and Economic Analysis at Bellagio, Italy, September, 1972).

16 A. A. Berle and G. C. Means, The Modern Corporation And Private Property (New York, 1932).

Firstly, the neoclassical microtheory suggests that managers will attempt to maximize profits just as if the stockholders were operating the firm. Secondly, it has been suggested that managers maximize their own utility functions, where utility depends on prestige or salary, and where salary may be positively related to the size of the firm. In this second case of utility maximization the managers will have a preference for growth.

A third explanation has been advanced by the behavioral school with allowance being made for uncertainty, but this approach may not be inconsistent with a firm's profit, maximization over time. In capital asset pricing models the operation of a firm will be reflected in the valuation of its shares. When such finance theory models are used specification of a utility function for the firm is not required.

Of forty-four studies reported by Stevens[17] the vast majority, that is thirty-four, offered support for the profit maximization hypothesis or one of its close variants. The alternative growth maximization theory and the behavioral hypothesis received support from only eight of the studies, and the final two studies were concerned with very general tests of portfolio theory. The actual studies on direct investment itself all revealed that profit maximization was the appropriate theory. From this extensive investigation by Stevens it is possible to conclude that empirical work on

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17. Stevens ibid, pp. 17-19, especially Table I.

the objective function for the multinational firm is little different in its findings from that of domestic firms investment. In both cases the profit maximization hypothesis is supported. From an analysis of the above study by Stevens it can be concluded that the objectives of foreign investment are broadly similar to the objectives of home investment; in both cases the motivation is profit maximization.

Another authority in this field, John Dunning, goes so far as to argue

> "that the behavior of firms in respect of overseas activities will be influenced by broadly similar objectives as domestic operations and that no specific theory of motivation is required."[18]

Dunning qualified his statement by mentioning that the decision takers in foreign subsidiaries may be different from those in the parent company, and consequently may have other objectives. Furthermore, the objectives of a subsidiary will depend on the specific national environment it finds itself in.[19] In addition there are local advantages available to a foreign subsidiary once it accumulates knowledge and expertise in the host country market.

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18. John H. Dunning (ed.) International Investment: Selected Readings, (Penguin Books, 1972) p.14

19. Dunning, ibid., p. 14

Foreign Investment and Foreign Operations

It is necessary to make a careful distinction between foreign investment and foreign operations. The theoretical basis for this thesis is the portfolio theory model which requires an analysis in terms of foreign investment. In the empirical sections, however, it is necessary to test the foreign operations of firms, as data are not available on foreign investment at the firm level.

Foreign investment is made up of two parts: financial capital flows (portfolio investment) and non-financial capital flows (direct investment). The latter is defined by convention on the basis of the investor(s) retaining control over the use of the investment made abroad. Direct investment is explained by variables such as income, tariffs, and market imperfections. In comparison, portfolio investment is determined by monetary variables, such as interest rate differentials.

The link between foreign investment and foreign operations is the multinational corporation. It is a vehicle for the transfer of direct investment and institutionalizes in itself the abstract advantages of world operations which motivate such foreign investment. Imperfections in the international markets for factors, goods, and securities motivate foreign investment via the specific mechanism of the multinational firm. These activities of multinational corporations are referred to as foreign operations, where the method of

operating abroad is through the establishment of foreign subsidiaries which produce and sell in the host economy.

In this thesis foreign operations are defined in a slightly different way. They include not only sales by foreign subsidiaries, but also exports from the parent company. This definition is not theoretically desirable but is forced into use in the empirical section because it is used in the only published source of data on foreign operations at the firm level.

In an uncertain world direct investment by the multinational firm based on these motives can be considered to entail an analytically different reason for international trade. International diversification of sales is likely to lead to a gain from trade quite separate from the welfare gains usually discussed in international trade theory. It is shown in Chapter Three that, as barriers to international asset holding exist, an individual may only be able to achieve the benefits of international diversification indirectly - through purchasing the shares of a multinational company. There will be greater stability of the expected rates of return on the securities of internationally diversified corporations.

Another problem arises from the difference between foreign investment and foreign operations. The latter treat sales of

goods, either through exports or sales by overseas subsidiaries. In the empirical tests using this (F/T) variable the increase in expected earnings stability is due to international diversification of such product sales. However, a theoretical analysis of foreign investment rather than foreign operations would indicate that the increase in expected future earnings stability could also be achieved through diversification in the factor market. For example, the activities of trade unions in national labor markets are likely to be imperfectly correlated, leading to wage rate differentials over and above those usually analysed in economic theory. Similarly profit rates and rates of return on invested capital will vary amongst nations due to imperfectly correlated disturbances in national capital markets.

These factor market imperfections lead the way to potential gains from international diversification, provided that there is not a perfectly positive correlation between national factor markets. Such benefits are available in addition to those due to diversification of product sales. It would be theoretically desirable to test separately the gains in international diversification due to either factor market or product market disturbances. This requires a comparison of the stability of earnings for firms with foreign sales alone (that is exports) and those with foreign direct investment (that is subsidiary sales). In the former case the firm can benefit only from international market diversification; while in the latter case

a multinational firm can enjoy both product and factor market diversification through foreign sales.

In practice it is not possible to make an empirical separation due to data limitations. Specifically, the fact that details on foreign investment (and foreign operations) are not available at the firm level, but only for industries.

Conclusion

In the survey of the literature in this chapter the modern theory of direct investment has been reviewed and developed with reference to portfolio theory. Foreign direct investment by firms arises when they attempt to take advantage of market imperfections. In the second part of this chapter the motivation of the firm was explored in more detail when the literature on its objective function was reviewed. It was concluded on the basis of available evidence it is useful to assume that the firm, and the multinational firm in particular, are basically motivated by the objective of maximizing profits. A distinction was made between foreign investment and foreign operations, and theoretically desirable model specifications were reconciled with empirical constraints. Use is made of these findings in Chapter Three, in which a portfolio theory approach to international diversification is developed.

Chapter Three -

Portfolio Theory and International Diversification

In this chapter portfolio theory is used to examine the behavior of large corporations. It is shown that through efficient international diversification a multinational enterprise is able to reduce the risk of its profits. A similarly sized firm operating mostly in the home market has a greater variance in its profits as it is subject to the specific risk of that market.

Portfolio theory has been used extensively at the national level to show the gains from diversification, largely using estimates involving financial assets and including equities. The capital asset pricing extension of this model has also been tested widely for national data, but there are not many studies of the international aspects of either approach. The contribution of these few studies to international portfolio analysis has been reviewed in Chapters One and Two, and they are further assessed in the latter part of this chapter.

In this chapter the Tobin-Markowitz portfolio model and its derivation is presented, with extensions, so that it can be used to infer certain aspects of the behavior of multinational firms. This extended model forms the basis for the empirical tests presented in Chapter Five. Extensions include some elements of the capital asset pricing model, as

the latter deals with choices at the level of the firm rather than with individual consumers.

Elementary Portfolio Theory

The Tobin-Markowitz model is an appropriate starting point since it is concerned with explaining the possible gains from portfolio diversification. Elementary portfolio theory is based upon assertions about risky choice and requires a clear understanding of:

(a) the choice object

(b) the preference set

(c) the opportunity set

(d) the conditions for equilibrium

Assumptions

The assumptions required for portfolio analysis are the following:[1]

(1) The rate of return from an investment efficiently measures the outcome from that investment, and investors view the possible rates of return in terms of a probability distribution over some holding period. All investors maximize expected utility over the holding period and exhibit diminishing marginal utility of wealth.

(2) Investors' risk estimates are proportional to the variability of the expected return.

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1. See for example Francis J.C. and Stephen H. Archer, Portfolio Analysis (Prentice-Hall, New Jersey) 1971, pp. 7, 112, for a typical statement of these assumptions.

(3) Investors are willing to base their decisions on only two parameters of the probability distribution of returns: The expected return and risk, where risk is shown by variance (Var) or as an alternative by standard deviation (SD). The investor's utility function is therefore:

$$E(U) = U\left[E(R), Var\right] \qquad 3.1$$

(4) For any given level of risk investors prefer higher rates of returns to lower rates of return, that is:

$$\frac{\partial U}{\partial E(R)} > o \qquad 3.2$$

Conversely for any given level of rate of return investors prefer less risk to more risk, that is they are risk averse:

$$\frac{\partial U}{\partial Var} < o \qquad 3.3$$

(a) The Choice Object

The choice object is a portfolio consisting of investment securities, some of which are risky and some of which are not. A security is a perfectly divisible investment asset. Most contain some risk and choices are assumed to reflect individual trade-offs between these risks and desired returns.

There are many possible definitions of rates of return but in portfolio theory only the single period market return is considered. The market return is the capital gain (or loss) plus dividends, divided by original price. Other possible measures are the earnings return (earnings per share divided by the market value per share) and the accounting return (the ratio of earnings per share to book value

per share). In portfolio theory the appropriate one is the market return, since this measures the rate at which an investor's wealth increases.

Since by assumption (1) the cash flows of a particular security are viewed as a random variable there will be a probability distribution of rates of return in which the mean represents the expectation of the various possible rates of return. The mean or expected return for a discrete distribution is defined as:

$$E(R) = \sum_i p_i R_i \qquad 3.4$$

where p_i is the probability of the i th rate of return.

The dispersion of outcomes around the expected value of a probability distribution is measured by the variance of returns. Again for the discrete case this is defined as:

$$Var = \sum_i p_i \left[R_i - E(R)\right]^2 \qquad 3.5$$

The standard deviation of returns is simply the square root of variance.

(b) The Preference Set

In an uncertain world the investor is assumed to maximize expected utility, E(U), where by assumption (3):

$$E(U) = U\left[E(R), Var\right] \qquad 3.1$$

The arguments in the expected utility function are the mean or expected value, E(R), of the probability distribution of the rates of return on the investment, and the risk or

variability of these expected rates of return shown by variance, Var. The two parameters of the utility function, mean and variance, are sufficient in portfolio theory, if there is a normal distribution of returns.[2]

From the utility function, and letting the risk measure be shown by standard deviation (SD) instead of variance, since for our purposes there is no difference between them, we have

$$E(U) = U\left[E(R), SD\right] \qquad 3.6$$

---

2. The mean and variance represent the first two moments for a normal probability distribution of returns. Higher order moments could be considered, such as skewness and kurtosis, but these are not required for a portfolio theory model. Most other writers have confined themselves to mean and variance (or standard deviation), and some empirical work has suggested that the distribution of returns is symmetric. Variance captures as much risk as can be dealt with in this thesis, given data limitations.

   We may avoid consideration of higher order moments and confine our model to mean and variance by assuming a normal distribution for the probability distribution. A theoretical alternative is to assume that the utility function of the individual firm is quadratic in wealth, but this is not done here. The problem with a quadratic utility function is that there is a limited range of it which correctly approximates the utility function for a risk-averting individual. There is also the problem that the quadratic utility function implies that risk aversion is an inferior good.

   See M.S. Feldstein, "Mean-Variance Analysis in the Theory of Liquidity Preference and Portfolio Selection," Review of Economic Studies, January 1969; James Tobin," "Comment" Review of Economic Studies, January 1969; and S.C. Tsiang, "The Rationale of the Mean-Standard Deviation Analysis, Skewness Preference and the Demand For Money," American Economic Review, June 1972.

we assume;

$$\frac{\partial E(U)}{\partial E(R)} > o \text{ and } \frac{\partial E(U)}{\partial SD} < o \qquad 3.7$$

Here the individual maximizes expected return but minimizes risk. This second assumption is often referred to as risk aversion, and if it represents the preferences of the investor it can be used to derive appropriate indifference curves.

It should be noted that the curvilinear indifference curves as drawn in Figure 1 are in mean-standard deviation space. If they were shown in mean-variance space they would be linear. When an indifference curve is linear in mean-variance space it implies constant risk aversion with respect to wealth.

The indifference curves are based on the assumption of risk aversion with their exact slope depending on the degree of risk aversion. In Figure 1 welfare is increased as the investor moves to higher indifference curves, since there is less risk for each level of expected return. The steaper the slope of the indifference curves the more conservative the investor, that is the less risk he will accept for a given change in expected return. The flatter the slope the more risk will be taken by the investor for a given change in expected return. A risk lover (gambler) will have a set of indifference curves which will be convex to the axis for expected return.

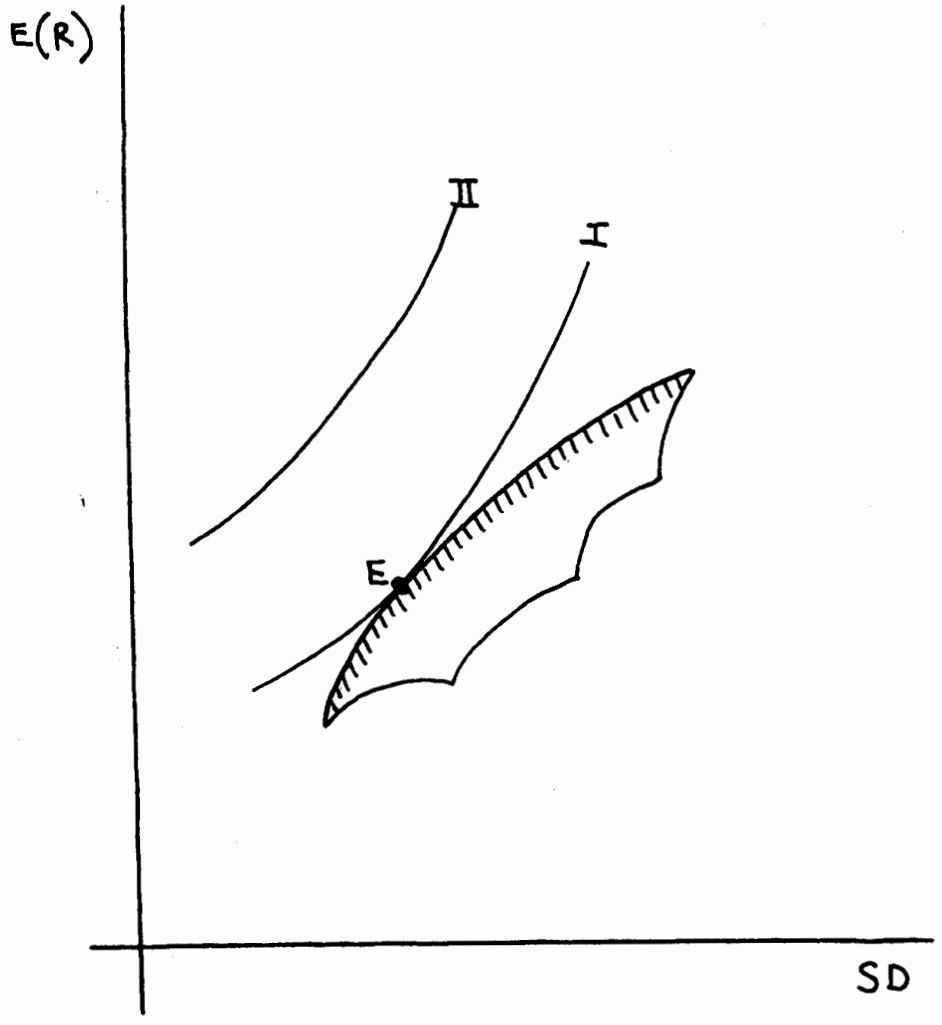

FIGURE 1

(c) The Opportunity Set

The opportunity set is defined as a set of individual securities in capital markets plus portfolios consisting of these individual securities. It is possible to combine individual assets into a portfolio by holding various proportions of such assets. There are clearly a very large number of individual assets and since they can be held in virtually any proportion, there are an infinite number of portfolios available. Many of these, however, can be eliminated from the efficient set. For example, at each level of risk those assets with a greater expected return will dominate assets with a lower expected rate of return. Similarly, at each expected rate of return those assets having a lower variance will dominate those with a higher variance.

When all investments, and all portfolio combinations, are plotted in expected return-risk space (where risk is shown by standard deviation) it is possible to generate an opportunity set. In the example (shown in Figure 1) there are several assets and the portfolio, E, consisting of a mixture of the assets. An efficient portfolio consists of combinations of securities which dominate inferior securities. In the diagram a security or portfolio on the opportunity locus passing through E will always dominate some other security or portfolio either because for any given level of risk every other asset has a lower return, or because for

any given level of expected return every other asset is more risky. The efficiency frontier of the opportunity set therefore dominates all other investments, and assets on the frontier are referred to as Markowitz efficient.

(d) Equilibrium

Investor equilibrium is found by setting the efficient opportunity set tangent to the highest available risk averse indifference curve. The procedure is analogous to the efficiency conditions of micro theory which require that the marginal rate of transformation in production (MRT) be set equal to the marginal rate of substitution in consumption (MRS). Here the opportunity set is MRT and the indifference curves are again MRS.

Equilibrium in this example is obtained where the efficiency frontier is tangent to the highest possible indifference curve for the risk averting investor. In Figure 1 this is at point E, on the efficient frontier, and shows that diversification has increased the welfare of the individual, over what it would have been were he to invest in any single security.

A Two Security Example

The portfolio model summarized so far can be further developed assuming only two securities. For simplicity let there be a series of portfolios made up of various combina-

tions of only two securities. The covariance of returns on securities 1 and 2 is denoted by Cov_{12}:-

$$Cov_{12} = E\left\{\left[R_1 - E(R_1)\right] \cdot \left[R_2 - E(R_2)\right]\right\} \quad 3.8$$

The covariance measures how the random variables (1 and 2) vary together, and has the same sign as the correlation coefficient, which in turn is denoted by r_{12}:-

$$r_{12} = \frac{Cov_{12}}{SD_1 \; SD_2} \quad 3.9$$

$$= \frac{E\left\{\left[R_1 - E(R_1)\right] \cdot \left[R_2 - E(R_2)\right]\right\}}{SD_1 \; SD_2} \quad 3.10$$

thus $Cov_{12} = r_{12} . SD_1 . SD_2$ 3.11

Portfolios can be made up of combinations of securities or of mixtures of the other portfolios. For example, if there are two assets, 1 and 2, with expected rates of return of $E(R_1)$ and $E(R_2)$ respectively, their expected rate of return in combination is:

$$E(R_p) = X\,E(R_1) + (1-X)\,E(R_2) \quad 3.12$$

where X is the proportion of the portfolio is asset 1, and (1-X) is the proportion of the portfolio in the other asset.

The risk of this portfolio is shown by the variance:

$$Var_p = Var_1\,X^2 + Var_2\,(1-X)^2 + 2X\,(1-X)\,r_{12}\,SD_1\,SD_2 \quad 3.13$$

where r_{12} is the correlation coefficient between the two assets.

The potential gain from diversification depends crucially on the values of the correlation coefficient, r_{12}.

This point may be usefully illustrated in Figure 2 where three special cases of r_{12} are examined.[3] In the diagram three efficiency loci are shown where the two securities are:

(a) r = -1; perfectly negatively correlated

(b) r = +1; perfectly positively correlated

(c) r = 0 ; independent, that is, not correlated.

An International Application

An international application of this two security model can be made by letting securities 1 and 2 represent the profits from sales by a firm in the home market and in the foreign market respectively. The proportion of profits from such sales in the home market (1) is X; and the proportion of profits from sales in the foreign market (2) is (1-X).

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3. A numerical example may be helpful in explaining the principle of portfolio diversification. Assume:

$Var_1 = 10$, $Var_2 = 10$, $r_{12} = .3$, $X = 1/2$

Then the variance on home and foreign investment is 6.5, which is less than each individual risk. In this example assume that E_1 is 5 and E_2 is 5, which means that

$E(R_p) = 1/2 \times 5 + 1/2 \times 5 = 5$

Here it has been shown that even with equal returns on home and foreign investment (of 5%) and with equal risks (of 10%) it is possible to significantly reduce risk (to 6.5) by having a mixture of home and foreign investments and yet retain the same return. It can be shown alternatively that for equal risks a combination of investments will lead to higher expected rates of return. See Herbert G. Grubel (1968) ibid.

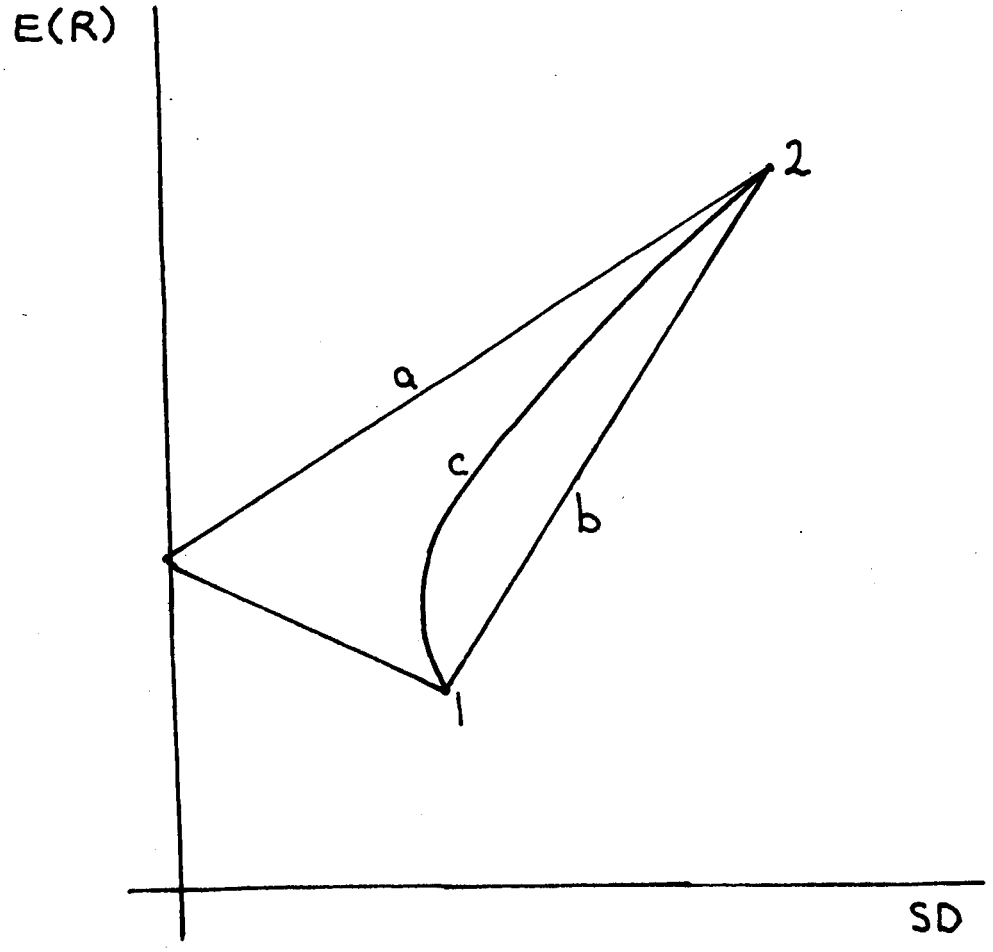

FIGURE 2

Foreign sales are due either to exports from the home economy or due to sales of a subsidiary in a host economy. In Figure 2 there is a greater expected rate of return from foreign sales but this is offset by greater risk, as shown by a higher value for standard deviation of that profit stream. When there is some, but less than perfect, positive correlation between the two markets, as in the range between (b) and (c), it can be seen that the available efficiency locus is to the left of case (b) where there is perfect positive correlation. In case (a), when the markets are perfectly negatively correlated, it is possible to eliminate risk completely. It can also be noted that if the correlation coefficient, r_{12}, is less than the ratio of the standard deviations of the securities (SD_1/SD_2) then risk may be reduced below SD_1 by dealing in both markets.

The actual portfolio equilibrium depends on the addition of the appropriate risk return functions for the individual firm, and it will be shown that the welfare for a risk averse firm increases as the firm's efficiency locus moves upwards to the left. It can therefore be concluded that in the absence of perfectly correlated markets a firm should attempt to diversify its sales internationally.

The Capital Asset Pricing Model

So far the two parameter portfolio theory model has been discussed in terms of an individual investor and his

choices among financial securities. It can be extended to cover stock market equilibrium and the pricing of a firm's shares. This branch of portfolio analysis is called capital market theory.

The four assumptions previously listed for the portfolio theory model are still required, and in addition the following are necessary for capital market theory.[4]

1. All investors are Markowitz efficient diversifiers who delineate and seek to attain the efficient frontier.
2. Any amount of money can be borrowed or lent at the risk-free rate of interest (R_F).
3. All investors visualize identical probability distributions for future rates of return - that is there are "homogeneous expectations" among investors.
4. All investors have the same one-period time horizon.
5. All investments are infinitely divisible: fractional shares may be purchased in any portfolio or any individual asset.
6. No taxes and no transactions cost for buying and selling securities exist.
7. No inflation and no change in the level of interest rates exist - or all changes are fully anticipated.
8. The capital markets are in equilibrium.

From assumption 2, any amount of money can be borrowed or lent at the risk free rate, R_F. Such risk free assets might be bonds with maturity dates corresponding to the holding period horizon. Risk free means there is no possibility of default. A lending-borrowing line can be drawn out from

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4. J. C. Francis and S. H. Archer, ibid, p. 112.

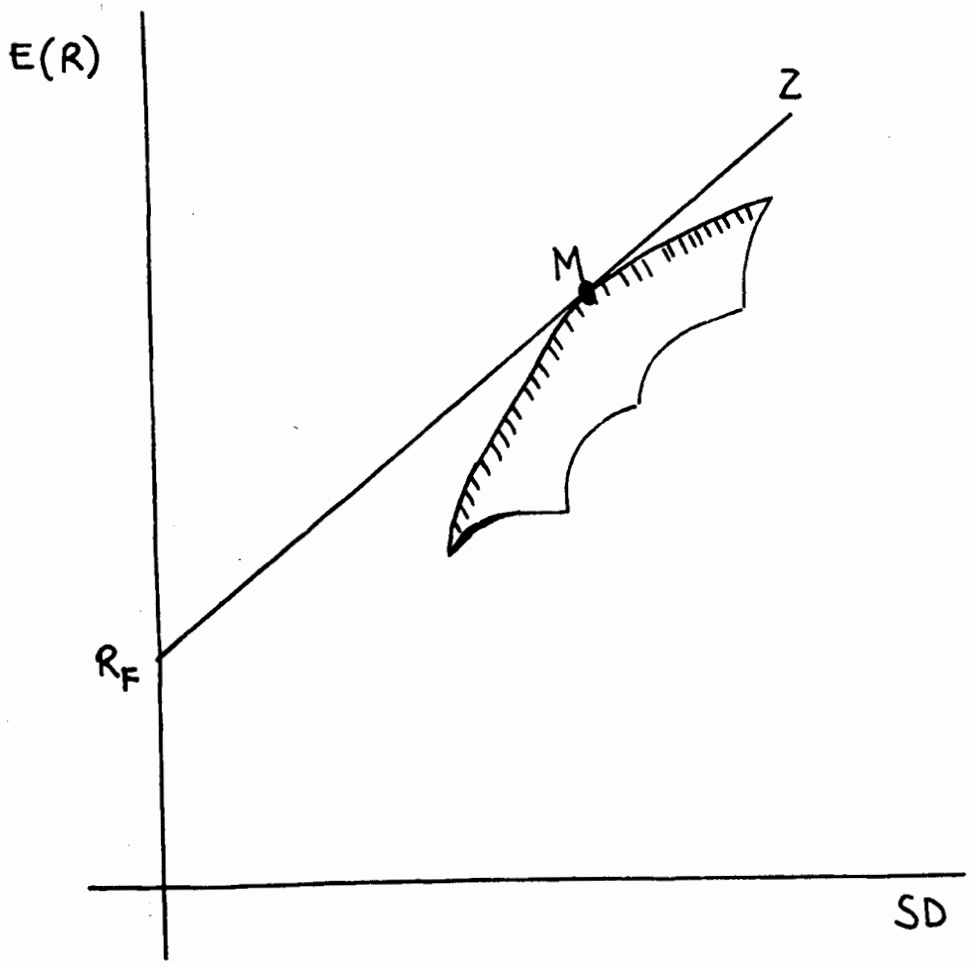

FIGURE 3

R_F and set tangent to the opportunity set at M.[5] The latter is again composed of securities available in the capital markets plus the portfolios formed from combinations of these securities. From assumption 3 all individuals have homogeneous expectations and therefore identical opportunity sets.

The investors now has access to portfolios along the borrowing-lending line R_F MZ. Points between R_F and M are lending portfolios which consist of various proportions of the risk free asset and M, where M is the market portfolio, that is the portfolio of all risky securities held in proportion to their equilibrium supply in the market.

Points to the right of M represent borrowing portfolios, and involve leverage. To achieve portfolios between M and Z there is borrowing at the risk free rate, which increases total investable capital. This is then invested in M and the risk and return on equity are increased along the M_Z line.

It is clear that the borrowing-lending line dominates the opportunity set of risky securities (except at M) and so the investment decision of all rational investors will be to purchase portfolio M.

This investment decision to buy M is independent of the financing decision, where the latter decision is to buy or sell some of the risk free asset in order to lever or

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5. See J.C. Francis and S. H. Archer, ibid, Chapter V.

unlever the portfolio. This is the so-called separation theorem, in which the investment decision is taken to be independent of the financing decision. It implies that all investors will hold the same mixture of stocks in their portfolios, and use lending or borrowing to obtain their preferred risk class. Strictly speaking the separation theorem does not require all investors to buy M, since their purchase of M depends upon the above assumptions (3 - 8).

As noted above, in equilibrium M is the market portfolio, where this is defined as the portfolio containing all securities in exactly the right proportions to clear the capital markets. Although, in practice, there is no market portfolio it is a useful theoretical abstraction. It is also empirically useful as it is approximated by the risk and return on stock exchange indices.

The borrowing-lending line of separation theorem is, in capital market theory, referred to as the capital market line (CML). The CML is linear in expected return-risk space, where standard deviation (SD) is the appropriate risk measure. The slope of the CML is given by:

$$\frac{dE(R)}{dSD} = \alpha \qquad 3.14$$

where $\alpha = \dfrac{E(R_i) - R_F}{SD_i}$ 3.15

$$\therefore E(R_i) = R_F + \alpha SD_i \qquad 3.16$$

Security Market Line

In general equilibrium, where prices are free to adjust, the security market line relates expected rate of return on an individual security, j, to the covariance of this security's return and the market's return, Cov (R_j, R_M). In effective portfolio diversification securities are combined which have less than perfectly positive correlation. Securities that covary inversely with the market portfolio or which have low positive correlation will be in demand and will have their prices bid up. In Figure 4 there is an upward sloping line as an asset's return is a positive linear function of its covariance of returns with the market.

It has been shows that in equilibrium in the capital asset pricing model there exists a simple linear relationship between expected returns and standard deviations for efficient portfolios. This relationship does not hold for inefficient portfolios, nor for individual securities. Instead a different measure of risk must be employed. Thus when j, an inefficient portfolio (or individual security), is held in combination with M, the market portfolio, we have:

$$E(R_p) = XE(R_j) + (1-X)\ E(R_M) \qquad 3.17$$

and

$$SD_p = X^2 \text{ Var } R_j + (1-X)^2 \text{ Var } R_M + 2X\ (1-X)\ \text{Cov}\ (R_j, R_M) \qquad 3.18$$

At equilibrium the slope of the curve jM must equal the

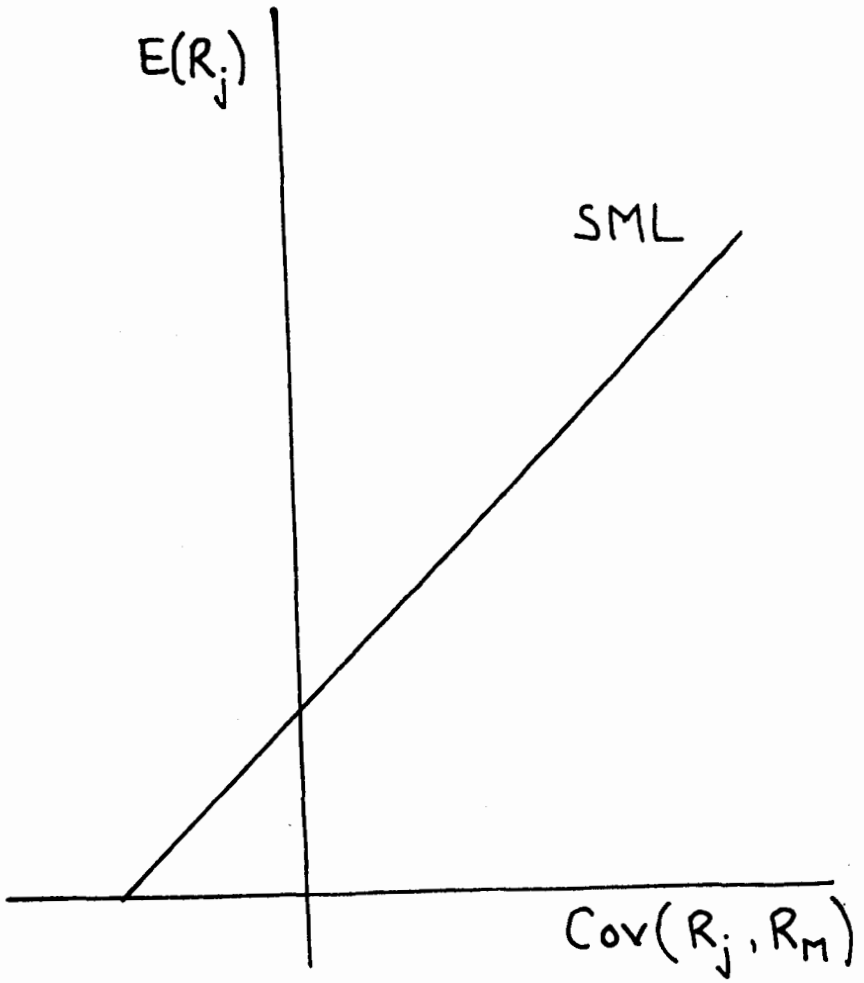

FIGURE 4

slope of the capital market line (CML), that is:

$$\frac{\left[E(R_j) - E(R_M)\right] SD_M}{Cov\ (R_j, RM) - Var\ R_M} = \frac{\partial E(R_p)}{\partial SD_p} \qquad 3.19$$

$$= \alpha$$

$$= \frac{E(R_i) - R_F}{SD_i} \qquad 3.20$$

Since in equilibrium the market portfolio (M) must plot on the CML it is possible to substitute $E(R_M)$ for $E(R_i)$, and SD_M and SD_M for SD_i.

$$\therefore \frac{\left[E(R_j) - E(R_M)\right] SD_M}{Cov\ (R_j,R_M) - Var\ R_M} = \frac{E(R_M) - R_F}{SD_M} \qquad 3.21$$

$$\text{or} \quad E(R_j) = \left[\frac{E(R_M) - R_F}{Var\ R_M}\right] \cdot Cov\ (R_j,R_M) + R_F \qquad 3.22$$

$$\text{let} \left[\frac{E(R_M) - R_F}{Var\ R_M}\right] = \lambda \qquad 3.23$$

$$\therefore E(R_j) = R_F + \lambda Cov\ (R_j, R_M) \qquad 3.24$$

Here λ is the price of risk and is a market determined constant. An absence of change in market factors and risk preference is required for λ to remain a constant. In an international context much risk remains. This is due to imperfections and distortions in the world capital market, especially when direct foreign investment is under consideration.

Using the foregoing notation the Security Market Line (SML) can be expressed in three ways.

a) The SML in covariance form:

$$E(R_j) = R_F + \lambda \, Cov\,(R_j, RM) \qquad 3.24$$

b) The SML in correlation coefficient form:

$$E(R_j) = R_F + \lambda \, (r_{jM} \, SD_j) \, SD_M \qquad 3.25$$

c) The SML in beta form:

$$E(R_j) = R_F + \left[E(R_M) - R_F \right] \frac{Cov\,(R_j, R_M)}{Var\ R_M} \qquad 3.26$$

$$= R_F + \beta j \left[E(R_M) - R_F \right] \qquad 3.27$$

Systematic and Unsystematic Risk

Total risk which is the variance of returns on a security may be regarded as consisting of systematic and unsystematic risk. The definition of systematic risk is that risk which is due to the variability of returns on assets due to a common source, such as in the stock market itself. It persists after the independent variation in returns of individual risk left in an efficiently diversified portfolio. Examples of systematic risk, due to variation in the expected rate of return on the market itself, are changes in the economic, political or psychological climates that affect all assets together. The beta coefficient has frequently been calculated to give an index of systematic risk.

Unsystematic risk is due to the independent variability

in returns of an asset itself. It is caused by events unique to the asset, security, or firm. Examples are management errors, inventions, strikes etc. The unsystematic risk is completely diversified away in an efficient portfolio. When a capital asset pricing model is derived unsystematic risk is shown by the divergence between the capital market line and the asset when plotted in risk-expected return space. This can be shown more formally, as follows.

The risk in holding a single security is SD_j. In a market portfolio, however, the risk of that security would be shown by:

$$r_{jM} SD_j \quad , \text{ or } \frac{r_{jM} \; SD_j}{SD_M} = \beta j \qquad 3.28$$

This is the systematic risk remaining after efficient diversification has completely eliminated all unsystematic risk from the portfolio.

Therefore the following may be defined:

total risk = systematic risk + unsystematic risk

$$SD_j = r_{jM} SD_j + (1-r_{jM}) SD_j \qquad 3.29$$

As all efficient portfolios, E, are perfectly correlated with the market portfolio all unsystematic risk is eliminated:

$$\therefore \quad SD_E = 1(SD_E) + (1 - 1) SD_E \qquad 3.30$$

International Aspects of Risk

To date there has been relatively little empirical work undertaken on the international aspects of risk. The pioneering papers on international diversification by Grubel, and Levy and Sarnat[6] gave indications that there were international gains to be made over and above those possible in national markets alone. These papers used portfolio theory models of financial assets. The capital asset pricing model was developed by Sharpe and Lintner.[7] It has been applied in an international context in papers by Agmon, Solnik, Lessard, and MacDonald.[8]

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6. H. G. Grubel (1968) ibid.
H. Levy and M. Sarnat (1970), ibid.

7. William F. Sharpe: "Capital Assets Prices: A Theory of Market Equilibrium Under Conditions of Risk," Journal of Finance (September 1964.

John Lintner: "The Valuation of Risk Assets and Selection of Risky Investments in Stock Portfolios and Capital Budgets," Review of Economics and Statistics (February 1965).

8. Tamir Agmon: "The Relations Among Equity Markets," Journal of Finance (September 1972).

Tamir Agmon: "The Country Risk: The Significance of the Country Factor for Share-Price Movements in the United Kingdom, Germany and Japan," Journal of Business (January 1973).

Bruno H. Solnik: "International Pricing of Risk," Journal of Finance (May 1974).

Donald R. Lessard: "World, National, and Industry Factors in Equity Returns," Journal of Finance (May 1974).

John G. MacDonald: "French Mutual Fund Performance: The Evaluation of Internationally Diversified Portfolios," Journal of Finance (December 1973).

In examining the international pricing of risk four cases may be considered. First, there can be a combination of no international trading in stocks and no direct foreign investment. Second, there can be free international trade in stocks and no direct foreign investment. Third, no international trading in stocks and no barriers to direct foreign investment can exist. Fourth, there can be free international trading in stocks and no barriers to direct foreign investment. Case one is a situation of perfect autarky, while case four is one of free trade with a perfect capital market. In case four portfolio capital flows will predominate as there is no reason for direct investment. Therefore case four collapses into case two. This thesis is mainly concerned with case three in which direct investment replaces portfolio investment due to segmented international capital markets. The basic question is the extent to which there is an integrated world market.

The assumption of segmented or integrated capital markets is a crucial one. First, let the two markets be perfectly positively correlated but with segmented national capital markets. In this case rates of return may differ (given the same degree of risk) simply due to the existence of imperfect international capital markets. Second, in the case of perfectly negatively correlated markets portfolio theory tells us there is the possibility of making large gains from efficient diversification, that is, the elimination of unsystematic risk. This will not be the case if the other condition is also reversed, and we now assume

perfectly integrated capital markets. In this case mean rates of return have been equalized through capital movements in the integrated world market, and there is no advantage in the negative correlation. In addition, if one of the markets is very large in relation to the other then there is little scope for international diversification with an integrated capital market.

This point may become clearer if we distinguish between portfolio investment (financial capital flows) and direct investment (non-financial flows). With a perfectly segmented securities market, that is where there is no portfolio investment, it is still possible to equalize the risk prices through uninhibited direct investment between countries. Such capital flows are assumed to take place in a competitive model in which factor markets, product markets, and national securities markets are all perfectly competitive. In this example there are barriers to financial capital flows, and in this event the only way to eliminate unsystematic risk at the international level would be through the purchase of shares of multinational firms. Individual investors would not be able themselves to diversify away such unsystematic international risk. However, if financial capital flows were to become perfectly mobile then private individuals could achieve diversification and there would be no remaining advantage to shareholders of firms engaging in foreign

operations.

To the extent that international market imperfections exist a distinction must be made between the actions of corporations primarily engaged in the domestic market, and those of corporations with a large amount of foreign operations. It has been shown that Markowitz type diversification is not really appropriate for firms operating in the domestic market if their shares are traded on a relatively perfect securities market. There is no compelling reason for shareholders to purchase shares in a domestically diversified firm when they can construct their own diversification by purchasing the shares of many corporations. Only if there are institutional barriers and market imperfections which prevent such private portfolio diversification will shareholders prefer to buy into a diversified firm.

The same statement can be made in an international setting. Indeed there are likely to be even greater barriers at the international level than in the domestic market. The interest equalization tax which the United States imposed from 1963 to 1973 is an example. It was a major barrier to the purchase of shares and other assets in international markets by American nationals. In such a case of imperfect markets an individual investor has an incentive to purchase the shares of multinational corporations in preference to the shares of domestic corporations.

The shareholder will also expect to pay a premium for the shares of a multinational corporation. Such a premium depends on the existence of an imperfect world capital market.

The nature of international assets is sufficiently different from that of domestic assets that it raises doubts about the appropriateness of the assumptions embodied in the capital asset pricing model. There are at least three major reasons for the difference between domestic and international assets.

First, there are political risks unique to each nation such as the chance of confiscation by nationalization, or of increased taxation in response to public pressure. These political risks affect the level of expected return and the variance of earnings. Secondly, there are greater regional and cultural differences affecting international assets than domestic assets. This allows for possibilities of regional risk diversification which are not normally available in a specific country, even one as large as the United States. It is therefore possible to insure against specific natural risks such as bad weather, natural disasters, and shifts in socio-cultural patterns. Thirdly, the holding of international assets permits diversification against business cycle risks. Each national government will adopt its own economic policy and due to time lags in the implementation of policy measures there will be various types of policy in operation

in different countries. Some countries are closely interdependent, such as the United States and Canada (which have nearly identical trade cycles) but unless national economic policies are perfectly positively correlated there remains some scope for risk reduction. Therefore a corporation with operations in Europe, Japan, Australia, South Africa, or elsewhere in the world should be able to overcome , or at least dampen, adverse fluctuations in the United States business cycle.

In addition to these factors affecting international diversification there are other reasons why the risk in expected rates of return may differ among countries. There are numerous institutional barriers which prevent the development of perfect capital markets.[9] These include:

1. Interest equalization taxes.
2. Foreign exchange controls and other restrictions on capital flows.
3. Withholding taxes on dividends to foreigners.
4. Exchange rate risks.
5. Cost and availability of information on foreign securities.

In summary, the international equilibrium implied by

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9. See, for example, Cohn Richard A. and John L. Pringle: "Imperfections in International Financial Markets: Implication for Risk Premia and the Cost of Capital to Firms", The Journal of Finance (March 1973, pp. 59-66).

the capital asset pricing models may not be possible due to national barriers to international capital mobility. In this case individual investors in securities will not be able to achieve efficiently diversified portfolios across national borders. For this reason alone we expect there to be an incentive for such investors to buy shares in multinational corporations as these corporations are able to achieve more stable profits than similarly sized corporations facing the specific risk of one national market alone. Therefore multinational corporations may benefit their stockholders through direct investment abroad, and the valuation of the shares of the multinational firm should reflect this advantage.

The foregoing discussion of the international aspects of risk has been confined to theoretical points. Several empirical studies will now be examined, and related to the theoretical work. This will lead to the formulation of a suitable hypothesis for testing.

There is some evidence that the economies and financial markets of other countries are not perfectly correlated with those in the United States. For example, Cohen[10] found the following correlations for trends in G.N.P. for the six major trading partners of the United States:

Correlations of Deviations from Average U.S. Aggregate GNP.

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10. B. I. Cohen (1972) ibid.

1961-1969

Canada	0.64
Brazil	0.64
Germany	0.44
France	0.28
U. K.	-0.55
Australia	-0.71

Some evidence on the lack of perfect positive correlation among equity markets in the United States and other industrial economies is revealed in the following table from Grubel.[11]

Correlation of R with U.S.A.

Canada	0.7025
West Germany	0.3008
U. K.	0.2414
Netherlands	0.2107
France	0.1938
Italy	0.1465
Japan	0.1149
Belgium	0.1080
Australia	0.0585
South Africa	-0.1620

The symbol R is the per country geometric mean return on the stock market, that is the mean of:

> "Annual rate of return from capital gains due to common stock price and exchange rate changes, under the assumption that dividends are re-invested each month in fractional shares at current prices and that interest is compounded annually."

This table shows the equity rates of return in various countries correlated with the United States equity rates of return. The latter are measured by fluctuations in Moody's

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11. H. G. Grubel (1968) ibid.

industrial average of common stocks on a monthly basis. These calculations by Grubel are for financial portfolio returns but, when added to the studies of gross national product in real terms by Cohen, provide some support for the necessary assumption that the United States economy is not perfectly positively correlated with its major trading partners.

Levy and Sarnat[12] extend Grubel's work to investigate the possibility of risk reduction by international diversification of securities portfolios. For the period 1957-1969 mean rates of return on common stocks and their standard deviations were calculated. Rates of return are in dollar terms, and are relevant only for countries with a constant exchange rate during 1951-1967, thus for example excluding the United Kingdom. Rates of return are the percentage changes in the dollar value of the index of common stocks.

Results show that in general U.S. stocks had a high rate of return (12%) and moderate risk (12% standard deviation). U.S. risk fell by diversification onto an efficiency curve consisting of shares of 26 other countries, especially those of some less developed countries and of Japan. Yet U.S. risk was not reduced by holding Canadian or European assets as these were highly correlated with U.S. stock return. For example, Canadian stocks had a positive correlation of .81 with U.S. stocks, and were more risky. There-

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12. Levy and M. Sarnat "International Diversification of Investment Portfolios", American Economic Review, September 1970.

fore U.S. stocks dominated Canadian ones, and thereby eliminated Canada from the efficiency locus. The correlations with the U.S. stocks were:

Canada	0.81
Belgium	0.83
Netherlands	0.53
Germany	0.43
France	0.34
Italy	0.09

The lack of a perfect correlation among various national stock market returns provides some evidence that (unsystematic) risk remains in an international setting. That such risk has not been diversified out of portfolios is likely due to imperfections in the international capital market. When there is not perfect integration of international capital markets then clearly there are gains to stock holders of multinational firms when attempts are made to take advantage of these market imperfections.

Cohn and Pringle[13] have shown recently that there is a residual amount of unsystematic risk remaining in international portfolios. This unsystematic risk reflects inefficient diversification. In terms of the last equation, 3.24, λ (the price of risk) will be raised in traditional estimates of the gains from international diversification.

In the diagram (Figure 5) on the axis we have the usual portfolio theory variables, that is E (R) represents the expected rate of return on the portfolio, and SD represents

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13. R. A. Cohn and J. L. Pringle (1973) ibid.

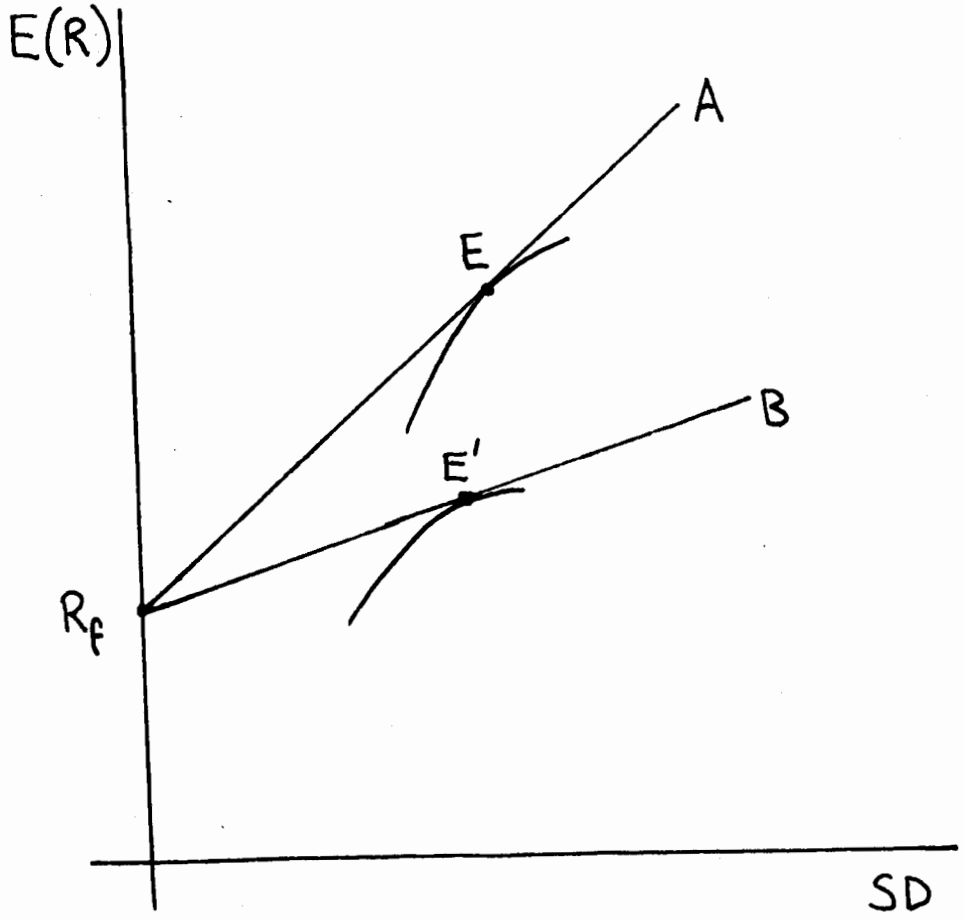

FIGURE 5

the standard deviation of a probability distribution of returns on the portfolio. R_f stands for the risk-free rate of interest on an asset held with certainty. Investors are assumed to be free to lend (and borrow) at this exogenously determined R_f.

The capital market line R_fA is tangent to an efficiency locus at point E. The capital market line represents the linear relationship between risk and return when investors can lend and borrow at the risk-free rate of interest R_f. It should be noted that the curved lines in the diagram represent efficiency loci and not indifference curves, which of course would slope in the opposite direction. These efficiency loci are for efficient sets of portfolios in the absence of risk-free lending and borrowing. Present studies estimate the risk of line R_fA, which incorporates the existence of imperfections in the capital market. The true capital market line should be pivoted downwards to the right, for example, to R_fB, where this new capital market line is tangent to another efficiency locus at point E'. This occurs since the marginal rate of substitution (MRS) between risk (SD) and return (E) has changed. MRS represents the risk premium which is the slope of the capital market line.

It should be noted that points E and E' are not necessarily portfolio equilibrium points, as the latter must be shown by adding appropriate indifference curves for risk averse individuals (or firms). Points E and E' represent the appropriate market portfolio where assets are being held in

the correct proportions. This indicates that at point E' less return is being accepted, (with correspondingly less risk) than at the initial point E.

It has been argued in recent studies by Agmon[14] that the potential gains from international diversification may be small, if they exist at all. This is found to be the case when an evaluation is made of systematic risk. Previous writers on international diversification (such as Grubel) have shown that most of the unsystematic risk may be diversified away by efficient holdings of bonds and/or equities. It is, however, now possible to reduce systematic risk, and this point needs special consideration.

Agmon could not reject the hypothesis that share prices in the equity markets of major western industrialized nations behave as if there exists one multinational equity market. This means that share prices in non-U.S. countries are related to, and affected by, price changes in the U.S. equity market itself. The share prices in each country are also affected by factors within that country, and this country factor is to some degree independent of other country factors. Because these country risks in non-U.S. equity markets are not systematic it is possible to diversify asway the unsystematic risk. It is clearly not possible to eliminate the systematic risk of the U.S. equity market, even by international diversification.

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14. T. Agmon (1972, 1973) ibid.

Agmon argues that there is one world capital market, in which there is systematic risk. He is critical of the approach by Grubel and others which assumed segmented national capital markets in which it was possible to reduce unsystematic risk by holding a set of efficient portfolios for different national markets. In Grubel's work on portfolio diversification from equity holdings there is a possible overstatement of the gains from international diversification. The stock market averages which are taken as measures of the rates of return in each country reflect already diversified portfolios, and the relevant measure for the benefits of diversification require a computation of the covariances between the rate of return on any asset and the return on the market as a whole.

The empirical work by Agmon is not very satisfactory although he does present some evidence that the movements of share prices in leading world markets are indeed related. Whether this common trend in share prices is strong enough evidence to suggest that there is one multinational equity market is open to question.

Lessard[15] has calculated the mean and standard deviation for groups of stocks in different countries and has used these calculations to derive a measure of the systematic risk in the world capital market. It is an approach towards estimation

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15. D. R. Lessard (1974) ibid. See also "International Portfolio Diversification," Journal of Finance (June 1973) pp. 619-633.

of the capital market line, and the empirical work is hedged with many qualifications. Lessard specifies and gives estimates of a world market factor, that is a capital asset pricing line. In the specification an individual security is related to the world market factor. There is a relationship between national stock market indices and a conceptualized world market factor. Using this diversified portfolio model Lessard claims that international diversification was more important than industry diversification.

One problem with international diversification is that it involves foreign exchange risk. Stock market returns may not be independent of such exchange risks. To some extent this reinforces the argument in favour of purchasing shares in the multinational corporation since it is better equipped than the private individual to overcome exchange rate risk. If multinational corporations are undertaking this type of activity then it might be expected that over time the degree of segmentation in world capital markets may decrease. That is to say the multinational corporation is an engine of international diversification.

Constraints on the Hypothesis

As shown above in Chapter Two, it is necessary to make a careful distinction between foreign investment and foreign operations. As data are not available on foreign investment at the firm level it is necessary, in the empirical sections, to test the foreign operations of firms. Imperfections in the

international markets for securities motivate direct foreign investment via the specific mechanism of the multinational firm. The sales and production activities of multinational corporations are referred to as foreign operations. The principal method of operating abroad is through the establishment of foreign subsidiaries. Foreign operations are defined here, however, to include not only sales by foreign subsidiaries, but also exports from the parent company. This definition is not theoretically desirable but is forced into use because it is so defined in the only published source of data on foreign operations at the firm level.

For a suitable test of the hypothesis that foreign investment can reduce the risk of expected rates of return, it is necessary to have data on the foreign investment of firms. Such data are only available at the industry level, however, and due to the requirements of confidentiality the U.S. Treasury will not release information on individual firms. Testing at the firm level (and not the industry level) is required since it has been argued that the motivation of direct investment is due to market imperfections and that the multinational firm itself embodies the specific transfer of factor and product advantages abroad. A suitable proxy for foreign investment must be found.

The best published data available is the analysis of the foreign operations of the largest five hundred U.S. mining and manufacturing corporations by Bruck and Lees.[16] They calculated the ratio of foreign to total operations in 1965, where

foreign operations are defined as exports from the United States plus sales by overseas subsidiaries of the firm. This data source was adopted, and is discussed in more detail in Chapter Four.

The choice of (E/K) as an indicator of the rate of return for a firm is explained in more detail in Chapter Four.

The portfolio theory model implies that there will be greater stability of rates of return on the securities of internationally diversified corporations. A problem on the empirical side is that there is only indirect published evidence on the rates of return on securities, such data being the book rates of return of corporations. More specifically, the ratio (E/K) is used in this thesis, where E represents reported net profits, and K represents net worth (at book) of the firm.

A fundamental issue raised by the hypothesis of international diversification of asset holdings is that the benefits from foreign asset holdings can largely be achieved by direct foreign investment abroad and the subsequent subsidiary sales rather than producing at home and selling abroad in the form of exports. If a corporation produces at home and exports some of its output then the firm will indeed benefit from in-

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16. Nicholas K. Bruck and Francis A. Lees "Foreign Investment, Capital Controls and the Balance of Payments" The Bulletin (New York University Graduate School of Business Administration Institute of Finance, No. 48-49 April 1968) and Nicholas K. Bruck and Francis A. Lees "Foreign Content of U.S. Corporate Activity" Financial Analysts Journal (Sept-Oct. 1966.)

creased stability of its total sales (domestic and foreign) rather than by selling all its output in the domestic market. This is because the firm is able to avoid the specific risk of trade cycle fluctuations, natural disasters and domestic political risks.

Sales diversification can provide a special reason for reduction in the unsystematic risk to the firm. While direct investment abroad should demonstrably produce a reduction in such unsystematic risk, such foreign investment of the firm is subject to national factors unique to the host country. On the other hand foreign sales, made by a subsidiary, may be subject to a somewhat different set of factors. For example, tariff barriers may be an important variable influencing direct investment while the possibility of confiscation may influence subsidiary operations.

When a corporation engages in foreign direct investment it makes a physical contact with a foreign company. Foreign production transforms the subsidiary of a parent corporation into a new entity, subject to localized conditions in the host economy. The subsidiary is therefore operating under a different set of parameters. These parameters may be affected in a truly exogenous manner. There may be changes in host economy taxation policies, in weather conditions, in union and labour policy, etc. These exogenous factors indicate the world is not perfectly independent in as far as direct investment is concerned. Yet when portfolio investment is

considered then there is more interdependence because of the centralized international capital market which mobilizes financial assets in response to interest rate differentials. The international bond market has increased in size and importance in recent years[17] and is not subject to the truly exogenous factors discussed above which affect direct investment.

Firms of comparable size which do not benefit from international diversification of sales are faced with greater uncertainty on their earnings stream. Usually this might make it necessary for the firm to contemplate some form of insurance being paid to safeguard against fluctuations in earnings. Whether or not such insurance payments are actually made it can be argued that the implicit total costs of operating a non-diversified firm exceed those of a diversified firm.

One of the major implications of this point is that direct investment will reduce the marginal cost of a firm's total operations. Alternatively, exports can achieve the same benefit. The marginal cost of operations is lowered because the firm gains a risk discount if it engages in extensive foreign operations, whereas a firm not engaged in such foreign operations has to pay a risk premium.

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17. See Richard Cooper in John H. Dunning (ed.) International Investment: Selected Readings. Penguin Books, 1972, pp. 220-240.

Specification of Hypothesis

Using the foregoing statements about earnings stability as a measure of risk, and foreign operations as a measure of foreign investment leads to an empirically testable hypothesis. For a corporation we use the mean (expected rate of return on book equity) and the risk of this expected rate of return where in this thesis the risk measure is variance.

The empirically testable hypothesis derived from the portfolio model is:

> "The instability of United States corporation earnings through time is a decreasing function of the ratio of foreign to total operations ceteris paribus."

Alternatively it can be stated that the risk of profits (as measured by variance) is inversely related to the ratio of foreign to total operations. Other factors clearly influence the risk of profits, and these are specified in the equation. An important variable is size, while others are product diversification and rate of growth of the firm. In general risk of profits would be negatively related to both increasing size, and to increasing product diversification. Other studies have found this to be the case, and these are discussed in Chapter Four in connection with the data. Reports of the empirical work are reserved for Chapter Five.

The equation specified for testing is:

$$\text{Var}\ (E/K)_i = f\ (F/T)_i, \text{SIZE}_i, \text{DUM}_i) \qquad 3.31$$

where:

Var is variance

(E/K) is the rate of return on capital using annual data, and where E is defined as net income (profits) and K is defined as net worth of the corporation.

(F/T) is the ratio of foreign to total operations, and where F is defined as exports by home firms plus sales by overseas subsidiaries.

DUM is an industry dummy variable.

i is a subscript denoting individual firms.

SIZE is a variable representing the size of a firm, as measured by either sales, assets, employees, or a size index, where:

S is the size of the firm as measured by sales,

A is the size of the firm as measured by assets,

N is the size of the firm as measured by number of employees.

In the specification of this equation it should be noted that S, A and N are correlated because they are alternative mea ures of the size of the firm. It is hypothesized that size is inversely related to variance, since as the size of a firm increases it is able to diversify its total operations in order to reduce risk. The sign of the industry dummy variable depends on the omitted dummy in the specific formulation of the particular equation tested, and cannot be determined here. It should also be noted that this equation is constrained by lack of availability of data.[18]

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18. Specifically data are not available on consolidated world-wide earnings of individual multinational corporations and the foreign operations of a firm cannot be divided into separate sets of data on exports and subsidiary sales. Such data are available at the

Clearly other variables influence the variance of (E/K) besides the variables specified for the empirical work. One such omitted independent variable is a measure of leverage. Highly levered firms, that is ones with a large ratio of debt to equity, would probably offer higher expected returns than firms with little leverage. At the same time the higher expected returns would be positively associated with risk. The measure of risk is variance in (E/K), which is the ratio of net profits to net worth. By including the expected (E/K) in the equation as the dependent variable this problem is removed, due to the correlation between (E/K) and any leverage variable.

A second point affecting the equations specified for empirical testing is the treatment of expectations. In the theoretical section it is hypothesized that international diversification is expected to increase future earning stability. A firm engages in foreign operations in order to reduce the expected variability in its (E/K) ratio. It is not possible to test this theoretical argument directly. This is due to the familiar research problem that only ex post data are available. It is conventionally assumed that the equations using such ex post data are suitable proxies for the ex ante theory specified in terms of expectations.

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18. cont'd.

industry level only. Secondly, there are no data on the value of foreign assets by country. There is also a lack of published data at the firm level on sales and exports to individual countries, and on the location of foreign investments by individual firms.

Summary

In this chapter the portfolio theory and capital asset pricing model have been applied in an international context. The procedure followed was to first specify the model assuming perfect international capital markets, and then to introduce the implications of imperfect markets due to factors such as: taxes, foreign exchange controls, information costs, and externalities in the factor and goods markets. Relaxing the assumption of a perfect international capital market prevents the achievement of general equilibrium in such models. It was shown that the theoretical arguments in favour of international diversification remain strong despite the introduction of market imperfections. On the empirical side it was argued that most of what has to be said about risk can be captured by use of variance. Data limitations prevented the specification of an equation with foreign investment, and rates of return on securities. Instead the proxies used were respectively foreign operations, and the rate of return on book value of equity.

CHAPTER FOUR - DATA SOURCES

The chapter is structured in the following manner. First there is a description of data sources, and definition of the main variables such as (F/T), (E/K), size, and dummies. Secondly there is a report of the data bank established giving information on the largest five hundred U.S. mining and manufacturing corporations. The use of these variables and data in this thesis is defended, and all related problems are qualifications are carefully explained.

Foreign Operations

Foreign operations are defined as exports and sales by overseas subsidiaries of the firm. The only published sources on foreign operations at the firm level, which were available to the author, were the studies by Bruck and Lees.[1] In these they have calculated the extent of foreign operations of the largest five hundred American corporations in 1964 and 1965, as ranked by Fortune magazine in its annual directory.

Their data were taken from three main sources; from annual reports of corporations, from information given by

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1. Nicholas K. Bruck and Francis A. Lees "Foreign Investment, Capital Controls and the Balance of Payments" The Bulletin (New York University Graduate School of Business Administration Institute of Finance, No. 48-49 April 1968) and Nicholas K. Bruck and Francis A. Lees "Foreign Content of U.S. Corporate Activity" Financial Analysts Journal (Sept. -Oct. 1966).

corporations to the Securities and Exchange Commission, and from interviews and correspondence with senior executives of the corporations. Not all of these three sources were used for each firm, and most of the information came from the annual reports.

The ratio of foreign to total operations was computed in several ways, depending on the availability of data. The methods use data on foreign sales (n = 186), foreign earnings (n = 136), foreign assets (n = 198), number of foreign employees (n = 74), extent of foreign production (n = 35), and other (n = 9). In this thesis the (F/T) statistic is chosen as sales, and when that is not available, as assets, then earnings, employment or production. It is reported[2] that there is normally little difference between these alternative measures of foreign operations and to check this a correlation matrix was calculated by the writer.[3] Number of observations is shown by n.

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2. Bruck and Lees The Bulletin ibid., appendix table II-A pp. 83-93.

3. The correlation matrix for alternative measures of (F/T) is:

	1 Sales	2 Earnings	3 Assets	4 Emply't	5 Prod'n	6 Other
1. Sales	1.00	.83	.79	.79	.61	.77
2. Earnings		1.00	.80	.78	.81	.51
3. Assets			1.00	.75	.67	.69
4. Employment				1.00	.56	.96
5. Production					1.00	.86
6. Other						

where $n_{12}=87$ $n_{13}=118$ $n_{14}=61$ $n_{15}=26$ $n_{16}=8$

$n_{23}=120$ $n_{24}=37$ $n_{25}=21$ $n_{26}=5$ $n_{34}=54$

$n_{35}=28$ $n_{36}=8$ $n_{45}=13$ $n_{46}=6$ $n_{56}=3$

The various measures of (F/T) are defined by Bruck and Lees as follows:

Foreign Sales; are equal to "exports from the United States and sales of overseas subsidiary companies."

Foreign Earnings; in principle "include all (worldwide) earnings whether remitted to the United States parent or not, with an adjustment for expected foreign exchange-rate gain or loss," but a number of definitions were used, depending on availability of data.

Foreign Assets; usually "were measured on an equity basis, i.e. the percent of consolidated worldwide net assets represented by net assets located outside the United States."

Problems With the Data

The data on the sales may involve some double counting. Some of the sales of overseas subsidiaries may have been directed to the parent company or its other home subsidiaries in the United States. According to Bruck and Lees the "extent of these biases is believed to be relatively small."[4]

Secondly, the treatment of consolidation of foreign subsidiary operations is not uniform. It ranges from

> "full consolidation of all significant subsidiaries to carrying all foreign subsidiaries at cost as investment. A large number of companies consolidate only majority-owned subsidiaries, and, in some cases only wholly-owned subsidiaries in the United States and Canada; a number of companies do not provide separate statistics of Canadian operations; and, in other cases, only operating results on assets outside of North America are treated as a distinct group."[5]

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4. Bruck and Lees ibid., p. 14.

5. Bruck and Lees ibid., pp. 21-22.

These problems of company reporting are not confined to the work by Bruck and Lees. All researchers using company accounts have to take notice of varying company practices. The author has checked the Bruck and Lees reports with the original company listings in Moody's Industrials, and has found the treatment of consolidation to be comparable in both sources.

Another writer in the area of foreign investment has given the opinion that the work by Bruck and Lees in their 1966 article on foreign content of U.S. corporations was "one of the more painstaking surveys of the foreign business of U.S. enterprises."[6] The survey by Bruck and Lees (reported in both of their contributions) covers one hundred and forty of the one hundred and eighty seven multinational enterprises as defined in the more recent study of Vernon's own team working on the Harvard Business School Multinational Project. Vernon's one hundred and eighty seven multinational manufacturing corporations are reported in his book, Sovereignty at Bay,[7] and in a source book of tables[8]. The data in these

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6. Raymond Vernon Sovereignty at Bay: The Multinational Spread of U.S. Enterprises (Basic Books, New York 1971) p. 121.

7. Ibid., Chapters I and IV.

8. James W. Vaupel and Joan P. Curhan The Making of the Multinational Enterprise: A Source Book of Tables Based on A Study of 187 Major U.S. Manufacturing Corporations (Harvard University, Boston 1969).

Harvard surveys were based on similar sources to the studies by Bruck and Lees, that is, they used published materials from Stock Exchange reports, annual reports, books, articles, and interviews.

Rate of Return (E/K)

E represents net income of the corporation, that is, the amount of profits earned in that year. As is well known profits are the difference between total revenue and total cost where total cost include expenditures on labour (such as wages) and expenditures on capital (such as depreciation).

In the Fortune directory E is formally defined as:

> "net income, that is, after taxes and after special charges or credits when they are shown on the income statement. Non-recurring items are footnoted when they amount to 10 per cent or more of total profit or loss."

K represents net worth of the corporation and it is sometimes referred to as invested capital. It is formally defined in the Fortune directory as:

> "invested capital, that is, net worth - the sum of capital stock, surplus, and retained earnings - at the year's end."

(E/K) represents the ratio of net income to net worth, that is profit as a per cent of invested capital. It represents the annual rate of return on invested capital.

Other researchers have used (E/K) as a measure of the rate of return on assets of a firm. For example,

Palmer[9] used this statistic as his dependent variable describing it as "the average rate of return on net worth." He assembled the data from the identical source, that is, the Fortune 500 from 1961 until 1969. The (E/K) ratio was also used by Cootner and Holland.[10] They used as a measure of the rate of return the net income after taxes plus interest all divided by the total capitalization of the firm.

In a survey of recent empirical work on the profitability of corporations, John Eatwell[11] defines the appropriate profit ratio as (E/K). The numerator is return from profits net of depreciation and after taxes. The denominator is K which is net worth of the firm, that is, the book value of its equity.

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9. John Palmer "The Profit-Performance Effects of the Separation of Ownership from Control in Large U.S. Industrial corporations" The Bell Journal of Economics and Management Science (Spring 1973), see page 294.

10. Paul H. Cootner and Daniel M. Holland "Rate of Return and Business Risk" The Bell Journal of Economics and Management Science (Autumn 1970), see page 214.

11. John L. Eatwell, "Growth, Profitability and Size: The Empirical Evidence," in Robin Marris and Adrian Wood (eds.) The Corporate Economy (Harvard University Press, Cambridge, Mass. 1971). See especially pp. 389-390.

Further evidence that (E/K) is the appropriate rate of return to a firm is contained in a study by Hall and Weiss.[12] They use the Fortune (E/K) as a measure of the firm's rate of return after tax on year-end equity, where equity (K) can include windfall gains and losses. They assume that managers seek to maximize this rate of return on equity. Hall and Weiss refer to the classic contribution by Stigler[13] and Baumol[14] in which the validity of the (E/K) ratio as a

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12. Marshall Hall and Leonard Weiss, "Firm Size and Profitability," Review of Economics and Statistics (1967) pp. 319-331. See especially pp. 320-321.

13. G. Stigler, Capital and Rates of Return in Manufacturing Industries (Princeton, 1963). See especially pp. 123-4.

14. W.J. Baumol, Business Behavior, Value and Growth (New York, 1959). See page 43. An alternative rate of return suggested by Baumol is the ratio of after tax profits to year-end assets.

profit measure is discussed.[15]

Size Measures

There are at least four possible measures of size of the firm. These are:

(i) assets, in book value, either total or net,

(ii) sales,

(iii) employment,

(iv) net profits.

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15. Other factors may influence the measure of profit rates, (E/K), but these do not reduce its validity. In the test by Hall and Weiss it is shown that size of firm is positively related to profit rate. They used the logarithm of assets as a measure of size, and found that it is positively related to the (E/K) ratio in a function where the rate of return (E/K) increases at a diminishing rate. Assets are preferred to sales or employees as the appropriate measure of size as financing of the firm can be better indicated by assets. Financing problems are in fact one of the major barriers to entry and limits to the growth of the firm. The logarithm of assets is the appropriate size measure rather than assets themselves as the problem of a firm's raising an extra 1% of its assets is more relevant than the raising of $1 million; it being easier for a large firm to raise $1 million than a small firm.
Similarly it is necessary to correct for heteroskedasticity. The variance of profits for large firms is less than for small firms, one reason for this being that large firms have more product diversification than small firms. This can be corrected by taking the square root of the observed profit rates. Alternatively, as in this thesis, the problem of heteroskedasticity is overcome by taking the ratio of (E/K) rather than profits in absolute terms. The ratio acts as a scaling device, and has the advantage of being the correct rate of return.

Not surprisingly it has been reported[16] that there is a "high degree of correlation between various measures, and ..... that often the choice of measure can depend largely on convenience, availability and ease of calculation."

In this thesis data is recorded on sales, assets, employees, and net profits of the firm. These provide alternative measures of the size and growth rate of the firm, depending upon the theoretical basis of any projected empirical test.[17] It has been

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16. Eatwell, ibid., pp. 392-394

17 In working with these size measures several problems may arise. For example, in order to achieve accurate calculation of the size of a firm using assets, allowance must be made for corporate policy towards inflation and growth. First, in a period of sustained inflation a firm may revalue the book value of its equity. This will bias downwards its profitability as in the (E/K) ratio the denominator has increased and therefore the profit ratio itself decreased. Secondly, if the firm has a policy of financing its growth through retained profits this will lead to an upward bias in estimates of its growth rate since in the (E/K) ratio the numerator will be increased. Another separate problem is that there is a three-way interdependence between profitability, growth and size. For example, in order to test the relationship between profitability and size it could be hypothesized that the variability of profit rates for large firms is less than that for small firms. This is because large firms can be expected to engage in greater product diversification and geographic sales diversification. The large firms will benefit from greater certainty in their profit streams. From this analysis the relationship between profitability and firm size is unclear. Either there is an inverse, or a positive relationship between profitability and firm size. There is some evidence that the profit rate increases until a firm reaches a size of about $10 million as measured by assets. Large firms may be more capital intensive, which means that the (E/K) ratio could remain constant. When the (E/K) ratio is used, an increase in E may be offset by an increase in K for large firms.

suggested elsewhere that "sales is the most widely used firm measure of size in the United States"[18], although in Britain assets are more popular since there is easy access to published balance sheets. The controversy over the appropriate measure of firm size has not been considered in much detail here because this is a minor part of the thesis, subsidiary to the main investigation of the effect of foreign operations on the variability of a firm's earnings. However, in the regression equations an index of size was constructed to avoid this problem, and this did not alter the results in any way. These tests are reported below.

Description of the Data Bank

A data bank was coded using one computer card for each of five hundred firms. The sources of all the data in the data bank were either the Bruck and Lees study of 1968[19], or from various years of the Fortune Directory of the top five hundred U.S. manufacturing and mining corporations. The following information was coded for each firm on its own computer card:-

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18. David J. Smyth, William J. Boyes, and Dennis E. Peseau, "Alternative Measures of the Size of the United Kingdom Firms" (Claremont Economic Papers #38, June 1972). Presented to the Western Economic Association Meetings at Santa Clara, August 1972. See page 2.

19. Bruck and Lees The Bulletin 1968 ibid.

(i) rank of the firm, in 1965 as determined by size of sales as given in Fortune Directory

(ii) (E/K) for each year from 1960-1969, i.e. ten observations as given in various issues of the Fortune Directory, reported as a per cent.

(iii) (F/T) of the firm for 1965 as calculated by Bruck and Lees, ibid., appendix table II-A pp. 83-93, as a per cent.

(iv) sales in millions of dollars for 1965 as given in the Fortune Directory

(v) assets in millions of dollars for 1965 as given in the Fortune Directory

(vi) net profits in millions of dollars for 1965 as given in the Fortune Directory

(vii) employees in thousands for 1965 as given in the Fortune Directory

(viii) Standard Industrial Code (SIC) for 1965 as given by Bruck and Lees, ibid., appendix table I, pp. 69-82.

(ix) sales in 1969 and 1960, as given in the Fortune Directory

(x) assets for 1969 and 1960 as given in the Fortune Directory

(xi) earnings per share in 1965 as given in the Fortune Directory

The collection of data presented many problems, some of which have been discussed previously; for example, the source of the (F/T) statistic for each firm. Except for the (F/T) statistic, and the SIC code, all the rest of the data were found in various issues of the Fortune Directory. It should be mentioned that this is a reliable source as it accurately reproduces published data on each firm and as such information is identical to that available in other sources such as Moody's.

The figures for (E/K) were obtained by searching in each annual

issue of the Fortune 500 Directory from 1961 until 1970 (the Directory is published with a one-year lag). Naturally over this ten year period the composition of the top 500 firms changed and this meant that there were missing data on several (E/K)'s especially for many of the smaller firms. When the variance of (E/K) was calculated for each firm this was adjusted for the different number of observations. Of the original five hundred firms listed from 1965, 41 were affected by name changes and 56 were involved in both name changes and mergers.

In the (F/T) figures taken from the Bruck and Lees study of 1968, five firms were foreign owned so that consequently no data were appropriate for the accepted definition of (F/T). These five firms were omitted from all calculations.

This Chapter has reported the data sources used, and expanded upon the reasons for the choice of the main variables: (F/T), (E/K), and different measures of size. The data limitations discussed in Chapters Two and Three have been further explained. All the variables have been carefully defined and related to the theoretically specified equation for testing. The regression results using these data are reported next in Chapter Five.

CHAPTER FIVE - EMPIRICAL WORK AND RESULTS

This chapter reports and interprets the regression results undertaken in this thesis. As explained in Chapter Three the reduced form hypothesis dictated by availability of data is:

$$\underset{i}{\text{Var}}\ (E/K) = f\left[(F/T)_i, S_i, DUM_i\right]$$

where variance of corporations earnings, Var (E/K) depends on: foreign operations, (F/T); S, which is a variable representing size of the firm; and DUM, which is a symbol representing dummy variables such as industry classification of the firm.

Throughout the chapter the subscript i will be dropped in the reporting of equations and regression results. It is to be understood that all such equations refer to individual firms, and the interpretation of the results is based on this assumption. The symbols have the same meaning as in Chapters Three and Four.

Using the model outlined in Chapter Three, and the data which were assembled in the manner described in Chapter Four, a series of tests was carried out. The method used was least squares regression analysis. Operations were performed using the MASSAGER programme in the SFU computing centre. The regression results are now reported and analyzed. One tail tests of significance are reported in all equations.

Various functional forms of the equation were estimated, namely linear, quadratic, and logarithmic.[1] The functional form specified is logarithmic, since it was thought that this type of function would be best able to capture the wide range in absolute numerical values of the observations in several of the variables (such as size measures).

Industry Dummies

The firms were coded into 18 industry groups plus one miscellaneous category making 19 in all. These classifications report the standard three digit SIC code number, as reported in Bruck and Lees (1968). As only 18 operations are available with the MASSAGER programme these industries were reduced to 12 dummies, as shown in the table.

A special programme was necessary in order to form the dummy variables. Briefly, the method consisted of three steps, for example, assuming SIC 37 is to be the dummy variable, firstly 37 is subtracted from each of the five hundred

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1. Several problems arose in the actual programming and operating of the computer. The canned programme used to generate regressions was MASSAGER and one of the difficulties in its use is the treatment of zero values of variables. The MASSAGER programme cannot take the log. of zero, and there are 97 firms of the 500 with a zero (F/T) ratio. To overcome this problem the value of 0.25 was added to each and every value of (F/T). This device does not affect the raw data as the original data of (F/T) from Bruck and Lees were themselves rounded to the nearest percentage point. Hence any firm with a (F/T) of less than 0.5 is reported as zero. By taking 0.25 as an estimate of the mean of the true (F/T) for these firms the programme can be used correctly, and any computing bias in the results can be avoided.

SIC codes; secondly the result is divided by itself; and thirdly the result is subtracted from a constant vector of ones. Therefore, in this example, SIC 37 appears as one, and all other SIC's as zero.

When the regressions were run, each industry dummy was omitted in turn. One such dummy has to be omitted in order to act as a standard of comparison for all other industry groups. The results are no different when alternative industry groups are omitted. It was found by this procedure that SIC group 37 was the most risky group. For simplicity in presentation results are reported with SIC 37 as the omitted dummy variable.

INDUSTRY DUMMIES

Dummy Number	SIC Code	Industry Name	Number of Firms
1	37	Transportation Eqpt.	46
2	36	Electrical Machinery	43
3	35	Non-electrical Machinery	55
4	34	Fabricated Metals	18
5	33	Primary Metals	49
6	28	Chemicals	56
7	20 + 21	Food: Tobacco	78
8	22 + 23	Textiles: Apparel	26
9	24 + 26 + 27	Lumber: Paper: Printing	39
10	29 + 30	Petroleum: Rubber	38
11	31 + 32	Leather: Glass	23
12	38 + 39	Instruments: Miscellaneous	28

ln Variance (E/K) 1960-1969 is a function of the following independent variables:-

	Constant	ln (F/T)	ln (Size)	(SIC 20 & 21)	(SIC 31 & 32)	(SIC 24 & 26 & 27)	(SIC 22 & 23)	(SIC 28)	(SIC 33)	(SIC 38 & 39)	(SIC 36)	(SIC 35)	(SIC 29 & 30)	(SIC 34)
(5.1)	1.056	-0.109		-0.495	-0.494	-0.375	-0.344	-0.319	-0.260	-0.230	-0.187	-0.111	-0.105	-0.028
	15.72*	-3.49*		-5.94*	-4.27*	-3.66*	-3.05*	-3.52*	-2.82*	-2.13^{x}	-1.95^{x}	-1.21	-0.95	-0.22
(5.2)	1.489	-0.078	-0.169	-0.512	-0.536	-0.422	-0.382	-0.358	-0.284	-0.276	-0.216	-0.177	-0.038	-0.079
	9.06*	-2.36*	-2.88*	-6.18*	-4.63*	-4.09*	-3.39*	-3.94*	-3.10*	-2.54*	-2.26^{x}	-1.88^{x}	-0.33	-0.62
(5.3)	1.285	-0.068	-0.194	-0.558	-0.526	-0.436	-0.365	-0.384	-0.301	-0.288	-0.203	-0.174	-0.090	-0.079
	13.96*	-2.06^{x}	-3.59*	-6.63*	-4.59*	-4.240*	-3.28*	-4.21*	-3.28*	-2.66*	-2.13^{x}	-1.88^{x}	-0.82	-0.63
(5.4)	1.639	-0.049	-0.252	-0.541	-0.521	-0.101	-0.387	-0.347	-0.249	-0.250	-0.226	-0.196	-0.007	-0.097
	11.74*	-1.48'	-4.73*	-6.59*	-4.60*	-4.00*	-3.51*	-3.91*	-2.76*	-2.36*	-2.40*	-2.14^{x}	-0.07	-0.78

•t values are reported below each coefficient where the significance test is satisfied at:-

* 1% level, ^{x} 5% level, ' 10% level.

On the last page four equations are reported, in all of which dummy variables representing industry classification have been added. Variables are in log. form, and the problem of zero (F/T)'s was overcome by adding 0.25 to each observation of (F/T). The number of observations is 492, with eight omitted due to data limitations (as explained in Chapter Four). Size variables have been included in equations 5.2, 5.3, and 5.4, where the size variable used is:

Sales in equation 5.2

Employees in equation 5.3

Assets in equation 5.4

The value of R^2 adjusted for degrees of freedom was as follows:

0.10 in equation 5.1

0.12 in equation 5.2

0.12 in equation 5.3

0.13 in equation 5.4

The mean value of the dependent variable, In variance (E/K), was about 0.69 in each of the four equations.

In the regressions twelve industry dummies have been added to the basic equation which tests the relationship of (F/T) to variance of earnings, and SIC code 37 has been omitted in order that the remaining eleven industry dummies may be compared to it.

In equation 5.1 (F/T) satisfies the 1% level of significance as shown by the t value of -3.49 (which is great-

er than the required value of -2.33). The explanatory power of the equation is about 10% as indicated by the multiple correlation coefficient ($\bar{R}^2$) as adjusted for degrees of freedom. The value of the (F/T) coefficient is about 0.1 which implies that an average increase in (F/T) for a firm of 10 percentage points would reduce its variance by 10 percentage points, and with a mean of about .7 the risk would be reduced by about one-seventh. In equation 5.1 the industry dummies are all inversely related to variance which shows that they are all less risky than those firms in SIC group 37.

When a size variable is added in equation 5.2 the (F/T) variable satisfies the 1% significance level, as does the size variable. With SIC 37 as the omitted industry dummy variable, all the industry groups are again inversely related to variance. For the first seven industry dummies reported, this stability satisfies the 1% significance level, while for another two it satisfies the 5% level. There is some evidence of multicollinearity between the (F/T) and sales variables as demonstrated by the correlation coefficient of 0.29 between (F/T) and sales which is greater than the value of the adjusted $\bar{R}^2$.

In equation 5.3 and 5.4 there is a similar pattern of results when employees and assets are used as alternative measures of size. The explanatory power of the equation as indicated by the multiple correlation coefficient adjusted for degrees of freedom is between 12% and 14%. When employees are used instead of sales (F/T) is significant at the

5% level, while when assets are used (F/T) is only significant at the 10% level. In both equations the size variable itself satisfies the 1% level of significance. In the equations there is again multicollinearity between (F/T) and the respective measure of size. The industry dummies perform in a consistent manner in each equation. In equations 5.3 and 5.4 for seven of the industry groups the more stable earnings as compared with SIC 37 are significant at the 1% level, while for another two this stability is significant at the 5% level. There is no multicollinearity between any of the industry dummies, since they are orthogonal by construction.

The results reported and interpreted above in general support the hypothesis as outlined in previous chapters. The sales variable in equation 5.2 gives the best results because with this proxy for size the crucial (F/T) variable satisfies the 1% significance level.

Many other experiments were undertaken in order to test the aspects of the hypothesis, and to check results. The more important of these empirical tests are now reported.

It is possible that none of the three size measures used so far is clearly superior to any other, nor is any one of them necessarily theoretically appropriate. Therefore an index of firm size was constructed, based on an equal weighting of the three size variables: sales, assets, and employees. This size index is an estimate of firm size given that all firms do not have assets and employees in the same proportion

as sales. For example, while the firms are ranked in descending order of sales, some capital intensive firms would have a higher ranking based on assets rather than on employees.

The index was constructed from information in the data bank on sales, assets, and employees. It was possible to normalize these three measures by converting them into indices. The resulting indices were added, multiplied by a constant, and divided by three to give the size index for each of the firms. Omitted from the regression calculations once again were the five foreign owned firms, and the three firms with the missing data, giving a regression for the 492 firms.

In general the regression equations were very similar, if not a little better than, those reported previously. The (F/T) variable is significant at the 1% level before the size index is added (that is, in an unreported equation which is identical to 5.1). The crucial (F/T) variable is significant at the 5% level in equation 5.5 after the size index is added. The size index itself is significant at the 1% level in this equation. The dummy variables perform in a similar manner to earlier equations, and the explained variance, as measured by the adjusted $\bar{R}^2$ of 0.13 is similar to previous equations. There is an indication of multicollinearity between the size index and (F/T) as their correlation is 0.34, which is greater than the $\bar{R}^2$ of 0.13.

5.5 $\ln \text{Variance } (E/K)_{1960-1969}$ = 1.115
(16.39)*

-0.063 $\ln$ (F/T) (-1.91)x	-0.220 ln (Size (-3.83)* Index)	-0.536 (SIC 20&21) (-6.47)*
-0.531 (SIC 31&32) (4.64)*	-0.427 (SIC 24&26&27) (-4.18)*	-0.380 (SIC 22&23) (-3.42)*
-0.369 (SIC 28) (-4.09)*	-0.282 (SIC 33) (3.10)*	-0.271 (SIC 38&39) (-2.53)*
-0.216 (SIC 36) (2.28)*	-0.188 (SIC 35) (-2.03)x	-0.091 (SIC 34) (-0.72)
-0.027 (SIC 29&30) (-0.24)	$\bar{R}^2$ = 0.13	Mean In Var. = 0.13

N = 492

A reduced sample was constructed consisting of 279 firms. Omitted from the sample once again were the five foreign owned firms, and also this time all the firms with missing values on (E/K)'s. The sample thus contained full information on each of the ten observations of (E/K), but it is necessary to check for any possible bias in such regressions due to this procedure.

In fact the results for this sample were very similar to those of the main test for the 492 corporations, as can be seen in the accompanying results.

In equation 5.6 the (F/T) variable has the correct negative sign and satisfies the 5% level of significance. The industry dummy variables are all inversely related to variance when SIC 37 is the omitted dummy, and most of these industries are significantly less risky than SIC 37.

The multiple correlation coefficient as adjusted for degrees of freedom is 14% of the variance.

In equation 5.7 the (F/T) variable is only significant at the 10% level when sales are added as a proxy for size. The industry dummies are much the same as before. The major difference between equations 5.6 and 5.7 is that in the latter the multiple correlation coefficient, adjusted for degrees of freedom, has increased to explain some 16% of variance. (The unadjusted R^2 is 0.20). There is some indication of multicollinearity between (F/T) and the size variable as the value of the correlation coefficient (0.31) is greater than the $\bar{R}^2$.

Similar results were obtained in equations using either assets or employees as alternative measures of size.

5.6 $\ln \text{Variance } (E/K)_{1960-1969}$

$$= \underset{(24.11)*}{1.986} - \underset{(-2.56)*}{0.091}\ \ln(F/T) - \underset{(-4.72)*}{0.545}\ (SIC\ 29\&30)$$

-0.523 (SIC 20&21) (-5.18)*	-0.379 (SIC 38&39) (-2.47)*	-0.351 (SIC 22&23) (-2.49)*
-0.326 (SIC 31&32) (-2.27)x	-0.318 (SIC 24&26&27) (-2.79)*	-0.257 (SIC 28) (-2.46)*
-0.177 (SIC 36) (-1.52)'	-0.163 (SIC 33) (-1.36)	-0.119 (SIC 34) (-0.78)
-0.035 (SIC 35) (-0.31)	$\bar{R}^2 = 0.14$	Mean In. Var. = 1.64

N = 279

t values are shown in parentheses

5.7 In Variance $(E/K)_{1960-1969}$

$$= \underset{(12.17)*}{2.471} - \underset{(-1.61)'}{0.059}\ \text{In}(F/T) - \underset{(-2.61)*}{0.179}\ \text{In Sales}$$

-0.555 (SIC 20&21) (-5.52)*	-0.524 (SIC 29&30) (4.57)*	-0.432 (SIC 38&39) (-2.82)*
-0.395 (SIC 22&23) (-2.81)*	-0.381 (SIC 31&32) (-2.67)*	-0.371 (SIC 24&26&27) (-3.25)*
-0.311 (SIC 28) (-2.96)*	-0.197 (SIC 36) (-1.70)x	-0.172 (SIC 33) (-1.45)'
-0.169 (SIC 34) (-1.11)	-0.105 (SIC 35) (-0.89)	$\bar{R}^2 = 0.16$

Mean In. Var. = 1.64 N = 279

t values are shown in parentheses

Other functional forms were tested for the 492 firms. In equation 5.8 the linear form of the regression is reported, with (F/T) only significant at the 10% level, while the size index is significant at the 5% level. The industry dummies are much the same as in earlier equations. The adjusted $\bar{R}^2$ is only one-half of those equations in log. form. There is multicollinearity between (F/T) and the size index as their correlation is 0.23, which is greater than the value of $\bar{R}^2$.

In equation 5.9 the regression is reported using a quadratic form. The (F/T) variable is significant at the 5% level, as is the size index, but $(F/T)^2$ is only significant at the 10% level. The industry dummies and adjusted $\bar{R}^2$ are similar to the next equation reported - 5.10. There is again

multicollinearity between (F/T) and the size index (as the correlation is 0.23).

5.8 Variance $(E/K)_{1960-1969}$

$$= \underset{(10.68)^*}{20.061} - \underset{(-1.34)'}{0.066\ (F/T)} - \underset{(-1.87)^x}{0.170\ (\text{Size Index})}$$

-14.219 (SIC 31&32) (-4.39)*	-13.473 (SIC 22&23) (-4.33)*	-12.238 (SIC 24&26&27) (-4.24)*
-12.148 (SIC 20&21) (-5.18)*	-10.845 (SIC 28) (-4.21)*	-9.936 (SIC 33) (-3.87)*
-9.014 (SIC 35) (-3.43)*	-9.012 (SIC 36) (-3.36)*	-7.826 (SIC 34) (-2.18)x
-7.755 (SIC 38&39) (-2.54)*	+3.765 (SIC 29&30) (1.20)	$\bar{R}^2$ = 0.06
Mean Var. = 9.31	N = 492	

5.9 Variance $(E/K)_{1960-1969}$

$$= \underset{(10.61)^*}{20.929} - \underset{(-1.83)^x}{0.234\ (F/T)} + \underset{(1.43)'}{0.004\ (F/T)^2}$$

-0.174 (Size Index) (-1.90)x	-14.261 (SIC 31&32) (-4.41)*	-13.940 (SIC 22&23) (-4.46)*
-12.286 (SIC 20&21) (-5.24)*	-12.248 (SIC 24&26&27) (-4.25)*	-10.478 (SIC 28) (-4.05)*
-10.098 (SIC 33) (-3.93)*	-8.980 (SIC 36) (-3.35)*	-8.676 (SIC 35) (-3.28)*
-7.928 (SIC 34) (-2.21)x	-7.724 (SIC 38&39) (-2.54)*	+3.610 (SIC 29&30) (1.15)
$\bar{R}^2$ = 0.06	Mean Var. = 9.31	N = 492

t values are shown in parentheses

The size variable is omitted and the equation tested for industry dummy variables in quadratic form. Again the regressions with the 492 firms do not fit as well in quadratic as in log. form. The (F/T) variable is significant at the 5% level, but the $(F/T)^2$ variable is only significant at the 10% level. The explanatory power of the equation as measured by the multiple correlation coefficient is under one-half of that in log. form.

5.10 Variance $(E/K)_{1960-1969}$ = 20.035
(10.43)*

-0.251 (F/T) (-1.97)x	+0.004 $(F/T)^2$ (1.38)'	-13.540 (SIC 31&32) (-4.20)*
-13.263 (SIC 22&23) (-4.256)*	-11.558 (SIC 20&21) (-4.99)*	-11.502 (SIC 24&26&27) (-4.017)*
-9.674 (SIC 28) (-3.78)*	-9.592 (SIC 33) (-3.74)*	-8.576 (SIC 36) (-3.202)*
-7.749 (SIC 35) (-2.99)*	-6.974 (SIC 34) (-1.96)x	-6.963 (SIC 38&39) (-2.30)x
+2.812 (SIC 29&30) (0.90)	$\bar{R}^2$ = 0.05	Mean Var = 9.31

N = 492

With SIC 37 as the omitted dummy variable, all but one of the eleven industry dummies are inversely related to variance, and of these the first eight are significant at the 1% level with the other two significant at the 2.5% level. All these ten industry groups are therefore more stable than SIC 37.

The value of the (F/T) coefficient can be interpreted by noting the elasticity at the point of means. An in-

crease in (F/T) of 10 percentage points will reduce variance by about 2.5 percentage points for an individual firm which is a reduction of over one-quarter in the mean value of its variance.

It may be that variance is affected by growth of the firm, for example a fast growing firm may be able to reduce risk. This problem was partly discussed in Chapter Four in the section dealing with mergers. From the data bank it was possible to calculate the change in sales, and the change in assets, from 1960-1969 as two alternative measures of growth. There were missing data on many firms, to such an extent that a new sample had to be constructed, consisting of 323 firms whose assets and sales were recorded for these years. Dummy variables were not included in this test. The results were as follows:

5.11 $\ln \text{Variance} = \underset{(8.2)^*}{1.067} - \underset{(-1.4)'}{0.050} \ln (F/T) - \underset{(-2.4)^*}{0.131} \ln (\text{Growth})$

$\bar{R}^2 = 0.03$ Mean In. Var. = 0.70

N = 323

5.12 $\ln \text{Variance} = \underset{(6.3)^*}{1.241} - \underset{(-1.4)'}{0.048} \ln (F/T) - \underset{(-0.5)}{0.045} \ln (\text{Growth})$

$\underset{(-1.2)}{-0.138} \ln (\text{Size})$ $\bar{R}^2 = 0.03$

Mean In. Var. = 0.7 N = 323

In equations 5.11 and 5.12 (F/T) variable satisfies the 10% significance level, and while in equation 5.11 the growth variable is significant at the 1% level, its influence

completely disappears when size is added in equation 5.12. The size variable (sales) is not significant even at the 10% level, and now neither is the growth variable. The (F/T) variable is not influenced in this way, and remains significant at the 10% level. Results were similar when assets were used as a growth measure instead of sales.

There is a possible bias in these results due to the omission of firms involved in mergers, and those fast-growing firms which moved in or out of the Fortune 500. These omissions should bias downwards the influence of the growth variable. In conclusion, we would not expect this variable to substantially alter our inferences about the importance of (F/T) as a variable influencing the variance of a firm's earnings.

Further Tests Omitting Dummy Variables

In order to further test the performance of the (F/T) variable under alternative specifications many other regressions were tried without the dummy variables, and several are reported below. In all cases the (F/T) variable was significant and correct as to sign.

The regression based on the data of 492 firms was tried in semi log form:-

5.13 In Variance (E/K) 1960-1969 $= 1.71 - 0.0086\ (F/T)$

$(26.64)^*\ \ (-2.32)^*$

$\bar{R}^2 = .009$

In this equation the independent variable (F/T) is significant at the 1% level, and has the correct negative sign. The (F/T) variable is not in log. form but the dependent variable for variance of earnings has been transformed into logs in order to reduce the large variation in individual operations. The explanatory power of the equation remains small, as again shown by the adjusted $\bar{R}^2$.

The addition of a size variable to the equation in semi log. form yielded:-

5.14 In Variance (E/K) 1960-1969 $= 1.76 \quad -0.008\ (F/T)$

$(25.49)^* \quad\ (-2.14)^x$

-0.00001 Assets

$(-2.55)^*$

$\bar{R}^2 = 0.03$

The (F/T) variable is significant at the 5% level, with the size variable used (Assets) significant at the 1% level, and the explained variance having increased slightly.

The basic regression for the 492 firms in log. form yielded this result:-

5.15 $\ln \text{variance}_{1960-1969}(E/K) = 1.8155 - 0.1052 \ln (F/T)$

$(18.986)^{*} \quad (-2.5034)^{*}$

$\bar{R}^2 = 0.011$

In this equation the regression coefficient of the independent variable (F/T) is significant at the 1% level, and has the correct negative sign. There is again a poor explanatory power of the regression as reflected in the low multiple correlation statistic.

In linear form the (F/T) variable satisfies the 5% level of significance:-

5.16 $\text{variance}_{1960-1969}(E/K) = 10.282 - 0.079 \ln (F/T)$

$(12.63)^{*} \quad (-1.76)^{x}$

$\bar{R}^2 = .01$ Mean Var. = 9.31

The addition of a size variable to the equation specified in linear form gives this result:-

5.17 $\text{variance}_{1960-1969}(E/K) = 10.46 - 0.061\ (F/T)$

$(-1.32)+$

-0.0008 Assets

$(-1.42)^{+}$

$\bar{R}^2 = 0.01$

In both of the linear equations the number of observations is 492. In equation 5.17 the (F/T) only satisfies the 10% level of significance, as does the size measure.

It may be that the relationship between (F/T) and Variance (E/K) is captured by a curved line, such as is in a quadratic equation of the general form:

$$\text{Var (E/K)} = a + b_1 (F/T)^2 + b_2 (F/T)^2$$
$$< 0 \qquad > 0$$

The (F/T) variable is hypothesized to be negatively related to variance while the square of (F/T) will naturally be a positive number. Regressions were run to test this functional form and alternative size variables were also added with one of these size variables being tried in quadratic form itself. In these equations N = 493.

5.18 Var (E/K) 1960-1969 $= 11.161 - 0.267 (F/T) + 0.0004 (F/T)^2$
(11.868)* (-2.679)* (2.419)* $\bar{R}^2 = 0.01$

5.19 Var (E/K) 1960-1969 $= 11.402 - 0.251 (F/T) + 0.005 (F/T)^2$
(12.002)* (-2.507)* (2.444)*
-0.0009 Assets
(-1.655)^x $\bar{R}^2 = 0.01$

5.20 Var (E/K) 1960-1969 $= 11.249 - 0.262 (F/T) + 0.004 (F/T)^2$
(11.783)* (-2.613)* (2.409)*
-0.0002 Sales
(-0.547) $\bar{R}^2 = 0.01$

5.21 Var (E/K) 1960-1961 $= 11.194 - 0.265 (F/T) + 0.004 (F/T)^2$
(11.683)* (-2.633)* (2.404)*
-0.002 Employees
(-0.182) $\bar{R}^2 = 0.01$

5.22 Var (E/K) 1960-1969 $= 11.7599 - 0.218 (F/T) + 0.004 (F/T)^2$
(12.054)* (-2.135)^x (2.098)^x
-0.003 Assets $+0.000 (\text{Assets})^2$
(-2.153)^x (1.57)' $\bar{R}^2 = 0.02$

There was some indication that the quadratic equation captured a significant inverse relationship between (F/T) and Variance (E/K). In equation 5.18 and (F/T) variable and the $(F/T)^2$ variable are both significant at the 1% level, with the correct signs. The explanatory power of the equation is small. In equations 5.19, 5.20, and 5.21 these two variables remain significant at the 1% level when alternative measures of size are added to the equation. Only one of these size variable is significant and that is assets in equation 5.19. The explanatory power of these equations is also low. The assets variable was added in quadratic form in equation 5.22 and while it was significant at the 5% level, the square of assets did not meet that significance test. In this equation the (F/T) and square of (F/T) variables were significant at the 5% level, and had the correct sign.

The potential gains from diversification for a given firm can be interpreted by considering the elasticity at the point of means. For example from equation 5.18 it can be seen by differentiation that an increase in (F/T) of 10 percentage points will reduce variance by 2.7 percentage points. As the mean value of the variance of (E/K) is approximately 9.4 such a 10 percentage point increase in the extent of foreign operations for one of the firms would reduce its variance of earnings by between one quarter and one third.

Summary of Empirical Work

The hypothesis that earnings stability is an increasing function of the share of foreign operations has been confirmed by the empirical work. In the regression results the main variable of interest, (F/T), emerges as a statistically significant determinant of a firm's variance in earnings. The significance of this (F/T) variable is maintained when alternative measures of size are added as a second independent variable. There is some correlation between the (F/T) and size variables, and this remains a problem due to the small explanatory power of the overall regression as indicated by the adjusted multiple correlation coefficient. The inclusion of dummy variables representing industry classification of each firm tends to strengthen the results and provides some useful information on the relative risk of various industry groups.

From the aggregate regression for all 500 firms (or the 492 actually tested) it is possible to estimate the possible gains from international diversification for an individual firm. For example it was reported that an increase of 10 percentage points in the average (F/T) ratio for a large corporation would reduce its risk by at least the same amount.

It is possible that the results exhibit a downward bias since the study is confined to American corporations, which are already well diversified due to the large domestic market. As it is established in this thesis that international diversification can increase the valuation of their shares it could be argued that the benefits of such international diversification should be even greater for non-American firms, which have smaller domestic markets. Offsetting this is a possible upward bias in the results due to the fact that no attempt has been made to measure systematic risk. It was argued in Chapter Three that the (F/T) variable is of interest in itself, and that it is sufficient to establish that unsystematic risk could be reduced through international diversification.

Another possible bias in the results is due to the modifications required in data on assets of the firm. One of the opportunities available to a multinational enterprise is that it may be able to disguise the source of its profits from various subsidiaries. It can do this through transfer pricing, retained earning, depreciation, and other devices. Similarly the data on net profits may be inaccurate. Multinational enterprises may attempt to avoid reporting all the profits on their foreign operations. This may permit the firm to minimize its tax bill, and it would engage in such a policy until the probability of detection offset potential gains from tax evasion. The actual policy followed depends on relative tax rates, laws, and other variables which need not be analyzed here. Neither of these problems will undercut

the basic results in this study. For example, if the multinational firms report an artificially low level of profits, and yet it is found here that their risk in profits is reduced through international diversification, then if the correct level of profits were reported it would tend to reinforce the benefits available to multinational firms.

Another problem is that when account is taken of foreign exchange rate risk it might be expected that multinational firms are open to greater risk than domestic firms. This was not found to be the case, indicating that multinational firms have overcome the problem of foreign exchange risk. Possibly this is due to their use of foreign subsidiaries instead of exports for the greater part of their foreign operations.

CHAPTER SIX - SUMMARY AND CONCLUSIONS

The hypothesis advanced in this thesis is an extension of previous work in the area of international economics and finance. Previous studies have suggested that international diversification of financial assets may be able to reduce the risk of an efficient portfolio of assets, provided that the financial markets of the countries concerned are not perfectly correlated.

In Chapters One, Two and Three this argument in favour of international diversification was extended to the area of direct investment. This is one of the first attempts to apply portfolio theory to the international investment decisions of individual firms. The literature on direct investment was reviewed and analysed in Chapter Two where a theory of direct investment was developed in which market imperfections act as the major motivating forces for such foreign investment. This motivation exists at the firm level, and equations appropriate for empirical testing were specified in Chapter Three. In these the firm aims to maximize profits, but also to minimize risk of profits. A link was made between the empirical tests of Chapter Five and the theory of direct investment by arguing that the risk in a firm's profit stream over time can be reduced if the firm increases the extent of its foreign operations. More specifically, it was argued that in an uncertain world firms are concerned not only with their expected mean profit rate but

also with the variance of expected profits. It was assumed that this variance is a measure of the risk facing the firm.

It was necessary to make a careful distinction between foreign investment and foreign operations. Foreign operations consist of sales by foreign subsidiaries and exports. The theoretical basis for this thesis was the portfolio theory model which requires an analysis in terms of foreign investment. In the empirical sections, however, it was necessary to test the foreign operations of firms, as data were not available on foreign investment at the firm level. The link between foreign investment and foreign operations is the multinational corporation. It is a vehicle for the transfer of direct investment and institutionalizes in itself the abstract advantages of world operations which motivate such foreign investment.

In an uncertain world investment based on these motives can be considered to entail an analytically different reason for international trade. Furthermore international diversification of sales is likely to lead to a gain from trade quite separate from the welfare gains usually discussed in international trade theory. There will be greater stability of the expected rates of return on the securities of internationally diversified corporations.

As one implication of this model it was shown that there will be a motive for foreign investment even if there is a zero earnings differential between home and foreign

investment, and even if there is no increase in profit level from selling in foreign markets rather than domestically. In this limiting case, international diversification will still take place provided fluctuations of foreign economies are less than perfectly correlated with fluctuations in the domestic economy.

Usually there will be less than perfect correlation between domestic and foreign economies due to the existence of exogenous influences. Such exogenous factors are independent economic policy decisions made by national governments, natural climatic variations, and weather disturbances leading to geographic variations in the business cycle. Previous studies have confirmed that the correlation between domestic and foreign assets returns is less than among domestic assets alone. These studies were for financial assets, whereas this thesis is concerned with real assets.

This thesis is an extension of previous work, but its contribution should not be overstated. It is not the aim of this thesis to offer a new explanation of direct investment, but only to suggest and confirm that one variable, the ratio of foreign to domestic activities, (F/T), is worthy of consideration, and that firms with a higher (F/T) ratio are able to reduce the risk of their earnings. Nor is it intended here to explain all of the factors influencing the variance of a firm's profits. (F/T) is only one of many potential variables affecting stability of earnings. However, the empiri-

cal results show that this variable is statistically significant, and that this significance remains when other important variables such as size and industry characteristics are included as independent variables.

In the construction of the model and in the empirical work several modifications of the hypothesis had to be made. These were always due to data limitations. The major problem is that the (F/T) ratio is not published at the firm level, even though firms report details of their earnings on consolidated worldwide subsidiaries to the U.S. Treasury. This agency only reports such details at the industry level, and due to a commitment to confidentiality will not release figures for individual firms. This problem was partially overcome by using the published work of Bruck and Lees. As reported in Chapter Four these authors have estimated the (F/T) ratio for the largest five hundred U.S. mining and manufacturing firms, in 1965. There is no problem in acquiring information on the earnings of firms, or in calculating the variance of this earnings stream over time. Profits are the proxies available for rates of return, and the ratio (E/K) is used in this thesis, where E represents net profits, and K represents net worth of the firm. The resulting regression equation is neither a true time series nor a true cross-section regression, but is the best available under the circumstances.

Data limitations also make it infeasible to attempt

a calculation of the systematic risk which remains even after efficient international diversification. Ideally it would be desirable to calculate a world capital market line, and the co-variances between individual firm rates of return and the rate of return on the (world) market as a whole. In some previous empirical studies of international portfolio investment based on the Sharpe-Lintner model the market rate of return has been approximated by taking the average rate of return on randomly selected stocks traded on the New York stock exchange. Such a market rate of return is unsatisfactory when non-financial capital flows are under consideration on an international scale. It is difficult to compute a satisfactory world capital market line. Because of this inability to compute a world market line it is possible that the estimate of gains from international diversification has a bias, but it is not possible to assess the magnitude of this possible bias.

Another bias in the estimates is a possible downward bias due to the selection of U.S. corporations for the analysis. The U.S. market is already large and well-diversified, especially on regional grounds. If the test had been made using corporations of European or Japanese origin, then the estimated gains form diversification would probably have been higher due to the smaller geographic and economic size of the markets in such countries.

The hypothesis that earnings stability is an increasing function of the share of foreign operations has been

confirmed by the empirical work. In the regression results the main variable of interest, (F/T), emerges as a statistically significant determinant of a firm's risk in earnings. The significance of this (F/T) variable is maintained when alternative measures of size are included as a second independent variable. There is some correlation between the (F/T) and size variables, and this remains a problem due to the small explanatory power of the overall regression as indicated by the adjusted multiple correlation coefficient. The inclusion of dummy variables representing industry classification of each firm as a third independent variable tends to strengthen the results and provides some useful information on the relative risk of various industry groups.

From the aggregate regression for all 500 firms, (or the 492 actually tested after allowance for data limitations) it is possible to estimate the possible micro gains from international diversification. For example in Chapter Five it was reported that an increase of 10 percentage points in the average (F/T) ratio would reduce risk by about the same amount for each individual firm.

Several policy implications arise from the fact that the foreign operations reduce risk. First individual American investors can purchase shares in multinational corporations in order to achieve the benefits of international diversification in an indirect manner. Since the early 1960's the cost of acquiring shares in foreign economies has been pro-

hibitive because of the tax payments required following the introduction of the Interest Equalization Tax in 1963. The stock holders of a multinational firm benefit from the more stable earnings stream in such a firm when compared to a similar firm selling largely on the domestic market. Recently the IET has been removed, but this advantage of multinational firms remains, and will be reflected in the valuation of their shares.

Secondly, foreign governments might attempt to measure the gains from diversification reaped by multinational firms selling in their own economies. It may then be possible for national governments to impose an "optimal" tax such that at the margin the multinational firm still benefits from foreign investment and sales by subsidiaries in the host economy, but that any "excess profits" in the form of more stable earnings have been eliminated.

Finally, a look into the future may reveal increasing world economic integration. The pace of this interdependence may be speeded up by the operations of multinational firms themselves, as they sell similar products, and introduce similar preferences in world markets. Greater economic integration will at least increase the correlation between fluctuations in the domestic economy and fluctuations in the foreign economy; thereby reducing the gains from international diversification. The motivation of direct investment by multinational firms has been argued to depend on market imper-

fections. As the integration of economies proceeds these market imperfections will become less important. In time a world market may develop in which knowledge, research, and technology can be freely bought and sold such that direct ownership of these techniques is no longer required. The benefits of international diversification of risk will eventually fade away. In the long run the market is therefore a natural built-in limitation to the growth of multinational enterprises.

APPENDIX TO CHAPTER ONE - THE FOREIGN OWNERSHIP DEBATE IN CANADA

Recent reports (Watkins 1968, Wahn 1970 and Gray 1972)[1] have examined the impact of foreign investment on the Canadian economy and its implications for American-Canadian political and economic relations. Official reports have considered only direct investment as a "problem" but portfolio capital cannot be ignored.

All three reports found it convenient to separate direct investment from portfolio investment, as the former is defined to involve control, for example, by foreigners owning over 50% of the share issue in a company.[2] While all statistics on direct investment involve the 50% control, many have argued that effective control is achieved with a holding of fewer shares, and many individuals therefore consider this as evidence of even more foreign involvement. Writers generally ignore portfolio investment, perhaps as they understand it cannot be accused of foreign ownership.

In general all three reports have expressed concern over:-

a) the amount of foreign investment which is now over $33 billion.

b) the growth of the share of U.S. direct investment to over 80% of the total.

c) the concentration of U.S. direct investment in key industrial sectors.

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1. M. Watkins et al. Foreign Ownership and the Structure of Canadian Industry. Report of the Task Force on the Structure of Canadian Industry (Ottawa: The Queen's Printer, 1968); Wahn Report, Eleventh Report of the Standing Committee on Defence and External Affairs Respecting Canada-U.S. Relations (Ottawa: Queen's Printer, 1970); Government of Canada, Foreign Direct Investment in Canada (Information Canada, Ottawa, 1972). (This is often referred to as the Gray Report); A Citizen's Guide to the Herb Gray Report, Canadian Forum (December, 1971).

2. The United States adopts a different definition of direct investment, based on a figure of 10%.

d) the apparent lack of investment opportunities for abundant Canadian savings.

e) the apparent financing of the majority of direct investment from Canadian sources, for example, retained earnings of foreign subsidiaries, and

f) the implied political dependence of Canada on the United States

These topics of concern have led to policy recommendations which may be distilled as follows:

a) Restriction of unlimited capital inflows, especially for "key sectors", in which it is vital to prevent foreign control. This has been adopted in the past for transportation, communications, the financial industry and utilities. There is some possibility that this key sector approach may be extended to Canadian resources, although this is not discussed in these reports.

b) Subsidization of domestic R.and D, education, and management training. This is required in order to overcome the research advantage of large American multinational enterprises.

c) Establishment of a Canadian Development Corporation to channel home savings into productive use. It has been argued that the outflow of Canadian funds to U.S. financial markets could be prevented if better opportunities were available to Canada. and to some extent a Canadian Development Corporation might serve to diversify and reduce risk.

d) The establishment of a screening agency to evaluate foreign investment and to prevent foreign takeovers and mergers which were not in the national interest.

e) The end of extraterritoriality and the establishment of Canadian sovereignty over political decisions.

f) The recognition that probably a new industrial strategy is required to overcome the many problems of foreign ownership, such as truncation.

It is worthwhile noting that the reports did not recommend radical measures such as the establishment of capital controls, the buying back of foreign owned industries or the nationalization of existing subsidiaries.[3]

These three reports on foreign investment in Canada represent an impressive collection of statistics and analysis by professional economists of all political viewpoints. The reports have generated a great amount of public debate in Canada in recent years, and the general level of understanding and awareness of the economics of the issue has increased substantially. Legislation has proceeded at a much slower pace than academic research. In the next section the history of recent legislation is reviewed, followed by a few pages illustrating the divided public opinion in Canada on this issue; this latter reason perhaps explaining why no clear government policy has been initiated. Finally the argument that foreign investment tends to increase the degree of concentration in Canada is examined, followed by a conclusion to the Appendix as a whole.

A major effort was made by Finance Minister, Walter Gordon, in his budget of 1963, to restrict foreign investment. There was strong political objection to his tax proposals, and the Liberal government chose to withdraw the controversial foreign investment provisions from the budget. While not commanding the support of his party, Gordon's influence was felt in subse-

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3. This might be contrasted with some of the recommendations in the Kierans Report on the mining industry in Manitoba, which advocates the charging of a higher rent for foreign use of resources belonging to the Province, and after ten years the replacement of private mining operations by Crown Corporations. See Professor Eric Kierans, Report on Natural Resources Policy in Manitoba, Secretariat for the Planning and Priorities Committee of Cabinet, Government of Manitoba, Winnipeg, Manitoba 1973.

quent government sponsored research of foreign investment. Legislation had previously been enacted to prevent foreign ownership of "key sectors" in the Canadian economy. Such key sectors were transportation, communications, utilities, and the finance industry. In the 1960's more legislation was enacted to preserve Canadian content in magazines and in the Canadian Broadcasting Corporation.

The Watkins Report of 1968 had little immediate impact on policy. In the report there was an emphasis on the industry context of foreign investment and an attempt to evaluate its costs and benefits. This involved an evaluation of Canada's tariff, competition and tax policies. One of its recommendations was to establish a Canadian development corporation to channel domestic savings into Canadian owned projects. A small scale version of this corporation was established in 1970.

The official version of the Gray Report was delayed in publication until mid 1972, but a draft of the Report was leaked to the Canadian Forum and published in late 1971. Both versions of the Report refer to the increasing power of multinational enterprises and to the potential conflict between them and nation states. The latter have responsibility for stabilization policy but multinational enterprises are not so concerned with employment, inflation and balance of payments problems. The Gray Report shows awareness of the modern theory of foreign investment as it emphasizes industrial determinants. Foreign investment is specific to each industry sector and is determined by specific rather than aggregate factors.[4] It occurs, for example,

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4. See Chapter Two for a more detailed exposition of the theoretical determinants of foreign investment.

when the investor has the ability to exploit an advantage in the host economy market. The vehicles of such monopoly exploitation may be by licensing, by trade or by foreign investment. Much of the Report is concerned with wider economic issues including an appropriate industrial, scientific and technological strategy for Canada, and with wider political questions such as extraterritoriality.

A basic premise of the Gray Report is that the multinational enterprise has different interests from the government of Canada. The latter is charged with safeguarding the political, cultural and economic independence of the nation and will seek to maximize taxation from the multinational enterprise. The former will wish to maximize profits and will rationally attempt to avoid taxation, for example, by one of the three following devices. Firstly, the multinational enterprise can engage in transfer pricing policies under which costs of supplies from the parent subsidiaries are artificially increased to reduce the profits and taxable income of the host country subsidiary. Secondly, the subsidiary can be thinly capitalized such that debt capital is issued instead of equity capital, which allows the subsidiary to deduct interest charges from its taxable income. Thirdly, as no tax is paid on loans of under one year, the subsidiaries may borrow in Canada on the short run and channel the funds back to the parent company at low interest rates.

The main recommendation of the Gray Report is to establish a screening agency to review new investments in Canada when such investments are likely to lead to a substantial proportion of foreign ownership. The aims of the screening agency are to prevent monopoly foreign ownership and to act as a bargaining agent with the powerful multinational enterprise. Such a screening agency could operate flexibly such that changing policy objectives over

time were appropriately weighted in the overall decision as to whether or not new foreign investment should be permitted. For example, greater weights could be given to foreign investment projects which promoted more employment or reduced regional inequalities. Each project financed by foreign investment will require a cost-benefit analysis with "suitable" weights given to the various parameters. If the Canadian interest were not served by proposed foreign investment, then the agency would have the power to block such foreign investment.

There is a division of public opinion in Canada on foreign ownership. In an impressive report of public opinion sampling,[5] Professor Murray of Windsor University reports that opinion is almost exactly divided on foreign investment in Canada as can be seen from the table below.

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5. J.Alex Murray, "Canadian Public Attitudes Toward U.S. Investment: A Longitudinal Analysis", prepared for the Meetings of the Society of Government Economists, Allied Social Science Meetings, December 28th-30th, 1972, Toronto, Ontario. Murray describes the study in the following way:

> "As part of a continuing study on attitudes of Canadians toward Canadian-American Relations and in particular foreign equity investment, these tables present the results of a number of cross-sectional surveys conducted in Canada on selected economic and political aspects of the topic.
>
> The International Business Studies Research Unit is composed of an interdisciplinary team that examines, studies and reports on topics of vital concern to the international business community in Canada. Members of the Research Unit who worked on this project are: J. Alex Murray, professor in International Business, Windsor; Akira Kubota, associate professor of Political Science, Windsor; Mary C. Gerace, lecturer in Communication Arts, Windsor; George L. Shields, president, Elliot Research Corporation, Toronto; David Perry, statistician, Elliot Research Corporation, Toronto."

TABLE I

Acceptance of a lower standard of living for more control over Canadian economy by reducing or abolishing U.S. investment (1971)

	Total Canada	Atlantic Provinces	Quebec	Ontario	The West
1. NO	46.6%[a]	55.6%	47.7%	40.7%	48.7%
2. YES	43.9	36.1	44.8	48.7	41.7
3. DK/NA/REF[b]	9.5	8.3	8.2	10.4	9.6

All respondents 1,800

[a]Percentages total to more than 100% due to rounding

[b]Don't Know/Not Available/Refused

Source: J. Alex Murray, ibid.

The sample consisted of some five thousand randomly selected respondents whose responses were reported for Canada as a whole and for the five major regions of Canada. There has been a hardening of opinion against foreign investment in recent years: the percentage of respondents feeling that U.S. ownership of Canadian companies is a "bad thing" for our economy has increased from some 34 per cent in 1969 steadily up to 47 per cent in 1972. Opposition to U.S. ownership is strongest in British Columbia where only some 29 per cent felt that it is a good thing compared with some 42 per cent in Quebec and in the Maritimes who felt that U.S. ownership is a good thing.

Responses to other questions asked by Murray's team indicated that in general Canadians like foreign investment for economic reasons, believing that it creates more employment, adds investment which helps develop industry, raises the standard of living, and is a useful addition to inadequate domestic investment. Less important reasons for believing that U.S. ownership is a good thing are the following: it encourages better products which help exports and world trade; it creates a friendly relationship; our economy is based on the U.S. and we need to operate with them; it brings more money into Canada.

Canadians give political reasons for believing that U.S. ownership of Canadian companies is a bad thing: that is, they list as most important the statements that Americans are taking over our economy, that profits and money are leaving the country, and that we should control our own business and be more independent of the United States. They are not so concerned with U.S. ownership of Canadian companies being a bad thing in bringing in undesirable U.S. unions, the fact that Canada is losing its identity and being "Americanized", that jobs are taken away from Canadians or that they are discouraged, that there is unequal trade.

The division of opinion in Canada on the issue of foreign investment should not be taken as an indication that it is an important issue. When asked their opinion of the most important Canadian issue at the present time (1972) only 3.2 per cent of the five thousand respondents listed Canadian-American relations, while 46 per cent listed unemployment, 30 per cent listed inflation, 16.5 per cent listed environment and pollution problems, and 6.4 per cent listed English-French relations in Canada.

When asked which type of independence was most important to Canadians,

about 48 per cent replied economic, 26.5 per cent political and 17 per cent cultural. The responses indicated a stronger opinion against foreign investment for those in the New Democratic Party, those on low incomes, for members of unions, and for females.

A frequent argument made in the public policy debate is that foreign ownership increases the degree of monopoly in the Canadian economy, or at least that firms subject to foreign control tend to be larger than domestic firms. In an earlier piece of research, Safarian[6] raised the question of whether foreign owned subsidiaries are about the same size as domestic firms. He concluded that "in broadly comparable circumstances the two sets of firms do not diverge markedly in most cases in terms of size".[7] In a more recent piece of research by Rosenbluth[8] this was not found to be the case because foreign owned subsidiaries are of a larger size than home firms. Firstly, foreign firms are up to two and one half times as large as domestic firms in the same industry. Secondly, foreign firms are concentrated in industries which themselves have a larger average size. Rosenbluth found that the level of concentration was not related to the level of foreign control and that there had not been a trend towards increasing concentration in the ten years of his study from 1954 to 1964. Most foreign control was in industries with

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6. A.E. Safarian, Foreign Ownership of Canadian Industry, (McGraw-Hill, Canada, 1972)

7. Ibid. p. 267

8. Gideon Rosenbluth, "The Relation Between Foreign Control and Concentration in Canadian Industry", Canadian Journal of Economics, February, 1970.

TABLE II

Distribution of Industries According to Concentration and Proportion of Foreign Control Among Leading Firms, 1964.

	Foreign Control		
Concentration	High	Medium	Low
High	Tobacco Automobiles Aircraft		Beverages Cotton Iron and Steel Transport Telephones Banks
Medium	Oil Rubber	Pipe lines Agricultural machinery Mining and Smelting	Structural steel Cement products Utilities
Low		Electrical products Food industries Trade Insurance Chemicals	Trust Cos. Pulp and paper

Source: Gideon Rosenbluth, ibid. p. 28

Definitions:

High concentration: the four leading firms have 80% or more of the assets

Low concentration: the four leading firms have less than 45% of the assets

High foreign control: all the leading firms are foreign controlled

Low foreign control: foreign control has less than 15% of the four leading firms' assets.

a "medium high" concentration ratio.[9]

From the table above it can be seen that there was high foreign control (over 90%) in concentrated industries such as automobiles, tobacco and aircraft; but a low proportion of foreign control in similarly highly concentrated industries such as beverages, cotton, iron and steel, transportation, telephones and banks. (It might be noted that the last three industries mentioned are "key sectors".) It is unfortunate that Rosenbluth's data only covers until 1964 because there may have been an increase in foreign owned oligopolies since then.

On the related question of mergers, Rosenbluth did not find any evidence to suggest that foreign controlled firms are involved in more mergers than domestic ones. He did find that foreign owned firms engage in horizontal, conglomerate and forward linkage mergers, whereas domestic firms engage in backward integration. This indicates that for the period studied United States firms were not engaged in the buying up of Canadian resources at least through vertical integration.

Conclusion:

In this Appendix it has been shown that public policy in Canada has been motivated by concern over the extent of foreign ownership and the influence of multinational enterprises on the Canadian government and economy. Legislation has lagged behind academic research, and the latter has to some extent brought forth ambiguous policy implications. This analysis of the

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9. Ibid. p. 19 and Table II.

Canadian debate on foreign ownership is a useful introduction to the main topic of this thesis, as it highlights the conflicting objectives of nation states and multinational enterprises. It will be postulated in this thesis that the net worth of a firm depends on the stability of its earnings as well as the absolute level of profits. An implication of this point is that maximization of such an objective function may conflict with the aims of national governments.

It is not the intention of this thesis to explore the problems of the relationship between nation states and multinational enterprises, although this is an important topic in the field of political economy. Instead, a narrower objective is pursued, which is to establish the validity of the argument that a large corporation, which may be multinational in character, is concerned with the stability of its profits over time as they are influenced by foreign operations.

Appendix to Chapter Five

Other Results

Variance can be calculated for a group of firms for one year. Using this group method various empirical tests were performed using small samples of firms drawn from the Fortune 500. In general the results indicated that there was some basis to the statement that foreign operations are inversely related to the variance of a firm's earnings.

Using the classification by Bruck and Lees of the five hundred companies into various groups it was established that the variance of a firm's rate of return measured by the ratio of net profits (E) to invested capital (K) was increasing as foreign diversification (F/T) decreased. This was over the period 1960-1969. For example, the results ranged from a variance of 5.6 for firms in group A to 32.3 for firms in the N group (see below). The variance increased consistently through the diversified groups A, B and C to the non-diversified groups D and N.

These results confirm the hypothesis that increasing foreign operations may be associated with less risk in profits. The firms with a large or moderate amount of foreign operations benefit from a more stable rate of return as measured by (E/K). These cross section results must be treated with caution, but they do provide some evidence of the possible gains from foreign diversification. In the first cross section test the sample of diversified and non-diversified firms consisted of the following:-

Diversified			Non-Diversified		
Rank	Name	(F/T)	Rank	Name	(F/T)
10	Gulf	33	14	Bethlehem Steel	2
21	Union Carbide	29	24	R.C.A.	6
30	Int. Telephone	59	29	Lockheed	4
31	Firestone	26	33	General Dynamics	5
39	Caterpillar	43	40	Borden	8
52	Dow	25	51	Armco	2
59	Grace	34	57	McDonnell	0
61	Anaconda	54	62	Jones & Laughlin Steel	5
65	Singer	52	67	Inland	5
79	Colgate	54	80	Grunman	0

The test was carefully constructed to allow a comparison of firms that were apparently identical in all respects except for their foreign operations, for example, firms of equal size were compared, as can be seen from the rank of columns. Pairs of firms were selected from the 1965 Fortune rankings such that one firm was put into the diversified sample and its partner (closest in ranking order) into the non-diversified group. Of the ten firms in the diversified sample, four come from group A and six from group B, while of the non-diversified sample two are from group N and eight from group D. The variances of each sample were calculated for each of the eleven years.

A test was performed and yielded the results shown in the table below. The results were interesting as they confirm that the diversified firms have more stable earnings (E/K). This was true for ten of the eleven years, the only exception being in 1964. In all other years the non-diversified sample of firms exhibited much greater variance in its earnings. The robustness of this result over eleven years is interesting. From these findings we would conclude that the value of the firms in the diversified group was greater due to the more stable pattern of earnings.

CROSS-SECTIONAL VARIANCES OF (E/K) FOR GROUPINGS OF DIVERSIFIED AND NON-DIVERSIFIED FIRMS

	Variance of (E/K) in each year	
Year	Ten diversified firms	Ten non-diversified firms
1960	12.9	16.84
1961	10.68	22.11
1962	10.62	84.7
1963	13.17	60.68
1964	26.9	16.23
1965	23.59	31.82
1966	9.21	37.72
1967	3.43	34.75
1968	8.88	21.35
1969	5.19	38.43
1970	9.6	21.76

Another sample was constructed by systematically taking the fourth or fifth observation in each of the Bruck and Lees groups. This resulted in ten observations being taken from group A, nine from group B, ten from group C, sixteen from group D, and eleven from group N. For each of these firms selected the variance of their (E/K) was calculated based on ten observations of (E/K) for 1960-1969. The results are shown below.

The variances for the (E/K) of each group range from 5.6 in group A up to 32.3 in group N. In general the diversified groups, A, B, and C showed less variance than the non-diversified groups, N and D. However, there is not a consistent progression through the groups.

The variance of (E/K) were calculated for each of the groups and for aggregations of the groups, as in the following table. A sample was obtained for each group (the number of firms being shown under n) by systematically selecting every fourth and fifth firm.

	Group	Variance	n
	A	5.6	10
Diversified	A & B	8.1	19
	A & B & C	9.2	29
Non-diversified	D & N	20.1	27
	N	32.3	11

The table clearly illustrates the following:-

(i) Group A, which has the largest (F/T) ratio of over 50%, has the smallest variance.

(ii) Group N, which has no foreign operations at all, has the largest variance.

(iii) Variance is low for some firms with at least some foreign operations i.e. either those in group B with a (F/T) of 25-50%, or those in group C with an (F/T) of 10-24%.

(iv) Variance is high for firms with few or no foreign operations, i.e. in group D with an (F/T) of under 10% and in group N.

Similar results were obtained for a slightly different sample of firms in the group. These variances were calculated by taking all of the available firms in group A, every seventh in group B, every eleventh in group C, every eighth in group D and every tenth in group N. Computational methods were as before. The results were:-

	Group	Variance	n
	A	5.6	10
Diversified	A & B	16.1	20
	A & B & C	17.7	30
Non-diversified	D & N	23.3	20
	N	25.6	10

Summary of 51 Firm Sample

Tests were made at an early stage of the thesis for a sample of 51 firms selected systematically by taking every tenth firm for which there was full availability of data for

(E/K) in each of the ten years.

A result in linear form was:

$$(1) \quad \underset{1960\text{-}1969}{\text{Var}}\,(E/K) = 11.18 - 0.198\,(F/T)$$

$$(7.58)^{*} \quad (-2.74)^{*}$$

$$\bar{R}^2 = 0.132$$

The coefficient for (F/T) is significant at the 1% level and has the correct negative sign. The explanatory power of this equation as indicated by the $\bar{R}^2$ is low, but not totally inconsequential.

In log.form, that is, taking the log.of Variance and the log. of (F/T), where 0.1 has been used instead of a zero value of (F/T), the result was:

$$(2) \quad \underset{1960\text{-}1969}{\text{In Variance}}\,(E/K) = 1.965 - 0.210\ \ln\,(F/T)$$

$$(10.91)^{*} \quad (-3.11)^{*}$$

$$\bar{R}^2 = 0.165$$

Here the coefficient for ln (F/T) is significant at the 1% level, and is inversely related to ln Variance. Also the $\bar{R}^2$ has increased slightly to 0.165 indicating that this one variable equation does explain some of the variance of the firms' earnings.

In quadratic form the result was:

$$(3) \quad \underset{1960\text{-}1969}{\text{Variance}}\,(E/K) = 11.779 - 0.301\,(F/T) + 0.002\,(F/T)^2$$

$$(6.39)^{*} \quad (-1.51)^{*} \qquad (0.56)$$

$$\bar{R}^2 = 0.138$$

Here (F/T) is significant only at the 10% level, while $(F/T)^2$ is insignificant. Both variables have the correct sign, and the $\tilde{R}^2$ is lower than in the log. form. Overall this quadratic function fits less well than the linear or log. forms.

The mean of the ten observations on (E/K) from 1960 to 1969 was added to the linear equation as a second independent variable. On the basis of the mean-variance analysis it was hypothesized that there would be a positive relationship between variance (E/K), and mean (E/K), that is firms will trade off risk against expected return and will accept a higher degree of risk if there is a higher level of return. Where the mean was included it was insignificant, and therefore not related to Variance (E/K). The mean was therefore excluded as an independent variable in further testing.

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