

**WORKING PAPER**

**THE ECONOMIC IMPACT OF  
MERGERS AND ACQUISITIONS  
ON CORPORATIONS**

*Working Paper Number 4  
February 1995*



Industry Canada Industrie Canada

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ON CORPORATIONS**

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## TABLE OF CONTENTS

<b>SUMMARY</b> .....	<i>i</i>
<b>INTRODUCTION</b> .....	1
<b>OVERVIEW OF RESEARCH</b> .....	3
<b>U.S. Studies</b> .....	4
<b>Canadian Studies</b> .....	8
<b>THE CONCEPTUAL FRAMEWORK</b> .....	11
<b>THE DATA</b> .....	17
<b>Definitions</b> .....	17
<b>Main Characteristics</b> .....	20
<b>ECONOMETRIC ANALYSIS</b> .....	25
<b>Profit to Sales Equation</b> .....	25
<b>The Research and Development Expenditures to Sales Equation</b> .....	26
<b>CONCLUSIONS</b> .....	29
<b>APPENDIX A</b> <b>DESCRIPTION AND LIMITS OF THE DATA SET</b> .....	31
<b>APPENDIX B</b> <b>ANALYSIS OF THE PROFIT FUNCTION</b> .....	35
<b>BIBLIOGRAPHY</b> .....	37
<b>TABLES</b> .....	39
<b>RESEARCH PUBLICATIONS PROGRAM</b> .....	49

## SUMMARY

While interest in mergers and acquisitions is not new, it has intensified recently as a result of a plethora of mergers and acquisitions in the 1980s. The importance of takeovers by foreign interests also increased in relative importance during that period. Several studies were conducted at that time to shed light on the motives for these transactions and to determine the consequences by evaluating the costs and benefits for both the corporations and the countries in which they were located. In the current climate of globalization, it is not surprising that interest in the mergers and acquisitions phenomenon has remained high.

The studies evaluating the profitability of corporations which were the objects of mergers or acquisitions have been using two different approaches:

The **financial approach** examines trends in the share prices of corporations involved in mergers or acquisitions and compares them to a reference group of corporations. Corporate performance is considered to have improved if the returns to shareholders are greater after the acquisition or merger. The results obtained using this approach, largely in the United States but also in Canada, show that corporate takeovers generally have favourable consequences for shareholders. Stock markets seem to take a positive view of announcements that corporations will be merged or taken over.

The **industrial organization approach** examines certain financial or economic performance variables of corporations before and after they have been taken over. Trends in these variables, as compared to a reference group, provide an indication of the net effect of the acquisition on profitability rates.

This study adopts the second approach. As part of Industry Canada's larger research program into the overall micro-economic adjustment process of corporations, this paper hopes to analyze the impact of mergers and acquisitions on corporate decisions and corporate performance.

The data used in this research was constructed by Statistics Canada for the specific purpose of the study. It is based on a list of firms that were the objects of merger or acquisition between mid-1985 and end of 1987. The observations are those takeovers that had to be approved under the Investment Canada Act. Because the Act establishes a minimum threshold on the value of the transaction to be reviewed, the firms included in the sample are of a large size. They are also, by definition, firms that become foreign-controlled after the transaction.

The usual statistical techniques were used to disentangle the impact of the takeover on the performance of the continuing firm.

Some of the important findings of the research are:

- Corporations that have been taken over by foreign interests increase their capital investment and their R&D spending.
- However, short-term profitability is not positively affected by foreign takeovers. In fact, the profit to sales ratio declines sharply immediately after takeovers by foreigners. The profit to equity ratio behaves in the same way.
- High levels of R&D spending seem to be associated with high profitability. In other words, a high level of investment in the production and use of new technologies is causing the profitability of firms to increase.
- Firms appear to undertake capital investment in tandem with R&D spending, implying complementarity between the two inputs in the production process.
- There exist economies of scale in the R&D activity sphere. This means that as the firm is growing in size, the relative amount of R&D spending it needs to do declines.
- The behaviour of corporations taken over by foreign interests differs significantly from corporations taken over by Canadian interests. The latter seems to show an increase in short-term profitability and, at best, no change in investment in physical capital or research and development.

These findings imply an interesting adjustment process to a foreign takeover. Immediately after the change of ownership, corporations seem to take a longer-term perspective and invest in R&D, or physical capital. To do this, they are prepared to accept a short-term reduction in profitability.

This research shows, in our view, the importance of analyzing the longer-term consequences of mergers and acquisitions. The relatively poor profitability of the target firm in the first few months and years after the transaction apparently reflects a period of adjustment during which the two different work cultures get to know each other and learn how to co-operate. In addition, corporations that invest in acquisitions have to take the time to recognize and use, in a profitable way, all aspects of the assets they have acquired.

Corporate assets are becoming increasingly intangible. This means that assets are increasingly composed of ideas, knowledge and know-how that cannot be easily codified. There may be embodied in a piece of equipment, or in the people within the firm. The internalization and technological competence theories suggest that acquiring these intangible assets is an important motive in making acquisitions. To profit fully from these intangible assets, corporations need time and complementary investments in physical capital and research and development. The findings of our research suggest that these two theories might lead to a correct interpretation of the motives for mergers and acquisitions activities.

## INTRODUCTION

While interest in mergers and acquisitions is not new, it has intensified recently as a result of a plethora of mergers and acquisitions in the 1980s. Several studies were conducted at that time to determine the effects on Canada of takeovers by foreign interests or by other Canadian corporations, and interest in this area has remained high — which is not surprising given the current climate of globalization.

Despite the intensity of this interest, there is a lack of consensus on the effects of mergers and acquisitions on the countries in which they take place and on the targeted corporations. Many studies have attempted to analyze and quantify the costs and benefits of mergers and acquisitions. However, the conclusions reached in these studies are so diverse that it is impossible to arrive at a clear, unequivocal consensus of opinion. In a working paper (No. 13) published by Investment Canada, Mr. Shapiro attributes this diversity of views to the multitude of hypotheses advanced by researchers and, most importantly, to the poor quality of the databases, which make it impossible to determine which of the various hypotheses are more accurate.

Using an approach similar to that used in the other studies, this paper attempts to determine the costs and benefits of mergers and acquisitions. It is a follow-up to Investment Canada's Working Paper No. 11, *Business Performance Following a Takeover*. It uses however a different data base and obtains results from a different methodology.

The economic models and econometric techniques used in this paper reflect the approach normally taken in studies of this nature, and are an improvement over the model used in Working Paper No. 11. Moreover, the database is original. It was designed and constructed specifically for this research.

In the next section, we describe aspects of the published research on the economic evaluation of mergers and acquisitions. We then define the conceptual framework within which we will evaluate the effects of mergers and acquisitions, present the methodology used to develop the database and describe the main features of the data. Finally, we present some of the results of our econometric analysis.

## OVERVIEW OF RESEARCH

Evaluating the performance of corporations involved in mergers or acquisitions has been the subject of a great deal of research. Large, and sometimes spectacular, mergers and acquisitions have attracted media coverage that has stimulated the interest of both researchers and the general public. Attempts were made to shed light on the motives behind these transactions and to determine their consequences by evaluating the costs and benefits for both the corporations and the countries in which they were located.

The variety of reasons for mergers and acquisitions and the diversity of their consequences have given rise to a range of hypotheses, each of which attempts to explain part of this phenomenon. These hypotheses can be subsumed into three major theories:

- internalization theory;
- technological competence theory;
- transaction cost theory.

The internalization theory described in Box 1 suggests that corporations attempt to acquire others because they want to procure intangible assets that generally give them a competitive advantage.

Another theory, derived from the first, is the technological competence theory explained in Box 2. According to this theory, corporations that engage in mergers and acquisitions are attempting to "internalize" technological advantages by acquiring the corporations that possess them.

A third theory, that of transaction costs, applies to vertical mergers and acquisitions aimed at reducing uncertainty or the cost of procuring particular factors of production. It is explained in Box 3.

### ***Box 1: Internalization Theory***

The internalization theory is based on the idea of intangible assets: in order for corporations to attract mergers or acquisitions, they must have intangible assets that make them profitable. These assets can include knowledge of a particular market, know-how in a particular technology or an enviable reputation for product quality. Usually, these assets have two major characteristics: they must have the attributes of a public good (i.e., their running costs within the corporation must be zero) and they must have high transaction costs so the most profitable way of acquiring them is through mergers or acquisitions rather than purchase or rental.

The internalization theory assumes that the purchasers of the targeted corporations want to obtain their intangible assets. These assets will produce a competitive advantage that should eventually find expression in increased profit. When intangible assets are recognized, it is usually by competitors. As a result, the internalization theory best explains horizontal mergers.



**Box 2:*****Technological Competence Theory***

The mounting importance of technology has given rise to a new theory that is an extension of the internalization theory, namely the technological competence theory recently developed by John Cantwell and based on the internalization of intangible technological assets. It assumes that technology consists of two factors: one that can be codified (e.g., written information about the technology, plans, etc.) and another that cannot be codified (e.g., certain abilities needed to operate it, particular knowledge, the ways in which it operates, etc.). It is this latter factor that constitutes technological competence, that is to say, an intangible asset. Technological competence is thought, moreover, to be of cardinal importance for corporate success.

This theory has certain consequences. First, when targeted corporations are in industries with high technological coefficients, potential purchasers will be more inclined to install research and development capacity there, thus enhancing local innovation. Second, when local corporations have low technological capacities, mergers and acquisitions may increase the technological content of production. Third, in intermediary cases when corporations engage in research but are not on the cutting edge of technology, mergers and acquisitions may result in the complete absorption of the targeted industry.

These three theories show the variation in reasons for a merger or acquisition. Khemani (1991) expressed this very well:

*There are multiple reasons, motives, economic forces and institutional factors that can, taken together or in isolation, influence corporate decisions to engage in mergers or acquisitions. Over the last few years, the pressures emanating from international competition, financial innovation, economic growth and expansion, heightened political and economic integration, and technological change have all contributed to the increased pace of mergers and acquisitions. Of course, mergers and acquisitions can still be motivated by such classic commercial and economic considerations as broadening the range of related products and the geographic market, diversification, and the risks and benefits of vertical integration. Finally, new or modified tax regimes, the cost of capital, and policy on such things as foreign property, economic regulations and privatization also have an effect on the intersectoral/international variations in the number of mergers and acquisitions.*

**Box 3:*****Transaction Cost Theory***

A corporation may decide to acquire an important supplier in order to ensure that a particular input is available, to reduce supply uncertainties or to reduce the cost of this input. This is the basis of the transaction cost theory which applies primarily to vertical transactions. It is more likely to come into play if the number of buyers and sellers in the market are limited, information about costs and prices is limited and the cost of changing suppliers is not negligible.

It can be assumed that these reasons and motivations have enhanced corporate profitability as the ultimate, long-term objective. It seems reasonable to assume that, even if this is not always the case, the ultimate concern of corporate managers who make acquisitions, regardless of their motives at the outset, is increasing long-term profit. However, this is affected by so many other factors that it can become very difficult to make isolated statistical measurements of the effect of mergers or acquisitions on profit.

The "free cash flow" theory developed by Jensen (1988) provides a good example of intermediate objectives that can lead to greater profitability in the long run. This theory assumes that corporate shareholders do not necessarily share the same objectives as the managers. The conflicts between these differing objectives may well intensify when corporations are profitable enough to generate "free cash flow," i.e., profit that cannot be profitably re-invested in the corporations. Under these circumstances, the corporations may decide to make acquisitions in order to use these liquidities. These acquisitions are often financed both by issuing debentures and liquidating the cash in hand. It is therefore higher debt levels that induce managers to take new measures to increase the efficiency of corporate operations. According to Jensen, long-term profit comes from the re-organization and restructuring made necessary by takeovers.

Studies that attempt to evaluate the profitability of corporations that have been the object of mergers or acquisitions can be categorized according to whether they take a financial or industrial organization approach.

The **financial approach** examines trends in the share prices of corporations involved in mergers or acquisitions and compares them with a reference group of corporations. Corporate performance is considered to have improved if the returns to shareholders are greater after the acquisition or merger. The results obtained using this approach, largely in the United States but also in Canada, show that corporate takeovers generally have favourable consequences for shareholders. Stock markets also seem to take a positive view of merger or acquisition announcements.

The **industrial organization approach** looks at certain financial or economic performance variables of corporations before and after they have been taken over. Trends in these variables compared with a reference group provide an indication of the net effect of the acquisition on profitability rates. Since the current study generally follows this second approach, we will analyze it in more depth. Boxes 4 and 5 provide summaries, in the form of tables, of the main conclusions that have been reached.

## U.S. Studies

In the United States, some studies that took this approach concluded that the performance of acquired corporations remains, at best, unchanged and usually declines. For instance, Ravenscraft and Scherer (1987 and 1989) showed that the profitability of

**Box 4:**  
**Summary of A Few Important Studies in the United States**

<u>Authors</u>	<u>Subject of the Study</u>	<u>Results</u>
Ravenscraft and Scherer (1989)	<ul style="list-style-type: none"> <li>- Ex ante analysis of the profitability of acquisitions for the targeted corporations</li> <li>- Ex post analysis of operating results</li> <li>- Manufacturing sector in the U.S.</li> <li>- 1957-77</li> </ul>	<ul style="list-style-type: none"> <li>- The targeted corporations (1989) were very profitable ex ante</li> <li>- Ex post profitability of the targeted corporations decreased sharply</li> </ul>
Caves (1989)	<ul style="list-style-type: none"> <li>- Survey of the published studies</li> <li>- Use of ex ante case studies and ex post evaluation</li> <li>- U.S.</li> </ul>	<ul style="list-style-type: none"> <li>- The ex ante case studies showed very slight increases in the value of the stock of the targeted corporations and the purchasers</li> </ul>
Lichtenberg (1992)	<ul style="list-style-type: none"> <li>- The relationship between changes in control of companies, productivity and investment in research and development</li> <li>- U.S.</li> <li>- 1972-81</li> </ul>	<ul style="list-style-type: none"> <li>- Large increase in total productivity of the factors of production after takeovers</li> </ul>
Brown and Medoff (1988)	<ul style="list-style-type: none"> <li>- The effect of acquisitions on corporate wages and employment</li> <li>- U.S.</li> </ul>	<ul style="list-style-type: none"> <li>- Mergers were associated with approximately a four percent decrease in wages and a two percent increase in total employment</li> </ul>
Hall (1988)	<ul style="list-style-type: none"> <li>- The effects of acquisitions on investment in research and development</li> <li>- Manufacturing sector in the U.S.</li> <li>- 1976-85</li> </ul>	<ul style="list-style-type: none"> <li>- No indication that acquisitions result in a reduction in research and development expenditures</li> <li>- Corporations that successfully innovate are the preferred targets of potential purchasers</li> </ul>

corporations decreases after takeovers. Similarly, Caves (1989) concluded that the market share and productivity of acquired corporations declined faster than that of corporations that had *not* been take over.

On the other hand, Lichtenberg (1992) concluded that corporate efficiency improved after takeovers. He examined changes in the total productivity of the factors of production during the seven years before and after takeovers in the manufacturing sector and observed that immediately before takeovers, the total productivity of the factors of production of the targeted corporations was significantly lower than that of other corporations. However, this gap narrowed considerably over time with the result that seven years after the takeovers, the differences in productivity between firms that had been taken over and those that had not were insignificant. These increases in productivity were partly due to a reduction in total employment. Lichtenberg also studied employment that was expressly related to research and development and concluded that there were no significant differences. Finally, his results confirmed that the market share of corporations that have been taken over declines after the acquisition is made.

**Box 5:**  
**Summary of a Few Important Studies in Canada**

<u>Authors</u>	<u>Subject of the Study</u>	<u>Results</u>
Baldwin and Gorecki (1987)	- Analyzes the relationship between acquisitions and productivity - Canadian manufacturing sector - 1971-79	- Takeovers are associated with strong increases in productivity
Baldwin and Caves (1990)	- Examines the effect of takeovers on market share and productivity - Provides data according to the amount of foreign control - Canadian manufacturing sector - 1970-79	- Takeovers result in increases in market share and productivity - The favourable effects noted above increase with the amount of foreign control
Tarasofsky and Corvari (1991)	- Analyzes the relationship between profitability and mergers and acquisitions - Canadian manufacturing sector - 1983-87	- Canadian takeovers do not cause unprofitable use of company assets - Profits remain unchanged after takeovers
Allen (1992)	- Analyzes the performance of companies that were taken over - Canadian manufacturing sector - 1983-87	- The economic performance of companies improves after takeovers - The amount of investment in physical capital and research and development exceeds the sectoral average

Brown and Medoff (1988) also examined the effect of acquisitions on the work force. They concluded that the public's general impression that acquisitions have a negative effect on employment is not true. They studied 200,000 corporations between 1978 and 1984 and found that mergers were associated with about a two percent increase in total employment and about a four percent decrease in wages.

Hall (1988) studied the effect of takeovers on research and development. He examined a relatively limited group of corporations in the manufacturing sector between 1976 and 1985. According to him, corporations that successfully innovate are more often the target of takeover attempts. However, the overall research and development expenditures of corporations that had been taken over did not differ significantly from corporations that had not been taken over.

## Canadian Studies

In Canada, the various studies fail to reach a consensus on the consequences of takeovers. To analyze determining factors, Baldwin and Gorecki (1987) studied the process through which corporations enter the Canadian manufacturing sector. They examined two differing entry processes: acquisitions and the establishment of new plants. They also examined the differences between Canadian-owned and foreign-owned corporations. Although Baldwin and Gorecki did not set out directly to explain the effect of mergers on profitability, they shed some light on the reasons why corporations enter particular industries. They concluded that high profit expectations are more associated with acquisitions than with the establishment of new corporations. However, they only found this to be true for acquisitions by Canadian corporations. Foreign corporations seemed less concerned about profitability. Regardless of whether they entered an industry by creating new plants or through acquisitions, foreign corporations did not react significantly to the growth and profitability variables to which their local competitors seemed so sensitive. These results jibe with the conclusion reached later in this analysis that foreign corporations are motivated to enter industries more by global than by local considerations. We will see below that these "more global considerations" of foreign corporations play an important part in explaining the results that we obtained.

In a more recent study, Baldwin and Caves (1990) examined trends in added value per worker between 1970 and 1979 in corporations that had been the object of mergers or takeovers during that period. They concluded that changes in control were followed by improvements in productivity. Baldwin and Caves also attempted to determine if the presence of a large number of foreign corporations in a particular industry changed the observed results for all industries. They divided their sample into three groups depending on the proportion of shipments made by corporations under foreign control. They concluded that the productivity gains following takeovers were larger in industries with high levels of foreign control, i.e., in industries with shipments majority-controlled by foreign corporations.

The above results are especially interesting when compared with each other. They show how important the selection of performance indicators is in judging mergers and acquisitions. However, they also show how important it is to judge the effects of mergers and acquisitions in a broad, evolving context. Baldwin and Gorecki (1986) pointed out that foreign-controlled corporations do not concern themselves much with the profitability of their mergers and acquisitions, at least in the short run. On the other hand, Baldwin and Caves (1990) claimed that labour productivity increases after takeovers, especially if these takeovers are by foreign corporations.

It is essential to have enough information to adequately judge these increases in productivity. Are they the result of significant reductions in employment? Are they accompanied by corresponding increases in real wages in the corporations? These are important questions in an overall analysis of mergers and acquisitions. The increases in productivity after takeovers should eventually result in greater profitability in the foreign-owned corporations. This could mean that

foreign-owned corporations tend to take a longer-term perspective when evaluating mergers and acquisitions.

Tarasofsky and Corvari (1991) obtained results that were the opposite of those described above. They believe that corporate profitability remains, at best, unchanged after takeovers and, in many cases, actually diminishes. Tarasofsky and Corvari used several different measures of corporate profitability. One was based on stock prices and constituted a measurement of the profit distributed to shareholders. Two other variables were based on accounting measurements of profitability, namely the rate of return on equity and the rate of return on assets. Both measures of profitability produced the same conclusion: takeovers improved profitability in only about 40 percent of cases. In the other cases, profitability remained, at best, unchanged, but usually declined.

The research in Canada and the United States is therefore rather ambiguous about the consequences of mergers and acquisitions. The results are crucially dependent on the measurement of profitability that is chosen, the conceptual framework and the methodology used for the analysis. The following section looks at the conceptual framework used for analyzing the results that follow.

## THE CONCEPTUAL FRAMEWORK

Reasons for mergers and acquisitions are numerous and include:

- to diversify or expand markets;
- to acquire particular production technologies;
- to take advantage of work forces with particular skills; or
- to benefit from "good opportunities" to take over a corporation.

These motives are ultimately related to a common objective: maximizing profit or returns for shareholders.<sup>1</sup>

For the purposes of this research, we assume that all corporate mergers or acquisitions are ultimately motivated by profit maximization. This implies that the managers involved in mergers and acquisitions take necessary and adequate measures to increase the efficiency of their corporate operations. However, these measures can be as varied as they are indirect, and it is important to be able to assess their effectiveness in an evolving environment of profit maximization.

Profit for a given period (month, year, etc.) is defined simply as the difference between total revenues from the sale of a company's goods and services and the costs incurred to purchase the factors of production needed to produce these goods and services over the period in question. In reality, there are many different factors of production, but for the purposes of this study, we assume that there are a limited number: labour, physical capital, technological capital, human capital and the capacity utilization rate.

The inclusion of the capacity utilization rate may seem surprising. In response to changes in their environment, corporations may decide to change their production levels without altering their demand for other factors. Suppose, for example, that the demand for a product declines. If the corporations that supply this product expect the decline to be temporary, they may decide to reduce their capacity utilization rate. This implies under-utilization of all factors of production, including labour. However, this option, which reduces profits in the short-run, could prove beneficial in the long-run. Had the corporation reacted, instead, by cutting jobs, the costs associated with dismissing people and then re-hiring could have been higher than the costs associated with the underutilization of factors. This process would thus generate losses which could be higher than the losses associated with reducing the capacity utilization rate. It therefore appears possible and, in some cases, profitable for corporations to change their capacity utilization rates rather than their demand for other factors of production.

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<sup>1</sup> There is another current in the research based on a different objective than maximizing profits. It assumes that corporate financial transactions aim to maximize the interests of the managers making the acquisitions. Although this research produces some interesting results, we do not emphasize it here.

In order to produce the goods and services they sell, corporations use labour and various stocks of capital in specific proportions. Following a takeover, corporations may decide to change their utilization of various factors of production. For instance, when corporations attempt to re-organize or increase efficiency, they often decide to reduce the number of jobs. This has an immediate impact on productivity and profit.

However, the use of some other factors of production, considered fixed in the short run, can also be modified without having a strong, immediate impact on profit (other than through direct investment costs). Such factors are physical, technological and human capital. In changing their production methods, corporations may decide to change the proportion of each of these capital stocks. They could increase their capital/output ratio by increasing gross fixed capital; they could attempt to strengthen their technological advantages by increasing their investments in research and development; or they could change the skill mix in their work force by increasing their investments in education and job training.

These measures are aimed at changing production processes in order to improve profitability. They only take effect gradually over the long run. In the short run, profit is not necessarily positively affected by these new investments, since only current expenditures are included in calculating profit. Corporations that are restructuring might thus accept a temporary, short-term reduction in profit. That is not to say that the takeover is not profitable. As we saw above, corporations may attempt to increase their long-term profitability by taking a series of measures to change their factors of production, which are considered fixed in the short-run. In this case, the short-term decline in profit is only temporary, and the long-term profit increase is presumably strong enough to compensate for the short-term decline.

In this case, ideally we would be able to determine a corporate profit function or, amounting to the same thing, a cost function in a system that also includes equations for the shares of the factors of production. However, to estimate this equation system, it is necessary to have a large number of variables such as product prices and the prices of all the factors of production, as well as the quantities of the factors, such as the work force employed, physical capital stocks, research and development expenditures, and investment in human resources. In order to be able to estimate a corporation's adjustment process after a takeover, longitudinal data on both corporations would also be needed. Adaptation occurs over a long period, and one would need to be able to observe such variables as profit and the productivity of the factors of production for several years after the takeover.

Unfortunately, the information currently in data banks about corporations involved in takeovers does not make it easy to analyze mergers and acquisitions in such an aggregate, dynamic way. Statistics Canada is developing a new data bank that would merge several sources of data. It would be longitudinal and would include several of the variables mentioned above. However, this data bank is not yet developed to a point where it can be used for research.



The data bank we used is therefore incomplete. Productivity, wages and employment, for instance, were not available. In addition, the time dimension was lacking. We only had access to only two observation points: before and after the takeovers. Under these circumstances, the model we present here is quite limited in comparison with the "ideal" version. It includes only two equations: a profit equation and an investment in research and development equation. *These equations cannot capture the dynamic process that corporations go through in adjusting to takeovers.* They serve, however, to compare the situation before and after the takeovers. Unfortunately, the structure of these equations is determined more by data availability than by a rigorous underlying theoretical framework. The results are nevertheless useful because they enable us to check the "statistical" validity of the preceding statements.

The first equation is for corporate profit. A profit function is normally expressed in value space, that is to say, with the price of inputs and products as arguments. However, these variables are not all available in our database. We will therefore have to rely on a mixed space of quantities and prices.<sup>2</sup> The profit equation looks as follows:

$$\left(\frac{\Pi}{S}\right)_i = \alpha_0 + \alpha_1 \times S_i + \alpha_2 \times \left(\frac{RD}{S}\right)_i + \alpha_3 \times r_i + \alpha_4 \quad (1)$$

where

- $\Pi_i$  represents the profit of corporation i
- $S_i$  total sales of corporation i
- $RD_i$  the research and development expenditures of corporation i
- $r_i$  the real interest rate in corporation i's industry
- $U_i$  the unemployment rate in corporation i's industry
- $D_i$  a dichotomous variable equal to 1 if the company was the object of a merger or acquisition or to 0 otherwise
- $\alpha_i$  the coefficients to be determined for  $i = 1$  to 5.

The purpose of this equation is to analyze the profitability of corporations that were taken over. It is therefore important to use profitability measurements as they are perceived by corporate managers, that is to say, those who make the economic decisions. For this reason, we preferred not to use such measurements as the profit to equity ratio, which is more a concern of shareholders and investors. Two possibilities remained: the ratio of profit to assets or of profit to sales. The ratio of profit to assets depends on corporate production structures, and inter-corporate comparisons are often difficult. Thus, we selected the profit to sales ratio as the dependent variable.

The total sales variable "S" is included in the equation to capture the effects of scale on corporate profit rates. Its coefficient could be positive or negative depending on whether returns

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<sup>2</sup> See Appendix B for a more conceptual presentation of the profit function used.

are increasing or decreasing. Some of the cyclical influences might also be captured by this variable.

The equation also includes a variable for the amount of expenditures on research and development. One would expect the coefficient for this variable to be positive, for there is generally a positive connection between corporate investment in research and development and profitability, at least in the long run. Ideally, therefore the equation should include, for estimation purposes, a variable for the amount of research and development lagged by several periods. However, this research and development variable was only available for one period in our database. We therefore assume that current research and development expenditures are sufficiently correlated with past expenditures to enable us to establish a causal connection between them and profitability.

The interest rate variable represents the cost of capital. This is a real interest rate for a specific industry, i.e., we subtract, from the nominal interest rate, the expected inflation rate in the industry to which the corporation belongs. The real interest rate is, of course, the one that matters in making decisions about physical capital. Similarly, the measurement of profitability is affected by real interest rates, not nominal rates. This variable therefore captures the effects of both the cost of capital and higher product prices on profit.

Finally, the unemployment rate variable is included to capture the possible effects of the business cycle on the industry involved. One would expect this variable to have a negative sign because employment generally increases with economic growth. Under normal circumstances, the unemployment rate declines therefore and profit rises.

On the whole, this equation is not fundamentally different from those used in various studies in the past. While many studies do not have a real profit equation, Ravenscraft and Sherer (1987), for example, developed an equation using various measures of profitability, including the profit to sales ratio. This equation is analytically very similar to ours.

The second equation is also in a mixed space of quantities and values. This function is similar to an equation of demand for capital or investment. It stands for a particular type of investment, namely investment in research and development:

$$\left(\frac{RD}{S}\right)_i = \beta_0 + \beta_1 \times S_i + \beta_2 \times \left(\frac{A}{S}\right)_i + \beta_3 \times \left(\frac{K}{S}\right)_i \quad (2)$$

where  $\beta_i$  represents the coefficients to determined for  $i = 1$  to 6.

This equation includes a variable for the corporation's total sales. It serves to capture the possible effects of economies or diseconomies of scale on research and development expenditures. Most studies we consulted concluded that there are diseconomies of scale. This means that increases in sales are associated with less than proportional increases in research and development

expenditures. In other words, one would expect this variable to have a negative coefficient when related to company sales.

The profit variable captures the possible effects of liquidity on investment in research and development. Higher profit may eventually relieve corporations of their financial constraints and therefore stimulate research and development investment. The presence of this variable in the equation means, however, that the two equations form a simultaneous system. We have already mentioned the possibility that a company's profitability is positively affected by higher expenditures on research and development. We are now considering the possibility that higher profit itself is the reason for higher expenditures on research and development. The estimation, which should take this simultaneity into account, will enable us to highlight the relative importance of this dual influence.

The equation also includes a variable for the amount of capital. The presence of this variable is intended to capture the interdependence effect between the factors of production consisting of physical capital and technological capital. The "theoretically correct" variable to capture this substitution or complementary effect is the price of physical capital. A positive (or negative) relation between the demand for technological capital (approximated by research and development expenditures) and the price of physical capital would mean that these two kinds of capital are substitutes (or complementary). Unfortunately, our database does not include an adequate variable for the price of physical capital. We therefore substituted the amount of physical capital per unit of sales for each company. A positive coefficient would indicate a complementary relationship between these two forms of capital and a negative coefficient would indicate a substitution relationship.

Real interest rates are an important element of the opportunity cost of the funds directed toward research and development. We assume therefore that it provides a useful approximation of that cost in the R&D investment equation. This variable would be expected to have a negative coefficient.

Finally, the equation also includes an unemployment rate variable. As in the profit equation, this variable serves to capture a possible cyclical effect on the amount of research and development expenditures. It is likely that at least part of the research and development expenditures are influenced by cyclical factors. In a period of recovery, for example, when general economic conditions are improving and predictions about the direction of the economy are optimistic, research and development expenditures would be expected to increase, and the coefficient would have a negative sign.

## THE DATA

### Definitions<sup>3</sup>

The database used for this study was developed by Statistics Canada from raw data supplied by Investment Canada on some 400 corporations that had been involved in mergers or acquisitions. This list included the names of Canadian corporations targeted by foreign interests in acquisition requests to Investment Canada. To be included in the sample, the acquisition request had to be accepted by Investment Canada between July 1, 1985 and December 31, 1987.

For that list, Statistics Canada first identified those acquisitions that targeted entire corporations rather than divisions. The purpose was to develop a database composed solely of entire corporations. Corporations that continued to exist after the mergers or acquisitions were also identified. It was preferable for the group of corporations to remain the same throughout the exercise.

After this filtering process, Statistics Canada correlated the list of selected corporations with the corporations in the data bank created from the share-capital property declarations of corporations subject to the *Corporations and Labour Unions Returns Act* (CALURA) and from the financial information that all corporations must provide with their tax returns. This data bank contains some financial variables. We used assets, sales, equity and profit. We also used three ratios: profit to sales, assets to sales and profit to equity. Total research and development expenditures and the ratio of research and development expenditures to total sales came from another data bank.

Statistics Canada measured all the variables mentioned above for two distinct periods: before and after acquisition. In all cases, 1984 was taken to be the year before the acquisition. This means that for those mergers that took place early, i.e., in July or August 1985, the interval was very short between the acquisition and the time when pre-acquisition performance was measured. However, for the rest of the sample, this interval was about two years on average. The year 1988 was taken to be the year after the acquisition. This means, on average, that nearly two years had passed after the merger or acquisition was approved.

Taking just one year for the period before and after the acquisitions is certainly a weakness in our database. Generally, corporate profit rates are sufficiently variable that using just one observation for each period may well limit how representative it is. A number of the studies we looked at used average observations over, for example, five years before and five years after the takeover. We neither could nor wanted to develop such a database for several reasons. First, our objective was to analyze the behaviour of corporations that kept their own identities after the

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<sup>3</sup> For more details, see the statistical appendix.

takeovers. If we had taken corporations that kept their own identities both five years before and five years after the takeovers, our sample would have been much smaller. In addition, when this database was developed, the only available financial variables were for 1988.

This study aimed to analyze the ongoing adjustment process that targeted corporations go through after takeovers. It was therefore important to be able to examine the behaviour of financial variables for several years after the takeovers in order to follow developments in these corporations. In that respect, the immediate impact of the takeovers and the repercussions over the next few years were equally important. The results of this study must therefore be analyzed in this long-term framework. While future research should obtain these data for other years after the acquisition, analysis of the immediate impact would remain crucial.

The use of single observation points for the periods before and after the acquisitions made it impossible to allow for changes over time in such variables as profitability. However, this inability to take changes into account over time in financial variables was offset by the fact that we had two reference groups of corporations to compare with the targeted corporations. It was therefore possible for us to take inter-industry variations into account.

As a result of the relatively limited number of corporations involved, we had to break up some industries in a special way. To preserve the confidential nature of the data, particular industries were grouped together. The industrial breakdown that we used covered five sectors.

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**TABLE A**  
**Industrial Representativeness of the Initial Sample**

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<u>Industry</u>	<u>Percentage of Corporations</u>	<u>Number of Corporations</u>
Mines	9	12
Manufacturing and construction	51	67
Wholesale and retail trade	22	29
Finance, insurance and real estate	11	14
Services and public amenities	7	9
<b>Total</b>	100	131

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Table A shows the percentage of corporations in each industrial group, as well as the number of corporations according to the industry to which they belonged at the time when the acquisition requests were made. The combined manufacturing and construction sector made up more than half of the corporations in the sample and were over represented in comparison with their contribution to the total production. Twenty-two percent of the corporations were in the

trade sector, eleven percent in the financial sector and eight percent in the service sector. The latter three sectors were under represented in comparison with their contributions to total production.

The list of firms thereby obtained thus forms our first group, identified hereafter as "MA". It consists of corporations that had been the objects of mergers or acquisitions. After the takeover, they were all under foreign control. We then wanted to create a reference group of corporations that had not been the object of mergers or acquisitions during this period and to which the MA group could be compared. Statistics Canada developed two of these groups. They were constructed to have the same industrial and size compositions. It was therefore possible to make comparisons between the groups, "holding constant" the size of the corporations and the industrial structure.

<b>Box 6:</b>		
<b>Table of the Corporate Groups in the Sample</b>		
<b>MA Group</b>	<b>CC Group</b>	<b>FC Group</b>
<ul style="list-style-type: none"> <li>- Industrial representativeness corresponds to the sample</li> <li>- Representativeness of the size of the corporations in the sample</li> <li>- Canadian or foreign control becoming foreign control</li> <li>- Change in control between 1985 and 1987</li> </ul>	<ul style="list-style-type: none"> <li>- Industrial representativeness corresponds to the sample</li> <li>- Representativeness of the size of the corporations in the sample</li> <li>- Canadian control</li> <li>- No change in control between 1985 and 1987</li> </ul>	<ul style="list-style-type: none"> <li>- Industrial representativeness corresponds to the sample</li> <li>- Representativeness of the size of the corporations in the sample</li> <li>- Foreign control</li> <li>- No change in control between 1985 and 1987</li> </ul>

The CC group consisted of Canadian-controlled corporations, and the FC group of corporations was solely under foreign control. Comparing the MA group with the FC group therefore isolated the merger or acquisition effect, since ultimate control was foreign in both cases. Comparing the MA and CC groups measured the combined effect of a takeover and a different country of control. Finally, comparing the CC and FC groups was also interesting because it measured the effect of a different control location on the behaviour of corporations that had not been involved in mergers or acquisitions. (In Box 6 we show the differences between these three corporate groups in table form.)

## **Main Characteristics**

In the next section, we examine the data in order to determine their main characteristics. The data are shown in Tables 1 to 8 (at the end of this report) and include the averages that were determined for each group (MA, CC and FC) covered in the database. The tables also include, for reference, the averages for all non-financial corporations according to whether they were Canadian- or foreign-controlled. This data comes from Statistics Canada's CALURA data bank.

It is interesting, first of all, to see our sample in the context of the entire economy. Tables 1 to 4 show that the corporations in our sample were among the largest in Canada. Table 1 shows, for example, that the revenues of the corporations in our database were considerably higher than the revenues for all corporations. While corporations in the MA group had average revenues of about \$131 million, the average for all Canadian-controlled corporations was only \$1.4 million.<sup>4</sup> These orders of magnitude remained the same when other variables were considered such as profit, assets or equity (see Tables 2 to 4). It is important to keep this in mind when analyzing the various results. Although the results are presented and analyzed in relative terms, the possibility of economies of scale could make the differences in the average sizes of the corporations a significant factor.

Let us look now at the data in our sample. The average revenues of corporations in the MA group increased only slightly between 1984 and 1988, namely 8.6 percent. The revenues of Canadian-controlled corporations that had not been involved in mergers or acquisitions (CC Group) increased by nearly 32 percent, and those of foreign-controlled corporations that had not been involved in mergers or acquisitions (FC Group) increased by 12 percent.

Table 10 provides detailed information about revenue trends by industry. It shows that slower revenue growth in the MA group, in comparison with the CC and FC groups, exists in all sectors, with the exception of finance, insurance and real estate.

Profits remained constant in the MA group, increased considerably in the CC group and declined considerably in the FC group. Three sectors in the MA group experienced increases that were quite large, namely manufacturing and construction, commerce and finance. The mining and service sectors, on the other hand, experienced decreases. The profits of corporations in the CC and FC groups experienced similar trends (see Table 11).

The growth in assets between 1984 and 1988, shown in Table 3, was about the same for the three groups of corporations, although it was a little stronger in the MA group. The detailed information on an industry basis in Table 12 shows quite a large increase in assets in the financial, services, and manufacturing and construction sectors.

Finally, the equity growth in the MA group fell between that of Canadian-controlled (CC) and foreign-controlled (FC) corporations. The mining and manufacturing sectors experienced

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<sup>4</sup> To put this in context, the average revenues of the thousand largest companies was nearly \$118 million.

greater increases in the MA group than in the CC and FC groups, while the commerce and services sectors experienced smaller increases.

Tables 5 to 8 show trends in financial ratios rather than the levels of the variables themselves. It should be noted that these ratios were determined by taking the average of the ratios for each corporation in the sample, not by taking the ratio of the average levels shown in Tables 1 to 4. Table 5 and Graph 1 show, first, that there was a general decrease in profitability between 1984 and 1988: the ratio of profit to sales in the three groups decreased considerably during this period. Although the profit margins were positive in 1984, they became negative for the MA and CC groups and about zero for the FC group. *Profit margins decreased the most in the group of corporations that had been the object of mergers or acquisitions by foreign corporations.*

**Figure 1**  
**Ratio of Corporate Profits to Sales**

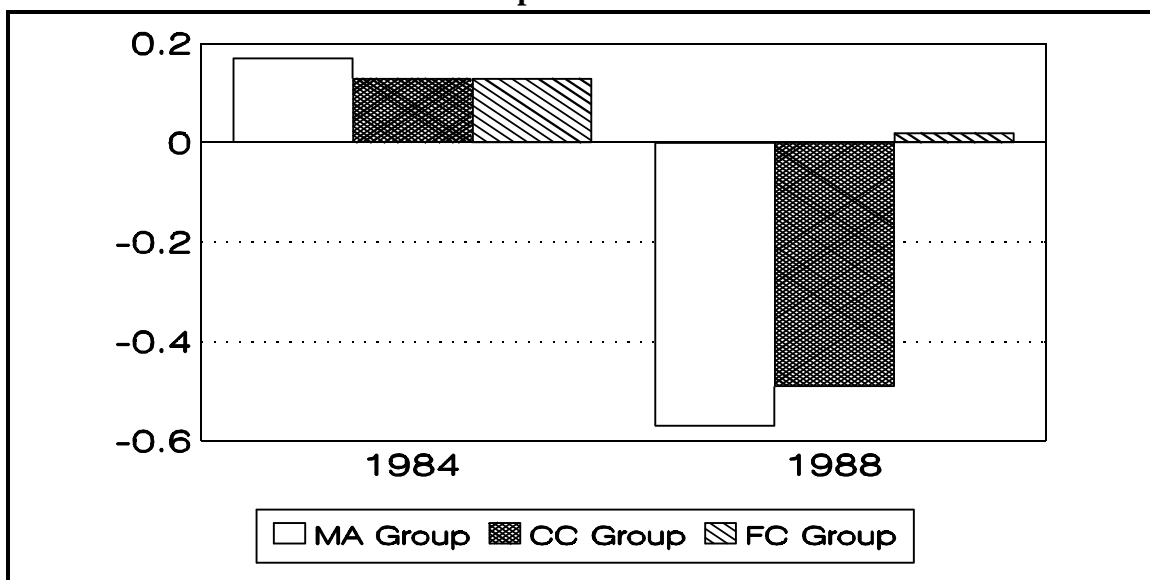
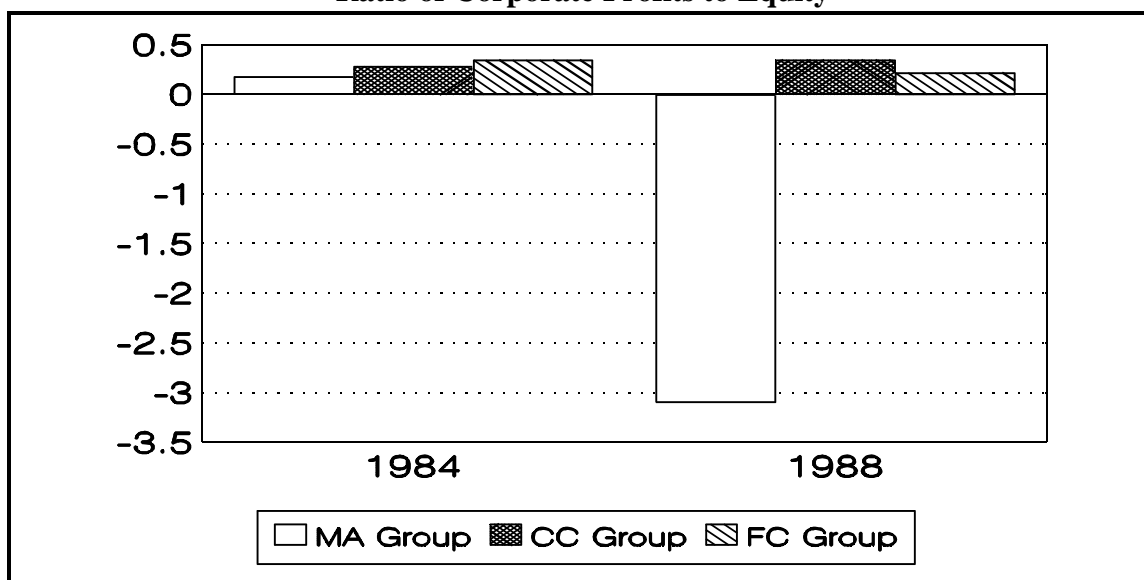


Table 14 provides detailed, industry-wide information about trends in the profit to sales ratio between 1984 and 1988. In the MA group, a decline in the ratio was observed in three of the five sectors: mining, manufacturing and construction, finance, insurance and real estate. Only in the latter two sectors was the decline steeper than in the CC and FC groups.



**Figure 2**  
**Ratio of Corporate Profits to Equity**



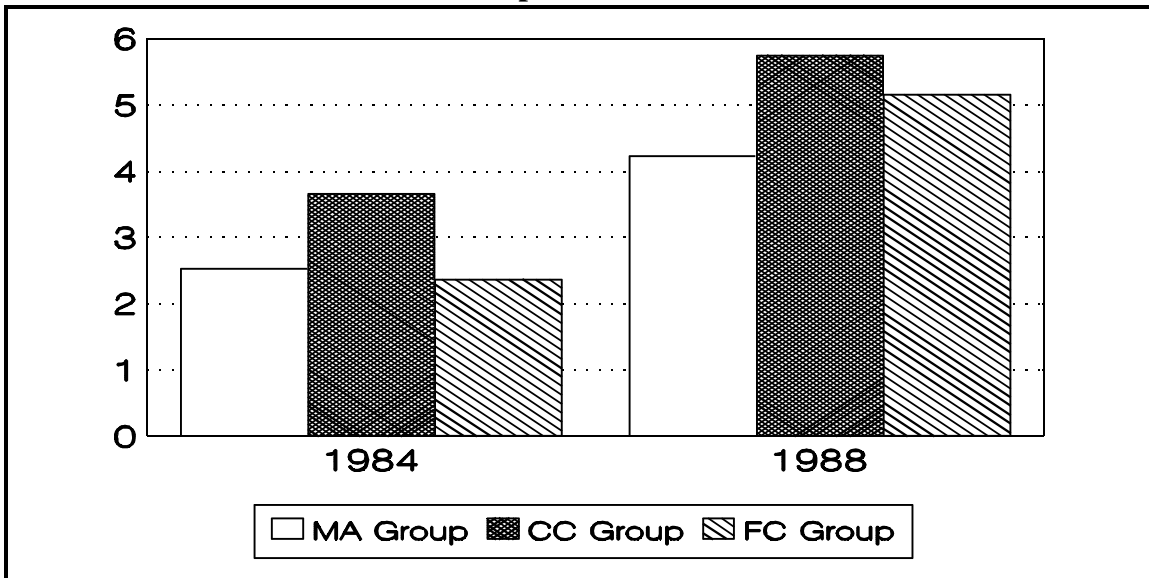
Graph 2 (and Table 6) show trends in another financial ratio, namely the corporate profit to equity ratio. Canadian-controlled corporations saw their ratio rise slightly, while the ratio for those under foreign control declined. *In the MA group, the profit to equity ratio declined much more precipitously.* Table 15 shows that a large part of this reduction in the profit to equity ratio was concentrated in the finance, insurance and real estate sectors. Nevertheless, the other sectors in the MA group were still relatively weak. The profitability of corporations involved in mergers or acquisitions does not seem to improve rapidly after takeover. This, at least, is the impression upon examination of two indicators of short-term profitability: the profit to sales ratio and the profit to equity ratio.

The next two ratios that we examined have more to do with long-term profitability: the corporate assets to sales ratio and the ratio of corporate assets to sales.

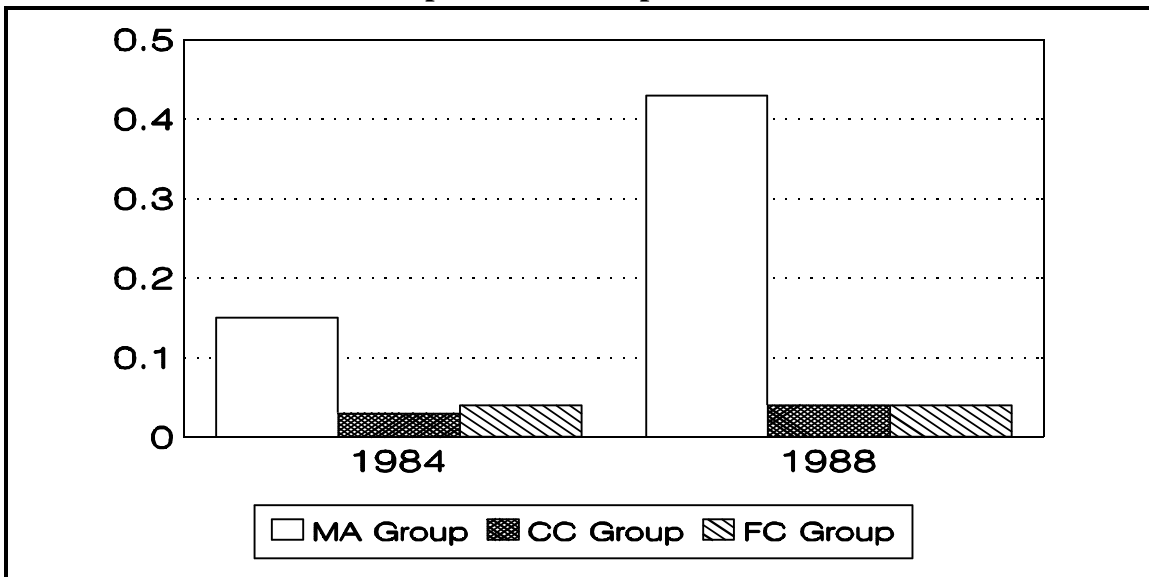
The corporate assets to sales ratio is used as an indicator of investment in physical capital and is shown in Graph 3 (and Table 7). The ratio increased strongly in all three groups, with the biggest increase in the FC group. *The MA group experienced the weakest increase. However, in view of this group's poor performance in regard to profit, the effort devoted to increasing investment in physical capital was the greatest for the group of corporations involved in mergers or acquisitions.*

Table 16 shows that the increase in the ratio of corporate assets to sales was quite well distributed across the industrial sectors. It is interesting to note that, in four of five sectors, the increase in the MA group's ratio placed it second.

**Figure 3**  
**Ratio of Corporate Assets to Sales**



**Figure 4**  
**Ratio of Corporate R&D Expenditures to Sales**



Finally, Graph 4 and Table 8 show the ratio of research and development expenditures to sales for the various groups. This ratio did not diminish for any group. However, *the level of research and development expenditures in the MA group were much stronger initially and also increased much more substantially between 1984 and 1988 than in the other two groups.* Corporations targeted in mergers or acquisitions seem to have a much greater tendency to invest in research and development even before the transaction takes place. Furthermore, the completion

of the transaction seems to accentuate this difference. Although detailed, industry-wide data are not available, the increase in the ratio of research and development expenditures to sales is known to be well distributed among the sectors.

One particular conclusion seems to arise from analysis of these four ratios: the profitability of corporations that merged with or were taken over by foreign corporations was not any greater than that of the two reference groups of corporations not involved in mergers or acquisitions. However, these corporations did make great strides in "long-term investment" in physical capital and especially in research and development.

So far, we have drawn comparisons between the group of corporations that were the objects of mergers or acquisitions by foreign interests and two other groups of corporations that were not involved in these activities. Our database did not contain reference groups of corporations that merged with or were acquired by Canadian corporations. To cover this gap, we developed Table 9 to show trends in various financial ratios for a group of corporations that were taken over by Canadian interests. We should point out, first, that the reference period was not the same as in our sample: the year prior to the acquisitions was 1983 and the year after was 1987. In addition, industry representation and company size were very different from our sample. Nevertheless, the comparison is still interesting.

Table 9 shows that the financial returns of corporations that were taken over by Canadian interests increased considerably after the acquisitions. The profit to sales ratio and the profit to equity ratio increased substantially between 1983 and 1987. On the other hand, investment indicators show, at best, little change. Assets increased only very slightly in comparison with sales, while research and development expenditures decreased slightly in comparison with sales. It appears, therefore, that the behaviour of corporations acquired by Canadian interests was exactly the opposite of the behaviour of corporations acquired by foreign interests.

Corporations acquired by Canadian interests seem to be somewhat myopic in comparison with those acquired by foreigners. This different behaviour might however be partly explained by size differences between Canadian and foreign takeovers in our sample.

The different "vision" between corporations acquired by foreign and Canadian interests could also be due to differences in the vision of the corporations making the acquisitions. For all sorts of reasons that we will not delve into here, Canadian corporations tend to devote much less of their budgets to research and development than corporations in other countries. Acquisitions of Canadian companies by foreign interests may well result in increased research and development expenditures as the targeted companies assume some of the characteristics of foreign corporations. The Investment Canada working paper, *Business Performance Following a Takeover* (1992), showed the same differences in profit and research and development expenditures with regard to corporations taken over by Canadian and foreign interests.

## ECONOMETRIC ANALYSIS

We proceeded with the estimation of the equations described under The Conceptual Framework. The two-stage least-squares method was applied to the system of equations formed by the two individual equations. The observation unit was a vector of variables, as specified in the data definitions. It was defined for a company on a given date. This means that, for all three groups, we started with a few more than 770 observations spread over two years, 1984 and 1988.

First we applied a logarithmic transformation to all the variables. We also made a correction to the initial sample. The distribution of the sample did not follow a normal law: some observations were at the extremities of the distribution and heavily biased it. Because the purpose of this research was to study the behaviour of corporations that continued to operate normally after a takeover, we eliminated two percent of the total number of observations, at both ends of the sample, which were causing this bias. The industrial representativeness of the sample remains similar after this correction is applied to the initial sample.

### **Profit to Sales Equation**

The estimation results are shown in Table 17. Let us look first at the equation for the profit to sales ratio. Several variables that were initially included in this equation proved not significant, for instance, the unemployment rate variable which was included to capture the effect of the business cycle. However, other variables were already linked closely enough to fluctuations in the business cycle, and the unemployment rate variable did not add anything to our measurement of cyclical effects.

A dichotomous variable was also added to capture the effect of takeovers on profit to sales ratios. However, this variable proved not significant. This means that the proposition that takeovers have no short-term effect, whether positive or negative, on profit to sales ratios cannot be rejected.

Two dichotomous variables did prove significant. The first captured the effect of the country in which control was exercised. This variable was "0" if the control was Canadian, and "1" if it was foreign. The results show that Canadian-controlled corporations had profit to sales ratios that were generally lower than those of foreign-controlled corporations. However, we observed earlier that takeovers themselves had no effect on profit. It was therefore not the takeovers that had a positive effect on corporate profit but rather the fact that control belonged to foreign interests. A certain dynamic seems to emerge in the relationship between profit and country of control. Takeovers by foreign interests do not seem to have an immediate positive impact on the profitability of the targeted corporations. However, over several years perhaps, foreign-owned corporations do tend to show greater profitability.

The second significant dichotomous variable captured the effect of the year when the observation was made. Its sign was negative. This means that, taking all the explanatory factors entering the equation into account, the average profit to sales ratio fell between 1984 and 1988. It is possible that this variable is the one actually capturing the effect of the business cycle on the profit to sales ratio.

The elasticity of the profit to sales ratio with respect to research and development expenditures was both positive and significant (0.75 on average for the entire sample). This leads one to think that there is an important connection between a company's research and development expenditures and its profitability. To establish this causal connection, it must be assumed that current research and development expenditures are a good approximation of past research and development expenditures. It is, of course, unrealistic to think that research and development expenditures can have a positive impact on profit during the same period. In general, it takes several periods before the benefits of research and development expenditures can be realized in the form of higher profit. If data were available, it would be interesting to replace the current research and development variable with the sum of all expenditures, past and present. The probable result would be coefficients showing an increasing, then decreasing importance of research and development expenditures.

The estimated elasticity of the profit to interest rates ratio was negative and significant. This reflects the interpretation of this variable as an approximate measure of the cost of capital. Increases in the cost of capital are reflected in short-term reductions in profitability.

Finally, the elasticity of the profit to sales ratio in comparison with total sales was not significant.

### **The Research and Development Expenditures to Sales Equation**

Table 17 also shows the results of the equation for the ratio of a corporation's research and development expenditures to its total sales. Several variables proved not significant in this case as well. For instance, the cyclical unemployment rate variable had no significant effect on profit rates, nor did the dichotomous variables of the country of control and the year. The ratio of a corporation's research and development expenditures to sales tends therefore to be rather stable over time.

However, the coefficient of the dichotomous takeover variable was significant. It will be remembered that this variable was "0" if a takeover occurred and "1" otherwise. The variable's sign of the coefficient meant that corporations that had been taken over experienced, on average, higher investments in research and development than those that had not been taken over. This confirms what was observed earlier about the main characteristics of the data.

The effect of takeovers on research and development expenditures may seem surprising. Most of the other studies we looked at indicated that there was, at best, no relationship between takeovers and research and development expenditures. However, we should remember the

particular nature of our sample. The corporations were very large and were already under foreign control or passing under it between 1985 and 1987. As was mentioned above, these two peculiarities may well explain the different behaviour of the corporations in our sample involved in mergers or acquisitions.

The next two coefficients for sales and assets should be interpreted together. The equation for the ratio of research and development expenditures to sales should theoretically include capital intensity and not the amount of assets as an independent variable. Since the equation was estimated using the logarithm of the amount of assets, we must add and subtract 0.05 multiplied by the logarithm of the amount of sales to obtain the equation set forth above. The results showed positive elasticity for the amount of research and development expenditures in comparison with the amount of capital. This tends to indicate that the stock of physical capital and investment in research and development are two factors that are used in a complementary way in production.

The elasticity of investment in research and development in comparison with total sales remained negative at  $-0.01$  (i.e.,  $-0.06 + 0.05$ ). Total research and development expenditures increased with rising total sales, but less than proportionally. There were therefore economies of scale that could be taken advantage of when investing in research and development.

The elasticity of interest rates was positive and significant. This contradicts the interpretation that interest rates are an approximation of the opportunity cost of the funds devoted to research and development. It is possible that the positive elasticity of interest rates was the result of a combined effect. The results of Equation 1 indicate, in fact, that if interest rates rise, profit immediately falls. In an attempt to offset this effect on profit, corporations may increase their expenditures on research and development. However, it is difficult to confirm this hypothesis, since the profit variable itself was not significant in the research and development expenditure equation.

This econometric analysis confirms the main conclusions of the previous data analysis. The profitability of corporations involved in mergers or acquisitions remains, at best, unchanged over the short run. The profit to sales ratio does not react immediately to takeovers. However, expenditures on research and development are affected positively by takeovers. These results support the hypothesis that the corporations in our sample that were merged or acquired tended to adopt a more long-term strategy by investing more in physical and technological capital.

## CONCLUSIONS

From the examination of the data, one observes the following two phenomenon:

- The short-term profitability of corporations is not positively affected by takeovers by foreign interests. The profit-to-sales ratio declined sharply immediately following the takeovers. The profit to equity ratio also declined.
- Corporations that had been taken over intensified their investments in physical capital or research and development.

These observations point to an interesting corporate-adjustment process after takeovers by foreign interests. Immediately after takeovers, corporations adopt a more long-term perspective and invest in physical or technological capital. In so doing, they are prepared to accept a short-term decline in profitability.

The results of the econometric analysis do not contradict these hypotheses. Indeed, we found that:

- The coefficients of the first equation, the profit to sales ratio, indicate that takeovers do not appear to have any immediate effect on corporate profitability. The post takeover decline for the MA group can be mostly explained by cyclical factors.
- The country of control of the corporation, whether it is Canadian or foreign, is having a significant impact on profitability, to the advantage of the foreign-controlled corporation.

It is therefore possible that, at the time when foreign interests take control of a Canadian corporation, profitability remains relatively unchanged or even declines. However, in the longer run, as the new "corporate culture" transfers to the newly acquired corporation, profitability increases and eventually surpasses the average for all Canadian-controlled corporations. This process of transferring the corporate culture can take several forms, including investment in human resources, such as training, and in technology.

- The equation for the ratio of research and development expenditures to sales confirms that investment in research and development increases after such takeovers.

We should recall here another result obtained when comparing our sample with that of another study which dealt with corporations taken over by Canadian interests. In contrast to takeovers by foreign interests, takeovers by Canadian interests result in higher profitability and lower investment in capital and research and development in the targeted corporations after acquisition. These results seem to indicate that there is a different "culture" in foreign- and Canadian-owned corporations.

This research shows, in our view, the importance of analyzing the consequences of mergers and acquisitions over time. The low profitability of the targeted corporations in the first months and years after the takeovers would be the result of a period of adjustment during which the two working cultures can get to know each other and learn how to co-operate. In addition, the corporation taking over has to take time to get to know and use profitably all of the various assets it has acquired.

Corporate assets are increasingly intangible. The internalization and technological competence theories outlined in this paper suggest that a desire to acquire intangible assets may be an important motive in acquisitions.

In order for corporations to profit fully from these intangible assets, they need time and investments, often complementary, in physical capital and research and development. The research results obtained here are certainly compatible with our interpretation of these internalization theories and the evolving adjustment that necessarily results.

The results of our research support even greater liberalization of foreign investment. The competitiveness of the entire Canadian economy improves if the long-term profitability of particular corporations increases as a result of the intervention of foreign interests which are able to make investments thanks to their greater size, their financial resources, their patience and more long-term perspective, their complementary assets and the synergies that result.

Future research in evaluating the adjustment of firms to takeover could be built on some of the weaknesses already identified in this research. It would be helpful, in particular, to have to have the database augmented with several additional years of observations before and after the takeovers. If it is true that the acquiring corporation is ready to accept short-term declines in profitability in order for investments to be made and long-term profitability increased, then the data should enable us to observe this adjustment process.

The relatively limited number of takeovers left us with a sample whose distribution did not reflect the norm. It was therefore difficult in some cases to draw clear, unequivocal conclusions. It is essential to increase the number of takeovers in our initial sample. This would make it possible to improve the representativeness of the sample and extend more easily the period of analysis before and after the takeovers.

In addition, the limited number of variables available did not enable us to analyze all the aspects of the adjustment process that corporations go through after being taken over. It would be helpful to increase the number of variables on the economic behaviour of corporations (to include for instance the number of employees, training data and productivity data) in order to be able to analyze all the aspects of the adjustment process more effectively.



## **APPENDIX A DESCRIPTION AND LIMITS OF THE DATA SET**

### **Description of the Data Set**

A list of foreign acquisitions of Canadian corporations approved by Investment Canada between July 1, 1985 and December 31, 1987 was provided to Statistics Canada. This list was checked using information collected under the *Corporations and Labour Unions Returns Act* (CALURA).

The information from the CALURA data bank showed that, in 11 cases, the approved acquisition never took place and in 127 cases, it pertained to only part of the legal entity making up the corporation. In all cases, the original legal entity continued to exist and was not absorbed by the foreign purchaser. In 115 cases, the acquired corporation was merged into the foreign-owned corporation and ceased to exist as a legal entity. In addition, two corporations were taken over twice during the three-year period of the study. In 131 cases, the legal entity that was taken over continued to exist as a legal entity after the acquisition. These 131 corporations were the group that we studied.

### **Financial Characteristics of the Corporations**

For the 131 corporations in the study, a connection was established with the government tax files for the years 1984 and 1988. The tax data provide only a limited view of the main financial characteristics of all corporations active in Canada. Four characteristics were pulled out for the years 1984 and 1988.

#### **Main Financial Characteristics**

##### *Assets*

These are the total assets on corporate balance sheets. They include such items as cash balances, exchangeable securities, accounts payable, inventory, net fixed assets, investments in affiliated corporations and other kinds of assets.

##### *Equity*

This reflects stockholder participation in the net assets of a corporation. It generally includes the total amount of issued and paid-up share capital, undistributed profit and other surplus accounts, such as initial and capital surpluses.

### *Sales*

In the case of corporations in non-financial sectors, "sales" represents gross revenues from non-financial operations. In the finance, insurance and real estate sector, "sales" represents total revenues from both financial and non-financial sources.

### *Profit*

The net value of all book profits and losses. This includes extraordinary items. The amount of profit is determined before deduction of income taxes.

### *Research and Development*

The 131 corporations were connected to the research and development database kept by the Services, Science and Technology Division of Statistics Canada.

Expenditures on research and development were collected as part of a Statistics Canada study and were looked at for 1984 and 1988.

Expenditures were considered to be on research and development if they pertained to:

- systematic research in the natural sciences or engineering based on experiments or analysis and conducted for scientific or commercial progress;
- original research conducted in a systematic way in order to acquire new knowledge; or
- the application of research results or other scientific knowledge to creating new or substantially improved products or processes.

In general, expenditures were considered to be on research and development if they complied with the definition of "scientific research and experimental development" in the *Canada Income Tax Act*. For a more detailed description of research and development, see *Statistics on Industrial Research and Development*, publication no. 88-202 of the Statistics Canada catalogue.

### **Industry Classification**

The corporations in this study were classified according to the Standard Industrial Classification (SIC) of 1960, in their entirety in particular industries, according to the activities that produced most of their gross revenues, even though the large corporations may have been involved in several different industrial categories. As a result of reorganizations, corporations might be reclassified into other industrial categories. To maintain the integrity of our analysis, we used the SIC corresponding to the 1984 data. We were forced to

amalgamate the industries into large groups for reasons of data confidentiality. The large groups or industrial sectors used in this study were:

- agriculture, forestry, fishing and mining;
- manufacturing and construction;
- the wholesale and retail trade;
- finance, insurance and real estate; and
- services and public amenities.

### **Selection of Reference Groups**

The study attempted to determine if the acquisitions approved by Investment Canada had any particular characteristics in comparison with all other corporations. However, the 131 selected corporations were not representative of all corporations from the points of view of size, industrial distribution, longevity or rate of return. As a result, they could not be compared with all other industries. In addition, the selected corporations were themselves quite disparate in size and rate of return, and the variables diverged from the norm in ways that were not in keeping with normal distribution. The deviations were biased, with large tails. For these reasons, we decided that the comparative analysis would be based on matched samples and non-parametric techniques.

The reference groups were designed to be as similar as possible to the group of corporations that had been taken over. The two matched reference groups had the following characteristics:

- The matched corporations were active throughout the entire five years covered by the study (1984 to 1988).
- The matched corporations had not been the objects of acquisitions, transfers or takeovers during the period in question.
- Crown corporations were excluded.
- The matched corporations had the same SIC (at a three-figure level of aggregation) in 1984 as the corresponding corporations that had been taken over.
- The matched corporations belonged to the same asset cohort in 1984 as the corporations that had been taken over. These asset cohorts were:
  - less than \$1 million;
  - from \$1 million to \$25 million;
  - from \$25 million to \$50 million;
  - from \$50 million to \$100 million; and
  - more than \$100 million.

- Two matched groups were established: one comprised solely Canadian-controlled corporations and another comprised solely foreign-controlled corporations.
- If more than one corporation fit the characteristics outlined above, the matched corporation was chosen at random among those that fit.

**Warning**

Analysis showed that around 70 percent of the 131 corporations registered an absolute variation of more than 100 percent in one or another of their financial variables over the period under study. In addition, the direction of the changes was not uniform. Some of these corporations were substantially restructured after being acquired, while others benefited from fresh injections of capital. Still others had some of their assets assigned or transferred to subsidiaries.

## APPENDIX B ANALYSIS OF THE PROFIT FUNCTION

Corporate profit was defined as the difference between revenues from the sale of goods and the cost of producing these goods. The profit identity looked as follows:

$$A = P \times Y - w \times L - r_k \times K - r_{rd} \times RD \quad (3)$$

where  $\Pi$  represents profit  
 $P$  the cost of production  
 $Y$  production  
 $L, K$  and  $RD$  purchases of the labour, physical capital and research and development inputs  
 $w, r_k$  and  $r_{rd}$  the cost of labour, capital and research and development.

Since it is an identity, this expression of profit can not be estimated. We used it instead to derive the profit equation containing the parameters to be determined. Let us assume the existence of a production function relating inputs to outputs and possessing normal continuity and concavity. Solving the problem of profit maximization under the constraints of the production function makes it possible to obtain functions for product supply and demand for the following factors:

$$\begin{array}{ll} L = L ( p , w , r_k , r_{rd} ) & w = w ( L , K , RD , Y ) \\ K = K ( p , w , r_k , r_{rd} ) & r_k = r_k ( L , K , RD , Y ) \\ RD = RD ( p , w , r_k , r_{rd} ) & r_{rd} = r_{rd} ( L , K , RD , Y ) \\ Y = Y ( p , w , r_k , r_{rd} ) & p = p ( L , K , RD , Y ) \end{array}$$

The four equations on the left-hand side are the supply and demand functions expressed in value space. This is the way these equations are usually presented. The four equations on the right-hand side are duals of the equations on the left. They express the supply and demand functions in quantity space. They can be considered marginal evaluation functions of the quantities supplied and demanded.

The profit maximization function can be obtained by substituting, in the profit identity, the functions of supply and demand—or of marginal evaluation—shown above. It is therefore possible to obtain a profit function expressed in value space, i.e., prices, or in quantity space. It is also possible, by substituting sometimes one and then the other, to obtain a mixed profit function. This is what we decided to do. The profit equation in this study came from substituting, in the

profit identity, capital demand and product supply equations and marginal evaluation functions of labour and research and development.

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## **TABLES**

**TABLE 1**  
**Average corporate revenues, by group and country of control, 1984 and 1988**  
(in thousands of dollars)

	1984	1988	Δ%
<b>MA Group</b>	120,870	131,314	8.6
<b>CC Group</b>	98,354	129,739	31.9
<b>FC Group</b>	123,843	138,931	12.2
<b>Total, Canadian Control</b>	1,359	1,454	7.0
<b>Total, Foreign Control</b>	47,761	50,498	5.7

**TABLE 2**  
**Average corporate profit, by group and country of control, 1984 and 1988**  
(in thousands of dollars)

	1984	1988	Δ%
<b>MA Group</b>	8,118	8,172	0.7
<b>CC Group</b>	8,371	11,072	32.3
<b>FC Group</b>	12,764	11,043	-13.5
<b>Total, Canadian Control</b>	67	88	31.3
<b>Total, Foreign Control</b>	4,214	3,529	-16.3

**TABLE 3**  
**Average corporate assets, by group and country of control, 1984 and 1988**  
(in thousands of dollars)

	1984	1988	Δ%
<b>MA Group</b>	133,750	174,155	30.2
<b>CC Group</b>	126,377	161,251	27.6
<b>FC Group</b>	106,542	137,910	29.4
<b>Total, Canadian Control</b>	1,287	1,317	2.3

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<b>Total, Foreign Control</b>	34,211	44,015	28.7
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**TABLE 4**

**Average corporate equity, by group and country of control, 1984 and 1988**  
(in thousands of dollars)

	1984	1988	Δ%
<b>MA Group</b>	55,621	69,553	25.0
<b>CC Group</b>	62,388	88,806	42.3
<b>FC Group</b>	53,761	64,283	19.6
<b>Total, Canadian Control</b>	403	461	14.4
<b>Total, Foreign Control</b>	15,995	19,421	21.4

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**TABLE 5**

**Ratio of corporate profit to sales, by group and country of control, 1984 and 1988**

	1984	1988	Δ
<b>MA Group</b>	0.17	-0.57	-0.74
<b>CC Group</b>	0.13	-0.49	-0.62
<b>FC Group</b>	0.13	0.02	-0.11
<b>Total, Canadian Control</b>	0.04	0.06	0.02
<b>Total, Foreign Control</b>	0.08	0.07	-0.01

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**TABLE 6**

**Ratio of corporate profit to equity, by group and country of control, 1984 and 1988**

	1984	1988	Δ
<b>MA Group</b>	0.18	-3.10	-3.28
<b>CC Group</b>	0.28	0.35	0.07
<b>FC Group</b>	0.35	0.22	-0.13
<b>Total, Canadian Control</b>	0.16	0.18	0.02
<b>Total, Foreign Control</b>	0.26	0.19	-0.07

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**TABLE 7**  
**Ratio of corporate assets to sales, by group and country of control, 1984 and 1988**

	1984	1988	Δ
MA Group	2.54	4.23	1.69
CC Group	3.66	5.75	2.09
FC Group	2.37	5.16	2.79
<b>Total, Canadian Control</b>	0.95	0.87	-0.08
<b>Total, Foreign Control</b>	0.73	0.77	0.04

**TABLE 8**  
**Ratio of corporate R&D expenditures to sales, by group and country of control, 1984 and 1988**

	1984	1988	Δ
MA Group	0.15	0.43	0.28
CC Group	0.03	0.04	0.01
FC Group	0.04	0.04	0.00
<b>Total, Canadian Control</b>	0.015	0.016	0.001
<b>Total, Foreign Control</b>	0.009	0.012	0.003

**TABLE 9**  
**Financial ratios of corporations that were the objects of mergers or acquisitions by Canadian corporations, 1983 and 1987**

	1983	1987	Δ
Ratio of Profit to Sales	0.02	0.06	0.04
Ratio of Profit to Equity	0.07	0.21	0.14
Ratio of Assets to Sales	0.72	0.77	0.05
Ratio of R&D Expenditures to Sales	0.0035	0.0026	-0.0009

**TABLE 10**  
Average corporate revenues, by group and country of control, 1984 and 1988, according to industrial group  
(in millions of dollars)

	Mining			Manufacturing and Construction			Wholesale and Retail Trade			Finance, Insurance and Real Estate			Services and Public Amenities		
	1984	1988	Δ%	1984	1988	Δ%	1984	1988	Δ%	1984	1988	Δ%	1984	1988	Δ%
<b>MA Group</b>	205	103	-49.8	99	116	17.17	212	235	10.9	30	91	203.3	30	26	-13.3
<b>CC Group</b>	60	37	-38.0	89	121	35.7	175	238	35.9	27	46	71.5	89	110	23.1
<b>FC Group</b>	260	159	-38.9	104	134	29.0	202	240	18.4	14	17	27.7	29	39	33.9
<b>Total, Canadian Control</b>	3	3	-	1.7	2	17.6	1.6	2	25.0	-	-	-	0.9	0.8	-11.2
<b>Total, Foreign Control</b>	59	33	-44.1	71.3	80.2	12.5	31.8	43	35.2	-	-	-	15.5	13.0	-16.1

**TABLE 11**  
Average corporate profit, by group and country of control, 1984 and 1988, according to industrial group  
(in millions of dollars)

	Mining			Manufacturing and Construction			Wholesale and Retail Trade			Finance, Insurance and Real Estate			Services and Public Amenities		
	1984	1988	Δ%	1984	1988	Δ%	1984	1988	Δ%	1984	1988	Δ%	1984	1988	Δ%
<b>MA Group</b>	50	-0.3	-100.6	3.9	10.6	171.8	2.4	4.3	-44.19	7.6	15.9	109.2	2.5	1.8	-28.0
<b>CC Group</b>	11	1.7	-84.5	7.1	10.1	42.3	1.5	10.6	606.7	3.4	6.9	102.9	41.0	35.7	-12.9
<b>FC Group</b>	78	16	-79.5	8.5	13.5	58.8	4.2	7.0	66.6	1.4	8.1	478.6	5.1	6.0	17.6
<b>Total, Canadian Control</b>	0.4	0.5	25.0	0.07	0.01	42.9	0.06	0.06	-	-	-	-	0.07	0.07	-
<b>Total, Foreign Control</b>	18	3	-83.3	5.2	6.8	30.8	0.75	1.5	50.0	-	-	-	2.0	1.1	-45.0

**TABLE 12**  
Average corporate assets, by group and country of control, 1984 and 1988, according to industrial group  
(in millions of dollars)

	Mining			Manufacturing and Construction			Wholesale and Retail Trade			Finance, Insurance and Real Estate			Services and Public Amenities		
	1984	1988	Δ%	1984	1988	Δ%	1984	1988	Δ%	1984	1988	Δ%	1984	1988	Δ%
<b>MA Group</b>	621	713	14.8	75	101	34.70	70	76	8.60	179	316	76.50	47	73	55.30
<b>CC Group</b>	233	188	-19.3	86	129	51	111	150	35.1	88	154	75.9	367	381	3.9
<b>FC Group</b>	383	575	49.9	79	97	23.3	93	116	25.2	76	57	-25	37	64	73.7
<b>Total, Canadian Control</b>	11.0	9.0	-18.2	1.3	1.5	15.4	0.7	0.8	14.3	-	-	-	1.5	1.4	-6.7
<b>Total, Foreign Control</b>	103	129	25.2	46	60	30.4	13	22	69.2	-	-	-	15.9	17.2	8.2

**TABLE 13**  
Average corporate equity, by group and country of control, 1984 and 1988, according to industrial group  
(in millions of dollars)

	Mining			Manufacturing and Construction			Wholesale and Retail Trade			Finance, Insurance and Real Estate			Services and Public Amenities		
	1984	1988	Δ%	1984	1988	Δ%	1984	1988	Δ%	1984	1988	Δ%	1984	1988	Δ%
<b>MA Group</b>	221	274	23.6	35	49	40.00	41	35	-14.60	56	72	28.60	18	28	55.60
<b>CC Group</b>	111	114	3.1	47	63	34.7	45	74	65.3	31	49	60.4	204	343	68
<b>FC Group</b>	228	245	7.5	40	53	34.1	38	47	22.2	34	22	-33.3	16	38	139
<b>Total, Canadian Control</b>	5.0	4.0	-20	0.5	0.6	20	0.2	0.2	-	-	-	-	0.4	0.4	-
<b>Total, Foreign Control</b>	47	57	21.3	23	29	26.1	4.5	8	77.8	-	-	-	6.2	6.2	-

**TABLE 14**  
**Ratio of corporate profit to sales, by group and country of control, 1984 and 1988, according to industrial group**

	Mining			Manufacturing and Construction			Wholesale and Retail Trade			Finance, Insurance and Real Estate			Services and Public Amenities		
	1984	1988	Δ	1984	1988	Δ	1984	1988	Δ	1984	1988	Δ	1984	1988	Δ
<b>MA Group</b>	0.27	-3.01	- 3.28	0.10	-0.25	-0.35	0.02	0.04	0.02	0.75	-1.70	- 2.4 5	0.07	0.14	0.07
<b>CC Group</b>	0.31	-5.85	- 6.16	0.06	0.00	-0.06	0.16	0.06	-0.10	0.26	0.25	- 0.0 1	0.08	0.04	-0.04
<b>FC Group</b>	0.28	0.04	- 0.24	0.08	0.09	0.01	0.07	-0.08	-0.15	0.21	1.01	0.8 0	0.28	0.24	-0.04
<b>Total, Canadian Control</b>	0.11	0.17	0.06	0.04	0.07	0.03	0.03	0.03	-	0.13	0.17	0.0 4	0.08	0.09	0.01
<b>Total, Foreign Control</b>	0.31	0.10	- 0.21	0.07	0.08	0.01	0.02	0.03	0.01	0.12	0.20	0.0 8	0.13	0.09	-0.04

**TABLE 15**  
**Ratio of corporate profit to equity, by group and country of control, 1984 and 1988, according to industrial group**

	Mining			Manufacturing and Construction			Wholesale and Retail Trade			Finance, Insurance and Real Estate			Services and Public Amenities		
	1984	1988	Δ	1984	1988	Δ	1984	1988	Δ	1984	1988	Δ	1984	1988	Δ
<b>MA Group</b>	-0.05	-0.09	- 0.04	0.18	0.22	0.04	0.19	0.21	0.02	0.25	- 27.86	- 28.1 1	0.34	0.13	- 0.21
<b>CC Group</b>	0.09	-0.22	- 0.31	0.41	0.21	- 0.20	0.14	0.91	0.77	0.18	0.39	0.21	0.29	0.15	- 0.14
<b>FC Group</b>	0.11	-0.71	- 0.82	0.23	0.21	- 0.02	0.46	0.39	s- 0.07	0.19	0.46	0.27	1.75	0.70	- 1.05
<b>Total, Canadian Control</b>	0.08	0.10	0.02	0.15	0.22	0.07	0.25	0.27	0.02	-	-	-	0.17	0.17	-
<b>Total, Foreign Control</b>	0.38	0.06	- 0.32	0.22	0.23	0.01	0.17	0.18	0.01	-	-	-	0.32	0.18	- 0.14

**TABLE 16**  
**Ratio of corporate assets to sales, by group and country of control, 1984 and 1988, according to industrial group**

	Mining			Manufacturing and Construction			Wholesale and Retail Trade			Finance, Insurance and Real Estate			Services and Public Amenities		
	1984	1988	Δ	1984	1988	Δ	1984	1988	Δ	1984	1988	Δ	1984	1988	Δ
<b>MA Group</b>	3.40	9.68	6.28	0.85	2.29	1.44	0.46	1.25	0.79	13.93	15.07	1.14	1.43	2.70	1.27
<b>CC Group</b>	22.30	21.32	-0.98	1.05	3.16	2.11	0.59	6.63	6.04	7.01	5.57	-1.44	2.11	1.59	-0.52
<b>FC Group</b>	4.35	14.92	10.57	0.96	1.24	0.28	1.14	2.94	1.80	9.44	18.24	8.80	1.31	4.35	3.04
<b>Total, Canadian Control</b>	3.26	3.13	-0.13	0.76	0.80	0.04	0.42	0.40	-0.02	7.09	7.56	0.47	1.70	1.67	-0.03
<b>Total, Foreign Control</b>	1.75	3.88	2.13	0.64	0.75	0.11	0.40	0.51	-0.11	5.08	6.06	0.98	1.03	1.35	0.32



**TABLE 17**  
**Results of estimations, two simultaneous equations<sup>1</sup>**

	<u>Equation for the Profit to Sales Ratio</u>		<u>Equation for the R&amp;D Expenditures to Sales Ratio</u>	
	Parameter	Statistic t	Parameter	Statistic t
<b>Constant</b>	-1.85	(-2.62)	0.19	(1.84)
<b>Sales</b>	-0.04	(-0.58)	-0.06	(-4.85)
<b>Assets</b>	-	-	0.05	(3.37)
<b>Real Interest Rates</b>	-0.14	(-4.69)	0.01	(2.33)
<b>R&amp;D Expenditures to Sales Ratio</b>	6.21	(4.03)	-	-
<b>Dichotomous Variable, Country of Control (foreign control = 1)</b>	0.36	(1.82)	-	-
<b>Dichotomous Variable, Takeover (takeover = 1)</b>	-	-	0.13	(2.98)
<b>Dichotomous Variable, Year (1988 = 1)</b>	-0.56	(-4.03)	-0.03	(-0.74)
<b>Overall Statistics:</b>				
<b>N</b>	574		574	
<b>R<sup>2</sup></b>	0.06		0.05	
<b>Value of F</b>	8.68		7.17	

<sup>1</sup> All variables are expressed as natural logarithms except the R&D expenditures to sales ratio which is expressed as a level.