

MARKETING DETERMINANTS OF UNITED STATES  
MULTINATIONAL CORPORATE DIRECT INVESTMENT  
IN CANADIAN INDUSTRIES

by

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## ABSTRACT

The search for causal explanations of foreign penetration among Canadian industries has attracted a significant amount of research effort.

Unfortunately, marketing related explanations of foreign direct investment have either been neglected outright or, at best, applied within a limited context.

One objective of this dissertation is to demonstrate the applicability of marketing variables to the explanation of United States multinational corporate direct investment among a sample of fifty Canadian manufacturing industries. A second objective is to argue the merits of employing a "comparative variable" approach whereby data from both the host and donor countries are considered simultaneously. (The traditional research approach has been to consider the countries in isolation from each other.)

Three empirical techniques are used to assess the efficacy of the variables as determinants of foreign direct investment.

1. Multiple regression is used to test the marketing variables and the "comparative variables" as well as a number of the more "traditional" explanations of direct investment. The latter group of variables are employed for replicative purposes and to provide a "bench-mark" with which it is possible to compare and evaluate the performance of the marketing and "comparative variables."
2. A principal component analysis is applied in an attempt to isolate the major dimensions underlying the independent variables. Additionally, the program also creates the necessary input for the last stage of testing.
3. A final set of regressions using four identified principal components with eigenvalues greater than one is conducted in order to establish a "rank ordering of importance" among the dimensions in terms of their "contribution" to the explanation of the dependent variable.

Empirical results of multiple regression indicate that the marketing and "comparative variables" perform as well as the more traditional "bench-mark" specifications.

The factor analytic results show the existence of two main underlying dimensions -- marketing and size. Two other dimensions are shown to be identifiable but their performance does not appear to be robust in terms of "explaining" foreign direct investment.

The results of regressing the four principal components on the dependent variable indicate that the marketing dimension accounts for marginally more of the unexplained variance than does the size dimension.

In summary, the empirical analyses appear to lend support to the contention that the marketing and "comparative variables" do fulfill a useful function in helping to explain the inter-industry variation of U.S. multinational corporate direct investment in Canada.

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Any errors remaining in this thesis are (unfortunately) attributable solely to myself.

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## INTRODUCTION

The issue of foreign business activity in Canada has a history much longer than that of confederation. Depending upon the time periods of concern, the arguments have varied from the desire to foster foreign investment within Canadian borders in the interests of economic development -- to the fear of foreign exploitation of the country's resource base and the destruction of its culture.

This national concern has naturally enough resulted in research projects regarding almost every possible aspect of foreign economic activity in Canada.

A good deal of current discussion bears on the issue of U.S. direct foreign investment in Canadian industry and the role of marketing activity involved in this penetration.

At the governmental level, parliamentary debates have arisen regarding the tax-deductible status of Canadian advertising expenditures placed in U.S. publications, and international disagreements have been caused by the spillover of U.S. television programming into major Canadian markets.

Government sponsored studies and data collection systems are now responding in a very limited fashion to the need for more information concerning the marketing-related aspects of

foreign direct investment. For example:

1. The Gray (1972) report on "Foreign Direct Investment in Canada" considered advertising and product differentiation as worthy of some (albeit limited) mention.
2. A small section of data collected under the auspices of "The Bryce Commission" on competition in Canada (1978) was devoted to media expenditure patterns according to industrial classifications.
3. The Ministry of Industry Trade and Commerce has similarly rekindled its interest in collecting advertising expenditure data for Canadian Manufacturing Industries.

The academic community has also, within the last decade, become progressively more interested in the role of marketing as an explanatory variable in foreign direct investment. This stands in marked contrast to earlier studies of foreign penetration which considered mainly such causes and correlates as tariff barriers, exchange rates, concentration measures, inter-country technological disparities and relative international prices.

The efficacy of the aforementioned variables has been established to various degrees. Marketing related variables (eg. sales growth and advertising) do not, however, appear to have been as thoroughly explored. This is not to imply that researchers have failed to incorporate marketing related

variables into the more recent literature. Such a statement would be totally misleading.

However, in this study arguments will be presented, that:

1. Where such marketing variables have been used to explain foreign penetration, the variable specification is suboptimal compared to alternative forms.
2. There exists a plausible explanatory model which is capable of describing how a foreign firm might undertake evaluation of alternative marketing opportunities and why as a result of these deliberations a Canadian marketing opportunity may, under given conditions, prove to be the most attractive marketing investment.
3. An empirical analysis of the explanatory model is feasible.

The two countries which are the focal points for discussion and analysis are Canada and the United States. Their selection was a consequence of the following factors:

1. Recent public controversy (especially since the early 1970's) concerning the impact of U.S. penetration and its associated cultural and economic effects within a Canadian marketing context provide adequate reason for this type of research.
2. Both Canada and the United States enjoy what may be considered (at least from the international industrial organization perspective) a highly symbiotic

relationship with regard to foreign direct investment (hereafter FDI).

"The single most important country market for sales of foreign affiliates of U.S. multinational companies has been Canada. There, affiliate sales reached \$18.5 billion in 1968, a 12% increase over the preceding year and some 220% over 1961" (U.S. Dept. of Commerce, 1972a, p.18). (emphasis added)

"Over 71% or \$26.1 billion of all direct investment in 1973 was owned by United States residents. The substantial volume of United States direct investment in Canada reflects not only the structure of industry in the North American Economy in general, but also the numerous links between Canada and the United States arising from geographical proximity, bilateral trade flows, and social and cultural similarities between the two countries." (Statistics Canada Cat. No. 67-202, 1977, pp.44-45). (emphasis added)

Similarly, Canadian penetration of U.S. markets, indicates that a significant reverse flow of foreign direct investment in that country is under way (approximately 6 billion dollars as of 1975).

3. The two countries were also selected because of their highly similar socio-economic structures, on the premise that these types of similarities provide the most conducive environment for observing the transference of marketing techniques on an international basis.
4. Finally, both countries were selected on the basis of data availability.

The scope of this research will be restricted to the manufacturing sector since the bulk of marketing

activity is related to this area. Additionally, it is necessary to restrict the size of the topic for purposes of manageability within the confines of a thesis.

The order of presentation in this thesis is:

1. Chapter One will deal with a literature review of industrial organization and marketing research on foreign direct investment.
2. Chapter Two will discuss the theoretical foundations of the variables used in an econometric model.
3. Chapter Three will present and review the empirical results.
4. Chapter Four will present the conclusions.

CHAPTER ONE  
A SELECTED CRITIQUE OF LITERATURE REGARDING  
FOREIGN PENETRATION

The volume of published information concerning foreign penetration is massive. Even a selective survey of the literature in this area cannot possibly do justice to each of the contending theories and collective schools of thought. Therefore, in view of gargantuan task that confronts a literature survey in this area, the strategy adopted in this chapter will be to:

1. Summarize briefly those theories which have enjoyed wide credibility as determinants of foreign direct investment but which are not central to the main thrust of this research.
2. Review in greater depth the theoretical and empirical studies which are directly related to this work.

The advantage of this approach may be to provide the reader with some idea of the types of problems the research addresses and of those problems which it ignores.

A final note concerning the format of the presentation is required. Among those theories briefly reviewed, the reader will note a marked variation in the amount of discussion. This

is because some of the theories are closely interrelated and, as a result, require more detailed explanation, while others are relatively straightforward and consequently need no further comment. For example the theory of securities markets imperfections is actually composed of concepts dealing with risk, information, stock-market speculation and fluctuation. Contrarily, demand similarity models are based on a single conceptual argument.

Initially, the following models shall be reviewed:

1. Models of comparative advantage.
2. Demand similarity models.
3. Product life-cycle models.
4. Theory of securities markets imperfections.
5. Models of tariffs and exchange rates.

#### 1. Models of comparative advantage (Heckscher-Ohlin Approach)

The Hecksher-Ohlin (Wells, 1972, p. 19) model postulates that countries tend to export those products in which they enjoy some factor endowment advantage relative to that of their buyers.

Södersten explains the functioning of the hypothesis very concisely. "Some countries have much capital, others have much labour. The theory now says that countries that are rich in capital will export capital-intensive goods, and countries that have much labour will export labour-intensive goods" (Södersten, 1970, p. 64).



The assumptions underlying this hypothesis are restrictive:

1. There are no transport costs or other impediments to trade.
2. There is perfect competition in both commodity and factor markets.
3. All production functions are homogeneous of the first degree. (i.e. an increase of inputs by a certain proportion, produces an increase of output by that same proportion.)
4. The production functions are such that the labour-intensive and capital-intensive commodities show different factor input intensities. The implication here is that different production techniques are used by the industries under consideration.
5. The production functions differ between commodities, but are the same in both countries.

The prediction of the Heckscher-Ohlin Model is that capital rich countries such as the U.S., will export capital-intensive products while importing labour intensive products.

The link to foreign direct investment (and hence, the rationale for the inclusion of this trade theory model) is the following: Given that we take the predictive statement of the Heckscher-Ohlin model as plausible, the foreign direct investment aspect also becomes plausible when viewed simply as another means by which countries (or firms) extend their exports. Stated differently, it could be argued that an act of foreign direct investment by a donor country firm is prompted by the same stimulus that causes the firm to undertake exporting. Within the Heckscher-Ohlin structure, the firm may export or foreign direct invest because it enjoys certain factor endowment advantages (e.g. plentiful and inexpensive labour supply or

technological superiority) which its trading partners demand but do not possess themselves.

While the technological superiority of capital intensive production systems might provide an incentive to foreign direct invest for purposes of manufacturing abroad, one cannot argue that a firm would feel compelled to undertake production activity in the host country if its comparative advantage lay in cheap labour costs at home. However, it can be argued that the act of FDI need not necessarily be related to production per se within the host country. The Heckscher-Ohlin model addresses the dissemination of factor endowed goods. FDI may well take the form of final product assembly or forward vertical integration to the distribution and/or marketing systems in the host country -- the goal of such activity being the furtherance of the factor endowed product's sales. That is, the firm may manufacture at home because of inexpensive labour costs and foreign direct invest in those capacities which will foster the sales of its factor endowed product(s).

## 2. Demand similarity models

Research in this area, though of general interest to us, is unfortunately difficult to integrate (in any empirical fashion), into a U.S.-Canadian penetration discussion.

Briefly, the theory implies that those products for which firms discover a domestic market, are eventually the products which become available for export (and FDI) to other countries.

Naturally, no trade will take place unless the potential foreign consumers of the product exhibit a similar demand configuration to that of the country which hopes to export the item(s).

Louis Wells has nicely captured the thrust of the theory in this quote from Frankel:

(... a country), with a large internal market for low quality goods is more likely to compete successfully in countries with a demand for similar goods than one whose internal markets are mainly in goods of higher quality, because less adaptation of production processes to export requirements will be needed in the former case (Wells, 1972, p. 22).

The difficulty of integrating this theory into the discussion is that the research objective restricts analysis to just one donor country (U.S.) and one host country (Canada). The demand similarity model, in order to be tested, would require a comparison among a number of countries each with different discernible demand configurations.

This is not to imply that the theory is intuitively unappealing. There is a vast literature available on the cultural, economic, and politico-legal similarities and dissimilarities of Canada and the United States.

Skepticism concerning use of the demand similarity model focuses on the difficulty in identifying an accurate quantitative proxy. Furthermore if such measures were available, would they be enlightening given that the discussion is restricted to just two countries?

### 3. Product life-cycle models

The initiation of product life-cycle models is generally attributed to Vernon's 1966 seminal article. The purpose of the article is contained in the following statement. "Our hypothesis asserts that United States producers are likely to be the first to spy an opportunity for high-income or labour-saving new products. But it goes on to assert that the first producing facilities for such products will be located in the United States" (Vernon, 1966, p. 194).

Vernon's justification of his hypothesis corresponds to the following:

1. The U.S. market is characterized by relatively higher income consumers than are most other markets. Any opportunity to provide a product to satisfy the wants of this high income group would be most readily apparent to those firms which are closest to the market (i.e., U.S. manufacturers).
2. "... the United States market is characterized by high unit labour costs and relatively unrationed capital compared with practically all other markets. This is a fact which conditions the demand for both consumer goods and industrial products" (Vernon, 1966, p. 192). The implication here is that any opportunity to reduce labour costs through innovation of capital-intensive goods or procedures would again be recognized by those closest to the market -- the U.S. firm.

3. The desire for monopoly advantage associated with being the initial producer of an innovation, together with the market forces delineated in both points 1 and 2 above provide the rationale for Vernon's statement: "Here we have a reason for expecting a consistently higher rate of expenditure on product development to be undertaken by United States producers than by producers in other countries, at least in lines which promise to substitute capital for labour or which promise to satisfy high-income wants" (Vernon, 1966, p. 193).

Although we may have gained some insight into the means by which innovations come to originate in the United States, as a result of Vernon's hypothesis and its justification, the real value of his work does not stop here. He goes on to explain a cycle or phase of development through which certain types of innovations (those associated with high income or which displace labour with capital inputs) might pass. In the interests of brevity, Hufbauer's summary of the developmental process expounded upon by Vernon is provided:

Successive stages on standardization ... characterize the product cycle. Initially a new good is made in small lots each with its own variety. Manufacturing processes are highly experimental; many different techniques are given a try. But as markets grow changes take place; national and international specifications are agreed upon. Simultaneously, the number of processing technologies decreases as inferior goods are weeded out. The surviving techniques grow familiar and marketing channels become better established. The expansion of output transforms the "sideline" to "mainline" status.

In the early stages, production and export advantages lie with sophisticated firms in advanced nations. As the product cycle unfolds however, firms and nations with less technical expertise begin making and exporting the item. Standardization aids and abets this migration in industry in two ways -- longer production runs and proven production technology bring industry within the technical grasp of more nations; standardized goods are more easily marketed both because sales channels have been established and because feedback problems are less severe (Vernon, 1966, p. 189).

Although Vernon supplied some of the key underpinnings for the product life-cycle (hereafter PLC) theory, the task of refinement and empirical testing fell to others.

Well's article (1969) on the PLC model attempts to determine the ability of the theory to predict export patterns of U.S. consumer durables over an eleven-year time-series. His model delineates four stages of product development in the cycle:

1. The United States is initially an exporter with a monopoly position.
2. Foreign production begins to displace American exports in some markets.
3. Foreign goods become competitive in third markets, further reducing American exports.
4. Finally, foreign goods are competitive in the United States (Wells, 1969, p. 153).

Those independent variables which he feels will have an impact on the speed and structure of the cycle include; the elasticity of demand of the product for different income groups, economies of scale and the effect of transportation costs and tariffs.

He concludes that, "American export performance of consumer durables for the period 1952-63 does seem to be consistent with the predictions of the cycle model" (Wells, 1969, p. 161).

A combined research effort by Gruber, Mehta and Vernon (1967) which deals with some elementary testing of the PLC hypothesis concentrated on the first phase of the cycle, with an attempt to establish a positive linkage between penetration performance of U.S. firms and the proliferation of product innovations as proxied by:

1. R&D expenditures/sales.
2. Scientists and engineers in R&D as a percentage of total employment.

The authors conclude that, "the figures ... indicate in various ways that the propensity for U.S. industries to build facilities or otherwise to invest abroad, when 'normalized' by the U.S. investment level, is higher in the research-oriented industries than in other industries" (Gruber, Mehta and Vernon, 1967, p. 127).

Hirsch (1967) similarly maintains support for the PLC theory after an empirical analysis of the electronics industry. He divided the electronics output into various groups within the product cycle (new, growth, and mature products). The analytical technique consisted of relating the theory's hypotheses concerning changes in technology, capital intensity, industry structure, critical human inputs and demand structure to the actual import and export conditions of the industry for

selected years between 1947 and 1964.

#### 4. Theory of securities-markets imperfections

Even in the absence of oligopolistic behavior or of technological advantages, direct investment may be attracted toward areas where average rates of profit are higher when such rates are not equalized internationally by portfolio capital flows owing to inefficiencies in securities markets (Ragazzi, 1973, p. 480).

Ragazzi appears to base the preceding quotation on two factors which tend to cause a "differential of attractiveness" for portfolio and direct investors presented with some investment alternative.

##### Risk and Information

It is Ragazzi's claim that a major impediment to portfolio investment activity is lack of information concerning investment alternatives. Thus, portfolio investment in many countries will be constrained by lack of information concerning the current financial health of individual companies or lack of faith in those figures which are made available since public auditing of the firm's books may not be required by law. These types of problems, of course, contribute to an increase in the standard deviation of the expected rate of return, hence an increase in risk associated with the investment alternative.

Contrarily, the foreign direct investor, by nature of his active involvement in controlling the firm, is able to restrict the element of risk to those situations pertaining to the actual operations of the company in the market place.



### Stocks, Speculation and Fluctuation

Another factor is that the market for stocks (and the ratio of stocks that are normally traded in the market to total stocks of single companies) is much smaller in most European countries than in the United States, and this may cause much larger fluctuations in the market price of stocks both for speculative reasons and in relation to fluctuations in the rate of return of the company, than in the United States. Since normally a portfolio investor is interested mainly in the day-to-day value of his stock, while a control (direct) investor is interested mainly in the medium-term and long-term profitability of the company, wide market fluctuations in the value of the stock have a higher negative weight for the former than for the latter (Ragazzi, 1973, p. 481).

The article ultimately suggests (for the reasons listed above) that U.S. firms have been attracted to foreign direct investment in Europe by that continent's higher profitability rates compared to equal risk opportunities in the U.S.

The reason why direct investment for control purposes does not occur even more frequently in Europe is due to the significant expenditures which are required. Only the very rich and large (especially U.S.) corporations are capable of meeting these requirements.

Conversely, the portfolio investor is attracted to U.S. investment alternatives because of the greater securities market efficiency displayed by that country.

It should be noted that this section of Ragazzi's article was developed primarily as a means of "explaining expansion of U.S. direct investment abroad, particularly in Europe" (Ragazzi, 1973, p. 480). He does however generalize his argument to a wide range of other countries.

The hypothesized relationship between portfolio investment and foreign direct investment should be negative based on the following rationale:

1. Ragazzi views foreign direct investment and portfolio investment as substitute methods of providing capital movement.
2. If this is so, the more efficient a securities market becomes, the greater the opportunity for portfolio investment to provide necessary equity funding as opposed to FDI.
3. If demand for capital funding is finite, the more active the role played by portfolio investment the less opportunity there is for foreign direct investment.

5. Models of tariffs and exchange rates

Tariffs

The effect of customs duties on the foreign direct investment decision appears to be exceedingly simple at first glance.

As customs duties are raised on imported goods, their prices rise and their consumption subsequently falls. This causes the exporter (on whose product the import tariff has been imposed) to turn to foreign direct investment as a way of continuing to service his foreign market. Unfortunately this explanation though concise, begs a number of serious questions.

First, the foreign market size plays an important role in that it must be of sufficient magnitude to warrant direct

investment. Certainly a minimum requirement to encourage FDI would entail a market size sufficient to capture economies of scale and offset the problems of decentralization. One can reasonably argue that the tariff concept is unable to stand alone as a predictive variable of FDI since the outcome of customs duty adjustments is certainly dependent upon a number of other variables. Hewitt argues from a position contrary to that tendered by Ragazzi.

It is popularly believed that Canadian protective tariffs have acted to increase foreign direct investment by discouraging exports. We believe this argument is valid only if applied to foreign firms already selling large amounts of their products in Canada before tariffs were raised. It is largely irrelevant, we suspect, when applied to foreign firms not yet committed to Canada (Hewitt, 1975, p. 144).

Hewitt's justification for the preceding statement follows a theory that firms, prior to actually undertaking the risk of a direct investment in a foreign market, initially establish its viability through exporting to it or establishing joint-ventures within it. The rationale then becomes, "anything, tariffs for example, which discourages these probing-operations will work to reduce FDI and total foreign penetration (Hewitt, 1975, p. 144).

The previous discussion demonstrates that the effect of a tariff can be argued to have either a positive or negative impact on FDI. The problem is confounded further by the interactive effects of other factors which must be "tied" to the tariff theories in order to deduce implications for FDI. The methodological requirements for applying this variable (in

cross-sectional studies at least) seem to be twofold.

1. The effect of the tariff must be 'lasting.' This implies that one can not make use of tariff data which are fluctuating, since the predictive element of any statement which is made with regard to the impact of a customs duty would be compromised following any change in the rate.
2. The tariff must be 'variable across industries.' If the tariff was the same for all industries there would be no base figure against which it might be possible to compare the impact upon FDI of the varying industrial tariff structures.

#### Exchange Rates

The discussion of exchange rates in terms of their influence on FDI appears to be centered around two factors: the absolute level of the exchange rate, and risks associated with changes in the exchange rate.

At the outset it is important to indicate the major weaknesses associated with the use of exchange rates. The problems bear some similiarity to those associated with the use of the tariff explanation of FDI.

Hewitt's discussion of domestic bias factors (hereafter DBF) which are general variables discouraging FDI, indicates one difficulty.

Some of the DBF, lack of knowledge about Canadian environment and currency conversion risks for example, do not vary much or at all across industries. The

only place where such DBF show up in our regressions is in the constant (Hewitt, 1975, p. 98).

The statement needs little elaboration except to add that cross-sectional studies make little use of a variable such as this, given that interindustry variability of reaction to exchange risk is minimal. Contrarily, if one were to engage in a time series study of significant duration, fluctuations in currency could be a useful variable aside from Hewitt's argument.

A second difficulty in the application of the exchange rate level as a determinant of FDI is described by Ragazzi.

In conclusion, if the exchange rate does not equalize production costs among different countries, there is a potential incentive for direct investment to flow to a country with an undervalued currency (and a disincentive for flows in the opposite direction) although, as for customs duties, the undervaluation alone cannot explain the direct investment (Ragazzi, 1973, p. 492). (emphasis added)

The dependency of the exchange rate in this instance is upon the technological gap explanation. A foreign firm with some technological advantage over potential competitors in the host country might be encouraged to invest there (rather than in its own domestic market) because of the implied lower production costs. The key point again is that, like the tariff explanation, the exchange rate theory must act in conjunction with a second factor (technological superiority), in order to influence FDI.

As a determinant of FDI the impact of risk resulting from a change in the exchange rate has been summarized in Ragazzi's interpretation of the literature.

... when there is a risk of change in the exchange rate the firms of the strong-currency area are at an advantage and are stimulated to invest in the weak currency area (Ragazzi, 1973, p. 492).

A very brief treatment of these theories was offered because of their (hopefully apparent) unsuitableness for use in cross-sectional regression studies.

This concludes the discussion of those theories which by necessity of time and space were presented in an abridged form.

The next section will introduce a range of theories more directly related to the research interests of this paper.

The presentation will continue with the following order of discussion:

6. Economies of scale hypotheses
7. Technological gap models
8. Human skills model
9. Market structure models
10. Management goal models
11. Advertising and foreign penetration

#### 6. Economies of scale hypotheses

The body of literature underlying the role of economies of scale as a determinant of multinational penetration is multi-faceted. We shall examine not only some applications where the economies of scale hypothesis is used as a variable in its own right, but also a number of situations where this variable is invoked for its explanatory power in support of yet

other hypotheses.

Caves (1974) establishes two useful categories for discussing economies of scale:

#### I. Intangible capital

Certain assets to which the firm may have access offer economies of scale beyond those obtainable from the construction of minimum efficient scale plants. Caves attributes the existence of these intangible economies of scale to a number of factors:

They may be due to scale economies in nationwide sales promotion, or the cost-effectiveness of oft-repeated advertising messages, ... But they may also result from gains through the administrative coordination of input purchasing or output distribution or from spreading the cost of research (and other activities producing proprietary knowledge) over larger outputs (Caves, 1974, p. 281).

The argument incorporating intangible economies of scale as a determinant of foreign penetration implies that, where such economies exist, they may be viewed as a positive influence on the decision to foreign invest. This is because the multinational firm which enters a host country is able to transport across international boundaries intangible assets which afford to it advantages sufficient to offset the disadvantages associated with operating in a foreign market. Caves selected product differentiation as the main manifestation of the intangible capital effects. He proxied this variable with advertising as a percentage of sales (hereafter AD) and research and development

expenditures as a percentage sales (hereafter RD). Both proxies appear to perform reasonably well. Depending upon the equation structure, t-values for AD vary between insignificance and significance at .05; for RD they range between significance at .05 and .01.

Two corollaries of the intangible assets hypothesis are introduced by Caves. Both of these lead to his specification of a variable called large size firms.

Caves' arguments are summarized below.

1. Given that a firm will attempt to capture the returns to its intangible assets, the issue of which method of foreign penetration it will use must be resolved. Exploitation of intangible assets might be achieved through licensing-joint venture agreements, exportation of goods embodying the intangible asset, or foreign direct investment.
2. In order to answer the aforementioned problem, Caves postulates his first corollary, that one of the determining factors will be,  

... the absolute size of the potential investing firm: direct investment entails higher (relatively fixed) costs of licensing, and thus is more likely the game of the firm big enough to amortize these search costs over a large direct investment outlay (Caves, 1974, p. 280).
3. The second corollary invokes the interaction of product differentiation and large size firms to argue that the multinational corporation is inclined to operate in



markets characterized by "differentiated oligopoly" where new competitors are likely to encounter barriers to entry.

Caves' conclusion is that:

... the MNC -- the established firm in another nation -- tends to have systematic advantages as an entrant to a market guarded by entry barriers, and so the height of the barriers and the prevalence of the MNC should be positively related (Caves, 1974, p. 280).

The variable specification for "large size firms" is:

shipments of U.S. firms with assets greater than \$100 million  
total shipments of U.S. firms

(Caves, 1974, p. 282).

The hypothesized relationship of this variable to foreign direct investment in Canadian industry is positive, based on two arguments:

1. Capital costs associated with entering a Canadian industry are more easily overcome by large foreign corporations than by smaller domestic firms.
2. Fixed costs related to foreign direct investment -- compared to those required for licensing or exportation to the host country -- are more readily absorbed by large firms capable of undertaking large financial outlays.

The variable's performance is impressive. In three equations where the variable was used the coefficients were nicely grouped (0.442; 0.471; 0.384) and their associated t-values were strong (3.41; 3.62; 2.56).

Caves noted that the performance of the specification was always significant but that multicollinearity with other variables indicated the presence of alternative influences captured by "large size firms."

## II. Tangible capital.

Caves' use of economies of scale within a tangible context is employed in an attempt to estimate barriers to entry of an industry. Toward this goal he introduces three variables:

EC = average value of shipments per plant of the largest plants accounting for (approximately) 50% of shipments in the Canadian industry, divided by total Canadian shipments.

DS = average value of shipments per plant in the United States industry, divided by average value of shipments per plant in the Canadian industry.

KC = size of "minimum efficient scale" plant (the numerator of EC) multiplied by the assets-to-sales ratio of the Canadian industry (Caves, 1974, p. 282).

The explanatory contribution of these variables is (according to Caves):

EC approximates the size (relative to the market) of a plant large enough to exhaust economies of scale in production, on the general proposition that the larger plants in an industry are likely to attain that size. KC indicates the capital cost of constructing a single plant of minimum efficient scale. The variable DS seeks to correct some of the serious weaknesses of EC as a proxy for scale economies (Caves, 1974, p. 282).

The contribution of these variables in explaining the multinational's advantages over those of their smaller rivals in terms of overcoming entry barriers is less than clearly defined.

EC is the only variable which performs according to expectations. "KC is never significant and usually has the wrong sign. DS is often correctly signed and close to significant ... but it does not pass the conventional test" (Caves, 1974, p. 284).

Another variable of interest which was introduced by Caves relates to multiplant enterprises. It has been included in the economies of scale classification because the underlying premise of the variable appears to warrant its inclusion in this "school of thought." Briefly stated the theoretics of the variable are:

1. When the economies to the firm extend beyond the cost-minimizing output of the efficient-scale plant (noting the influence of transport costs on the latter) the organization of multiplant firms becomes a rational technique for minimizing costs (Caves, 1974, p. 280).
2. The scope of these economies to the multiplant firm may be of a wide-ranging nature. Caves lists some possibilities:
  - a. ... scale economies in nation-wide sales promotions.
  - b. ... the cost effectiveness of oft-repeated advertising messages.
  - c. ... gains through the coordination of input purchasing or output distribution.
  - d. ... spreading the cost of research (and other activities producing proprietary knowledge) over larger outputs (Caves, 1974, p. 280).

Calculation of Caves' multiplant enterprise variable was:

$$\frac{\text{U.S. shipments of multiplant firms for all industries "i"}}{\text{total U.S. shipments for all industries "i"}}$$

A U.S. data base as opposed to the Canadian equivalent was

selected in order to avoid the possible dangers of endogeneity related to usage of the latter since U.S. multinationals already extant in Canadian markets could have an effect on the Canadian statistics.

Results of the multiplant enterprise variable in the three equations in which Caves applied it are as impressive as those obtained from "the larger size firm" specification. Performance of the variable was well within the .01 level of significance.

Caves' conclusions on the variable were:

The 'multiplant operations' variable MP is always quite significant and invulnerable to changes in specification (Caves, 1974, p. 284).

It should also be noted that the multiplant enterprise variable did suffer from collinearity problems-especially with the large size firm variable (the simple correlation = .702).

The aforementioned variables were used by Caves in attempt to evaluate the penetration of Canadian industry by U.S. foreign direct investment. The balance of his paper attempts to extend the same hypothesis to the United Kingdom.

Variations of U.K. data sources allowed for some reformulation of variables which proxied for intangible and tangible economies of scale.

ADB, the U.K. data alternative to AD, represents "advertising plus market research outlays as a percentage of sales of the United Kingdom industry" (Caves, 1974, p. 288).

A new intangible economies of scale variable was also introduced: "NR royalty receipts (in respect of patents,

trademarks, manufacturing rights, etc.) of the United Kingdom industry divided by payments of royalties by the industry" (Caves, 1974, p. 288).

Results for AD and RD which were also used in the U.K. study were again significant. The ADB variable also reached significance. NR was not quite so encouraging: "NR proxying the intangible assets possessed by the British industry ... is seldom significant at the .10 level" (Caves, 1974, p. 290).

Finally, a new tangible economies of scale variable was introduced:

DSB value added per worker in the largest plants accounting for (approximately) 50% of net output, divided by value added per worker in the smallest plants accounting for the other 50% (Caves, 1974, p. 289).

This variable according to Caves, "is designed to capture both the extent of diseconomies of small scale and also part of the influence of minimum efficient scale (as measured by EC) in the Canadian study" (Caves, 1974, p. 289). The variable appears to function well in all equations.

Hufbauer, (1970) concisely summarizes the standard theory of economies of scale. Briefly paraphrased it corresponds to two notions.

First, the opportunities for economies of scale to be developed will chiefly occur in large countries which are characterized by their large domestic markets. Such markets are considered necessary in order to foster the specialization required to develop increasing returns to industry size.

The advantages inherent in economies of scale -- greater gains from production and advantages in market dominance if such productivity gains are passed along in competitive pricing -- may thus provide an impetus for large-sized firms to expand their output through exportation or foreign direct investment to other regions where their potential competitors enjoy no such efficiencies and hence are at a competitive disadvantage.

Second, occasionally the firms of smaller sized countries, with limited domestic markets, may find it feasible to develop economies of scale. The scenario as introduced by Dréze (1960) in elucidating the determinants of economies of scale attained by Belgian firms, employs the concept of international standardization. Some industries in Belgium are able to undertake large scale production runs by reason of the fact that they produce goods which "match" the tastes of their neighboring countries. Therefore the demand for output of some industries is sufficient to allow employment of mass production techniques which capture economies of scale. Since the production is "standardized" to meet the needs of both the domestic consumption in Belgium as well as the requirements of the neighboring nations the demand is of sufficient magnitude to justify large size firms which can capture increasing returns to scale and thus produce at internationally competitive prices.

The import of both theories for purposes of FDI research is that, where economies of scale characterize the production of certain industries, firms within such classifications may be

more predisposed to undertake foreign penetration than will companies in other industries which do not appear to exhibit economies of scale.

Wells (1969) introduces an economies of scale variable in his research on U.S. exports of consumer durables within the product life-cycle hypothesis. In this case, however, the variable functions as an explanatory link within the PLC theory. It is not per se employed as an explanatory variable in its own right. The relationship between the two concepts is described by Wells:

Foreign production was assumed to begin only when the market in the country was large enough to support production at a level such that costs were below United States marginal cost plus transportation and duties. One would expect products which have, in some sense, different returns-to-scale to have different export patterns (Wells, 1972, p. 62).

Wells concludes of his empirical work, that "... there is probably a relationship between scale and export performance as predicted" (Wells, 1972, p. 62).

Donald Jud's (1974) work, dealing with the determinants of foreign direct investment versus exportation, as alternatives to expansion for U.S. multinational firms employs an economies of scale variable based on the same justification as that provided by Wells within the product life-cycle theory.

Jud's model incorporates the economies of scale variable as a component of real cost differentials -- a classification which also includes differences in wage rates and input costs.

In order to estimate the economies of scale which might be

available to foreign direct investment, Jud calculated:

$$\frac{\begin{array}{l} \text{host country production}_{\text{industry "i"}} \\ + \\ \text{host country imports}_{\text{industry "i"}} \end{array}}{\text{U.S. production}_{\text{industry "i"}}$$

as a proxy variable.

Actually, this is tantamount to a relative market size variable. At any rate, Jud's hypothesis would imply that where (in some industry "i") the relative market size is large, one should see a higher proportion of U.S. subsidiary sales to U.S. exports in industry "i", than would be observable in some other industries where the ratio was not so large.

Jud's results which concern the U.S.-Canadian relationship in 1963 support his contention with regard to real cost differentials at a significance level of .01 (on a one-tailed test).

Esposito and Esposito (1971) used their economies of scale variable in a somewhat different fashion from that of Jud, since their research was concerned with the impact of foreign penetration via imports on industry profit rates.

The Espositos approached the economies of scale phenomenon with a consideration of its impact as a barrier to entry. A number of tenets are offered in this regard.

First, it is possible that a foreign entrant to some industry in the host country may have cheaper factor input costs (e.g. labor), than do domestic entrants. Such might be the case where a multinational firm purchases some of its inputs in a



cheap factor market and then exports the partly finished good (embodying the cheap factor input) to another market which has no such production advantages.

Lower factor prices for the potential foreign entrants may ... imply that minimum efficient scale of plant is achieved at a smaller level of output for the potential foreign entrants than for the potential domestic entrants. The smaller the increment to total industry output as a result of entry at a minimum efficient scale, the smaller the difference between pre-entry and post-entry price (Esposito and Esposito, 1971, p. 344).

It would appear also, that if the foreign entrant has access to minimum efficient scale plants at smaller output levels than that available to domestic entrants, the foreign entrepreneur may additionally be able to access markets in the host country which might not be efficiently (in terms of fully exploiting economies of scale) serviced by the domestic entrant.

Second, entry barriers for the potential foreign entrant may also be reduced (relative to that of the potential domestic entrant) if the former can spread their output sales over a range of international markets. The Esposito's reasoning is that:

If the potential foreign entrants can distribute their minimum efficient scale output among several markets, their impact on industry price in any one market will be less than the impact on industry price should they sell only in that one market. Thus the economies of scale barrier facing potential foreign entrants in any one market may be a function of the percentage of their output allocated for that market. More importantly, there will be no economies of scale barrier for those potential foreign entrants who already sell their entire minimum efficient scale output in their own or the world market (Esposito and Esposito, 1971, p. 344).

A point of interest may be noted in the preceding quotation. Namely, the similarity between the initial portion of the quotation and the rationale underlying Dréze's (1960) work (previously discussed) on economies of scale and Belgian firms. From a theoretical standpoint, both Dréze and the Espositos appear to arrive at the same possibilities of international economies of scale albeit from different directions.

With respect to the economies of scale variable, theory suggests that the greater the output of an entrant's minimum efficient scale of plant relative to industry output, the higher the entry forestalling price. In this context one would expect profits to be positively associated with the level of scale economies (Esposito and Esposito, 1971, p. 344).

The variable specification selected by the authors to proxy for economies of scale takes the following form:

$$\frac{\text{average plant size for the largest plants} \\ \text{supplying approximately 50\% of industry output}}{\text{average plant size for total industry output}}$$

It is important that the reader appreciate the fact that the Espositos were concerned with the effect of foreign competition (through import penetration) on domestic industry profit rates. They were not attempting to define determinants of foreign penetration. A discussion of their theoretics concerning economies of scale was provided in order to supply a brief insight into some of the hypothesized effects which this variable exerts within the context of acting as a barrier to entry. Within this capacity the variable unfortunately behaves in a poor and erratic fashion. It is either significant with

the incorrect sign, or properly signed and insignificant. The authors attribute this to multicollinearity problems.

This should not be taken as evidence that the economies of scale proxy, or the theoretics are inappropriate -- it merely indicates that within the context of determining domestic industry profit rates (as opposed to determining foreign penetration) some difficulties arise.

#### 7. Technological gap models

The key argument of technological gap models as determinants of foreign penetration stresses the benefits of innovation that accrue to those countries which initially develop them. Naturally, a time lag exists before foreign competitors acquire the necessary technology which allows them to produce a viable imitation of the innovation. During the period of this lag, the firms or industries which originally produced the innovation enjoy the advantages of exporting to, or foreign direct investing in, those countries which have demonstrated a demand for the product.

Although a significant number of trade theorists in the past have been proponents of the technological gap concept, this discussion shall be restricted to a few of the more current authors and the manner in which they applied their theory.

Thomas Horst (1972a) developed a model which included the technological gap aspects in a Canadian-U.S. setting. He regressed three different dependent variables (U.S. exports,

subsidiary production, and the sum of both of these factors) on his independent variable; "company sponsored research and development expenditures deflated by U.S. sales" (Horst, 1972a, p. 39).

That each of these regressions should yield a statistically significant fit should come as no surprise. -- that R & D is more closely related to total U.S. sales to the Canadian market than to either U.S. exports or production by U.S.-owned subsidiaries provides strong if indirect, support for the hypothesis that exporting and foreign investing represent alternative methods by which U.S. firms exploit the same technological advantages over their Canadian competitors (Horst, 1972a, p. 40).

His justification for use of "the company sponsored R&D expenditures" variable as a proxy for the technological gap advantage provides some useful insight into the application of the theory.

A second and far more difficult challenge is to devise a satisfactory measure of the technological advantage of U.S. firms relative to their Canadian competitors. In theory the problem seems insurmountable; not only must we combine product technology with the more general organizational, marketing and financial skills of U.S. management, but we must also be careful to distinguish the technology existing at a particular point in time (a stock) from the most recent contributions to that technology (a flow). In practice the problem may be less formidable: as one compares one industry to another, not only do the various bases of technological advantage appear to be multicollinear, but also their relative importance seems to be reasonably stable over time (Horst, 1972a, p. 39).

Horst then concludes that there is some basis for using the variable in penetration studies. Hufbauer (1970) maintains the technological gap premise, but with a slightly different tack

concerning the use of the proxy measurement.

Another -- approach successfully pursued by Gruber, Mehta and Vernon and Kessing, and by Gruber and Vernon in the present volume, is to measure technological sophistication by research expenditure. This approach by contrast with individual product studies, can quickly encompass a wide range of manufactures trade. But it requires an examination of trade flows on an industry basis. In this and the next section we prefer measures more closely identified with commodities (Hufbauer, 1970, p. 186).

The "commodity measurement" used in this case is a product date measure which "provides the basis for dating the arrival of new products to the status of internationally traded goods" (Hufbauer, 1970, p. 187). Despite a number of weaknesses Hufbauer appears to feel that the measurement has some merit as a proxy for technological gap advantages.

Hewitt (1975) also deals with the technological gap theory in what by now will appear to the reader to be the "standard treatment." The hypothesis is that U.S. firms will find expansion easier in those Canadian industries where their technological superiority allows them a competitive advantage. This being the case, one should expect to see a higher penetration in those industries where the technological gap in favour of U.S. firms is greatest.

Hewitt's choice of proxy in this case was "U.S. employment of scientists, technicians, and engineers divided by the same for Canada," rather than R&D expenditures (Hewitt, 1975, p. 99). His predicted positive relationship between this variable and foreign penetration of Canadian industry was generally

substantiated in tests.

The reader who desires a more detailed explanation of how the technological gap variables come to be an advantage especially for U.S. firms, is directed to p. 146 of Well's (1972) text for a description and bibliography.

An alternative interpretation of the role of the R&D variable is given by Dale Orr (1974) -- and subsequently by Paul Gorecki (1976). Orr tested the hypothesis that R&D expenditures in the host country could act as a barrier to entry for new firms. His underlying rationale is taken from work by Mueller and Tilton (1969).

The chief component of these barriers generally is the extent of economies of scale in the R&D process. The second major factor contribution to R&D entry barriers is the accumulation of patents and knowhow on the part of incumbent firms. [(Orr, 1974, p. 61) quoting (Mueller and Tilton, 1969, p. 578)].

Orr's variable was calculated as the ratio of R&D expenditures to industry sales. As a barrier to entry the variable performed moderately well.

Gorecki, using Orr's data carried the research one step further by comparing the differential responses of foreign and Canadian firms to R&D entry barriers. The hypothesis underlying Goecki's use of R&D expenditures was that foreign firms (multinational corporations) are insensitive to entry barriers due to their advantages of tangible and intangible assets. Canadian firms, which, on a comparative basis do not enjoy the same asset advantages as the multinationals, were hypothesized

to respond negatively to the height of the entry barriers.

Results of the hypothesis testing indicated that Canadian firms responded negatively to the height of the R&D entry barriers, while the impact on foreign firms was found to be statistically insignificant.

#### 8. Human skill models

The designation for models falling within this category was acquired from Louis T. Wells Jr's. text "The Product Life Cycle and International Trade" (1972). The relevant hypothesis is that those U.S. industries which are intensive users of skilled labour are concomitantly the industries most likely to be engaged in exportation of their output. It appears that the hypothesis developed, in part, from attempts to improve the performance of factor endowment type models by introducing the labour skill factor as a separate variable. A good example of the approach indicated by the preceding statement can be seen in this quote from Donald Keasing.

Yet, I have put forward evidence, and will add to it here, showing that the differences in the skill intensity of products are reflected systematically in the pattern of trade. I infer from this evidence that differences in supplies of skills afford a factor explanation of trade and location in manufacturing industries within the framework of the Heckscher-Ohlin Theory (Keasing, 1968, p. 5, fn. 6).

Unfortunately the human skills variable as a determinant of foreign penetration suffers from a type of interpretive difficulty which has already been associated with a number of

other variables. An argument can be made that those industries which employ an abnormally high amount of skilled labor (scientists, engineers, technicians and other professionals), are the same industries which are concerned with the development and diffusion of innovative products and techniques. These are precisely the types of output which the product life-cycle theory would also predict as constituting a major source of export for U.S. firms. The discussion can become somewhat confusing if one views a portion of human skills as the accumulation of a stock investment in education which then makes possible the development of innovations (which ultimately are exportable). Confusing, because if we accept this plausible explanation, we must find some way of separating the "human skills" embodiment in an export industry from other embodied inputs, such as capital investment in the form of R&D expenditures and the fixed costs involved with tangible assets investment. This is not to imply that those quantifiable variables which appear in the literature are of no value as determinants of foreign penetration.

It appears that a number of authors have used the same type of proxy variable that would be intuitively useful for measuring the stock of skilled labor. However, rather than attribute foreign penetration to this particular input variable, the trend appears to be moving toward a 'wider' version of descriptive theory which, interestingly, uses the same proxy observations (or close variations) as those which had originally been



employed to capture the effect of skilled labour inputs.

This transition in approach can be demonstrated with allusion to a few of the more current theories.

#### Entrepreneurial Resources

Caves (1974) has attempted to determine the effect of skilled entrepreneurial resources on the decision to penetrate a foreign market. He argues that the entrepreneurial resources of firms must be of a sufficient level of 'sophistication' in order to allow for the complexity of controlling an organization capable of international activity. The technique and proxies to be used in capturing the effect of his variable are revealed in the following statements:

The role of skilled entrepreneurial resources might be tested if we can identify those industries in which the problems of management and coordination require a high order of skill (Caves, 1974, p. 283).

His proxies are:

1. NP -- Non-production workers as a percentage of total employees in the Canadian industry.
2. PE -- Payroll per employee in the Canadian industry.
3. PP -- Wages per production worker in the Canadian industry.

The variable NP can be justified on the argument that complex management tasks arise in industries where a large proportion of employees are engaged in some activity other than turning out the product -- research, sales, distribution and management itself (Delehanty, 1968). Variables PE & PP are alternative measures of the average skill levels of employees in an industry, on the assumption that interindustry variations in pay are substantially related to differences in the amount of human capital utilized. A higher skilled labor force probably requires management that is both more skillful and whose skills are more easily transferred from country to country.

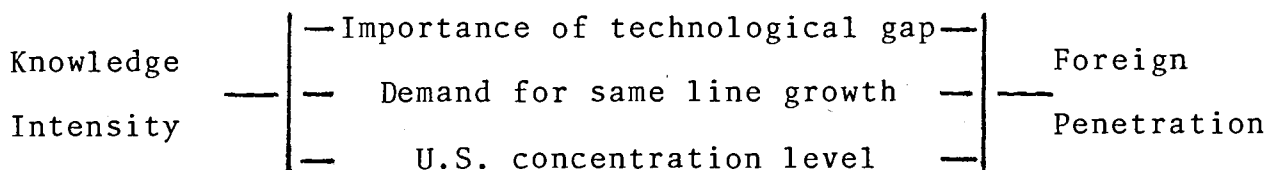
(Caves, 1974, p. 283).

Caves' conclusion regarding the efficiency of these variables is very similar to the conclusions which were drawn at the beginning of this section.

Finally, the 'entrepreneurial resources' variables turn in a curious performance, looking rather strong when entered alone -- but proving insignificant when included with other variables. In light of the economic collinearity built into these variables and the a priori weakness of the hypothesis supporting them, my judgement is that the 'entrepreneurial resources' hypothesis gets no real support (Caves, 1974, p. 286). (emphasis added)

#### Knowledge Intensity

A section of Hewitt's thesis (1975) reveals a second example of the attempt to incorporate the type of data which one could conceivably classify as being supportive of a 'human skills' type variable. The proxy in this case however, is employed in an attempt to support a rather different hypothesis as revealed by the following diagrammatic and paragraphic summary of Hewitt's model.



The prime variable is knowledge intensity. The higher it is the more concentrated the industry. At the same time, for the same reasons, more knowledge intensive industries are more committed to same line expansion as opposed to diversification. Finally, the higher is knowledge intensity the more important the technology gap that exists in favour of U.S. firms (Hewitt, 1975, p. 43).

The reader who requires a more detailed explanation of the

underlying rationale for the preceding hypothesized relationships is directed to Chapter Three of Hewitt's thesis. The variables selected to act as proxies for knowledge intensity are advertising intensity and the ratio of all U.S. technicians, scientists, and engineers as a percentage of U.S. employment. (Variable name ATSE). Hewitt chose these proxies because in his opinion, they provided a better estimate of the stock of accumulated knowledge of U.S. industry than did R&D expenditures. In various regressions with the dependent variables being alternatively exports, FDI or both, the variable appeared to perform relatively well. He also used a technological gap variable which was discussed in greater detail in the appropriate section, but which should again be touched upon here because of the nature of the proxy data selected.

Hewitt selected a variation of the proxy we have just discussed. In this case the technological gap variable was calculated as the U.S. employment of scientists, technicians and engineers divided by the equivalent group for Canada. The reader will recognize the similarity of this variable to other human skill proxies which have been discussed.

#### 9. Market structure models

Ragazzi maintains that "in oligopolistic markets, the main determinant of direct investment may simply be that of increasing profit rates by reducing competition, irrespective of whether the investor is a more efficient producer than the firm

that is taken over" (Ragazzi, 1973, p. 489).

The key factor in the quotation is that of reducing competition -- whether it be in terms of domestic competitors or international competitors. When considering foreign direct investment motives which might be attributed to the profit maximizing firm, a number of defensive strategies become apparent:

- (i) The donor country firm may choose to invest in the host country in order to protect its already established export market from increasingly aggressive host country competitors in the same industry.
  
- (ii) The foreign direct investor may choose a host country whose firms pose an increasing threat to the investor's domestic market. In this way he may achieve some protection for his own domestic market from potential foreign competitors who may have the advantage of cheaper (especially labor) production costs.

Consideration of the manner in which concentration ratios (and their accordant underlying theories) are used in the literature will indicate the diversity of interpretation which has been assigned to this variable.

Résearch by Jud (1974) regressed a dependent variable (subsidiary sales by U.S. companies in industry "i"/export sales by U.S. companies in industry "i") on -- among other variables

-- the percentage of the value of shipments accounted for by the top four enterprises in each industry in the United States, i.e. the four-firm concentration ratio.

The results on this variable in three different equations indicate significance in the .05 to .01 region. Jud's rationale for these expected results is as follows:

This suggests that more concentrated industries tend to favor supplying foreign markets through subsidiary production rather than by exporting. There are two alternative explanations for this phenomenon. First many authors ... feel that an oligopolistic market structure leads member firms to be more conscious of their position in a 'world industry' and to equate long-run survival with the maintenance of a given market share. And, where the existence of local production facilities gives a firm a competitive edge in the marketing of its product, firms operating in an oligopolistic industry will undertake foreign investment to assure a certain market share in the face of real or potential investment activity by rival firms. A second explanation ... reflects the affinity of large firms for direct investment (Jud, 1974, p. 43).

The balance of Jud's second explanation elaborates on large size firm advantages concerning tangible and intangible assets and their ability to overcome entry barriers associated with entering foreign markets.

It may be noted that once again the interaction of two different variables is evident in Jud's hypothesis. It becomes difficult therefore to separate foreign direct investment as a function of oligopolistic pressures from the penchant for large size firms to expand into foreign markets. Ideally, one would prefer some indication of the collinearity in Jud's model.

Hewitt tested a four-firm and an eight-firm concentration

ratio in his attempt to explain U.S. penetration of Canadian industry. His reasons for inclusion of the variable were:

- a. First, the more concentrated the industry, the more likely are its firms, especially the leading ones, to look beyond same line for expansion opportunities.
- b. Second, the 'band-wagon' effect is stronger the more concentrated the industry.

The band-wagon effect postulates that:

In some cases, when several companies in the same industry went abroad, others felt compelled to follow suit in order to maintain their relative size and their relative rate of growth ... These cases ... may ... be classified as the 'band-wagon' effect: imitating the commitments of a leader on the grounds that one is less vulnerable if his exposures are the same as those of his principal competitors [(Hewitt, 1975, p. 67) quoting (Aharoini, 1966, p. 66)].

- c. Third, the higher is concentration, the sooner, ceteris paribus, in the U.S. industry's history will U.S. firms have considered foreign expansion.

Regression results of Hewitt's four-firm concentration ratio on U.S. subsidiary market share of Canadian industry provide strong support for his hypothesis.

The eight-firm concentration ratio was apparently discarded from Hewitt's regressions on the basis of its inferior performance.

The theoretical arguments and data bases underlying the concentration variable have, to this point in the discussion, been concerned with the market structure as it relates to multinationals in the donor country.

In the interest of a balanced discussion, it also is

important to review the role of the concentration variable as a barrier to entry in the host country.

Orr and Gorecki tested the Canadian concentration ratio as a barrier to firm entry into Canadian industries. Orr's reason for inclusion of the concentration ratio, (which he entered as a dummy variable) was that incumbent firms in a given industry might be inclined to collude in an attempt to block the entry of a new competitor. The implication of his argument is that ceteris paribus higher levels of industry concentration contribute to higher entry barriers for the potential new competitor. Depending upon the equation structure in which the concentration variable was tested, the results ranged from insignificant to significant at .01.

It will be recalled that Gorecki was interested in the differential response of foreign versus Canadian firm reaction to incentives and barriers to entry. Gorecki concluded that concentration did have a significant negative impact as an entry barrier for domestic firms in Canada. The effect of concentration on foreign firm entry was not clear-cut due to multicollinearity.

#### 10. Management goal models

The variables and theories falling within this classification have, and continue, to provide a considerable degree of controversy.

There is little constructive value in belaboring the issue

of whether or not firms maintain as their primary goal, profit maximization. The concern in this section is to delineate two of the key theories (and their associated variables) which have shaped research on the goals of the firm as they apply to foreign penetration.

The discussion will begin with growth maximization and conclude with profit maximization. The latter topic will also discuss the concept of risk.

#### A. Growth Maximization

Ragazzi (1973) discusses the goal of growth maximization within the context of oligopoly behavior. Briefly he maintains that theories which favor growth maximization (as opposed to profit maximization) as one of the firms's major goals give rise to the arguments that the oligopolist may undertake foreign as opposed to domestic expansion because:

- (i) it may be less costly to increase market share in a foreign country than to risk antagonizing other powerful oligopolists in one's own domestic market.
- (ii) foreign direct investment may involve less danger of government intervention (especially with regard to U.S. antitrust activity) than would domestic attempts to expand.

As an alternative view, Ragazzi generalizes on the conclusions of Hymer and Rowthorn (1970) who found that U.S. firms undertook foreign penetration, not to achieve a greater share of world markets, but to avoid slow growth rates in their own U.S.



domestic markets.

Ragazzi expanded the aforementioned premise to the following:

A generalization of the argument would be that companies of all countries strive to achieve a similar rate of growth and that they invest abroad whenever growth in their own markets lags behind that in the rest of the world (Ragazzi, 1973, p. 490).

Orr and Gorecki each used a growth variable in their respective papers related to entry. It will be recalled that Orr was concerned with the determinants of entry for all firms entering Canadian industry, while Gorecki, using the same data base, wanted to compare the difference between domestic and foreign firms' entry responses.

The variable of concern here is Orr's "past rate of growth of industry output" calculated as:

$$\dot{Q}_i = \frac{1}{3} \frac{Q_i(1963) - Q_i(1960)}{Q_i(1960)}$$

where:

$Q_i$  = value added in the " $i^{\text{th}}$ " industry

$\dot{Q} = \dot{Q}_i \dots \dot{Q}_{71}$  industries

The rationale for the variable was that, "the higher the rate of growth of industry output, ceteris paribus, the less an entrant's supply will depress industry price and output. Similarly, the more new customers coming into the market, ceteris paribus, the lower the selling expense of attracting customers" (Orr, 1974, p. 61).

The performance of " $\dot{Q}_i$ " was less than encouraging. The

results led to the conclusion that the variable was a weak incentive to entry.

Gorecki's results with  $Q_i$  were somewhat better. He found that foreign firm's entry was positively related to industry growth. Contrarily, no statistical relationship could be established between domestic firms' entry and industry growth rates.

The differences between Orr's and Gorecki's results are attributable to the dependent variables each was trying to explain. Orr was concerned with the entry of all competitive firms while Gorecki's research attempted to distinguish between foreign versus domestic entrants.

## B. Profit Maximization

In this section the roles of profit and risk in foreign penetration are the topics of concern.

### Profit

Horst (1972b) employed a net profits variable in his empirical study of foreign investment decisions. Unfortunately he provides very little indication of the variable's performance in explaining the decision to invest in Canada, other than to state "once interindustry differences are washed out, the only influence of any separate significance is firm size" (Horst, 1972b, p. 261). Evidently the profit variable proved to be insignificant as a determinant of foreign penetration of Canadian industry.

Orr's and Gorecki's research provide a more detailed explanation of profit as a determinant of entry.

Orr's specification was:

$$\Pi_{pit} = \frac{\text{net income} + \text{interest payments}}{\text{total assets}}$$

where:

$$\Pi_{pi} = \frac{1}{4} \sum_{t=1960}^{1963} \Pi_{pit}$$

$$\Pi_p = \Pi_{pi} \dots \Pi_{p71}.$$

The preceding formula is designed to calculate the average level of past industry profit rates. In theory one would expect that the potential entrant would be attracted by an impressive past profit rate as a proxy for expected returns in the future.

Orr cautions against too much dependence on this variable for a number of reasons:

1. Accounting procedures regarding profit vary within and across industries.
2. Impressive past profit rates may be a function of rents springing from product or firm characteristics which may be extremely difficult to copy. Therefore the high past profit rate may not be such a strong incentive for the potential entrant.
3. Past profit rates may be "artificially" high due to short term market conditions, and all participants (incumbents and potential entrants) may be well aware

of the situation (Orr, 1974, p. 60).

Results of this variable in regression are less than impressive. In six equations the variable did not reach significance once.

Gorecki's finding on the same variable was a negative, albeit insignificant, relationship between past profit rates and domestic entry and a positive (and insignificant) relationship with foreign and domestic entrants combined.

In summary, performance of the profit variable as an incentive to foreign direct investment appears to be indeterminate. The results on this variable cannot necessarily be related to a basic fault in the underlying hypothesis--that past profit rates provide an incentive to foreign penetration. Indeed, any attempt to argue the counter position would seem to contradict common sense. Rather, the basic problem lies more with the great complexity of measuring profit rates. Orr captures the issue quite nicely. "... There is the infamous gap between true and measured profits" (Orr, 1974, p. 58).

### Risk

We again turn to Orr for an empirical example of risk applied to foreign penetration. Operation of the variable is explained by the following:

It is implied that for any expected profit rate, as the standard deviation increases the incentive to enter decreases (Orr, 1974, p. 61).

Specification of Orr's risk variable corresponded to:

$r_i$  = standard deviation of industry profit rates  
1960-1968.

$r = r_i \dots r_{71}$  industries (Orr, 1974, p. 62).

He also placed a useful caveat on his calculation of risk by indicating that measurement of the variable captures deviation of profit rates over time, but not deviation of profit rates over individual firms within an industry. Orr concluded that risk was only a modest barrier to entry.

Gorecki, using the same specification of risk obtained indeterminate results and concluded:

Each of the entry barriers except risk has a significantly negative impact on the entry of domestic enterprises (Gorecki, 1976, p. 486).

It must be remembered that Orr and Gorecki were testing different dependent variables; hence the different results concerning the risk variable.

The performance of the risk factor when considered over the two aforementioned studies leaves one with a suspicion regarding the ability of the hypothesis to partially explain foreign penetration. Again one must consider the possibility that the measurement of the variable rather than its underlying theoretics may be at fault. Multinationals (despite their size) are likely to be somewhat risk averse as indicated by numerous studies regarding the capital asset pricing model.

#### 11. Advertising and foreign penetration

A literature survey in the advertising area of foreign penetration is difficult. The problem lies with the number and

diversity of theoretical hypotheses for which the "advertising variable" has been claimed to act as a proxy.

In some instances only a brief allusion to the underlying theory(ies) which prompted the use of a given "advertising variable" will be offered, since the rationale will be recognized as having been discussed in a previous section.

It was considered necessary however, to create this section in the literature review in order to provide a convenient aggregate summary of empirical findings with regard to the role of the advertising variable per se in explaining foreign penetration.

The fact that many of the authors invoked the advertising variable as a proxy for their own "non-advertising" related theories is of secondary importance.

This section of the discussion was also considered necessary on the grounds that the main thrust of the research to be presented here lies in the area of marketing (and especially advertising) applications to foreign penetration.

The discussion begins with a review of Caves' (1974) results, since it was his work which prompted a good portion of this research.

It will be recalled that Caves tested the intangible assets hypothesis using R&D and advertising variables as proxies for product differentiation advantages held by multinationals..

Calculation of the advertising variable took the standard form of the ad/sales ratio. Caves argued that the data base for

this variable should be U.S. as opposed to Canadian because:

1. Advertising expenditures in Canada could be influenced by U.S. multinationals already in the country -- therefore an endogeneity problem with the variable could arise.
2. Caves' hypothesis suggested that he be concerned with the effort expended to create the intangible asset. This effort, he argued, occurred in the domicile of the multinational corporation. i.e., in the donor country not the host country.

His model presented the advertising variable in four different equations. The objective of these equations was to explain the interindustry variation of market-share held by foreign firms in Canada.

A fair range of variation is evident in Caves' results. The ad/sales ratio appears to produce coefficients which are near significance in two of the equations and in the 5% region of significance in the remaining equations.

Serious multicollinearity (.723) is reported between Caves' ad/sales ratio and one of his entrepreneurial resources variables -- "non-production workers as a percentage of total employees in the Canadian industry."

In the second portion of Caves' paper he divided his data base into producer, consumer and convenience goods industries. Caves found that his ad/sales variable performed with a larger coefficient and t-value in his "producer sample" equation than

in his "consumer sample" equation. Justification for this rather counter-intuitive result is provided in a footnote:

Most producer-good industries do little advertising; advertising probably serves as a potent proxy for the structural differentiation that exists in those that do -- such as industrial electrical equipment and professional and scientific instruments (Caves, 1974, p. 286, fn. 21).

Caves subsequently broke his Canadian data base into two more subsamples and compared the ad/sales response between convenience and non-convenience goods. He expected to find a stronger correlation between foreign investment and the ad/sales ratio in the convenience industry sample than in the non-convenience industry sample. The rationale for the expected result was that convenience goods manufacturers differentiated their brands more through advertising than did non-convenience goods manufacturers. The latter group were hypothesized to rely more on retailers to provide the product differentiating function.

Caves interpreted the equation results as support for his hypothesis (the convenience goods coefficient was 7.29; the t-value was 2.01 -- the non-convenience goods coefficient was 7.81; the t-value was 1.20).

The final portion of Caves' paper addressed the question of foreign direct investment in the United Kingdom. Again, the ad/sales ratio was used with encouraging results. In two of his equations the t-values indicated strong significance. The U.K.



results were confused however by the ad/sales performance on the producer goods industry sub-sample. The advertising variable turned in a negative (and fortunately for Caves' hypothesis) insignificant result.

Orr, (1974) unlike Caves, (1974) did not consider the ad/sales ratio as a proxy for intangible assets -- that is, he did not view advertising as a form of competitive advantage. Rather, he used it as a proxy for the "barriers to entry hypothesis" -- in other words -- for the competitive disadvantage which a potential entrant had to overcome. For justification of this position Orr cites Comanor and Wilson (1967) and Bain (1956).

Orr's advertising variable was calculated as:

$$A_i = \frac{\text{advertising expenditures, 1965}}{\text{industry sales 1965}}$$

A = A<sub>i</sub> ... A<sub>71</sub> industries.

In this instance the data base selected was Canadian since Orr was interested in the advertising related entry barrier which was erected by incumbent firms in the Canadian sample of industries.

Regression results confirmed his hypothesis in four out of five equations.

Gorecki, (1976) (using the same advertising data as Orr) found that the ad/sales variable could not be shown statistically to constitute a barrier to foreign entrants in their penetration of Canadian industry. In the domestic entrant's case however,

the coefficient was negative and significant at .01. Gorecki concluded therefore, that domestic Canadian entrants had a negative response to the advertising barrier variable, while the reaction of foreign entrants was statistically indeterminate.

The Espositos used their ad/sales ratio as a "surrogate for the degree of product differentiation in an industry [which] should reflect the height of the product differentiation barrier" (Esposito and Esposito, 1971, p. 346).

It should be remembered that their objective was to investigate the influence of foreign competition on domestic industry profitability. Their ad/sales ratio was calculated as an average for the period 1963-1965. The expected relationship with the dependent variable -- profit -- was positive.

Their regression results led them to conclude that advertising was indeed a barrier to entry.

As with other researchers, the Espositos broke their data into producer and consumer goods industries, and achieved the expected results (that is advertising appeared to be a greater barrier to entry in the latter industry classification than in the former).

Jud, (1974) in attempting to resolve the issue of foreign penetration through exportation versus foreign direct investment in Canada, used a U.S. based ad/sales ratio. His variable operated as a proxy for product differentiation advantages held by U.S. domiciled firms over competitors in the host country.

Jud (1974) did not find any significant relationship

between his advertising variable and the U.S. firm's choice of foreign penetration alternatives.

Horst (1974b) used, among a broad spectrum of other variables, an advertising expenditures variable in his research on the decision of multinationals to invest in Canada. His sample consisted of 1191 manufacturing corporations, slightly less than half of whom owned controlling interest in a Canadian subsidiary in 1967.

Horst determined that:

Once industry and size are taken into account, there are no consistent differences among the multinational firms, the Canadian investors and the total sample of 1191 manufacturing firms in the extent of vertical integration, labor or capital intensity, advertising or research effort, product diversity or any other characteristic I could observe (Horst, 1972b, p. 261).

One of Horst's footnotes did indicate a "limited caveat" on the preceding quotation:

Data on advertising and R&D expenditures were quite incomplete and, thus, the tests of these effects are less reliable. Nonetheless, what data there were lent no support whatsoever to a hypothesis that advertising or R&D encouraged foreign investing when size and industry were held constant" (Horst, 1972b, p. 261, fn. 6).

This concludes the discussion of advertising and foreign penetration -- as well as the literature review of Chapter One.

The next chapter will introduce a series of variables to be tested in an econometric and a factor analytic model which are presented in Chapter Three.

## CHAPTER TWO

### DETERMINANTS OF FOREIGN DIRECT INVESTMENT

The objective of this chapter is to define and justify the variables and relationships which are to be used in the empirical analysis presented in Chapter Three.

The order of presentation adopted is:

- I. Three theoretical arguments which provide the foundation for a number of the marketing variables will be introduced. The theoretical discussion will address the concepts of:
  - A. Advertising from an investment perspective.
  - B. Spillover effects of advertising.
  - C. Average and marginal implications for advertising.

These arguments will naturally be couched in the context of Canadian-American relationships given the objective of the model.

By definition then, the posited behavioral relationships will not be generalizable (at least without a great many caveats) to other international trading structures. Consequently these theoretical arguments may be considered to be unique to the Canadian-American interaction.

II. The variables which comprise the empirical model will subsequently be presented.

I. Theoretical Discussion

A. Advertising From An Investment Perspective

A literature review concerning the treatment of "advertising variables" within the FDI context elicits one important generalization. Researchers in the FDI field base their advertising data either on host country statistics or donor country statistics. (This is determined by which of the respective theories they wish their advertising data to proxy.) This "mutually exclusive" treatment (host country versus donor country information) of the advertising data base begs an important issue. Specifically, it could be argued that theories of multinational corporate (hereafter, MNC) penetration of Canadian industry must take account of the relative attractiveness of the host to the donor country markets.

Rationalization of the preceding statement is based on the following reasoning:

1. Advertising can be viewed as an investment in an intangible asset. This line of reasoning was pioneered by Nerlove and Arrow (in "Optimal Advertising Policy Under Dynamic Conditions," Economica, 1962).

Their work involved the application of an elementary financial concept (depreciation) to advertising. The suggestion is made herein that other financial

theories (in addition to the concept of depreciation) may be applied to advertising expenditures as well.

2. If we consider advertising within an investment context, we might also consider "ranking" alternative advertising expenditure decisions, much as a financier would rank alternative capital investment decisions. That is, given independent capital expenditure projects, the most profitable (in terms of return on investment) is undertaken first.
3. Within the marketing framework, the ranking of alternative advertising projects may well be influenced by the firm's knowledge of its current and/or expected advertising/sales ratios.
4. A United States MNC confronted with the options of expanding its domestic market or expansion into the Canadian market might be expected to rank the two alternatives in terms of sales potential response to its marketing (specifically advertising) effort (since advertising effort is expected to play a major role in product acceptance).
5. The key point in the preceding is that the choice between the two potential markets is a relative choice, just as a menu of capital investment projects represents a relative choice situation.
6. The executive of a firm requires a means of evaluating these different capital investment alternatives in order

to compare them. This is achieved through the use of widely agreed upon "standards of measurement" such as financial ratios.

The advertising/sales ratio as employed in industry serves much the same function as does the return on investment or rate of return calculation used in accounting or financial management. The advertising/sales ratio (more accurately in this case -- its inverse), like the return on investment calculation, provides the firm with information regarding a very basic trade-off -- the amount of money forthcoming in response to the amount of money invested in a project. The advertising/sales ratio, as employed in this research however, is different from the return on investment calculation in the following ways:

- a. The comparison of advertising/sales ratios is concerned with the evaluation of intangible assets. Contrarily, the return on investment calculations deal with tangible asset comparisons. The two asset classifications while differing with regard to the phenomena that each purport to measure share a common ground in that "intracategory" comparisons are nevertheless feasible.
- b. Whereas return on investment is calculated on a multi-period cash flow with a single period investment, the advertising/sales ratio is confined

to a single period calculation.

7. Extension of the preceding arguments leads to four conclusions concerning the relationship between the advertising/sales ratio and United States multi-nationals in the context of this research:
  - a. A "good" advertising/sales ratio for some industry "i" in the donor country does not imply the MNC will necessarily expand its domestic efforts in that industry.
  - b. Neither does a "bad" advertising/sales ratio for some industry "i" in the donor country imply an MNC would look elsewhere for expansion opportunities.
  - c. The question of which strategy the firm might choose depends rather on the alternative marketing choices which the company perceives as being readily available and the relative attractiveness of those choices compared to its current situation.
  - d. The implication of this approach for the role of advertising/sales ratios leads to the suggestion that both United States and Canadian ratios should be incorporated into the same regression equations.

#### B. Spillover Effects of Advertising

A careful review of the literature reveals only a limited number of references to advertising spillover effects as a potential contributing factor to foreign penetration. As far as



can be determined, no attempt has been made to relate empirically advertising spillover and FDI within the context of multiple regression.

Prior to elucidating the theoretical rationale which incorporates the spillover effect into an FDI model, the basic spillover argument will be introduced through the following quote from research by Schoner and Schwindt:

In general, the appeals which are effective for the American audience are effective for the Canadian one. Thus, spillover advertising (i.e., advertising aimed at the United States market, but which reaches the Canadian market either through border television stations or magazines) represents a costless investment to the United States firm.... Advertising from United States firms to the American market spillover to Canada, creating demand for their product. This, together with advantages of marketing know-how, provides an incentive for the larger United States consumer good corporation to expand its Canadian activities. (Schoner and Schwindt, 1980, p. 138).

For purposes of this research two caveats concerning the preceding quotation are required.

1. Schoner and Schwindt in the latter portion of the quotation link the concept of "marketing know-how" to the spillover effect. While one might agree that the two theories must operate in concert, regretfully, no mechanism for introducing an accurate measure of "marketing know-how" exists. Nevertheless, an attempt to capture the "marketing know-how" effect will be subsequently introduced in the form of a "marketing management infrastructure" variable.
2. The authors tie the spillover effect to consumer goods

United States firms. In this research, the applicability of the spillover effect will also be expanded to industrial sector firms. While one might readily agree that the vast majority of spillover incidents are indigenous to consumer sector industries there is no a priori reason for excluding the possibility that industrial sector firms (especially through international trade journals) might benefit from the same phenomenon.

The theoretical development through which the advertising spillover effect is linked to United States FDI in Canada is presented below.

1. Empirical investigation of spillover activity on a "macro" basis suggests that those media most ideally suited to conveyance of the spillover effect should be the likely candidates for observation. This suggests that United States network television and magazines (as opposed to spot television, newspapers and/or outdoor advertising) should provide the data base. It can be argued that the former group--more than the latter group--possess the necessary potential for international (in this case Canadian) exposure. One would expect network television to act as a spillover medium because the northern United States border television stations (especially Bellingham, Washington; Buffalo, New York; and Bangor, Maine) all fall into the network classification and are widely received in Canada. A similar argu-

ment concerning the international coverage of such United States originating magazines as Time, Fortune, Newsweek, Business Week, Playboy, Cosmopolitan, etc. can also be made.

2. In order to relate United States advertising spillover effects to FDI in Canada one must also consider the competitive effects inherent in the use of Canadian media, as perceived by the United States MNC. Identification of those United States industries which are characterized by a relatively heavy concentration of advertising effort in network television or magazines does not necessarily provide us with justification for predicting an associated large United States FDI component in the equivalent Canadian industry by reason of the spillover motive. A number of constraining scenarios might exist which would effectively limit the advertising spillover incentive to the potential foreign direct investor.

a. A substantial investment of their total advertising budget in network TV and magazines (therefore good spillover potential), by some United States domiciled industry "i" might be thwarted due to an equally significant (if somewhat smaller in absolute terms) media investment by the extant firms of the equivalent Canadian industry "i".

This argument reduces to an entry barrier effect. The United States spillover potential

could be effectively nullified by competing Canadian based advertising in national mass media (network TV and magazines).

- b. A high United States spillover potential may not correspond to a high United States multinational market share of some Canadian industry "i" because the extant MNC's in Canada might not choose to capitalize on the spillover effect. This situation might occur where the United States-owned subsidiary has chosen to "naturalize" the parent company's basic product through "Canadianizing" the brand image. The implication of this strategy is that the multinational in Canada will consequently be forced to use Canadian media to advertise its "ersatz Canadian" product. General Motors, for example, produced the "Chevy Nova" for the United States market; the equivalent car was renamed the "Acadian" for the Canadian market.
- c. It is possible for some Canadian industry "i" to attract multinational entrants from a United States industry which is characterized by a relatively low spillover potential. This situation might pertain where advertising activity in Canadian media, by the Canadian incumbent firms, is even less intensive than the American advertising activity by United States firms in their "spillover media." The

result could be that United States firms might be tempted to enter the Canadian market since even their minimal quantity of spillover advertising might be sufficient to overcome any advertising related entry barriers constructed by the Canadian firms.

3. The preceding examples are designed to demonstrate, with regard to the advertising spillover effect, an argument which was introduced in the section concerned with viewing "advertising as an investment." Studies of FDI must consider activities in both the host and donor countries simultaneously if a more accurate assessment of conditions confronting the multinational are to be appreciated.
4. Two methodological implications of this approach to linking advertising spillover and FDI must be discussed.
  - a. Inherent in the argument to this point has been the juxtaposition of United States spillover media with that of Canada's network TV and magazine activity. This is due to the existence of three tacit assumptions which must now be formalized.
    - i. The United States spillover effect by its very nature must impact on a Canadian national basis. (United States network broadcasting and magazines reach all of Canada.)
    - ii. To the extent that advertisements originating

in Canada provide a barrier (or advertising alternative) to the United States spillover effect -- one is most likely to observe that barrier in the form of Canadian media capable of national coverage, i.e., network TV and national magazines.

iii. If United States multinationals have been motivated to expand into Canada in order to recover the spillover effects of their own domestic advertising, reason suggests they would expand up to the point where all of the rents associated with the spillover can be captured. This implies national distribution (in order to take full advantage of nation-wide spillover).

b. The advertising spillover effect differs in its behavioral dimensions, from that which was hypothesized for the advertising sales ratio.

The reader will recall that an argument regarding the "relative attractiveness" of the United States and Canadian advertising/sales ratios was introduced in the first section of this paper. Inherent in that discussion was the idea that a relative comparison could then be made between the ratios. This implied that the Canadian advertising/sales ratio might well play as large a role in the multinational's deliberations as the American advertising/sales ratio.

In the advertising spillover case however, the hypothesized behavioral interaction of the Canadian and United States media is altered. Specifically, it is posited that: (1) initial multinational investment in Canada is influenced by United States originating media which spillover into this country. It is a desire to capture the full economic rents of their United States advertising budgets which leads the multinationals to consider FDI. The role of Canadian based advertising in network TV and magazines as used in this research is to function as an adjustment calculation to the United States spillover data; (2) to the extent that the United States spillover effect coincides with multinationals already active in Canadian industry, the implication is that these firms have not felt the necessity of relying on the use of Canadian media as a substitute for United States spillover media.

5. The implication of the preceding approach for the incorporation of spillover variables into research concerning FDI is that both Canadian and United States media data should be used in the same regression equations. It is not sufficient to rely on United States spillover data alone.

### C. Average and Marginal Implications for Advertising

This section of theoretical analysis is required in order to provide a necessary caveat for the arguments presented in section A (Advertising from an investment perspective).

One of the major arguments presented earlier in section A of this chapter was that the advertising/sales ratios of both the host and donor countries should be considered simultaneously. A difficulty with implementing such an approach is that measurement error is created by nature of the fact that the advertising/sales ratio is an average figure. The implication of the "comparative" approach to variable specification is that the firm is considering the relative return for investing its advertising dollars in the host versus the donor country. The nature of such a decision suggests consideration of the marginal return to each advertising dollar expended -- not the average return. Since data availability for empirical research is limited to information which is based on average figures, it is necessary to resolve the issue of whether or not the average may serve as an accurate proxy for the marginal. That is, it must be determined under what circumstances a firm would commit a decision error in considering a lower ad/sales ratio in Canada (as opposed to that available in the United States) to be indicative of a superior sales return for the marginal advertising dollar invested. The following graphical presentation will attempt to clarify the "average as proxy for marginal" issue.

A set of assumptions are required:

1. The hypothesized relationship between advertising dollars invested and the accordant sales dollar response, approximates the traditional "S-shaped" curve shown in the upper area of Figure 2-1. The curve



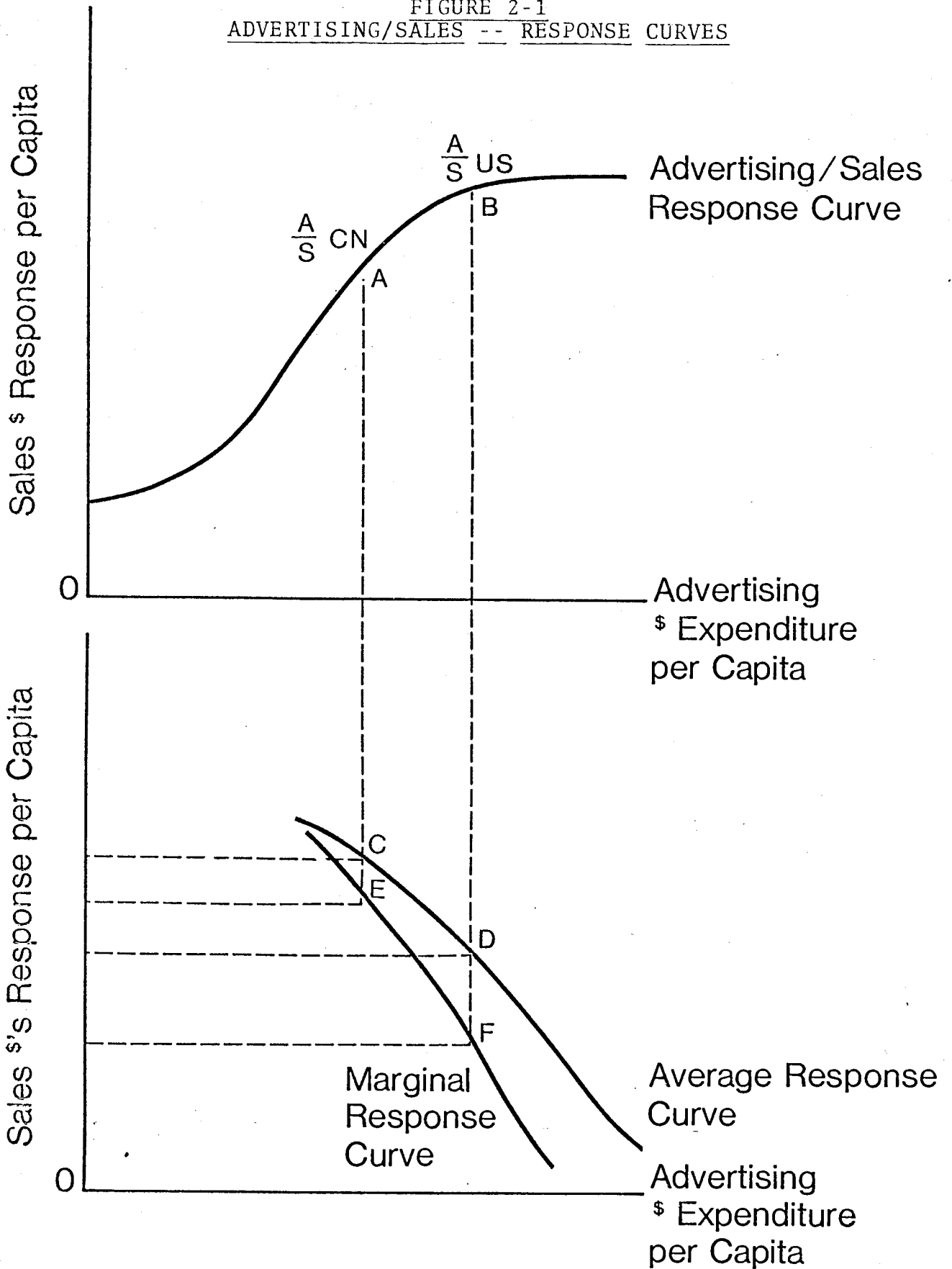
embodies the assumption of increasing returns to scale for advertising expenditures over part of its range, followed by decreasing returns. The curve also intersects the vertical axis rather than passing through the origin -- i.e., some sales are forthcoming even without advertising.

2. United States industries have generally penetrated further into the range of advertising saturation than have the equivalent Canadian industries. Support for this assumption may be seen in the relative disparities between the Canadian and U.S. advertising expenditures per capita. For example, over the time period 1962 to 1977, Canadian advertising expenditures per capita have ranged between 51% and 67% of U.S. expenditures.
3. It is assumed that both the U.S. and Canadian "S-shaped" response curves (Figure 2-1) are similar. This assumption is based on the similarity between U.S. and Canadian markets, consumers, cultures and reactions to advertising.

The following arguments are germane to Figure 2-1.

1. The axes in the graph have been normalized by a per capita denominator in order that the U.S. and Canadian advertising/sales relationships can be represented by a single curve. This technique eliminates the scale effect differences which would require that the U.S. curve be presented as a proportionally larger version

FIGURE 2-1  
ADVERTISING/SALES -- RESPONSE CURVES



of the Canadian equivalent.

2. The lower portion of the advertising/sales response curve is not considered to be crucial in this analysis because of the premise that firms would not logically elect to remain in a region of the curve where they would forego the opportunity to acquire increasing sales returns for each advertising dollar invested.
3. The marginal and average curves which are related to the advertising/sales response function are considered to be approximately linear over their downward sloping portions (where firms could logically be expected to operate). This result follows from the shape of S-curve. If the preceding property did not hold the monotonicity requirement could fail and it would become extremely difficult to develop conclusions regarding marginal conditions given average based data.
4. Application of the "advertising saturation assumption" to the advertising/sales response curve leads to the location of the hypothetical U.S. industry higher on the curve (point B) than its Canadian counterpart (point A).
5. Through tracing the location of the U.S. and Canadian industries from the advertising/sales response curve to the marginal and average curves situated in the lower graph of Figure 2-1 it can be seen that where the Canadian average (point C) lies above the U.S. average (point D), the Canadian marginal (point E) will

similarly lie above the U.S. marginal (point F). The preceding condition can be shown to hold for any locations on the advertising/sales response curve which lie beyond the point where the average is equal to the marginal. Furthermore, the difference between two advertising/sales ratios will provide a reasonable proxy for the difference between the two corresponding marginal values. This relationship can be shown to hold for any industry comparisons as long as they can be located on the downward sloping portions of the marginal and average curves.

6. It can therefore be argued that for the relevant portion of the advertising/sales response curve (i.e., the section of the curve in which firms are expected to be active) decisions based on the difference between the average figures correctly proxy decisions based on the difference between the marginal figures.
7. In those Canadian industries where the average as represented by the advertising/sales ratio is less than the U.S. industry's average, it is rational to argue that ceteris paribus the Canadian industry will appear to be a relatively more attractive advertising alternative than will the U.S. equivalent industry. The greater the difference in the advertising/sales ratios, the more attractive the Canadian investment in advertising will appear relative to the American.

Resolution of the "average versus marginal analysis" issue cannot be achieved easily. Because this study is committed to an average analysis approach, one point in its defense is warranted. Since the research presented here is directed toward modeling the behavioural dimensions of multinationals, it is reasonable to argue that the variables and data bases employed, should approximate as closely as possible the information inputs which are used by the firms in their decision-making. As far as can be determined, the information input often takes the form of average based data, since marginal figures are much more complex and difficult to develop from the firm's perspective.

This concludes the discussion of the three theoretical arguments which underly a number of the key marketing variables.

In the following discussion (which deals with variable specification) the reader will also encounter instances of "non-marketing related variables" which allow for a generalized application of the basic theoretics presented in the previous sections.

## II. Variable Specifications

The variable discussion in this section will adopt the following structure:

- A. The variable and its method of calculation will be introduced.
- B. The rationale for expected results will be given.

A. Dependent Variable

Variable Name:

MNCSHAR -- United States based multinational corporate market share of Canadian industry.

Calculation:

$$\text{MNCSHAR} = \frac{\text{sales of United States owned multinational corporations in Canadian industry "i"}}{\text{total sales of Canadian industry "i"}}$$

i = 1 ... 50 industries

Commentary:

1. This specification of the dependent variable was selected in order to account for two factors:
  - a. Penetration of Canadian industry can be accomplished by United States MNC entry into Canada during the time period of concern.
  - b. Penetration of Canadian industry can also be accomplished through the sales growth of United States multinationals already active in Canadian industries.
2. Previous research on FDI (especially that conducted by Richard Caves) played a significant role in the decision to use this dependent variable specification. Use of the same dependent variable as that introduced by Caves had the added appeal of allowing some cross-comparability (albeit limited, due to the differing time periods

involved) between his results and information produced by this study.

Independent Variable:

Variable Name:

1. US-CNA%S The difference between the United States and Canadian advertising/sales ratios.

Calculation:

$$\text{US-CNA}\%S = \frac{A\$US_i}{S\$US_i} - \frac{A\$CDN_i}{S\$CDN_i}$$

where:

$\frac{A\$US_i}{S\$US_i}$  = Total advertising expenditures in the United States divided by total dollar sales in the United States for each industry "i" in the sample  $i = 1 \dots 50$  industries.

$\frac{A\$CDN_i}{S\$CDN_i}$  = Total advertising expenditures in Canada divided by total dollar sales in Canada for each industry "i" in the sample  $i = 1 \dots 50$  industries.

A brief note concerning the lagged relationship of US-CNA%S to the dependent variable is required. The advertising/sales ratio is based on 1972 data while MNCSHAR is constructed from 1975 information. This was done to mitigate the problem of endogeneity in the independent variable. Otherwise, it could be argued that the presence of multinationals in Canada contributed to the structure of the Canadian advertising/sales ratio data (the subtrahend in US-CNA%S). The two-way causality argument will be discussed in greater detail in Chapter Three.

Expected Results:

The expected sign for this variable is positive, based on

the following rationale:

1. Taken from an investment perspective -- if the Canadian market yielded a better sales return per advertising dollar invested than did the equivalent U.S. market -- ceteris paribus -- it would be considered more attractive as an investment project for advertising funds.
2. A more profitable (hence more attractive) advertising/sales ratio is indicated by a smaller number.
3. Through subtraction of the advertising/sales ratios, it can be seen that as the remainder becomes a larger positive number (indicating Canada has a more attractive ratio), U.S. multinational corporate share of the Canadian market should also become larger. This is because the Canadian industry "i" would then appear to be a relatively more attractive investment per advertising dollar expended than would the equivalent industry "i" in the U.S.

Commentary:

The advertising/sales ratios were selected as the appropriate proxy for assessing the relative attractiveness of advertising in the host versus donor country markets. This was done because evidence in the literature suggests that the ad/sales relationship is indeed a key ratio of concern in corporate deliberations regarding advertising expenditure decisions.

Hurwood (1968) found that most firms employed the advertising/sales ratio as a guideline for budgeting. San Augustine and



Foley (1975) basically confirmed Hurwood's results with the majority of their respondents indicating advertising expenditures based on "% of anticipated sales, unit anticipated sales or % of past year's sales" (San Augustine and Foley, 1975, p. 12).

Clearly there exist corporations which employ more sophisticated techniques in advertising budget determination. Results of work conducted by the aforementioned authors however leave little doubt that these firms are in the minority.

Variable Name:

2. US-CNTV The difference between the U.S. and Canadian percentages of total advertising budgets invested in network television advertising.

Calculation:

$$US-CNTV = \frac{A\$NTVUS_i}{TA\$US_i} - \frac{A\$NTVCDN_i}{TA\$NTVCDN_i}$$

where:

$$\frac{A\$NTVUS_i}{TA\$US_i} = \frac{\text{industry "i" advertising dollars invested in U.S. network TV}}{\text{industry "i" total dollars invested in U.S. advertising}} \times 100$$

i = 1 ... 50 industries

$$\frac{A\$NTVCDN_i}{TA\$CDN_i} = \frac{\text{industry "i" advertising dollars invested in Canadian network TV}}{\text{industry "i" total dollars invested in Canadian advertising}} \times 100$$

i = 1 ... 50 industries

Expected Results:

The expected sign for US-CNTV is positive based on the following justification:

1. The percentage of total advertising budget devoted to network TV in the United States acts as a proxy for the spillover effect produced by some U.S. industry "i".
2. The U.S. spillover calculation however, is adjusted downward through subtraction of the Canadian industry "i's" percentage of advertising budget spent on network TV.
3. "Step 2" above is undertaken in attempt to achieve a more accurate estimation of the "spillover incentive" to a potential U.S. entrant to Canada. With regard to the relationship between the spillover effect and U.S. multinationals resident in Canada -- subtraction of the percentage of Canadian network advertising from the U.S. equivalent, provides an estimate of the extent to which the MNCs persist in their reliance on the U.S. spillover medium to the exclusion of Canadian network TV.
4. If the spillover effect provides an advantage to the U.S. multinationals involved in Canadian FDI (at either the entry stage or growth stage) one would expect to find a positive correlation. In other words, where the "net spillover effect" is substantial in industry "i" the market share held by U.S. multinationals in that industry should also be substantial. (Note the term "net spillover effect" refers to the U.S. percentage of advertising budget invested in network TV for industry "i" net of the equivalent Canadian figure.)

Commentary:

Two points of clarification concerning the spillover variable US-CNTV (and US-CNMAG to be presented next) are in order.

1. The ideal formulation for these variables should be based on the dollar value of advertising attributable to U.S. television and magazines which actually attain exposure in Canadian markets. The counterpart Canadian data which comprise the subtrahends of both variables should also be based on advertising dollar values.

Unfortunately, the paucity of advertising data make such a formulation impossible to construct.

Due to data availability limitations UC-CNTV and US-CNMAG are constructed on a percentage basis. The difficulty with this approach to formulating the variables lies in the lack of specificity associated with the industry observations. For example, it cannot necessarily be determined by observing the percentage of advertising budget devoted to network TV whether industry "i" is creating a larger spillover effect than industry "j" because the actual dollar size of the advertising budgets are unknown. Neither can the "true" amount of advertising effort which is actually spilling over into Canadian markets be determined.

US-CNTV and US-CNMAG must therefore be interpreted as proxies for the general industry "posture" toward the type of advertising which can lead to the spillover effect. An industry which devotes a high percentage of its advertising

budget to network TV is therefore considered to be more likely to contribute to spillover than one which devotes negligible proportions of its budget to this medium.

2. US-CNTV and US-CNMAG should be incorporated in the same equation to avoid commission of a type two error with regard to the spillover hypothesis. The reason for this precautionary measure is that the spillover effect is hypothesized to occur either through network TV, magazines, or both media forms simultaneously. For example if US-CNTV was excluded from an equation while US-CNMAG was included, it is possible that industries which are heavy users of network TV (but not of magazines) would be eliminated as sources of spillover. The argument can similarly be reversed with the exclusion of US-CNMAG from an equation.

Variable Name:

3. US-CNMAG The difference between the United States and Canadian percentages of total advertising budgets invested in magazine advertising.

Calculation:

$$US-CNMAG = \frac{A\$MAGUS_i}{TA\$US_i} - \frac{A\$MAGCDN_i}{TA\$CDN_i}$$

where:

$$\frac{A\$MAGUS_i}{TA\$US_i} = \frac{\text{industry "i" advertising dollars invested in U.S. magazines}}{\text{industry "i" total dollars invested in U.S. advertising}} \times 100$$

i = 1 ... 50 industries

$$\frac{A\$MAGCDN_i}{TA\$CDN_i} = \frac{\text{industry "i" advertising dollars invested in Canadian magazines}}{\text{industry "i" total dollars invested in Canadian advertising}} \times 100$$

$i = 1 \dots 50$  industries

Expected Results:

The expected sign for US-CNMAG is positive. In the interest of brevity, the reader is directed to the explanation of expected results and the commentary for the previous variable (US-CNTV) since the same justification applies to US-CNMAG.

Variable Name:

4. US-CNRMG The difference between the United States and Canadian relative average percentage market growths.

Calculation:

$$\text{US-CNRMG} = \frac{\text{GUS}_i}{\text{RGUS}_i} - \frac{\text{GCN}_i}{\text{RGCN}_i}$$

where:

$$1. \text{GUS}_{i,t} = \frac{\text{VSUS}_{i,t} - \text{VSUS}_{i,t-1}}{\text{VSUS}_{i,t-1}}$$

and:

$\text{VSUS}_{i,t}$  = dollar value of shipments in the "i<sup>th</sup>" U.S. industry in the "t<sup>th</sup>" year.  
 $i = 1 \dots 50$

$$2. \text{GUS}_i = \frac{1}{3} \sum_{t=1973}^{1975} \text{GUS}_{i,t}$$

$$3. \text{RGUS}_i = \frac{1}{n} \sum_{i=1}^n \text{GUS}_i$$

$$4. \text{GCN}_{i,t} = \frac{\text{SCDN}_{i,t} - \text{SCDN}_{i,t-1}}{\text{SCDN}_{i,t-1}}$$

and:

$\text{SCDN}_{i,t}$  = dollar value of sales in the "i<sup>th</sup>" Canadian industry in the "t<sup>th</sup>" year.  
 $i = 1 \dots 50$

$$5. \text{GCN}_i = \frac{1}{3} \sum_{t=1973}^{1975} \text{GCN}_{i,t}$$

$$6. \text{RGCN}_i = \frac{1}{n} \sum_{i=1}^n \text{GCN}_i$$

A brief note regarding calculation of this variable is required. The minuend is based on the dollar value of shipments, while the subtrahend is composed of the dollar value of sales. Ideally, one prefers to subtract variables which are based on precisely equivalent measurement scales. In this instance, U.S. "sales dollars" were unavailable, therefore the alternative "value of shipments" had to be employed. Statistics Canada indicated that both measurements (sales dollar volume and dollar value of shipments) were considered to be indicators of gross revenue and were basically treated as interchangeable by that organization, and are so treated here.

The denominators of US-CNRMG are included in order to standardize the individual industry average percentage growth rates by the mean average percentage growth rate of all the industries in the sample. This is done separately for the U.S. and Canadian industries in an attempt to avoid the differing scale effects in the two countries. The U.S. market is many

times larger than the Canadian market -- consequently dollar increases in a given U.S. industry market must be many times larger than dollar increases in the Canadian equivalent market in order to produce the same growth rate. Failure to adjust through use of the denominators results in Canadian industry growth rates which appear to be superior in nearly all instances to the U.S. equivalent industry growth rates.

Expected Results:

US-CNRMG is expected to correlate negatively with U.S. multinational investment in Canada. The expectation is based on the following rationale:

1. If a U.S. industry "i" is experiencing a faster rate of growth than the equivalent Canadian industry -- ceteris paribus -- the former market would appear to be more attractive with regard to entry or expansion of existing operations than would the latter.
2. Identification of the market experiencing the most rapid growth and therefore presenting the most attractive investment alternative can be achieved through observing the remainder of the subtraction. A positive number would indicate the U.S. market is relatively more attractive than the Canadian equivalent market. Accordantly, one should observe less FDI in Canada in that particular industry.
3. The larger the negative value of the remainder -- the more attractive the Canadian market relative to the

U.S. equivalent. Hence the larger should be the MNC market share in the Canadian industry.

Variable Name:

5. RUSD-USC The difference between the United States and Canadian industry levels of risk.

Calculation:

$$\begin{aligned} \text{RUSD-USC} = & \frac{1}{2} \sum_{t=1973}^{1975} (\text{GUS}_{i,t} - \text{GUS}_i)^2 \\ & - \frac{1}{2} \sum_{t=1973}^{1975} (\text{GMNC}_{i,t} - \text{GMNC}_i)^2 \end{aligned}$$

where:

1.  $\text{GUS}_{i,t}$ ;  $\text{GUS}_i$ ; are as previously defined in the variable US-CNRMG.

2. 
$$\text{GMNC}_{i,t} = \frac{\text{SUSC}_{i,t} - \text{SUSC}_{i,t-1}}{\text{SUSC}_{i,t-1}}$$

and:

$\text{SUSC}_{i,t}$  = dollar value of sales of U.S. multinational corporations in the "ith" Canadian industry in the "tth" year.

$$i = 1 \dots 50$$

3. 
$$\text{GMNC}_i = \frac{1}{3} \sum_{t=1973}^{1975} \text{GMNC}_{i,t}$$

Expected Results:

A positive relationship between RUSD-USC and the dependent variable is expected on the basis of the following rationale:

1. Ceteris paribus -- a Canadian industry should be perceived as more attractive than its U.S. counterpart if the variance associated with its market growth rate is



smaller than that of the American industry.

2. Since the variable is presented in a difference form, a larger positive remainder would indicate the Canadian industry "i" has less risk associated with its market growth rate than the U.S. industry "i". Assuming multinationals behave in a risk averse fashion, they should prefer that industry which displays the greater degree of stability in its growth pattern. As the remainder becomes a larger positive number the U.S. multinational market share should also increase.

Commentary:

The specification of the risk variable represents a departure from those formulations discussed in the literature review. It may be recalled that Orr and Gorecki both calculated their risk variables based on industry past profit rates. As previously indicated, the efficacy of their formulation in explaining MNC entry into Canadian industries was not very encouraging.

The concept of risk functioning in the capacity of an entry barrier does however have an intuitive appeal. The specification of risk in this model consequently attempts to retain the theoretics underlying the variable but concomitantly tries to avoid the use of host country past profit rates as the basis of calculation. This is done for two reasons:

1. A brief review of the comments in Chapter One regarding the results obtained by Orr and Gorecki should remind the reader of those reasons for distrusting the role of

profit in explaining FDI. There is equal cause for suspicion of the efficiency of a risk variable which is calculated on the standard deviation of those same profit rates.

2. The theory invites a rationale similar to that applied to the advertising/sales ratio hypothesis, namely, that risk is a relative concept. In order to be properly tested, it should include the risk factors associated with the Canadian industry "i" as well as the U.S. equivalent industry. The implication, as with previous discussions, is that both variables should be included in the same regression.

Two final remarks concerning RUSD-USC are in order:

1. The specification of this variable suffers from the same problem which Orr attributed to his own formulation. Namely, that measurement of risk should encompass two elements:
  - a. The standard deviation of sales over time must be accounted for.
  - b. The standard deviation of sales across individual firms within a given industry should also be estimated.

Regrettably RUSD-USC (like Orr's variable) provides an indication of element "a" (above) but fails to capture element "b".

2. The subtrahend of RUSD-USC is calculated on the dollar value of sales attributable to U.S. multinationals in

each industry, rather than the total Canadian dollar value of sales. The former rather than the latter measure was used on the supposition that the "band wagon effect" might well enter into MNC considerations regarding risk. The justification for linking the "band wagon effect" and risk corresponds to the following:

If the multinationals tend to emulate each others behaviour for the reasons postulated by Aharoni (1966) (eg. attempts to maintain relative sizes and growth rates in order to counter activities by principal competitors), it is also plausible that they might be more interested in the sales performance of MNC residents in Canada than of domestic Canadian firms because:

1. Comparably sized multinationals represent the most likely form of direct competition for a given MNC -- whether in the domestic U.S. or in foreign (Canadian) markets. Consequently the behaviour of a perceived "direct competitor" should be of the greatest interest to a particular multinational.
2. Sales fluctuations (and for that matter other operational indicators) of U.S. multinationals resident in Canada could be argued to provide a superior indicator of conditions which potential MNC entrants might expect to encounter.

Variable Name:

6. USMKTMG The proportion of sales managers for each industry "i" in the U.S.

Calculation:

$$\text{USMKTMG} = \frac{\text{number of sales managers in each U.S. industry "i"}}{\text{total occupational positions for each U.S. industry "i"}}$$

i = 1 ... 50 industries.

Expected Results:

There should be a positive correlation between USMKTMG and the dependent variable. The justification for the positive sign on this variable is:

1. The proportion of positions in each industry "i" which are directly related to marketing management are meant to act as a proxy for the "marketing infrastructure" which characterizes the particular industry.
2. The "marketing infrastructure" represents a sunk investment cost in marketing expertise.
3. It can be argued that U.S. multinationals might be inclined to use this stock of marketing expertise as a competitive means of penetrating Canadian industry.
4. Naturally the marketing expertise which an MNC may possess would be most useful in penetrating those types of Canadian industries which are most reliant on marketing as a means of competition.
5. To again borrow from Caves' (1974) terminology -- exploitation of this "intangible asset" (marketing expertise) should be observable as a positive correlation between those Canadian industries which have been heavily penetrated by U.S. multinationals and those

U.S. industries which have invested heavily in a marketing management infrastructure.

Commentary:

USMKTMG belongs to the genre of "human skills" variables discussed in Chapter One. The variable specification in this study, however, differs from other human skills proxies on theoretical as well as data based criteria.

USMKTMG is unique from the standpoint that no other studies appear to have employed a variable to proxy the "stock" of marketing activity. The word "stock" in this context requires elaboration. Foreign direct investment research has, in recent years, attempted to avoid variables based on "dollar value expenditures" because of the potential for volatile year-to-year fluctuations.

Proxies based on "number of employees" related to some given variable of interest have, on the other hand, been acquiring popularity due mainly to the belief that this latter basis of measurement is more stable over time (and hence a more accurate long run indicator) than dollar value of expenditures in a given year.

The theoretical rationale given for inclusion of USMKTMG attempts to avoid one criticism raised earlier in this paper. The specification of the marketing infrastructure variable based on the proportion of sales managers in each U.S. industry, attempts to tie a marketing data base to a marketing hypothesis. USMKTMG has an intuitive appeal in that the variable does not use marketing information to proxy other hypotheses which in some cases appear to be distantly related at best. An example may lend

weight to the previous argument. The percentage of research and development-related occupations has been used as a proxy for "knowledge intensity." However, it might reasonably be argued that R&D related personnel produce technologically innovative goods which are then used to competitive advantage by multi-nationals in penetrating other countries. One might therefore ask "does the MNC direct invest abroad because it possess 'knowledge intensity' or because its R&D staff have invented some new products which give the multinational a 'competitive jump' on host country firms?". The preceding simply argues for attempting to keep the theory for which a proxy variable has been selected, as closely related as possible to the data which the specification purports to measure.

Variable Name:

7. USMUC      The proportion of shipments attributable to multiunit companies in the U.S.

Calculation:

$$\text{USMUC} = \frac{\text{U.S. multiunit companies' value of shipments for industry "i"}}{\text{total value of shipments for all companies in U.S. industry "i"}}$$

i = 1 ... 50 industries

Expected Results:

Multiunit companies are hypothesized by Caves to correlate positively with United States MNC market share in Canada. His rationale corresponds to the following:

1. "When economies to the firm extend beyond the cost-

minimizing output of the efficient-scale plant ... the organization of multiplant firms becomes a rational technique for minimizing costs. If the economies to the firm do not stop at the national boundary, the MNC becomes simply a species of the multiplant firm" (Caves, 1974, p. 28).

2. Among Caves' economies of scale for the multiplant firm are, "nation-wide sales promotion, or the cost effectiveness of oft-repeated advertising messages ..., administrative coordination of input purchasing or output distribution, or from spreading the cost of research over larger outputs." (Caves, 1974, p. 280).

Commentary:

The equivalent specification to USMUC was introduced originally by Richard Caves. The formulation has been used in this model for a number of reasons:

1. Caves' "multiplant companies" specification performed quite well as an explanatory variable for MNC market share of Canadian industry.
2. Inclusion of a prototype variable in this model was

therefore undertaken to:

- a. provide a "weak" (since different time periods are involved) external validity check on Caves' formulation.
- b. provide a "bench-mark" performance level for the marketing and other "new" variables which are presented in this model. The idea underlying this procedure is to select a variable which has previously been established via its robust performance and then regress the dependent variable on it along with other "unproven" variables. If the "new" variables are able to attain an acceptable standard of performance in spite of "competiton" for the unexplained variance from the "bench-mark" variable -- some evidence (albeit indirect) can be obtained regarding the "robustness" of the "unproven" variables.

A caution regarding USMUC is required. By nature of the data base itself, collinearity with other independent variables is bound to be a problem. Multiplant companies for example, correlate with large sized firms (another variable introduced by Caves and also used in this model) and large sized firms correlate with a potentially wide range of explanatory variables.

The difficulty of collinearity at a first order level is not an issue since the correlation matrix provides an approximation of the problem. The dangers of USMUC (and variables of



similar composition) lie in the higher order collinearities which are likely to exist, and possibly in problems related to missing but collinear variables which the multiplant specification (because of its broad measurement base) may be proxying.

Variable Name:

8. USLSF      Proportion of shipments accounted for by firms with greater than 100 employees in U.S. industry "i".

Calculation:

$$\text{USLSF} = \frac{\text{dollar value of shipments accounted for by firms with } > 100 \text{ employees in U.S. industry "i"}}{\text{dollar value of total shipments in U.S. industry "i"}}$$

i = 1 ... 50 industries

Expected Results:

The dependent variable should correlate positively with USLSF because -- according to Caves:

1. Entry barriers related to capital costs of penetrating Canadian markets are more easily overcome by larger sized firms, which generally have better access to internal and external funding.
2. The fixed costs of FDI relative to the requirements for exporting or licensing a foreign producer are more easily amortized by the firm which can undertake large financial outlays.

Commentary:

The calculation of "large sized firms" (USLSF) in this model differs from that used by Caves. He identified "large sized firms" on the basis of asset size exceeding \$100 million dollars. The formulation used here applies a condition of firms employing 100 or more employees. The "100 or more employees criterion" was determined by necessity. Ideally, one would prefer to construct USLSF on the basis of firms employing 500 or even 1000 employees in order to identify the truly large size organizations. Unfortunately, a significant number of industries in the sample would not qualify for inclusion given such a requirement. Rather than reduce the number of observations the "employees criterion" was lowered until all the industries could be included.

Excluding this formulation difference, USLSF is intended to perform the same function as Caves' variable.

The reasons for introducing this specification correspond to those given for using USMUC. Unfortunately, the caveat regarding multicollinearity problems with USMUC also applies to USLSF. (It should be noted that Caves' found the collinearity issue serious enough to warrant comment.)

A final note regarding USLSF (and for that matter USMUC) is in order. Despite the impressive performance of these variables in Caves' work, there exists an element of "generality" concerning both the data bases from which they are constructed and the theories which they are said to proxy. Considered from

a "behavioral" dimension, USLSF and USMUC provide insight concerning "the prerequisites" for FDI in Canada but do very little in terms of clarifying:

1. Why a firm would choose to exercise its direct investment option.
2. Through which specific competitive techniques it is able to penetrate and expand its market share of Canadian industry.

Variable Name:

9. U-CCON      The difference between the United States and Canadian, "four firm" concentration ratios for industry "i".

Calculation:

$$U-CCON = C4FUS_i - C4FCN_i$$

where:

$C4FUS_i$  = percentage value of shipments accounted for by the largest four firms in the U.S. industry "i"

$i = 1 \dots 50$  industries

$C4FCN_i$  = percentage value of shipments accounted for by the largest four firms in the Canadian industry "i"

$i = 1 \dots 50$  industries

Expected Results:

The sign on this variable is expected to be positive on the grounds that:

1. Ceteris paribus, one would expect that concentration in any market (U.S. or Canadian) would represent a barrier to entry.

2. To the extent that concentration is relatively lower in one market as opposed to another, that market in which the concentration is lower should be the more attractive market.
3. A positive remainder from subtraction of the U.S. and Canadian ratios means that the Canadian market exhibits the lesser degree of industrial concentration. Considered on a relative basis, a larger positive remainder would imply that the Canadian market is therefore characterized by a "less intensive degree of concentration" and should therefore be more attractive to U.S. multinationals.
4. Note that the specification of U-CCON relies on the "relative comparison" argument introduced earlier in this study.

Commentary:

The specification of U-CCON is a departure from the "standard treatment" of concentration ratios in the literature. Rather than rely on host or donor country ratios, calculation of this variable is based on the "relative comparison" hypothesis introduced earlier in this chapter.

To the extent the U-CCON involves a simultaneous accountability of both host and donor country ratios, one should not interpret this change in formulation as a rejection of the traditional theories regarding the role of concentration indices

in FDI research. The U-CCON variable simply argues that industrial concentration ratios should be interpreted relative to each other. Eg. A four firm concentration ratio of 60% in the Canadian market may appear to constitute a strong barrier to entry until it is compared to the same ratio for the U.S. equivalent industry where the figure is perhaps 85%. Only when this latter piece of information is known, will the Canadian index appear to be relatively more attractive than the U.S. alternative.

U-CCON (as with a number of other variables previously discussed) presents a problem with regard to collinearity. The issue, elaborated upon by Donald Jud, (1974) relates to the interaction of the "large sized firm" variable and the concentration variable. Industries characterized by high concentration ratios are often concomitantly associated with the prevalence of "large sized firms."

The effect of this variable interaction with regard to concentration theories concerning donor country multinational behavior is to create a measurement problem. The major difficulty is determining whether multinationals choose FDI as a result of home country concentration-related pressures or whether they opt for FDI because they often fall into the category of "large sized firms." Separation of the confounding effect of "large sized firms" on the efficacy of the donor country concentration ratio would imply at the least, that both variables should be tested in the same regression prior to being

tested separately. This technique would clarify to some degree, the amount of interdependence between the two variables.

One final caveat regarding U-CCON is necessary. The concentration ratio is based on national as opposed to regional data. To the extent that Canadian regional markets are disparate in size of volume and participating competitors, the national industry concentration index may tend to under or over state the actual concentration based barriers facing the potential entrant. Unfortunately, data availability necessitates the use of nationally based concentration indices.

Variable Name:

10. USR&D            The proportion of research and development related personnel in each U.S. industry "i".

Calculation:

$$\text{USR\&D} = \frac{\text{number of scientists, mathematicians, engineers and technicians in U.S. industry "i"}}{\text{total number of employees in all occupations in U.S. industry "i"}}$$

i = 1 ... 50 industries

Expected Results:

USR&D should be positively related to the U.S. multi-national market share of Canadian industry. The rationale corresponds to the following:

1. U.S. investment in research and development personnel can be viewed as an accumulated stock of expertise in technology.
2. Product and process innovations (acquired as a result of the stock of R&D) can be exploited in the form of a

competitive advantage by multinationals investing in Canada.

3. One should consequently find a positive relationship between those U.S. industries characterized by intensive R&D activity and the MNC market share of Canadian industries where the R&D innovations can be exploited.

Commentary:

USR&D was included in the model for purposes of comparison. In previous studies, proxies based on research and development data have always performed well. The specification used in this model (the equivalent of that employed by Hewitt) was selected in order to:

1. determine whether the variable would perform as well in this research as it had in previous studies.
2. provide another "bench-mark" variable against which the performance of the "new" variables could be compared.

The rationale underlying point "2" above corresponds to that given in the section regarding USMUC.

Discussion of the "human skills" family of variables in Chapter One should make apparent the difficulties associated with use of a research and development proxy (and hence with USR&D).

Two problems related to use of the R&D variable merit further consideration.

1. The first difficulty relates to the choice of the data base which should be used for a research and development variable. Caves and Orr for example, used research and development expenditures to construct their variables. Contrarily, other authors have argued that a superior formulation of the variable would use research and development related employment. Preference for the latter specification is based on the idea that an employment based variable provides a rough estimate of the stock effect related to research and development activity while an expenditures based formulation tends to capture a more volatile flow effect. It is further argued that if product and process innovations are considered to be a function of cumulative research efforts as opposed to lump-sum research and development expenditures in a given year, the employment based version of the variable appears to be preferable.

The counter-argument to the employment based version of the R&D variable is that total research and development expenditures capture both fixed (capital investment) and variable (labour) costs. Therefore the expenditures based calculation of the R&D variable can be argued to be a better estimate of the research and development stock than its employment based counterpart. This is because of the more stable (over



time) fixed capital cost component inherent in total R&D expenditures.

At any rate, the aforementioned countervailing arguments concerning the appropriate R&D measure for purposes of this study are resolved by a totally unrelated constraint--data availability.

The total expenditures based version of the R&D variable would limit the sample size in this study to approximately 23 observations. The employment based version allows data for all 50 industries in the sample.

USR&D therefore uses the "employment basis" as opposed to "expenditure basis" for proxying research and development activity.

2. The second source of concern regarding the use of a research and development variable relates again to the interdependence of competing hypotheses. Those industries involved in research and development activity produce innovations which can be sold in other countries -- hence the rationale for the variable. Unfortunately the product life-cycle theory leads to the same conclusion. That is, innovations produced for one market will ultimately spread to other markets in other countries. The conclusion of both theories is that innovations enable multi-nationals to penetrate foreign markets.

One final note regarding the research and development variable is required. The ideal formulation of USR&D would have to account for all factor inputs which are pertinent to the production of innovations. This would imply that data for the labor and capital investment components at both the directly related and indirectly related levels are required. Unfortunately information containing this degree of specificity is unavailable.

Variable Name:

11. USNP            the proportion of salaries and wages devoted to non-production employees in U.S. industry "i".

Calculation:

$$\text{USNP} = \frac{\text{salaries \& wages of total employees} - \text{salaries \& wages of production employees}}{\text{salaries \& wages of total employees}}$$

i = 1 ... 50 industries

The numerator of the ratio, through subtraction, provides an estimate of the salary and wage bill going to non-production employees, (production employees + non-production employees = total employees). Division by the denominator converts this to a ratio of non-production salaries and wages to total salaries and wages.

Expected Results:

1. The sign on this variable should be positive on the premise that U.S. domestic industries which devote a larger amount of their wage bill to employees not directly related to

production of the company's products will be more ideally suited to penetration of foreign (Canadian) markets.

2. This concept belongs to Caves' entrepreneurial resources hypothesis. Briefly stated it says that a higher proportion of non-production employees implies more managerial talent, more effort going into R&D, more effort expended on advertising and more specialists related to total company operations.
3. These entrepreneurial resources allow the U.S. multinational to overcome the competitive disadvantages of penetrating foreign markets and cultures. Since this managerial talent already exists in the MNC, accessing another market will simply make more efficient use of the firm's resources.

Commentary:

Formulation of USNP was motivated by Caves' variable -- non-production workers as a percentage of total employees. Caves selected this variable as one of the proxies for his entrepreneurial resources hypothesis.

Two differences between Caves' formulation and USNP require elaboration however:

1. Caves' specification was based on Canadian data because of "... the better match of the Canadian data to the industry classification of the dependent variable and the proposition that an industry's

optimal factor input mix at Canadian relative prices should define the entrepreneurial resources needed for successful direct investment in Canada" (Caves, 1974, p. 283).

The specification of USNP is based on U.S. data rather than Canadian information. The rationale for changing data bases lies with Caves' own statement regarding the entrepreneurial resources hypothesis. "Direct investment has been explained as an outlet for underutilized entrepreneurial resources of the firm. The MNC expands abroad in order to give full employment to the coordinating abilities of its fixed stock of entrepreneurial talent." (Caves, 1974, p. 280). (emphasis added)

The thrust of the preceding quotation suggests the selection of donor country (U.S.) as opposed to host country (Canadian) data if the objective of the MNC is to fully exploit the "underutilized entrepreneurial resources of the firm."

2. Caves used the number of non-production employees in the numerator of his variable. To the extent that some industries use a significant amount of relatively untrained clerical staff, the effect which the non-production employees variable is supposed to capture (management, specialists, etc.) may be somewhat obscured. In an attempt to mitigate the effects of such a possible over-estimation, USNP is constructed on the basis of the wage bill which accrues to non-production employees. Assuming that the "entrepren-

erial resources component" (management, specialists, etc.) of the non-production employees classification receive a greater wage for their efforts than do clerical staff, use of the wage bill proxy might be expected to improve the performance of USNP. This approach not only accounts for the number of non-production employees but also provides a rough indication (through the wage bill) of the occupational level held by the personnel in the industry sample.

The logical criticism of USNP is that it is too general -- both as a theory of foreign direct investment and from the perspective of the data base upon which it is constructed.

One intuitively would expect this variable to be correlated with other independent variables. Specifically:

1. large sized firms, because these are the likely source of large non-production employee infrastructures.
2. the USR&D and USMKTMG variables since they are both subsets of the USNP variable.

Variable Name:

12. CPRD The wage rate per employee for production and related workers in Canadian industry "i".

Calculation:

$$\text{CPRD} = \frac{\text{wages of production and related workers in Canadian industry "i"}}{\text{number of production and related workers in Canadian industry "i"}}$$

i = 1 ... 50 industries

Expected Results:

CPRD should be negatively related to the dependent variable because:

1. This independent variable measures one key factor input of firms operating in Canada -- the cost of labour attributable to production.
2. There is no a priori reason to believe that multinational corporations react to high labour costs any differently than other firms.
3. If high labour costs are considered a disincentive to entry, one should expect to observe a lower MNC market share in those Canadian industries characterized by higher wage rates.

Commentary:

CPRD is modeled after another of Caves' entrepreneurial resources variables -- wages per production worker in the Canadian industry. The similarity between Caves' formulation and CPRD stops at the common data base upon which both variables are constructed. The hypothesis which CPRD is intended to represent differs markedly from the theoretics which were posited by Caves.

Distillation of the "entrepreneurial resources" discussion in Chapter One indicates two key arguments which Caves felt the "wages per production employee" variable would proxy.

1. Wages per production employee correlate with the amount of human capital employed. Therefore, those industries which contain a relatively more skilled labor force can be identified by the relatively higher wage which must be paid their employees.
2. A labor force which is more highly skilled will likely require a management component which is also highly skilled. It is these superior skill levels which are more easily transferred to other countries.

As with Caves' "non-production employees" variable, the hypothesis underlying his "wages per production employee" specification suggests the use of U.S. as opposed to Canadian data.

Since Caves opted for the use of a Canadian data base, it would appear that one more issue must be resolved -- the problem of an endogenous independent variable. In those Canadian industries characterized by a high MNC market share, Caves hypothesis would suggest a concomitantly high production employee skill level (identified by the correspondingly high Canadian wage in those particular industries). The difficulty lies in determining whether the relationship is causal in nature or correlative. That is, one must separate the issues of whether higher Canadian wage rates in some industries (indicating higher labor skill levels) were caused by multinationals already resident in Canada (in which case a correlative relationship exists) or, whether some Canadian industries which merely happen to be characterized by skilled labor input requirements have attracted MNC's whose competitive advantage happens to lie in areas which require skilled labor (in which case a causal relationship exists).

In addition to the endogeniety problem of using a Canadian data base to proxy the entrepreneurial resources theory, two final comments regarding the hypothesis are required.

1. Caves' argument that skilled labour is associated with skilled management would be intuitively more appealing if empirical support for his contention was available.
2. Aside from the endogeniety issue, if Caves wanted a proxy variable for U.S. management expertise, the logical choice



would be information based on American and not Canadian data. In addition, choice of Canadian data to proxy opportunities for MNC "skilled management expertise" assumes that the Canadian industries do not have management talents equivalent to that of their U.S. counterparts.

In light of the aforementioned difficulties with the entrepreneurial resources hypothesis, CPRD is introduced as a proxy for the disincentive to enter Canadian industries. The wage rate of production employees is simply viewed as a deterrent to entry. The higher the wage rate in any given industry, the less attractive (ceteris paribus) that industry will be to multi-nationals.

CPRD was introduced for replicative purposes in order to determine if its behaviour in this study is consistent with reported results in the literature. However, a different formulation of CPRD is also suggested by the "relative comparison" approach to variable specification which was argued previously in this chapter. It is with the "relative comparison" objective in mind that the following alternative to CPRD is introduced.

U-CPRD                      The difference between the American and Canadian wage rates for production workers' in industry "i"

Calculation:

$$U-CPRD = \frac{US\$PRD}{USPE} - \frac{CN\$PRD}{CNPE}$$

where:

$\frac{US\$PRD}{USPE}$  = U.S. production workers' wage bill divided by the number of U.S. production employees for each industry "i" in the sample.  
i = 1 ... 50 industries.

$\frac{CN\$PRD}{CNPE}$  = Canadian production workers wage bill divided by the number of Canadian production employees for each industry "i" in the sample.  
i = 1 ... 50 industries.

Expected Results:

The expected sign for this variable is positive because:

1. A positive remainder produced by subtracting the Canadian wage rate from the U.S. equivalent indicates that the Canadian production costs related to labour are less than those of the United States industry.
2. If the Canadian industry "i's" wage rate is less than the U.S. equivalent industry's wage rate then ceteris paribus multinationals should find the Canadian labour costs more attractive than those in the United States.

3. As the labour cost advantages for Canadian industries increase relative to that of the U.S. industries, MNC's should be induced to expand their manufacturing capacity in Canada and multinational market share of Canadian industries should increase.

Commentary:

It is intended that U-CPRD act as a proxy for any comparatively advantageous production costs which exist in Canadian as opposed to American industries. U-CPRD differs from CPRD with regard to the hypothesis it is designed to test. While CPRD functions as a barrier to entry measure, U-CPRD may be considered to act as proxy for the relative attractiveness of Canadian versus U.S. production costs. In other words U-CPRD is intended to function as a measure of the MNC incentive to enter or expand existing operations.

This concludes the discussion regarding the variables which are to be tested in the regression model.

CHAPTER THREE

EMPIRICAL RESULTS

The purpose of Chapter Three is to provide an empirical evaluation of the variables and hypotheses which were presented in the preceding chapter. The order of presentation is:

- I Methodological Issues in FDI Research
- II Regression Analysis
- III Performance of Variables
- IV Principal Components Analysis

Information concerning Canadian-U.S. industrial equivalencies will not be discussed in this chapter (these may be found in the attached appendix).

Preliminary interpretation of the empirical results will be undertaken where considered appropriate in this chapter. Final conclusions will be reserved for Chapter Four.

I Methodological Issues in FDI Research

This section is included in order to provide a series of caveats which are germane, not only to research concerning foreign direct investment, but to the entire range of foreign penetration studies.

The research presented in this thesis is consequently

vulnerable to some of these methodological problems. Wherever possible, remedial (or in some instances only palliative) steps were taken in order to resolve the difficulty.

Three issues are of sufficient importance to require comment:

1. Static versus dynamic analysis

A common problem of foreign penetration studies is found in the relationship between the dependent and independent variables. Since the dependent variable used in this research corresponds to that employed by Caves, it is appropriate to introduce his comments on the "static-dynamic" misspecification problem.

The dependent variable reflects the stock of direct investment accumulated over a long time. AD, RD, [Caves' advertising and R&D variables] and other independent variables measure flows occurring at or around the time when the dependent variable is observed (Caves, 1974, p. 282). (emphasis added)

The following quotation from Horst also indicates concern regarding the "static-dynamic" problem.

The principal deficiency ... is the absence of dynamic considerations. Nowhere is there a description of how a firm came to acquire its current attributes; nowhere is there an analysis of how a foreign investment position adjusted to the changing economic circumstances of a firm. Although the literature provides ample precedent for the tacit assumption that a current situation represents a steady-state equilibrium, such an assumption should not be allowed to go unchallenged.... If we are ever to unravel the complexity of the foreign investment process, a systematic study of the dynamic behaviour of firms must be undertaken (Horst, 1972, pp. 264-265).

Needless to say, the model presented here suffers from the problem elucidated by the quotations.

In an attempt to account for the "dynamic" misspecification in his research, Caves suggests one possible solution:

unless we implausibly assume that subsidiaries' market shares are continuously in long-run equilibrium under conditions of perfect information a theoretically preferable form of each independent variable would be an average of past observations weighted by the increases in the book value of foreign investment that took place in each period (Caves, 1974, p. 282).

This technique, while perhaps methodologically viable, is virtually impossible to fulfill due to lack of adequate time series data.

## 2. Endogeneity among variables

Endogeneity in the context of FDI research becomes a problem when variables which measure phenomena related to the host country are incorporated into the equation structure. In order to more fully appreciate the manner in which endogenous variables may confound the regression results, consider the following rationale:

- a. Recall that the dependent variable is U.S. multinational market share of Canadian industries and that the objective of the research is to explain interindustry variation of FDI as proxied by the dependent variable.
- b. If an independent variable constructed from a Canadian data base is used as a regressor and a significant relationship is discovered, two plausible hypotheses regarding the result are possible:

- i. the factor which the independent variable was designed to measure is truly linked in a causal relationship with the dependent variable and actually does exert an effect on MNC's.
- ii. multinationals already resident in Canada have, through their behaviour in the market place, exerted an influence on the data which the independent variable is measuring.

To summarize, endogeniety allows the causality to run in both directions. It is difficult therefore to determine whether the independent variable "explains" the dependent variable or vice versa.

The technique for mitigating two-way causality -- which has been applied to the empirical testing in this study -- is to lag the independent variables relative to the MNC market share. This strategy makes it difficult to argue that MNC market share in year "x" has caused the data configurations among the independent variables in the preceding years "x-2" or "x-3". It should be noted that the "lagging" technique only mitigates the two-way causality, it does not remove it in total, because previous activity of multinationals in Canada can still be argued to have influenced the independent variable data bases.

### 3. Scale effects

When "raw data" variables are used in an equation without prior transformation to a ratio format, those characteristics which are related to the dimension of "size" are preserved. Situations could arise in which it would be more rewarding to analyse actual advertising dollar expenditures or sales dollars

than to consider an advertising/sales ratio. For purposes of this research, the ratio approach to construction of the variables is considered to be more useful. This is because a number of the hypotheses in the model are based on the notion of a "relative comparison" between donor and host country information. Since the U.S. and Canadian markets are so different in terms of size (the American market is many times larger than the Canadian) any variable which involves a comparison of untransformed "raw data" will automatically be biased. For example, subtracting the Canadian dollar value of ad expenditures for some industry "i" from the U.S. equivalent, simply produces a variable which reflects the American advertising situation. Information contained in the Canadian advertising data is effectively "swamped" by the equivalent U.S. expenditures. Unless the information for both countries is compared on a ratio basis, data reflecting conditions in Canada could be nullified and, in the interest of parsimony, dropped from the equation.

The role of scale effects in FDI research is to some extent a "double-edged sword." Whether the strategy is to retain the effects of size, or to eliminate them -- sacrifices are involved.

## II Regression Analysis

The data analysis is based on a number of cross-sectional regressions. A time series approach to testing unfortunately had to be rejected because of data availability problems. The



major difficulty lies with both U.S. and Canadian government changes in their standard industrial classification codes over the last two decades. Achieving Canadian-U.S. concordance in the data bases could become an extremely complex task since the industrial classifications of both governments were changed in the 1960's and again in the 1970's.

The time period of concern for the regression analysis ranges from 1972 to 1975. The dependent variable is based on the 1975 market share held by U.S. multinationals in Canada while the independent variables are constructed from information taken from the years 1972 through 1974 inclusive.

The sample size was originally composed of 53 industries in the manufacturing sector (primary and tertiary sectors were not considered). Ideally, the sample population should have been randomly selected. Unfortunately, this was not possible. The industries selected were those which fulfilled the data availability requirements.

The sample population was subsequently reduced to 50 observations when further research indicated anomalies in a number of industries.

The industries which were deleted and the justifications for doing so are:

1. The "motor vehicle and parts" manufacturing industry was eliminated due to Canadian-American government involvement through the Auto Pact agreement.
2. The "petroleum refineries" classification was dropped

because of Canadian government participation in the oil industry.

3. The "brewery" industry was omitted in accordance with what has almost become a "policy" in FDI research. The argument for the omission is that U.S. prohibition in the 1920's could have distorted the penetration pattern of Canadian alcohol producing industries.

Table 3-1 contains eight equations which demonstrate the performance of the independent variables. Table 3-2 provides the corresponding simple correlations among the independent variables for each of the equations.

Wherever possible the independent variables have been included in alternative equations. This was done for two reasons:

1. Collinearity problems are always a source of concern in FDI research. Presentation of the variables in a series of "different scenarios" will allow for a more realistic assessment of their performance.
2. An attempt has been made in selection of the equations, to demonstrate the range of performance displayed by the variables.

The regression results are presented in a format which progresses from variables that could be considered "general" in nature (equations 1 and 2) toward those which reflect more specific hypotheses (equations 5 through 8).

TABLE 3-1  
REGRESSION RESULTS

DEPENDENT VARIABLE = USMC CANADIAN MARKET SHARE

CORRELATIONS WITH DEPENDENT VARIABLE	INTERCEPT	RUSD-USC	US-CNA%S	USJUC	USLSF	U-CCON	USNP	US-CNTV	US-CNMAG	USR&D	USMKTNG	CPRD	US-CNR&G
		.3031	.5753	.5546	.4480	.3582	.4318	.5340	.3233	.5293	.3512	-.1515	-.1698
<u>EQUATION 1</u>													
COEFFICIENTS	-.125	.297	.037	.492	.005	.407							
t-VALUES	(-1.01)	(1.27)	(2.13)b	(5.62)a	(3.17)a	(1.67)c							
d.f.=44	R <sup>2</sup> =.59												
se.=.168	R <sup>2</sup> =.55												
F=12.84													
<u>EQUATION 2</u>													
COEFFICIENTS	.128	.381	.062	.284	.004								
t-VALUES	(1.23)	(1.47)c	(3.93)a	(2.25)b	(2.09)b								
d.f.=45	R <sup>2</sup> =.50												
se.=.184	R <sup>2</sup> =.46												
F=11.26													
<u>EQUATION 3</u>													
COEFFICIENTS	.178	.532	.064	.160	.004				.005				
t-VALUES	(1.75)b	(2.08)b	(4.21)a	(1.21)	(2.10)b				(2.37)b				
d.f.=44	R <sup>2</sup> =.56												
se.=.176	R <sup>2</sup> =.51												
F=11.00													
<u>EQUATION 4</u>													
COEFFICIENTS	-.009	.500	.452	.005	.729				.005				
t-VALUES	(-.05)	(2.05)b	(2.98)a	(2.65)a	(3.46)a				(2.37)b				
d.f.=43	R <sup>2</sup> =.61												
se.=.167	R <sup>2</sup> =.55												
F=11.05													

TABLE 3-1  
(cont'd)

DEPENDENT VARIABLE = USMNC CANADIAN MARKET SHARE

CORRELATIONS WITH DEPENDENT VARIABLE	INTERCEPT	RUSD-USC	US-CNA'S	USMJC	USLSF	U-CCON	USXP	US-CNTV	US-CNNAG	USR&D	USWTKMG	CPRD	US-CXPMG
EQUATION 5													
COEFFICIENTS	-.108	.3031	.5753	.5546	.4480	.3582	.4518	.5340	.3255	.5293	.3512	-.1515	-.1698
t-VALUES	(-.90)	.253 (.89)		.387 (2.37)b						1.797 (2.73)a	12.972 (2.36)b		-.066 (-1.89)b
d.f.=44	R <sup>2</sup> =.49												
se.=.188	R <sup>2</sup> =.44												
F=8.55													
EQUATION 6													
COEFFICIENTS	.149	.369		.393		.005				1.904	11.761	-.021	
t-VALUES	(.94)	(1.60)c		(2.73)a		(3.02)a				(3.24)a	(2.43)a	(-1.58)c	
d.f.=43	R <sup>2</sup> =.62												
se.=.165	R <sup>2</sup> =.56												
F=11.49													
EQUATION 7													
COEFFICIENTS	.192	.408			.178	.004		.006	.007				
t-VALUES	(1.94)b	(1.60)c			(1.38)c	(2.46)a		(4.46)a	(2.91)a				
d.f.=44	R <sup>2</sup> =.57												
se.=.175	R <sup>2</sup> =.52												
F=11.69													
EQUATION 8													
COEFFICIENTS	.287	.438		.234		.004		.004	.006	1.439	8.871	-.029	
t-VALUES	(1.89)b	(1.98)b		(1.66)c		(2.26)b		(2.35)b	(2.85)a	(2.56)a	(1.85)b	(-2.01)b	
d.f.=41	R <sup>2</sup> =.70												
se.=.150	R <sup>2</sup> =.64												
F=11.86													

STUDENT'S t-VALUE ONE TAILED TEST

a = SIGNIFICANT AT 1%

b = SIGNIFICANT AT 5%

c = SIGNIFICANT AT 10%

TABLE 3-2  
COLLINEARITIES AMONG INDEPENDENT VARIABLES

Please note that all collinearities in excess of .40 have been underlined. Selection of this "cut-off point" is totally arbitrary. The simple correlations with the dependent variable (U.S. multinational market share of Canadian industries) are also shown.

EQUATION 1

Correlation Matrix

	RUSD-USC	US-CNA%S	USMUC	U-CCON	USNP
RUSD-USC	1.0000	0.1499	0.3590	-0.0854	0.1060
US-CNA%S		1.0000	0.3007	0.2325	<u>0.5382</u>
USMUC			1.0000	-0.0550	0.1946
U-CCON				1.0000	0.0299
USNP					1.0000

Simple correlations with dependent variable

0.3031	0.5753	0.5346	0.3528	0.4318
--------	--------	--------	--------	--------

TABLE 3-2

(cont'd)

EQUATION-2

Correlation Matrix

	RUSD-USC	US-CNA%S	USLSF	U-CCON
RUSD-USC	1.0000	0.1499	0.3443	-0.0854
US-CNA%S		1.0000	0.2275	0.2325
USLSF			1.0000	0.1352
U-CCON				1.0000

Simple correlations with dependent variable

0.3031	0.5753	0.4480	0.3528
--------	--------	--------	--------

TABLE 3-2

(cont'd)

EQUATION 3

Correlation Matrix

	RUSD-USC	US-CNA%S	USLSF	U-CCON	US-CNMAG
RUSD-USC	1.0000	0.1499	0.3443	-0.0854	-0.1136
US-CNA%S		1.0000	0.2275	0.2325	0.0336
USLSF			1.0000	0.1352	0.3461
U-CCON				1.0000	0.1088
US-CNMAG					1.0000

Simple correlations with dependent variable

0.3031    0.5753    0.4480    0.3528    0.3233

TABLE 3-2

(cont'd)

EQUATION 4

Correlation Matrix

	RUSD-USC	USMUC	U-CCON	USNP	CPRD	US-CNMAG
RUSD-USC	1.0000	0.3590	-0.0854	0.1060	0.1605	-0.1136
USMUC		1.0000	-0.0550	0.1946	0.1669	0.3260
U-CCON			1.0000	0.0299	-0.4432	0.1088
USNP				1.0000	-0.0886	-0.0875
CPRD					1.0000	0.1977
US-CNMAG						1.0000

Simple correlations with dependent variable

0.3031	0.5346	0.3528	0.4318	-0.1515	0.3233
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TABLE 3-2

(cont'd)

EQUATION - 5

Correlation Matrix

	RUSD-USC	USMUC	USR&D	USMKTMG	US-CNRMG
RUSD-USC	1.0000	0.3590	0.1663	0.0935	-0.0531
USMUC		1.0000	0.4580	0.2013	0.0616
USR&D			1.0000	0.1164	-0.0054
USMKTMG				1.0000	0.0900
US-CNRMG					1.0000

Simple correlations with dependent variable

0.3031      0.5346      0.5193      0.3512      -0.1698

TABLE 3-2  
(cont'd)

EQUATION 6

Correlation Matrix

	RUSD-USC	CPRD	USMUC	U-CCON	USR&D	USMKTMG
RUSD-USC	1.0000	0.1605	0.3590	-0.0854	0.1663	0.0935
CPRD		1.0000	0.1669	-0.4432	0.1927	-0.0212
USMUC			1.0000	-0.0550	0.4580	0.2013
U-CCON				1.0000	0.0034	-0.0191
USR&D					1.0000	0.1164
USMKTMG						1.0000

Simple correlations with dependent variable

0.3031   -0.1515   0.5346   0.3528   0.5193   0.3512

TABLE 3-2

(cont'd)

EQUATION 7

Correlation Matrix

	RUSD-USC	USLSF	U-CCON	US-CNTV	US-CNMAG
RUSD-USC	1.0000	0.3443	-0.0854	0.2670	-0.1136
USLSF		1.0000	0.1352	0.1673	0.3461
U-CCON			1.0000	0.1279	0.1088
US-CNTV				1.0000	-0.1320
US-CNMAG					1.0000

Simple correlations with dependent variable

0.3031    0.4480    0.3528    0.5340    0.3233

TABLE 3-2

(cont'd)

EQUATION 8

Correlation Matrix

	RUSD-USC	USMUC	U-CCON	USR&D	USMKTMG	CPRD	US-CNTV	US-CNMAG
RUSD-USC	1.0000	0.3590	-0.0854	0.1663	0.0935	0.1605	0.2670	-0.1136
USMUC		1.0000	-0.0550	<u>0.4580</u>	0.2013	0.1669	0.2961	0.3260
U-CCON			1.0000	0.0034	-0.0191	<u>-0.4432</u>	0.1279	0.1088
USR&D				1.0000	0.1164	0.1927	0.3687	0.2137
USMKTMG					1.0000	-0.0212	<u>0.4210</u>	-0.0687
CPRD						1.0000	-0.0471	0.1977
US-CNTV							1.0000	-0.1320
US-CNMAG								1.0000

Simple correlations with dependent variable

0.3031	0.5346	0.3528	0.5193	0.3512	-0.1515	0.5340	0.3233
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### III Performance of Variables

In this section, an interpretation of the regression and collinearity tables as they pertain to the independent variables will be undertaken. Where appropriate, a number of other equations will be introduced in order to demonstrate the performance of some alternative specifications to those shown in Table 3-1. In the following discussion, the variable name together with a brief description will be repeated for ease of reference.

1. US-CNA%S the difference between the United States and Canadian advertising/sales ratios.

The performance of this variable is encouraging. Significance levels in two of the three equations for which US-CNA%S has been reported lie well within the one percent region. In Equation 1 the variable is close to significance at one percent.

US-CNA%S, despite a reasonably strong simple correlation with the dependent variable (.5753) is fairly sensitive to collinearity problems. The difficulty is exacerbated by the suspicion that the collinearity is higher order in nature. Note that in Equation 1, US-CNA%S is robust despite a first order collinearity with USNP of .5382.

2. US-CNTV the difference between the U.S. and Canadian percentages of total advertising budgets invested in network television advertising.
3. US-CN MAG the difference between the U.S. and Canadian

percentages of total advertising budgets invested in magazine advertising.

The two spillover variables are discussed simultaneously since both share a common hypothesis.

US-CNTV is reported in Equations 7 and 8. Performance of the variable falls within the .05 and .01 levels of significance.

US-CNMAG appears in a total of four equations and exhibits a pattern of behaviour similar to that of US-CNTV. Both variables perform according to expectations and are correctly signed. In addition, US-CNTV and US-CNMAG are relatively free of collinearity problems -- with the possible exception of Equation 8 where the first order collinearity between US-CNTV and USMKTMG is .4210. One plausible explanation for the relationship between the two variables is that industries which are characterized by a significant degree of network television advertising are generally inclined to be marketing intensive with regard to their competitive behaviour. The "marketing management" variable provides a general indication of the industry infrastructure which logically should be related to marketing intensity.

The spillover variables were also analysed in a disaggregated format in order to determine if the components of US-CNTV and US-CNMAG behaved consistently when the dependent variable was regressed on them.

The following variables were tested:

A. Canadian advertising in network television.

- B. Canadian advertising in magazines.
- C. U.S. advertising in network television.
- D. U.S. advertising in magazines.

The analytical technique involved "dummying" each of the four preceding variables (one for those industries with greater than the sample mean dependence on the particular media form in question -- zero otherwise). The effect of this approach is to identify the "heavier" media users in Canada and the United States.

A positive relationship between the U.S. media variables and the market share held by MNC's in Canada could be expected by reason of the spillover rationale provided in Chapter Two. The expected sign of the Canadian media variables is not as clear cut since two scenarios are possible:

1. U.S. multinationals may apply their advertising expertise in the Canadian market through the use of Canadian media. In this instance the causality would run from the MNC's to the Canadian advertising variables and a positive relationship would pertain.
2. U.S. multinationals might rely chiefly on the spillover effects from U.S. based advertising and not feel the necessity for further expenditures in Canadian media. Given the plausibility of this case, one could expect to observe a negative relationship between the Canadian media variables and the market share controlled by multinationals. This is because the Canadian and U.S.

media sources might be treated as substitutable factor inputs by the MNC's. To the extent that spillover is considered a "near free" good by nature of the "sunk costs" argument associated with U.S. based advertising, multinationals, in the absence of specific incentives for buying Canadian media, might be expected to rely on the "cheaper" of the two factor inputs.

The tendency to rely on U.S. based media as a substitute for Canadian media might further be enhanced if the latter advertising source is considered (by MNC's) to be inferior to the former.

Performance of the variables is indicated in the following equation:

EQUATION 9

$$\begin{aligned} \text{MNC SHAR} = & .009 \text{INTERCEPT} + .251 \text{RUSD-USC} + .488 \text{USMUC} + .006 \text{U-CCON} \\ & (.085) \quad (1.07) \quad (3.69)^a \quad (3.91)^a \\ & -.133 \text{CNMAG} + .143 \text{USNTV} + .945 \text{USMAG} + 4.5 \text{USMKTMG} + e \\ & (-1.75)^b \quad (2.00)^b \quad (1.46)^b \quad (.84) \end{aligned}$$

$$R^2 = .63 \quad \bar{R}^2 = .56$$

$$\text{se.} = .165 \quad \text{d.f.} = 42$$

$$F = 10.07$$



Correlation Matrix For Equation 9

	RUSD-USC	USMUC	U-CCON	CNMAG	USNTV	USMAG	USMKTMG
RUSD-USC	1.0000	0.3590	-0.0854	-0.1754	0.1866	0.0113	0.0935
USMUC		1.0000	-0.0550	-0.1516	0.2161	0.1971	0.2013
U-CCON			1.0000	0.2396	0.1148	0.1155	-0.0191
CNMAG				1.0000	-0.0576	0.1551	-0.3060
USNTV					1.0000	<u>0.5016</u>	0.3500
USMAG						1.0000	0.2500
USMKTMG							1.0000

Simple correlations with dependent variable

0.3031	0.5346	0.3528	-0.1878	0.5065	0.3992	0.3512
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The majority of the independent variables have been identified previously. The three dummy variables require elucidation:

CNMAG = a dummy variable equal to one for those Canadian industries spending 14.45% (sample mean) or more of their total advertising budget in Canadian magazine advertising -- zero otherwise.

USNTV = a dummy variable equal to one for those U.S. industries spending \$23,753,000 (sample mean) or more in U.S. network television advertising -- zero otherwise.

USMAG = a dummy variable equal to one for those U.S.

industries spending \$14,382,000 (sample mean) or more in U.S. magazine advertising -- zero otherwise.

Equation 9 does not contain a variable for Canadian advertising investment in network television because collinearity problems made its inclusion untenable. Canadian network TV advertising was simply too weak in its performance -- both from a collinearity standpoint and as an explanatory variable in its own right. (The t-values were always insignificant and in many cases, incorrectly signed relative to the simple correlation with the dependent variable.) Consequently, results on the variable are inconclusive.

The remaining three media variables, CNMAG, USNTV and USMAG are all significant at .05. USNTV and USMAG produce the predicted positive result. CNMAG yields an interesting result with a consistent negative relationship to the dependent variable.

If the scenario concerning MNC preference for U.S. spillover advertising has any merit, the negative sign on CNMAG together with the positive relationships exhibited by USNTV and USMAG might be taken as supportive empirical evidence.

To the extent that a consistent negative relationship between CNMAG and MNC SHAR appears evident, one could argue that weak empirical support exists for the Canadian government's taxation policy regarding advertising expenditures. The 1976 alteration in policy removed tax deductible status for

advertising expenses incurred by resident Canadian firms which purchased U.S. media.

4. US-CNRMG the difference between the United States and Canadian relative average percentage market growths.

The performance of US-CNRMG was surprising, since it was a priori expected to be a strong variable. In its final form (Equation 5) it achieves significance at the 5% level, but this result represents the strongest which could be developed for the sales growth data.

Numerous alternative specifications were tested before US-CNRMG was developed. The concern regarding this variable stems from the number of transformations to which the data base was subjected in order to produce a "workable" formulation. Consequently, there exists a plausible basis for doubting the validity of US-CNRMG as an explanatory variable.

Although the sales growth specification is suspect, this is not meant to imply a negation of the hypothesis upon which US-CNRMG is based. The likely reason for the variable's performance may be found in the basis of its calculation. The growth variable was based on the year-to-year change in sales (value of shipments for U.S. industries) 1972 to 1975. The problems of establishing a growth trend on the basis of three observations need not be elaborated upon. Unfortunately, limited data availability restricted the length of the time series upon which the sales growth figures could be calculated.

A preferred treatment of US-CNRMG would be to test the variable in a lagged time series regression based on one or two decades of information. Changes in the sales growth rate could then be correlated with changes in MNC market share.

5. RUSD-USC the difference between the United States and Canadian industry levels of risk.

The risk variable performs reasonably well across all equations. RUSD-USC is clearly not as robust as other variables in the model (significance levels are generally .10 and .05), but it does have the advantage of being relatively free of first order collinearity problems.

6. USMKTMG the proportion of sales managers for each industry "i" in the United States.

The marketing management variable was tested in Equations 5, 6 and 8. Regression results indicate USMKTMG performs at or near the .01 level of significance.

First order collinearity is a minor problem between USMKTMG and US-CNTV (.421). One plausible explanation for the interaction of these two variables was given in the discussion of US-CNTV.

A variation of USMKTMG was also tested. US%ALMKT was constructed from the proportion of all sales related employees to total employees. The variable performed poorly with insignificant t-values and a weak simple correlation with the dependent variable (.2391). The likely reason for the mediocre results of US%ALMKT is that the variable is too general in terms

of its data base. It is unlikely for example, that a significant proportion of sales clerks in some industry "i" will act as an accurate proxy for the marketing expertise possessed by that industry. Contrarily USMKTMG, because its is based on sales management personnel, appears to be sufficiently accurate for purposes of defining the marketing expertise component which this model suggests is a form of competitive advantage that is exportable through FDI to Canadian industries.

7. USMUC the proportion of shipments attributable to multiunit companies in the United States.

USMUC performs almost as well in this study as it did in Caves' research. The variable appears in Equations 1, 4, 5, 6 and 8 with significance levels generally in the .05 and .01 category. Results overall are sufficiently strong to suggest that Caves' variable does indeed replicate across industry samples and time periods.

As previously stated, some degree of concern regarding the general nature of USMUC is warranted. The first order collinearity matrices lend an element of support to this contention. Collinearities between USMUC and other independent variables are:

$$\text{USMUC/USR\&D} = .4580$$

$$\text{USMUC/RUSD-USC} = .3590$$

$$\text{USMUC/US-CN MAG} = .3260$$

$$\text{USMUC/US-CNA\%S} = .3007$$

The preceding correlations are admittedly not very large.

They do however rank among the larger collinearities reported among the eight equations and, more importantly, they all involve USMUC; hence the concern regarding what exactly, the multiplant variable is measuring. Recall also, that only first order collinearities are being considered.

8. USLSF the proportion of shipments accounted for by firms with greater than 100 employees in U.S. industry "i".

USLSF, as previously stated, is a variation on Caves' large size firms variable. The two specifications differ in that Caves' version was based on shipments by firms with assets of \$100 million or more, while USLSF is calculated on the shipments accounted for by firms with 100 or more employees. The underlying hypotheses which both variables purport to test are similar however. USLSF does not perform as well as Caves' specification. His variable consistently achieved significance at the .01 level. USLSF functions at the .05 and .01 levels and in Equation 3 it fails to reach significance. The simple correlation with MNCSHAR (.4480) suggests the variable should yield better results in multiple regression than is apparent from equations 2, 3 and 7. The likelihood of higher order collinearity must be considered and, again, due to the general nature of USLSF it is prudent to be wary of the alternative effects which the variable may be proxying.

Caves as well, appears to be aware of the dangers inherent in the use of the large size firms variable.

LS [Caves' large size firm variable] is apt to capture

too many influences on direct investment. The firm that has developed a successfully differentiated product in the past is apt to become large, so size will tend to reflect any and all advantages that have made firms in an industry successful both at home and as foreign investors (Caves, 1974, p. 282).

USLSF and USMUC could not be included in the same regressions because of collinearity problems. It appears that of the two variables, USMUC is more robust, since inclusion of both specifications in the same equation always had the effect of driving USLSF to statistical insignificance.

9. U-CCON the difference between the United States and Canadian, "four firm" concentration ratios for industry "i".

The "concentration variable" was tested in every equation with the exception of number 5. The performance of U-CCON is fairly consistent across all regressions. Significance levels on this variable lie in the .01 region or in the top of the .05 classification. U-CCON was employed in seven of the eight equations because there are relatively few collinearity problems with the variable. The only other independent variable with which some degree of first order collinearity exists is the Canadian production employee wage rate -- CPRD (-.4432). A plausible explanation for the U-CCON/CPRD relationship is not easily arrived at. One possible explanation is provided however, in the section discussing CPRD.

It is possible that U-CCON is biasing downward the barrier effect of the Canadian concentration ratio relative to that of

the U.S. concentration index. Further, to the extent that a concentration based entry barrier exists, its impact is apt to asymmetrically favour U.S. multinationals as opposed to smaller Canadian domestic firms. The preceding statement is motivated by the following surmised relationship between U-CCON, MNC's and Canadian domestic firms.

1. Given that there exists an element of validity to the "intangible assets" hypothesis it can be argued that the MNC possesses some competitive advantages (e.g. accumulated stocks of research and development or advertising investments contributing to spillover) which can, at negligible opportunity costs, be transferred to foreign markets.
2. The entry barrier posed by high Canadian industrial concentration may have a diminished effect on U.S. MNC's if the entry forstalling price which host country competitors can bring to bear on the potential multinational entrant are mitigated by the latter firm's ability to rely on previously sunk investment costs in factor inputs of the type described in point one above.
3. The effect of the MNC entrant's "cheaper" factor inputs in the advertising and R&D areas should contribute to lower costs which in turn create better ability to withstand price decrements instituted by the extant oligopolists.



4. The rationale to this point, reduces to the argument that multinationals, because some of their inputs have a near zero variable cost, are able to attain a lower average cost curve than their Canadian competitors. Consequently, the extant Canadian firms may encounter difficulty in driving the industry unit price low enough to forstall foreign penetration.
5. Ceteris paribus -- the Canadian domestic potential entrant on the other hand, may not have access to those low cost factor inputs ascribed to the multinationals. The host country firms must therefore suffer all the costs associated with entering a market where the extant oligopolists can bring a stringent pricing policy to bear. In this instance the standard theory of concentration as a barrier to entry would apply.
6. Gorecki concluded from his research that:

Domestic enterprises largely enter low barrier industries; foreign enterprises enter high and low barrier industries with approximately the same frequency; ... entry barriers are likely to affect domestic and foreign enterprises differently (Gorecki, 1976, p. 487).

The preceding scenario regarding the concentration ratio as a barrier to entry is consistent with Gorecki's conclusions.

10. USR&D the proportion of research and development related personnel in each U.S. industry "i".

USR&D performs well in Equations 5, 6 and 8. The t-values all lie in the .01 region. The research and development

variable used in this model behaves consistently with previous results presented in the literature.

Collinearity problems with USR&D are not overly severe but nevertheless merit attention. The variable interacts with USMUC (.4580) and with US-CNTV (.3687).

The probable linkage between USR&D and USMUC is the large size firm variable (USLSF). The collinearity between USLSF and USMUC is .8655. A rational supposition is that the industries employing the greatest proportion of research and development personnel would be those which are characterized by large size firms (larger firms should be better able to absorb the overhead of non-production employees than medium and smaller sized firms). Since these are the same industries which are also likely to contain a high proportion of multiplant firms, it is possible that a linkage between USR&D and USMUC may appear.

A similar relationship between USR&D and US-CNTV may pertain. Just as large sized firms might be inclined to support a significant research and development staff, they may also be inclined to make the greatest use of network television since (ceteris paribus) large scale production and distribution systems often require substantial advertising efforts.

11. USNP the proportion of salaries and wages devoted to non-production employees in U.S. industry "i".

USNP is the last of the "general" variables tested in this research. As with USMUC and USLSF the "non-production employees" specification is worrisome because one cannot be

completely sure what exactly the variable is measuring. A strong argument can be made that two of the other variables (USMKTMG and USR&D) measure the same factors as USNP. Beyond the marketing management or research and development effects, however, the variable must be assumed to be proxying other entrepreneurial resources since this was Caves' rationale for establishing the specification. It should be remembered that Caves ultimately discounted his entrepreneurial resources hypothesis because of collinearity problems and a basic distrust of the underlying theory itself.

The performance of USNP in Equations 1 and 4 indicates t-values in the .01 and .10 range respectively. Note that collinearity with US-CNA%S (.5382) appears in Equation 1. This interaction indicates that marketing intensive industries tend to employ a larger number of non-production personnel than do other industries.

The conclusion regarding USNP is similar to that drawn by Caves. Although the variable performs somewhat better than Caves' version (possibly due to the difference in formulation) one cannot avoid being suspicious of the possible alternative dimensions which the variable may be capturing. The vulnerability of USNP when included with other independent variables does not assuage this skepticism.

12. CPRD the wage rate per employee for production and related workers in Canadian industry "i".

The "cost of labour" variable produces the correct sign in

Equations 4, 6 and 10. It achieves significance however, in only the latter two equations. In Equation 4, CPRD borders on the .10 significance level with a t-value of 1.20.

The collinearity problems of CPRD are restricted to the concentration variable (-.4432).

If the performance of CPRD in Equations 4, 6 and 8 is considered to be supportive of the hypothesis that MNCs' prefer to avoid high wage industries -- then, through the application of Caves' contention that the MNC is apt to operate primarily in market structures of "differentiated oligopoly" it can be argued that a correlate of multinational presence is industrial concentration (Caves, 1974, p. 280). One might therefore observe a greater MNC market share (and therefore higher concentration ratios) in those industries where wage rates are relatively low. This is because of the suggestion presented here that ceteris paribus the causal relationship between Canadian labour costs of production, MNC's and concentration is:

1. Low labour costs of production provide an incentive to entry while high labour costs represent a disincentive.
2. MNC's are therefore attracted by lower labour cost industries.
3. Because multinationals tend to be large sized firms they often account for a significant proportion of output in a given industry.
4. The effect of point three is to cause an increase in the concentration level of those industries which the

MNC's have entered.

5. Therefore, those industries characterized by relatively low labour costs of production may also, as a result, be characterized by a relatively high level of concentration due to entry of MNC's.

Although the preceding rationalization of the CPRD and U-CCON interaction is speculative, it would be interesting to regress labour costs of production on the concentration ratio as a causal explanation of the latter variable.

U-CPRD the difference between the American and Canadian wage rates for production workers in industry "i".

The performance of U-CPRD is not impressive. An equation containing this variable was not included in Table 3-1 because U-CPRD yielded consistently confounding results.

Despite a reasonable and correctly signed simple correlation with the dependent variable (.3665), U-CPRD in multiple regression equations always produced a negative and insignificant result.

Two possible explanations for this "flip-flop" of the variable sign are:

1. Collinearity. U-CPRD is collinear with: US-CNA%S (.3784); USMUC (.4132); and USMKTMG (.5530). There are no plausible explanations for these correlations between U-CPRD and the other independent variables. Conjecture leads to the suggestion that perhaps this "labour cost differential variable" is acting as a

proxy for some other missing variable which is itself collinear with US-CNA%S, USMUC and USMKTMG.

2. U-CPRD may simply be too crude a measure of the production cost differential between the U.S. and Canadian industries. It is possible that all production related costs must be incorporated into the variable before any kind of robust performance can be achieved. Perhaps the labour cost portion of total production expenses is not sufficiently large in some industries -- especially those characterized by heavy capital intensive investment -- to warrant serious consideration as a factor input expenditure with which the firm must be concerned.

U-CPRD may not be measuring accurately enough that which it was intended to capture. The effect of this problem may be causing the variable to be highly vulnerable to any kind of collinearity with the other independent variables.

#### IV Principal Components Analysis

A principal components analysis\* of the independent variables was undertaken for three reasons:

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\* A detailed discussion of the principal components algorithm can be found in the Statistical Package For The Social Sciences (2nd edition) by Nie, Hull, Jenkins, Steinbrenner and Bent, McGraw-Hill, 1975.

1. To produce a quantitative basis for assigning some of the independent variables used in FDI research to their appropriate genre. An example may clarify the rationale for this objective.

Caves classifies his variables according to three main categories -- "intangible capital, multiplant enterprise, and entrepreneurial resources" (Caves, 1974, p. 279). The three categories each have their accordant supporting hypotheses. The difficulty of this taxonomic approach lies in the danger of misallocating a variable to the wrong classificatory "family." Since it is possible for the "families" to overlap each other (according to Caves' own admission) a dual problem arises:

- i. a variable can be misclassified to the wrong family, in which case the proxy for the hypothesis is incorrect.
- ii. it is possible that a "classificatory family" and its related theory are "incorrect" in the sense that the hypothesized relationship simply does not exist. Consequently, any attempt to allocate the independent variables to that family will also be incorrect. This type of error reduces to an invalid Aristotelian syllogism.

2. To clarify the issue of multicollinear relationships which exist between the independent variables.  
Principal components analysis should be particularly useful with regard to isolating the effects of the "general" variables (USMUC, USLSF and USNP) from other

independent variables.

3. To create a set of dimensions which could be subsequently tested in a principal components regression for purposes of identifying the key factors and their order of "importance" in explaining U.S. multinational market share of Canadian industry.

The correlation matrix in the factor analytic program uses as input all of those variables presented in the regression model discussion. However, an exception with regard to the spillover variables, US-CNTV and US-CNMAG was made. These variables enter the analysis in their disaggregated form. The rationale for entering CNMAG, USNTV and USMAG separately rather than in a differenced form is again based on the desire to determine if the components of US-CNTV and US-CNMAG behave consistently.

Finally, one more variable is introduced as a check on the hypothesized major source of U.S. spillover. USNTV\$ is based on the actual advertising dollars invested in U.S. network television by each of the industries in the sample. USNTV\$ is useful in that it allows scale effects to enter into consideration as well as providing a cross-check on the performance of the dummy variable USNTV.

#### 1. Extraction of Initial Factors

A principal component analysis is used to explore the potential for data reduction. The procedure imposes a



requirement which is of particular value to this research in that selection of the defined factors is conducted subject to the constraint of orthogonality; that is, the components are selected in order of importance in capturing variance in the data, subject to the requirement that each component is uncorrelated with its predecessor. This attribute of the program is useful because it allows one to directly address the issue of multicollinearity among the independent variables.

Selection of the components to be retained is based on the eigenvalue or total data variance accounted for by each factor. The four factors which produce eigenvalues greater than one (and which are therefore retained for the next step in the analysis) are listed below:

Factor	Eigenvalue	Cumulative % Variance Explained
1	4.211	29.2
2	2.388	46.4
3	1.856	59.4
4	1.119	67.5

## 2. Varimax Rotation for Terminal Factors

An orthogonal rotation was imposed on the initial factor matrix for two reasons:

- A. To simplify the factor structure.

B. To create more stability in the factor loadings.

A varimax rotation was selected in order to produce the final factors.

Prior to conducting the factor analysis, it was hypothesized that at least two major dimensions would be identifiable from the terminal factor correlation matrix. These corresponded to:

A. Marketing Factor. The marketing dimension should (naturally) act as the common factor underlying the marketing related variables.

B. Size Factor. The common element of size should provide a focus for those variables introduced by Caves, (USMUC, USLSF).

### 3. Principal Component Results

The terminal factor correlation matrix is presented in Table 3-3.

The first principal component identified in the program is composed of US-CNA%\$S, USNP, USNTV, USMAG, USNTV\$ and USMKTMG. Given the common element underlying most of these variables, the first dimension can be identified as a marketing factor.

The second factor, as predicted, appears to be related to size. Variables loading on factor two are RUSD-USC, USMUC, USLSF and USR&D. The "multiplant companies" and "large size firm" variables perform as expected.

TABLE 3-3

VARIMAX ROTATED FACTOR MATRIX

Variable Number	Variable Name	Factor 1	Factor 2	Factor 3	Factor 4
V1	RUSD-USC	0.05575	<u>0.54090</u>	-0.23111	0.06280
V2	US-CNA%S	<u>0.84146</u>	0.21760	0.02249	0.17573
V3	CPRD	-0.21049	0.18578	<u>-0.76468</u>	-0.30187
V4	USMUC	0.17322	<u>0.90022</u>	-0.04746	-0.11367
V5	USLSF	0.04206	<u>0.91722</u>	0.20654	0.03441
V6	U-CCON	0.08147	0.00916	0.31836	<u>0.71586</u>
V7	USNP	<u>0.77133</u>	-0.00889	-0.32237	0.17907
V8	CNMAG	-0.20548	-0.10307	<u>0.81425</u>	0.10228
V9	USNTV	<u>0.72699</u>	0.17653	0.20160	0.03534
V10	USMAG	<u>0.57518</u>	0.23413	0.48274	0.02798
V11	USNTV\$	<u>0.80387</u>	0.17744	0.14426	-0.02784
V12	USR&D	0.36357	<u>0.51298</u>	-0.29245	0.07756
V13	USMKTMG	<u>0.78464</u>	-0.07435	-0.25180	-0.09759
V14	US-CNRMG	-0.03329	-0.02683	-0.00677	<u>-0.86910</u>

Note that all factor loadings in excess of .50 have been underlined. Assignment of the variables to the factors on this basis is arbitrary.

It is possible that the marketing factor is marginally superior to the size factor in terms of performance because of the greater number of variables which comprise the former dimension as opposed to the latter dimension. The marketing factor is composed of five variables whereas the size factor contains two variables.

Contrarily, it can be argued that the individual marketing variables appeared to be as significant as the individual size variables in the econometric results of Table 3-1. This should provide some degree of credibility to the marketing factor performance in the principal components analysis.

Two variables merit discussion due to their unexpected performances.

USNP, the "non-production employees" variable, loads on factor one (.771). It is possible that the variable, behaves in this fashion because it contains the sub-set of marketing management personnel.

CNMAG, the dummy variable for "magazine advertising intensive" industries, fails to load on factor one. A possible explanation for the behaviour of this variable is provided below.

The "risk variable" (RUSD-USC) loads only to a moderate degree on factor two. No explanation for the performance of this variable "comes to mind." It was initially surmised that the risk variable, because it is based on sales data, might load on factor one.

USR&D appears to display a factor complexity of greater than 1, with loadings of .364 on factor one, .513 on factor two and -.293 on factor three. The interpretation which should be placed on this variable is that it may well be measuring more than one theoretical dimension. Caves argued that USR&D acted as a proxy for product differentiation -- a marketing hypothesis. Results of the factor analysis indicate that:

- A. USR&D proxies more than one dimension.
- B. To the limited extent that USR&D does load on a dimension, it is more closely aligned with the "size factor" than with the "marketing factor."

Factors three and four pose a taxonomic conundrum. Since the existence of these two dimensions was not anticipated, any ex post facto explanations must be suspect by reason of their ad hoc nature. Nevertheless, a brief commentary is warranted.

CPRD and CNMAG load on factor three. The variables share one common characteristic in that both provide information on conditions in the host country because of their exclusively Canadian data bases.

Labelling factor three as a "host country market" dimension would not be inconsistent with the literature in that other FDI studies have successfully defined variables which capture entry barrier and entry incentive effects.

U-CCON and US-CNRMG are associated with factor four. Identifying the common element of these variables involves an

even greater degree of speculation than does interpretation of factor three. The "concentration" and "growth" variables could be interpreted as supplying information on the relative attractiveness of host versus donor country market conditions.

This concludes the discussion of the principal component results.

#### 4. Principal Components Regression Results

This segment of the discussion reviews the results of a principal components regression procedure applied to the four identified dimensions. The dependent variable MNCSHAR, remains as described previously.

The objective of the principal components regression as used in this study is to determine the relative ranking of importance among the four factors in explaining U.S. multinational corporate share of Canadian industries.

Finally, a tolerance-level of 1.0 was established in order to block inclusion of any factor(s) which yielded an F-value of less than 1.0.

Table 3-4 contains the regression results.

TABLE 3-4

PRINCIPAL COMPONENTS MULTIPLE REGRESSION

Dependent variable = U.S. multinational corporate market shares of Canadian industries (MNCSHAR)

Variable	Variables in the Equation			
	B	Beta	std error B	F
F1 (marketing)	0.1282243	0.51352	0.02376	29.120
F2 (size)	0.1232386	0.49355	0.02376	26.899
F4 (relative markets)	0.6888887E-01	0.27589	0.02376	8.405
(constant)	0.3426750			

tolerance-level insufficient for further computation

Variables not in the Equation

Variable	Tolerance	F
F3 (host country markets)	1.00000	0.004

Summary: Table 3-4

	Multiple R	R <sup>2</sup>	R <sup>2</sup> Change	Simple R
F1 (marketing)	0.51353	0.26371	0.26371	0.51353
F2 (size)	0.71226	0.50731	0.24360	0.49356
F4 (relative markets)	0.76382	0.58342	0.07611	0.27589

Conclusions drawn from Table 3-4 are:

- A. The marketing factor outperforms the size factor in explaining the dependent variable -- albeit marginally.
- B. The marketing and size factors taken together account for the majority of the unexplained variance in the dependent variable.
- C. Factor three (host country market conditions) is eliminated as an explanatory dimension from the regression. (Note the F-value of only .004.)

## 5. Internal Validity

An internal validity check on the four defined factors was conducted in order to assess their stability. Three random sub-samples were extracted from the industry sample and subjected to the factor analysis program. The sub-samples were constructed on the basis of a random number generator where the seed value was automatically determined by the program. Each of the three sub-samples accounted for approximately 65% of the total industry sample.

Results indicated that the four factors were stable across the sub-samples.

This concludes the presentation of the empirical research in Chapter Three.

A summary of the conclusions drawn from this study as well as implications for future research will be presented in the following chapter.



## CHAPTER FOUR

### CONCLUSIONS

Chapter Four will deal with the following topics:

1. Review and Assessment of the Research Objective.
2. Evaluation of Variables.
3. Evaluation of Principal Components Analysis.
4. Implications for Future Research.
5. Implications for Government.

#### 1. Review and Assessment of the Research Objectives

Generally stated, the major objective of this study is to introduce and demonstrate the viability of marketing related variables in foreign direct investment research. The objective is motivated by two perceived problems concerning the traditional treatment of marketing variables in the literature. First, to the extent that a marketing variable such as the advertising/sales ratio is employed, the position taken in this research is that its formulation has been handled incorrectly. Second, it is argued that too few of marketing related variables have been previously considered.

To the extent that a series of new "marketing variables"

were introduced along with their accordant theoretical justifications, and, in the majority of instances, successfully tested, the research objective has been achieved.

Results of the factor analysis and the principal component multiple regression are considered to lend plausible support to the contention that the "marketing variables" do indeed provide a valid contribution to the explanation of the dependent variable.

## 2. Evaluation of Variables

The performance of the variables presented in the regression model can, on the basis of their originality, be divided according to three classifications:

### A. New variables

As far as can be determined, the "spillover" variables (US-CNTV, US-CNMAG) and the "marketing management" variable (USMKTMG) have never been used as explanations of foreign direct investment activity. Based on the criteria of performance -- independently of other variables and collectively in terms of maintaining their explanatory power in spite of "competing" hypotheses -- US-CNTV, US-CNMAG and USMKTMG produce reasonable results. Ideally, one would prefer to see a far more sophisticated measure of spillover activity than that which was used of necessity in this research.

## B. Formulation alternatives

Variables allocated to this classification cannot be considered as "truly innovative." Rather, they are based on a reformulation (hopefully an improvement) of variables which have previously been introduced in the literature. In the majority of instances the reformulation involves transforming the specification to a "comparative variable" in order to account for both host and donor country information. Performance of the independent variables that have been so transformed leads to the conclusion that the "comparative variable" approach appears to work quite well.

The variables included in this category together with the justification for their classification are listed below.

### (i) RUSD-USC

The "risk" variable is treated in the literature as an entry barrier related to host country penetration. For purposes of this study the hypothesis and the variable specification are altered to reflect the idea that "risk" is a relative concept between markets. The variable performs reasonably well.

### (ii) US-CNA%S

The advertising/sales ratio differential, as with RUSD-USC, is motivated by the rationale that MNC evaluation of foreign market opportunities is not made solely with regard to donor or host country conditions considered in isolation. Rather, it is argued that multinationals judge markets relative to each other.

US-CNA%S cannot be considered a superior variable to the

U.S. advertising/sales ratio. In terms of regression results both appear to perform equally well. It must be stressed however, that the comparative performance of various specifications is not at issue here. What is of concern relates to the question of how best to formulate the advertising/sales ratio in order to most accurately proxy MNC decision behaviour. Stated more succinctly, a real trade-off exists between: 1. the search for a parsimonious variable specification; and 2. the need to produce a formulation which retains the characteristics of the phenomenon one chooses to measure.

(iii) U-CCON

U-CCON is based on the "concentration as a barrier to entry" argument. Again, the alteration in the traditional hypothesis and formulation of the variable is directed toward creation of the "relative comparison approach" of evaluating market opportunities. Performance of U-CCON in the regression equations is encouraging.

(vi) US-CNRMG

The "comparative sales growth variable" makes good sense from a theoretical standpoint. It is not without a significant degree of frustration that the empirical performance of the variable must be described as mediocre. The variable can be made to perform at the .05 level of significance, but intuitively, one cannot help being suspicious of the results given the number of alternative specifications which were unsuccessfully tested and subsequently discarded.

(v) USNP

The "non-production employees variable" represents only a minor change in the format of the specification as it originally appeared in the literature. The underlying hypothesis as stated in this study corresponds with that provided by previous research. Although the USNP variable turns in an acceptable empirical performance, to restate an earlier contention, one cannot help being suspicious of the "general nature" of the variable. As evidence for this position, it is worth noting that although USNP loads on factor one (.771) it also loads negatively to some degree on factor three (-.322).

(vi) MNCSHAR

The dependent variable, MNCSHAR, is included in the "alternative formulations group" since it is based on similar specifications previously developed in the literature. The contribution of MNCSHAR however, is that the market share calculation has been made strictly applicable to U.S. MNC's. Previous studies had been unable to acquire the necessary data and consequently relied upon total foreign market share information.

C. Replicated variables

The variables allocated to this classification are USMUC, USLSF, USR&D and CPRD. Their collective contribution to this research lies not in the area of originality but in the fact that each of them replicates well in the regression results.

One could argue that in the absence of such replicability there might be reason to doubt the data base underlying the dependent variable.

Despite the heavy loading of USLSF and USMUC on the size dimension -- which indicates a factor complexity of one -- it would be faulty to conclude that these independent variables are highly specific with regard to their measurement of the behavioral characteristics of MNC's. A cautionary reminder has already been provided, but will be repeated here. One must consider what type of variables contribute to the characteristic of corporate size. If the answer to such a question relies on explanations of marketing expertise, technological advantages over competitors, cheaper labour, etc., the size dimension simply becomes a function of the other operational and behavioural variables.

### 3. Evaluation of Principal Components Analysis

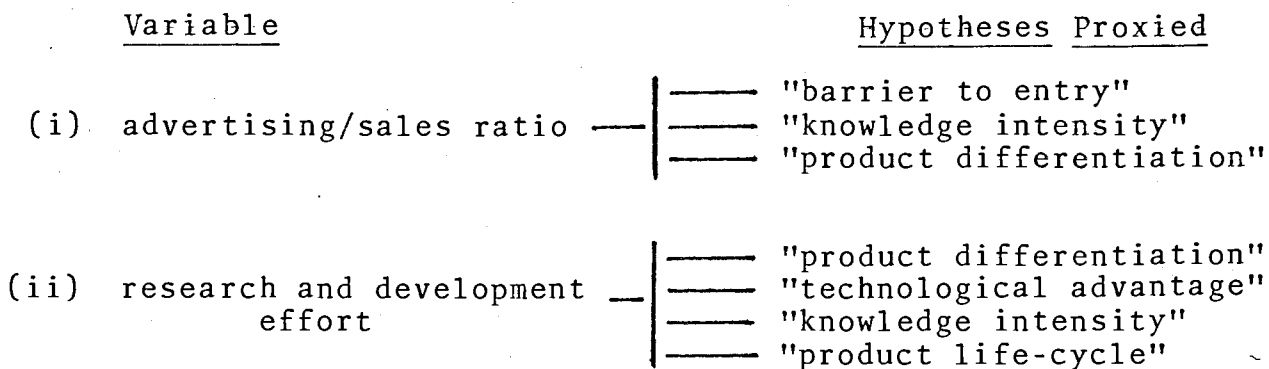
The principal component analytic program contributes to this study at a number of levels:

#### 1. Genre identification

One particularly difficult problem of FDI research involves the assignment of proxy variables to their respective hypotheses. Many authors, especially in survey articles, are inclined to establish "schools of thought" regarding the major theoretical determinants of direct investment. The independent variables which they identify as proxies for the various

theories are then allocated accordingly.

The following diagrammatic presentation should demonstrate the difficulties which arise with regard to the variable allocation problem.



The preceding diagram depicts two variables which have been assigned by various authors to a total of five different hypotheses.

Two possibilities are apparent:

- a. The variables actually are good proxies for all five hypotheses and measure or capture the various effects posited by each of the authors.
- b. Some (or all) of the hypotheses are "misrepresented" by the particular choice of proxy variable.

The factor analytic approach can be useful for resolving "scenarios" of the sort just described since the algorithm identifies the major dimensions and assigns the variable according to where it loads most heavily. (For example recall the information acquired concerning the USR&D variable.)

The factor analysis program should not be construed as providing an automatic and "fool-proof" linkage of variables to

hypotheses. Rather, the technique should be considered as a cross-check of the researcher's contention that the variables which he has selected are actually "measuring" that which they were intended to "measure."

## 2. Verification of variable performance

The factor analysis results are interpreted as providing confirmatory evidence that the "marketing variables" do, in the main, represent the marketing hypotheses for which they were intended. In the event that US-CNA%S, USNTV, USMAG, USNTV\$ and USMKTMG had failed to load on factor one, an obvious cause for concern would have arisen. A similar statement applies to the "size variables" (USMUC and USLSF) with regard to factor two.

The principal components multiple regression "stepped in" factor one (marketing) before factor two (size). This is welcome information in that rejection of the "marketing variables" as a source of explanation for FDI becomes more difficult.

Finally, the factor analysis allows a better assessment of collinearity problems among the variables than that which is available from the regression analysis. The orthogonality constraint in the factor regression is useful for a similar reason.

## 4. Implications For Future Research

Three areas concerning future research efforts appear to offer the most potential. Unfortunately the first two of these



are confounded by data availability limitations.

The dynamic issue in FDI research remains one of the main, and as yet unresolved, problems to be studied. The difficulty lies with the differing structural make-up of the variables used in the regression models. Some variables capture inherent stock effects in their data bases while others represent flow effects.

The solution to the problem of dynamics versus statics is of course, to develop a sufficiently long time series such that all effects may be captured. The problem with the time series approach is that sufficiently long and consistent data bases do not exist.

However, given two observations some number of years apart, one possible resolution to the dynamic issue might be to regress the change in the dependent variable over the time period on the change in the independent variables over the same period.

Even this recommendation is not without its problems; one of which is that governments continue to alter their standard industrial classifications over time (because industries are created and others disappear over time). This difficulty is compounded further because the contents of any given classification code change depending on the country engaged in data collection. Achieving concordance between the industrial classifications of two countries over two time periods is consequently a slow and tedious process.

The second recommendation -- if not already apparent from the thrust of this research -- is to incorporate a greater

number of more sophisticated (from a measurement standpoint) marketing variables in empirical FDI studies. Again, data limitations are the major deterrent to implementation of this recommendation. While a genuine paucity of marketing data exists at the governmental level, there is some reason to believe that private sector organizations are less than "statistically bankrupt" with regard to marketing information. The problem of course is that private marketing research organizations are all too well aware of the price which their accumulated data can fetch in the market place. A quick perusal of their price lists will make this abundantly clear to the researcher intent on using macro-marketing data.

In the absence of further government involvement in marketing data collection, opportunities for public sector research will certainly be limited.

The third suggested area for expansion of FDI research is more amenable to immediate action than were the previous two recommendations.

The application of factor analytic techniques in this paper is simplistic. Due to time and space considerations, many of the optional, more sophisticated algorithms were not applied. To the extent that much of factor analysis is concerned with data reduction and resolution of complex multicollinearity problems, the potential for further contribution to FDI research is substantial.

## 5. Implications For Government

Implications of the research undertaken in this study address two separate but nevertheless related topics.

Data collection and publication by federal governmental agencies is virtually non-existent where marketing information is concerned. In those rare instances where data relevant to marketing researchers are acquired -- they are not published with regularity. An example is provided by Statistics Canada which publishes the "Corporations and Labour Unions Returns Act." Advertising expenditures which are collected by industry are simply categorized as "expenses not elsewhere specified" under the "other expenses" classification (C.A.L.U.R.A., 1979, p. 122). This seems a rather ignominious treatment of a business expense which ranges between \$2.5 and \$3.0 billion per year in Canada.

The collection inactivity with regard to marketing data is even worse where estimates of U.S. media spillover are concerned. U.S. broadcasting spillover may become especially controversial in the 1980's if satellite dish reception is found to be legal in Canadian courts.

Neither do Canadian authorities appear to be overly concerned regarding the competitive implications of large scale marketing programs brought to bear by multinationals on smaller Canadian rivals. Nowhere in Canadian anti-combines activity can the equivalent of U.S. anti-trust intervention in the Proctor and Gamble-Clorox merger be found. The Canadian Royal

Commission on Competition similarly gave short shrift to the implications of marketing activity in their deliberations.

The likely reason for the lack of governmental concern in the marketing area (excluding of course consumer legislation) may be found in the nature of employment opportunities traditionally associated with the civil service. Government might be the venue of economists, lawyers and accountants -- it is seldom so for marketers. One can only presume that the civil service does not feel any particularly pressing need for marketing information or personnel.

A favoured political topic for many years has been the role of U.S. multinationals within Canadian borders; hopefully this dissertation will contribute to one dimension of that many-faceted discussion.

APPENDIX A

CANADIAN AND U.S. INDUSTRY CONCORDANCE

The correspondence between Canadian and U.S. industries in this sample was determined with the aid of the Canadian-United States Industrial Classification Convertibility Index -- by the Standards Division of Statistics Canada (No. 11, Nov., 1974).

The following list indicates the concordance between the three digit standard industrial classification (SIC) Canadian industries and their U.S. counterpart four digit industries.

The "bracketed" three digit figures represent those SIC codes which the Canadian government revised for the decade of the 1970's.

Finally, it was necessary in some instances to aggregate only a portion of the U.S. four digit industries in order to approximate the equivalent Canadian three digit industry. Where such a calculation was conducted, it may be identified by the weighting factor (in brackets) applied to the particular U.S. industry(ies).

1. Meat products 101, 103 (101)  
2011, 2013, 2016, 2017
2. Dairy products 104, 107 (104)  
2021, 2022, 2023, 2024, 2026
3. Fish products 111 (102)  
2091, 2092
4. Fruit and vegetable canners 112 (103)  
2032, 2033, 2034, 2035, 2037
5. Grain mills 123 (106), 124, 125 (105)  
2041, 2043, 2045, 2047, 2048
6. Bakery products 128, 129 (107)  
2051, 2052
7. Soft drinks 141 (109) 1091  
2086, 2087
8. Brewery 145 (109) 1093  
2082
9. Leather products 172, 174, 175, 179  
3111, 3131, 3142, 3143, 3144, 3149, 3151, 3161, 3171  
3172, 3199, 3293 (x.29)
10. Men's clothing (665) (243)  
2311, 2321, 2322, 2323, 2327, 2328, 2329, 2384 (x.5)  
3172, 3199, 3293 (x. 29)
11. Women's clothing 244  
2331, 2335, 2337, 2339, 2341 (x.5), 2384 (x.5),  
2385 (x.33), 2386 (x.5), 2395 (x.5)
12. Fur goods 246  
2371
13. Foundation garments 248  
2342
14. Sawmills 251  
2421, 2429, 2426
15. Veneer and plywood industry 252  
2435, 2436
16. Planing mills 254, (254, 251)  
2426, 2431, 2434, 2439, 2452

17. Household furniture 261, 268  
2426 (x.25), 2511, 2512, 2514, 2517 (x.5), 2519, 3645,  
2515
18. Office furniture 264  
2521, 2522
19. Pulp and paper mills 271 (271, 031)  
2611, 2621, 2631, 2661
20. Paper boxes and bags 273  
2643, 2651, 2652, 2653, 2655 (x.5)
21. Commercial printing 286 (286, 287)  
2732, 2751, 2752, 2761, 2771, 2782 (x.5), 2754
22. Publishing 288  
2731 (x.5), 2741 (x.5), 2721 (x.5), 2711 (x.5)
23. Iron and Steel mills 291, 292  
3312, 3313, 3316, 3324, 3325
24. Smelting and refining 295, 296, 297, 298  
3331, 3332, 3333, 3334, 3339, 3341 (x.66), 3351, 3353,  
3354, 3355, 3356, 3361, 3362, 3369, 3497 (x.5)
25. Structural steel 302  
3441
26. Ornamental iron works 303  
3442, 3446, 3448
27. Metal stamping 304  
3444, 3412, 3411, 3466, 3469, 3471, 3479 (x.33),  
3599 (x.25)
28. Wire and wire products 305  
3315, 3451, 3452, 3495, 3496, 3399 (x.25)
29. Hardware and tools 306  
3421, 3423, 3425, 3429 (x.25), 3524 (x.25), 3544 (x.5),  
3545 (x.33)
30. Heating equipment 307  
3433, 3585 (x.33), 3589 (x.33)
31. Machine Shops 308  
3599 (x.25)
32. Agricultural implements 311  
3523, 3524 (x.33)

33. Motor vehicles and parts 323, 325  
3711, 3714, 3465, 3492 (x.5), 3592 (x.33), 3647, 3694
34. Truck bodies 324  
3713, 3715, 3792, 2451, 3799 (x.5)
35. Small electrical appliances 331  
3634, 3635, 3639 (x.5)
36. Major appliances 332  
3631, 3632, 3633, 3636 (x.5), 3639 (x.5)
37. Radio and T.V. receivers 334  
3651
38. Communications equipment 335  
3661, 3662, 3671, 3672, 3673, 3674, 3679, 3675, 3676,  
3677, 3678
39. Industrial electrical equipment 336  
3511 (x.5), 3612, 3613, 3621, 3622, 3623, 3629, 3825
40. Cement manufacturing 341 (352)  
3241
41. Concrete manufacturing 347 (354)  
3271, 3272, 3299 (x.33)
42. Ready mix concrete 348 (355)  
3273
43. Glass and glass products 356 (356, 303)  
3211, 3221, 3229, 3231
44. Petroleum refineries 365  
2911, 2992
45. Fertilizers 372 (372, 378)  
2873 (x.5), 2874 (x.5), 2875
46. Pharmaceuticals 374  
2831, 2833, 2834
47. Paint and varnish 375  
2851
48. Soap and cleaning compounds 376  
2841, 2842 (x.5), 2843 (x.5)
49. Toilet preparations 377  
2844



- 50. Industrial chemicals 378
  - 2873 (x.5), 2812, 2813, 2816, 2819, 2822, 2895,
  - 2861 (x.5), 2865, 2869, 2873 (x.5), 2899 (x.5),
  - 2874 (x.5)
  
- 51. Scientific and professional equipment 381, (391)
  - 3811, 3822, 3832, 3841, 3842, 3843, 3851, 3861, 3873,
  - 3429 (x.25), 3545 (x.33), 3823, 3824, 3829
  
- 52. Jewellery and Silverware Mfgrs. 382 (392)
  - 3911, 3914, 3915, 3341 (x.33), 3479 (x.33), 3497 (x.5),
  - 3961
  
- 53. Sporting Goods and Toys 393
  - 3751, 3942, 3944, 3949

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