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Canadian Firm Turnover:
Why Regional Industrial Adjustment Patterns Differ.

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This analysis compares patterns of industrial adjustment in Québec, Ontario, and the rest of Canada over the 1978 to 1986 period. This is done in the aim of testing whether or not industrial adjustment varies significantly from region to region.

The analysis begins with a review of the recent literature concerning firm turnover. This is helpful in standardizing the methodology of the analysis concerning the appropriate measures of firm turnover, the length of the time period used to calculate them, and the level of industrial aggregation (two-digit vs. four-digit) among other factors.

Patterns of firm turnover are compared for Québec, Ontario and the rest of Canada. Firm entry, exit, volatility, turnover and net-entry are used, with breakdowns by size, ownership and the industry of operation of the firm.

The hypothesis, that industrial adjustment is different between provinces, is tested first with an F-test which compares provincial standard deviations in the turnover measures. An analysis of variance is then presented. This is followed by regression analysis and a chow test to examine the distinction between the three regions.

The final part of the analysis presents the theoretical reasons behind the initial hypothesis that industrial adjustment differs from region to region. Two main factors are cited in this respect. The first is the actual difference in the economic environment between regions. This stems from the different economic, political and institutional factors which make up each region. A second factor is the uneven distribution of entrepreneurial talents between regions.

RESUME

Le but de cette étude est de vérifier si l'adaptation industrielle s'est faite d'une façon distincte au Québec par rapport à l'Ontario et le reste du Canada entre 1978-1986. L'intèrêt de cette question relève des analyses faites en vue de mesurer l'impact du libre-échange sur le Canada. Dans la plupart de ces études, cet impact était calculé au niveau national, et simplement réparti par province en tenant compte de la proportion de chaque industrie dans les provinces. Ce système utilisé suppose que l'adaptation industrielle est constante en dépit de l'emplacement de l'entreprise, hypothèse qui n'est pas très réaliste quand on pense aux différents environnements économiques dans lesquels baignent actuellement les differentes régions du Canada. La sur-chauffe de Toronto et la stagnation économique de plusieurs régions de Terre-Neuve peuvent servir d'exemple.

Pour en vérifier l'hypothèse (que l'ajustement industriel se réalise d'une façon distincte entre les différentes régions), nous avons comparé cinq mesures d'adaptation. Ces mesures sont les taux d'entrée, de sortie, de volatilité, de roulement et d'expansion nette des compagnies.

Dans un premier temps, nous avons comparé ces cinq mesures dans les trois régions suivantes: Québec, Ontario et le reste du Canada. Cette comparaison a indiqué que le Québec est distinct du reste du pays sous plusieurs angles. En terme de grandeur des entreprises, le Québec a la plus grande proportion de petites compagnies (firmes), ce qui n'est pas très avantageux lorsqu'on sait que les petits compagnies sont les moins stables. En même temps, c'est le Québec qui a subi la plus grande perte de compagnies de taille moyenne et grande.

En termes de propriété, le Québec avait la plus basse proportion de compagnies étrangères. Ceci semble indiquer que l'investissement étranger était dans cette periode 1978-1986 moins vibrante au Québec qu'ailleurs. Par le fait même, le Québec se trouvait plus dépendant des compagnies domestiques (qui, elles aussi, sont plus volatiles que les

compagnies étrangères).

En termes de croissance économique, le Québec a expérimenté une croissance nette négative tandis que l'Ontario et le reste du Canada en ont experimenté une positive.

Dans l'analyse statistique, nous avons premièrement comparé les écarts types de ces cinq mesures d'adaptation en utilisant un F-test. Ce test a indiqué que les taux moyen de roulement des compagnies du Québec comparativement à l'Ontario et le reste du Canada n'ont pas été différents d'une façon significative.

Après cela, nous avons entrepris une analyse de variance sur les mesures d'adaptation industrielle (en divisant les effets par province, par grandeur de compagnies, par industrie dans laquelle elle fonctionnait et par proprieté). Cette analyse a montré que la province était souvent une source significative de variation. Et de façon plus spécifique, l'effet provincial était une source significative de variation dans les taux de sortie, roulement et volatilité.

Pour vérifier notre hypothèse, comme dernier test, nous avons utilisé un Chow test. Pour y arriver, il a fallu une analyse de régression, premièrement sur tout l'échantillon et par la suite sur chaque province séparement. Les résultats de ce test nous ont amené à rejeter l'hypothèse nulle, à savoir que les coéfficients étaient les mêmes dans chaque region. La nullité de l'hypothèse s'appliquait spécialement aux équations sur la sortie et la volatilité (à un niveau de confiance de 1%) et aux taux d'entrée nette (à un niveau de confiance de 10%).

Nous avons déduit à partir de ces résultats que l'adaptation industrielle s'est faite d'une façon distincte entre l'Ontario, le Québec et le reste du Canada. En affirmant ceci, nous avons cité deux facteurs possibles qui pourraient expliquer le phénomène.

Le premier est la différence de facteurs économiques, politiques et institutionels caractérisant chaque region. Ceci peut susciter un environment économique très différent dans un même pays. Dans ce cas, il serait normal que les compagnies aient une manière diiférente de s'adapte dû a la non-similarité du climat.

Le deuxième se trouve dans l'inégalité de concentration de l'activité économique, ce qui implique aussi la distribution inégale du talent entrepreneur entre les régions.

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LIST OF ABREVIATIONS

FTA	Free Trade Agreement
MSE	Minimum Efficient Size (of plant)
OLS	ordinary least squares
ALU	Average Labour Unit
Cdn	Canada
FIRA	Foreign Investment Review Agency
NEP	National Energy Program

abreviated industry names:

Food	Food, beverage, & tobacco products
Leather	Leather, textiles, knitting, & clothing
Wood	Wood and furniture
Paper	Paper and allied
Printing	Printing, publishing & allied
Prim Metal	Primary metal industries
Metal Fab.	Metal fabricating
Machinery	Machinery industries except electrical
Transport	Transportation Equipment
Electrical	Electrical products
Non met mi	Non-metallic mineral products
Rubber	Rubber, plastics, petroleum, & chemicals
Misc.	Miscellaneous manufacturing

DEDICATION

to my Father

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INTRODUCTION

With the signing of the free trade agreement (FTA) between Canada and the U.S. comes the necessity to accurately forecast the inherent industrial adjustment which is expected to accompany it. At the national level there has been an abundance of literature, giving witness to avant garde general equilibrium modelling encompassing the more realistic assumptions (for the Canadian economy) of imperfect competition and economies of scale (Harris and Cox, 1984). However, the shortcoming in this research has been the analyses of the regional impacts of free trade.

Forecasts of regional impacts of the FTA have generally used national forecasts of industrial adjustment, or national elasticities, which assume that each region would be affected depending on the proportion of each industry in that region (Harris and Cox, 1984: Magun et al., 1987; Tremblay, 1985). For example in the Magun study the national impact was disaggregated by province "***using the provincial distribution of output and employment by industry - implicit in the Statistics Canada Regional Input-Output Model...***" [1]. Tremblay's model, and the Harris-Cox model use a similar framework for regionalizing the national impact.

Disaggregation of the national impact in this manner amounts to the assumption that industrial adjustment is constant within industries regardless of location, an assumption which William Watson characterized as ***'heroic'*** [2].

The present state of the free trade literature makes it all the more important to test this assumption. If it is found to be a reasonable assumption then this would be one more point in favor of the nationally based regional impacts we have at our disposal. However, if in testing the assumption we find that industries do adjust differently (to external shocks) depending on their location, then this would be an incentive to increase the effort in

developing regional general equilibrium models of the impact of free trade [3].

In this thesis I hope to test just how heroic this assumption is by comparing the industrial adjustment patterns of Québec, Ontario and the rest of Canada over the 1978 to 1986 period. Analysis of variance, regression analysis and a chow test are undertaken in order to compare firm entry, exit, turnover, net-entry and volatility in Québec, Ontario and the rest of Canada. This should give some insight on the factors which could explain some of the differences in regional industrial adjustment.

The first part of the thesis presents a review of the firm turnover and Industrial Organization literature. Part two describes the databank. Part three then compares some measures of firm turnover for Québec, Ontario and the rest of Canada. Firm turnover has often been examined at the national level (see Baldwin and Gorecki (1983), (1987), (1989), and Shapiro and Khemani (1987), among others) however, to our knowledge, this is the first research to undertake a provincial comparison of firm movements. Part four presents the methodology and tests the hypothesis that industrial adjustment differs between provinces by undertaking a decomposition of variance and a Chow test using regression analysis. Part five then summarizes some regional factors which could influence industrial adjustment. This is followed by a conclusion.

of the room for new firms as a result of growth, P is actual firm profitability, B is a vector of entry barriers, and R represents the risk characteristics of the industry.

The problem the authors found with estimating this equation is that N is not exogenous. Since we would expect previous levels of entry to influence it. Two solutions were then proposed to avoid this problem. The first was to add another equation:

$$N_t = b_0 + b_1 S_t + b_3 B_t$$

which now allows N to be exogenously determined by the ratio of sales to MES (S) and barriers to entry (B). We can then estimate both equations using a simultaneous estimation technique. Another solution they proposed was to estimate the reduced form equation:

$$E_t = (a_0 + a_1 b_0) + a_2 G_t + a_1 b_1 S_t + (a_4 + a_1 b_3) B_t + a_3 P_t + a_5 R_t$$

using OLS. The drawback in this case is the interpretation of the coefficients. In the final analysis all 3 methods mentioned above were tested. However, the results were only given for the OLS estimation of the structural equation.

The authors used a number of variables to capture the effects of entry, growth, profitability, barriers to entry, and other factors such as trade on the various dependent variables [4]. The independent variables which they tested as proxies for the number of existing firms included (by industry): the number of unconsolidated firms (1970), the number of foreign-owned unconsolidated firms, R & D intensity, advertising intensity, real growth in domestic production over the period, real growth in imports and exports over the period, the gross rate of return earned by the industry, the ratio of MES to domestic market size, and the four firm concentration ratio.

Other variables included were: a regional dummy variable which was 1 for regional industries; a risk variable (VAR) based on deviations in shipments; trade variables such as

PART ONE REVIEW OF THE LITERATURE

The aim of this section is to review the previous empirical and descriptive studies on firm entry and exit. This review is by no means complete or exhaustive. Rather, we shall examine the major analyses on industrial organization and adjustment, pointing out possible shortcomings and learning from the many innovations and lights they have brought to the subject.

Baldwin and Gorecki (1983):

This is one of the most comprehensive regression analyses of firm entry-exit decisions to have been undertaken to date. The authors used a recently developed data base (from Statistics Canada) which can provide a wealth of micro data at the firm level. This data base uses various statistical sources (such as CALURA, Revenue Canada, The Commission of Employment and Immigration...) in order to track the movements of individual firms over time. They examined firms at the national level for the 1970 to 1979 period. Not only did the study examine entry and exit seperately but also distinguished between the acquisition and divesture processes of firms.

The study's emphasis was placed on : 1) the impact of exports and imports on the turnover process as opposed to domestic demand, and 2) the different turnover experience of domestic as opposed to foreign controlled firms.

The structural equation of their model was given by:

$$E_t = a_0 + a_1 N_t + a_2 G_t + a_3 P_t + a_4 B_t + a_5 R_t$$

where E is the number of entrants, N is the number of firms in the industry, G is a measure

M (proportion of domestic disappearance accounted for by imports as of 1971), and CA (comparative advantage of the industry) and a foreign ownership variable (FO).

They examined 167 four-digit Canadian manufacturing industries. Some of their major results were as follows: 1) domestic firms building new plants did react to the growth variables but **not** to the profitability variables, 2) advertising and R&D expenditure were negative, indicating reduced entry, however these variables were seldom significant, 3) domestic firms responded much more to trade variables than foreign-owned firms, 4) continuing and new firms which created plants tended to respond to variables in the same way, 5) exit was less likely when trade variables were high -this was not true, however, for continuing firms that scrapped a plant- 6) generally, the scrapping process response was different depending on whether it was done by a declining firm or an exiting firm.

Baldwin and Gorecki (1989):

In this article, the authors use the same data base as in their previous article, presenting stylized facts for Canadian manufacturing rather than regression analysis. They begin with an overview of the methodological issues surrounding the firm entry question. For example, they point out the difference between entry-exit rates taken at the 4-digit industry level as opposed to those calculated for the sector as a whole (which do not capture entry or exit between industries within a sector). Time period choices are also shown to be important, leading to three different rates of measurement:

"Entry and exit can be measured by comparing two adjacent points in time using annual data or by using endpoints that are further apart. The first procedure yields instantaneous rates of entry - short run rates; the second provides measures of the cumulative effect of entrants - long run rates. The two can be compared by using the annual equivalent value of the cumulative rate - the value which, when compounded,

gives the cumulative rate."[5]

The OECD, in its comparison of turnover rates, standardized everything to the cumulative rate. Other studies have chosen other measurement techniques. The main concern here is that the measurement technique be clearly stated along with its implications on the rate's interpretation (a point which is not always the case). Ideally, to examine the nature of turnover (i.e. whether it is rapid but short lived, or has a long term impact) both long term and short term rates should be calculated and compared.

The other methodological suggestions made dealt with the units of measurement. They suggested that rates be based on firm rather than plant or factory turnover, since it is the firm which decides whether or not to enter or exit an industry. They also suggested that gross entry and exit be used rather than net rates, since the net measure confounds the analysis of the two adjustment processes (they argue that net entry is a measure of expansion rather than entry). Finally, they suggest that entry by plant creation be distinguished from entry through acquisition, likewise, exit by plant closure be distinguished from divestiture. This suggestion is based on the fact that the divestiture-acquisition process does not affect industry supply as does firm creation or closure.

The paper then goes on to give an excellent description of firm entry and exit in the Canadian manufacturing industries at the 4-digit level and for the sector as a whole, over the 1970 to 1979 period. The main issues examined are entry by firm creation vs. acquisition and exit by closure vs. divestiture. They also compare firms' short term and long term rates of turnover, their average rate of survival, and the relative importance of different adjustment patterns in terms of employment, value added and the number of firms.

Their main conclusions were that: 1) entry through plant birth and exit by plant closure were more common than acquisition and divestiture respectively, 2) firms that entered by plant creation had a high infant mortality rate, with an average span of life of 13 years,

whereas exit rates of merger entrants were more variable, 3) even with a high infant mortality rate, there were still many entrants continuing a decade later, however the post-entry success function was very different between entrants by acquisition (merger) and new firms, and finally 4) size had a considerable role to play in a firm's choice of adjustment (i.e. large firms are more likely to exit by divestiture, while small firms by closure) which is as one would expect.

Shapiro and Khemani (1987):

In this empirical analysis the authors examine the ***"symmetry hypothesis"*** that barriers to entry are also barriers to exit. This now famous hypothesis, stems from Caves and Porter (1976) who emphasized the effects of sunk costs. When costs are both firm or product specific and durable they can be considered as sunk costs, since a firm would have great difficulty reselling this capital if it were to shut down. Therefore these sunk costs are a barrier to exit. Obviously they are also a barrier to entry because they increase entry risk.

The authors tested this symmetry hypothesis empirically in two stages. First they specified the entry and exit equations in terms of logs (ignoring the displacement effects of entry on exit). These equations were written as linear functions of a vector of barriers to entry and exit and incentives to enter and exit respectively. The variables that were used as barriers included an advertising sales ratio, scientists and engineers as a percentage of industry employment, capital requirement to build MES plant, the nominal tariff rate... For the incentive variables they used an average price-cost margin, and the industry growth rate. Finally, in each equation they added a vector of variables controlling for size in terms of shipments, and the regional character of markets.

It is interesting to note that they found a semi-logarthmic specification to be the most appropriate for the data, based on a successful Box-Cox test. This was not the case in

other studies, which generally used actual entry (often standardized by dividing or subtracting it by the number of firms in the initial period). They were also original in the use of a lag structure which assumed that entry response occurs after a lag. The exit equation is similar but with a shorter lag period, which assumed that the exit response of firms to changes in profitability and growth was faster. The results of this estimation showed a great deal of symmetry between barriers to entry and exit, with all the coefficients on the barriers to entry variables being negative in both equations.

However, they found the error terms of the entry and exit equations to be highly correlated (r=.49) suggesting that displacement should be explicitly modeled. Accordingly, in the second stage of their analysis they added a displacement variable to each equation. To proxy this effect they added potential exit to the entry equation and potential entry to the exit equation. Due to high correlation they had to use the logarithm of industry shipments as an instrument for potential exit. Actual entry was used in the exit equation to represent actual displacement.

When these equations were tested the observed symmetry was much weaker, with only multi-plant firms experiencing less exit. The results of the second stage indicated that much exit is the result of displacement.

Schwalbach (1987):

This research examined inter-industry mobility in German manufacturing industries. Entry was modeled as the difference between average pre-entry profits and entry-forestalling profits. This latter variable was in turn written as a function of the height of entry barriers such as economies of scale, product differentiation, R & D intensity, market risk, and strategic entry deterrence (proxied in this case by a Herfindahl index).

The entry equation was tested on 122 four-digit German manufacturing industries

between 1977 and 1982. It is important to note that in this case entry refers only to diversyfing entry by established firms, entry by firm creation is ignored. Entry was measured as the share of production in 1982 by firms which had their base industry in another industry.

Results showed that high price cost margins and economies of scope increase entry. However, only three of the five entry barriers used were significant. Both the R & D intensity variable and the potential for strategic deterrence variable had erroneous signs (with the latter being significant!). This presence of significantly incorrect signs is not surprising since the majority of entry by diversification is typically into industries which closely resemble the initial industry. Given this close resemblance, the traditional barriers to entry will naturally tend to be less important!

The nature of the analysis is interesting but the measure of entry is particularly inappropriate if one wants to measure the impacts of barriers to entry.

Baldwin and Gorecki (1987):

They used the same data set as in their previous article to examine two issues. First, is entry by merger as important as entry by plant creation, and second, do foreign firms respond to entry barriers in the same way as domestic firms?

They found that only one-fifth of entrants occured through mergers between 1970 and 1979, however their share of shipments in 1979 was almost as large as new entrants' through plant creation - which tend to be much smaller. Therefore, entry is more to be feared from diversyfing firms than newly created firms. Their results also showed that foreign firms generally tended to enter by diversification.

They then used regression analysis to examine the factors which influence this entry. Their entry function was identical to Schwalbach's (i.e. entry is a function of the difference

between perceived profitability and the entry limiting profitability, where the latter is a function of standard barriers to entry) with the exception that entry was measured in terms of the actual number of entrants and was divided into foreign and domestic. They also added a vector of variables to capture the room for new firms as a result of growth (such as export growth, import growth, and domestic production growth). They used the standard barriers to entry while adding some interaction terms (such as multiplying the entry barriers by the number of firms in the industry).

They found that entry by merger responded more to trade growth and less to entry barriers. Whereas new firm entry responded more to domestic growth and was negatively influenced by the barriers to entry. This is as one would expect, since, as mentioned above, merger entry is normally into similar industries so that barriers to entry are less pertinent.

With respect to ownership, they found that domestic firms responded to profitability and export growth, whereas foreign firms did not. This can be explained by the fact that operating in a foreign country requires a larger initial investment, compared to local firms. Since foreign firms have greater sunk costs we would expect them to be more hesitant in entering and exiting than domestic firms. They also found that entry barriers were not important for domestic firms and seemed to stimulate foreign firms. Contrary to other studies they did not find any relation between entry and profitability.

Highfield and Smiley (1987):

In this study the authors examined not only microeconomic effects on entry but also macroeconomic influences. This was done in an attempt at determining the macroeconomic climate which stimulates new business activity.

In the first part of their study they analysed the growth rate of aggregate new business

starts from 1947 to 1984. Explanatory variables included, the growth rate of real GNP, the growth rate of real expenditures on new plant and equipment, the change in the unemployment rate, the inflation rate, and the real interest rate. Instead of proposing a structural model the authors employed time series analysis to find the best fitting lag structure.

The evidence was not conclusive, nevertheless the macroeconomic climate found to most favor new business activity was sluggish economic growth! However, most of the variation in aggregate business growth remained unexplained by their model.

At the micro level the authors used the same entry function as that used by Schwalbach and Baldwin and Gorecki. However, their entry variable was unique:

$$\text{Relative entry rate} = \text{entry}_{it} - \text{entry}_{t}$$

where entry_{it} is the number of new firms in industry i divided by the number in existence in the initial period, and entry_{t} is the average entry rate across all industries i for period t. This was used so as to control for economy wide factors which could effect entry. Like Shapiro and Khemani (1987) they used a lagged structure (four of the entry barriers are lagged one year).

They also developed an auto-regressive equation to measure expected profitability, so that profits were assumed to be linearly related to profits in the two previous periods. Their results showed higher rates of entry for industries with higher rates of sales, higher profit and, curiously enough, higher R & D expenditure. This last relationship is stated without any explanation in the analysis, but goes against the traditional view of R & D expenditure as a barrier to entry. In fact, none of the traditional barriers to entry had any significant relation to entry in their estimations. The article is particularly weak in its explanation of the lack of results, that is, they don't mention the possibility of specification

error...

Dunne, Roberts and Samuelson (1988):

This article also presents stylized facts of firm entry and exit patterns, but on US manufacturing industries. Their sample was constructed from individual plant-level data at the four digit industry level, for the census years 1963, 1967, 1972, 1977, and 1982. The plant level panel data was then aggregated to the firm level.

They separated new entrants into new and diversifying firms, where diversification could be through buying production facilities from existing producers or by altering the mix of products manufactured (this latter type of diversification has not been examined in other studies). However, they did not purge their data set of entry and exit due to legal reorganizations, which change the plant's identification number. This measurement error tended to exagerate entry and exit especially among the small plants that are owned by single-plant firms[6]. To correct this they deleted the smallest firms in each industry which produced 1% of that industry's output.

Other problems with their data set were that: it overlooked firms that enter and exit between the 5 year census periods, so it tended to underestimate year over year turnover. The date or method of entry of firms in the 1963 census are unknown. Finally, the data on extremely small plants have been gathered from various other government sources, therefore they are not always strictly comparable.

In their analysis, size of firms was measured in terms of output rather than employment and entry was measured as the ratio of new firms in a given year and industry to all firms in that industry in the initial year.

They examine three main questions. First, does an industry's entry and exit pattern persist over time, second, what is the relationship between entry and exit in an industry at a

point in time, and finally, how is the post entry performance of new firms in terms of their ability to grow and survive.

They found that there were a large number of small firms which entered and exited through plant creation or closure, whereas there were fewer diversyfing firms and these tended to be bigger. This closely resembles what Baldwin and Gorecki found for Canada (1989).

They also examined the correlation beween entry and exit. Their results show a high correlation in average market shares in 20 sectors (.92), and an even higher correlation between entry and exits average relative size (.98). Their results suggest that industry-specific factors affect both entry and exit and this correlation occurs not only at a point in time but persists over time.

Dunne and Roberts (1989):

In this article the authors used the same data base as in the previous article to examine the cross section and time-series variation in industry entry and exit. They examined correlations between industry structure and entry and exit, and the implications of high cross-sectional correlation between entry and exit for measures of net entry and turnover.

Their results showed that the degree of entry and especially exit were fairly stable over time for each industry. Entry and exit were also found to be positively correlated across industries in each time period.

To examine the partial correlation between entry and exit and the characteristics of the manufacturing industries they regressed the industry entry and exit statistics on a set of industry characteristics (which vary over time). For example, they used variables such as real output growth, industry price-cost margin, ratio of capital input to real industry output, the number of firms, and the average size of firm in the industry. The equation was written

in the form:

$$Y_{it} = b_0 + b_t + \sum b_k X_{kit} + u_{it} \quad (1)$$

where Y is the observation on one of the four entry or exit statistics for industry i in period t, and X is a vector of industry characteristics.

They found that industry characteristics which were positively correlated with entry were also positively correlated with exit. They found that industries with high price-cost margins, higher capital intensity, smaller numbers of firms, and larger average firm size tend to have lower rates of both entry and exit - as was the case in other studies.

However, when they modified the structural equation used to allow for ***"industry fixed effects"*** (by allowing the intercept to change between industries) they found that industries do not have equal intercepts. Even after including many of the industry variables which are usually found to be very important in cross-section industry regressions, the inclusion of the industry fixed effects alone increased the adjusted R^2 of the equations by between 80 to 400 percent! Their tests suggest that OLS estimation on cross-sectional industry data without including industry fixed effects is inappropriate.

They also discussed the use of net entry as opposed to the turnover rate. They argued that it is turnover rather than net entry (as used by Baldwin and Gorecki among others) which is a more appropriate measure:

"Because of the high correlation between entry and exit across industries net entry will tend to obscure the underlying differences in entry and exit patterns across industries. It is particularly inappropriate as a measure of the contestability of a market because it fails to distinguish industries in the most important dimension, the degree of producer turnover."[7]

The important conclusion of this article is that even the best industry characteristics available are not adequate in controlling for cross-sectional differences in entry and exit. However, the inclusion of industry-specific effects (i.e. a flexible industry intercept) while relying on panel data at the industry level substantially increases the explained variation. Therefore:

"The alternative direction for estimation of structural models is to rely on panel data at the industry level or time series data for individual industries. In either case the heterogeneity in industry technology and demand can be controlled for."[8]

The former case is precisely the approach taken in this research.

Dunne, Roberts, and Samuelson (1989):

In this article the authors use the same data base as above in order to examine the growth and failure of manufacturing plants in the U.S. between 1967 and 1982. The article is empirical in its approach, examining plant failure rates as well as growth rates for all plants that were in operation at the beginning of each time period (1963, 1967, 1972, 1977, and 1982) and all plants in operation that do not fail.

To test their empirical model they grouped individual plants into cells based on their characteristics (current size, age, 2-digit industry, year of observation, ownership status, and initial size). Three summary measures were then calculated for each cell, such as the cells mean growth rate of plant employment, the variance in the growth rate, and the exit rate. A regression model was then used to examine the pattern of each summary statistic across-cells. The model was written as

$$Y_{ct} = \sum a_i D_i^t + \sum b_k D_k^t + e_t$$

where Y is one the the three summary statistics mentioned above, D_i and D_k are dummy variables to control for the different cell characteristics and e is white noise.

Their results showed that plant growth and failure are systematically related to plant's age, size and ownership type. More specifically they found that exit rates declined with increases in plant size and age, which coincides with what was found in other analysis. Looking only at successful plants they found that their mean growth rate declined with size. When ownership type was considered results showed that single-plant firms' expected growth rates declined with size. Whereas for multiplant firms the expected growth increases with size.

SUMMARY

In summary we can say that reviewing these articles has allowed us to achieve a consensus on some important facets in the analysis of turnover. For example, the actual calculation and measure of turnover is important. It is better to examine entry and exit separately rather than net entry which only gives an indication of expansion, and since entry and exit tend to be highly correlated, net entry tends to change very little across industries. Furthermore, since entry and exit are often highly correlated, measures of turnover and volatility can shed more light on the adjustment process.

The time periods used to calculate these measures are also important. Shorter time periods accentuate turnover, while longer time periods give a better indication of long term adjustment.

Examining firm turnover is more appropriate than plant turnover since it is the firm which is the decision making unit. Examining turnover also in terms of shipments is

important since this indicates what is occuring in terms of returns to scale. For example, if returns to scale are being exploited this would lead to a lower number of more dfficient firms which might be improperly interpreted if one is only looking at the number of firms.

Obtaining control variables to characterize the industry specific effects does not seem to be as important as having panel data on the various industries (Dunne and Roberts, 1989). If one has panel data, the industry dummy variables should be constructed to allow the intercept to change between industries. This has been shown to be the most effective method of controlling for the heterogeneity in industry technology and demand.

With these points in mind we begin the analysis.

PART TWO DATABANK DESCRIPTION

The data used in this analysis was drawn from the same data bank as that used by Baldwin and Gorecki (1983, 1989). It was provided by Statistics Canada's Business Microdata Integration and Analysis Division. This longitudinal data base is a relatively new development resulting from the linkage of Statistics Canada files on business-related surveys, administrative micro data records, and Statistics Canada's Business Register, Revenue Canada, and CALURA. This linkage of business records allows us to follow individual firms over time.

The data bank covers all firms which have issued T4 slips to their employees -whether they are incorporated or not. This criteria tends to capture all but the smallest "one-man" businesses.

The sample enabled us to distinguish four "states" of businesses; whether they were just created, they continued to exist over the period while expanding, they continued to exist while contracting, or they closed down. Our sample covers firms in Québec, Ontario, and the rest of Canada (aggregated as a whole) for the 1978 to 1986 period. It permits us to distinguish businesses by their size (in terms of employment) and ownership.[9]

The three size categories are: small firms which have less than 20 employees; medium sized firms which have 20-99 employees; and large firms which have over 100 employees. Employment in these firms is calculated in terms of Average Labour Units (ALUs) [10], a measure which is accurate to the extent that the individual firm resembles the average firm size and employment behavior of that industry.

The ownership data comes from CALURA, and allows us to distinguish between Canadian, and other foreign owned businesses.

Our sample also allows us to control for the industry of operation, for which we used the two-digit industry breakdown for 13 manufacturing industries. We also examine the

economy as a whole.

Data for the other independent variables was also collected from Statistics Canada. The investment variable is capital expenditure and repair expenditure which was available by industry and province, but only beginning in 1985. R&D expenditure is the average expenditure on R&D over the period, by industry. We also tested a provincial unemployment rate, but this was too correlated with the Québec provincial dummy variable to be used.

PART THREE DESCRIPTIVE STATISTICS

This section of the thesis aims at describing and comparing the turnover experience of businesses in Québec, Ontario and the rest of Canada. In the subsequent section we will verify the significance of some of these observations. We begin first by examining the distribution of businesses in all industries, then the distribution in the manufacturing sector is portrayed. Finally, turnover is examined for the manufacturing sector by comparing measures of entry, exit, net entry, volatility, and turnover for the sector as a whole, and later separately for thirteen 2-digit industries in the sector.

Before beginning the analysis a note of caution should be made concerning the interpretation of the tables. Comparing the number of firms rather than shipments has disadvantages. The major drawback is that returns to scale might be occuring which would reduce firm size (in terms of employment) and/or the number of firms required in an industry, however, this is unobservable when examining only the number of firms.

One should also note that in calculating measures of entry, exit, volatility, turnover and net-entry, the long term approach was used. The long term approach uses the endpoints of the period (in this case 1978 and 1986) in calculating the rates, rather than calculating on an annual basis. As shown by Baldwin and Gorecki (1989), this procedure gives a more accurate measure of the long term movements. Since the data bank tracks individual firms over time, the movement of firms in the interim is reflected in these endpoints.

ALL INDUSTRIES

Table I shows the actual number of businesses in Québec, Ontario, and the rest of Canada, by size, for 1978 and 1986. First, we see that Québec had the largest increase in small businesses (46% from 1978 to 1986) while in Ontario the percentage increase was

37%. A second, and more disconcerting fact is that the number of medium and large sized businesses decreased in Québec over the period.

Table II depicts the same information as Table I but in percentage form. This table shows more clearly the importance of small businesses in Québec. For example, in 1978 small businesses represented 91.7% of all businesses, while in 1986 they represented 94.3% of all businesses. Over the same period the number of medium sized businesses decreased to 4.7% of all businesses (from 6.8% in 1978). While large businesses went from 1.5% in 1978 to 1% of all businesses in 1986.

TABLE I

Number of Businesses in All Industries, by Province and Size (1978,1986).

	Québec		Ontario		Rest of Cdn	
	78	86	78	86	78	86
Small	127130	186484	179382	245845	528141	757767
Medium	9398	9345	12789	13634	35947	37581
Large	2057	1919	3082	3086	7979	7909
Total	138585	197748	195253	262565	572067	803257

TABLE II

Percentage of Businesses in All Industries, by Province and Size (1978,1986).

	Québec		Ontario		Rest of Cdn	
	78	86	78	86	78	86
Small	91.7	94.3	91.9	93.6	92.3	94.3
Medium	6.8	4.7	6.5	5.2	6.3	4.7
Large	1.5	1.0	1.6	1.2	1.4	1.0

TABLE III

Number of Businesses in All Industries, by Province and Ownership (1978,1986).

	Québec		Ontario		Rest of Cdn	
	78	86	78	86	78	86
Canadian	135940	195459	191055	258898	557885	790250
Foreign	2645	2289	4198	3667	14182	13007
Total	138585	197748	195253	262565	572067	803257

TABLE IV

Number of Businesses in the Manufacturing Sector

by Province and Size (1978,1986).

	Québec		Ontario		Rest of Cdn	
	78	86	78	86	78	86
Small	9878	14158	12771	18120	36465	50361
Medium	2829	2341	3245	3033	8338	7476
Large	997	849	1385	1286	3212	2887
Total	13704	17348	17401	22439	48015	60724

There were very similar trends in Ontario and the rest of Canada, however these changes tended to be more pronounced in Québec.

In terms of control, Table III shows the distribution of Canadian-owned and foreign-owned businesses in each province over the period. There was a decline in foreign-owned businesses, from 1978 to 1986 in Québec, Ontario and the rest of Canada. The number of foreign-owned businesses declined from 1.91% of businesses in Québec in 1978 to 1.16% in 1986, compared to 1.4% of businesses in Ontario and 1.62% in the rest of Canada in 1986. So Québec has consistently had the lowest percentage of foreign-owned businesses compared to Ontario and the rest of Canada.

THE MANUFACTURING SECTOR

Now examining just the manufacturing sector, Table IV shows the breakdown of businesses over the period. We notice that there has been a general trend across Canada toward increasing numbers of small businesses and decreasing numbers of medium and large sized businesses. However, Québec, again seems to have undergone a more pronounced change than Ontario and the rest of Canada.

TABLE V

Number of Businesses in Each Province by 2-Digit Manufacturing Industry (1978,1986).

	Québec		Ontario		Rest of Cdn	
	78	86	78	86	78	86
Food	13704	17348	17401	22439	48015	60724
Leather	2901	3499	1455	1881	5254	6523
Wood	2474	3210	2338	3038	7868	9914
Paper	249	289	362	430	961	1102
Printing	1546	2044	2396	3159	5743	7768
Prim Metal	124	160	242	284	577	653
Metal Fab.	1453	1786	3066	3942	6599	8199
Machinery	474	695	1041	1437	2415	3420
Transport	378	444	657	863	1959	2346
Electrical	353	487	654	949	1550	2160
Non Met Mi	451	494	653	634	1941	1964
Rubber	800	1033	1276	1680	3492	4454
Misc.	1040	1628	1518	2240	3845	5909
Total	13704	17348	17401	22439	48015	60724

For example, the number of small manufacturing businesses in Québec increased by 43.3% between 1978 and 1986. The number of medium sized businesses dropped by 17.25%. While large sized businesses decreased by close to 15 %. Both Ontario and the

rest of Canada experienced similar increases in the number of small businesses and a decreased number of medium and large sized business. However, it was Québec that underwent the largest proportionate change.

Whether this general movement toward smaller manufacturing businesses is due to a lack of success in manufacturing so that fewer firms have the means to expand, or is rather due to decreasing MES in manufacturing (given technological improvements in computer added design...) remains to be seen in future analysis, through the use of corresponding data on shipments.

Table V depicts manufacturing by thirteen 2-digit industries. The movement of businesses over the period in Québec and Ontario has been very similar with Ontario generally having between 25-50% more businesses in each industry. The exceptions to this trend occured in the leather, textile, knitting and clothing industry and the wood and furniture industry which are heavily concentrated in Québec. The other exception was the non-metallic mineral products industry which had an increase in the number of businesses in Québec while the number of businesses decreased in Ontario. We will see the implications of these movements for the provincial economies when we examine the turnover experience of these industries below.

ENTRY

The entry measure was calculated as the number of new businesses which entered the economy between 1978 and 1986 divided by the number of businesses which existed in 1978. Table VI shows entry rates by province, size of business, and ownership. From this we see that on average Québec, Ontario and the rest of Canada had very similar rates (.3257 for Québec compared to .3286 for Ontario and .3452 for the rest of Canada). The rates for this period were lower than rates found (over the shorter time period, 1977-1982)

in the U.S. (Dunne, Roberts, and Samuelson, 1988, p.503) where the average entry rate was found to be .408.

In terms of size the rates do differ more. Small Québec businesses had the highest rate of entry (.6461). In the medium sized category, Québec had the lowest rate of entry (.1707). While among the large sized firms Québec had the highest rate of entry (.1666). This seems to indicate that the Québec economy was characterized by a large number of entrepreneurs starting up very small businesses, few medium sized business entrants, and even fewer large business entrants but that the latter are relatively higher than the number of entrants occuring in Ontario or the rest of Canada.

TABLE VI

Entry by Province, Size, and Ownership

	Québec	Ontario	Rest of Cdn
Small	.6461	.6282	.6428
Medium	.1707	.1980	.2107
Large	.1666	.1456	.1526
Foreign	.1759	.2041	.2044
Canadian	.4679	.4468	.4716
Provincial Average	.3257	.3286	.3452

N.B. Entry was calculated as the number of new firms which entered the economy between 1978 and 1986 divided by those that existed in 1978.

In terms of ownership we see that there were few foreign-owned firms that decided to start up in Québec (.1759) relative to Ontario (.2041) and the rest of Canada (.2044). This follows from the fact that the level of foreign direct investment in Québec declined over the period. We shall examine the cause of the lower foreign investment below.

Table VII shows the breakdown of entry rates for individual manufacturing industries, by province. For Québec the machinery industry received the highest rate of entry followed by the primary metal and electrical products industries. Whereas in Ontario

the transportation equipment industry had the highest entry rate (of close to 50%) followed also by primary metal. The food, beverage, and tobacco industry received low entry in both Québec and Ontario. However, the real loser in terms of entry for Ontario was the non-metallic mineral products industry.

TABLE VII

Entry by Two-Digit Industry, by Province (1978-1986).

	Québec	Ontario	Rest of Cdn
Food	.2359	.2265	.2226
Leather	.3163	.3756	.4081
Wood	.3012	.2796	.3326
Paper	.2790	.3289	.3145
Printing	.3416	.2771	.3914
Prim Metal	.3833	.3954	.3127
Metal Fab.	.2502	.2368	.2751
Machinery	.4185	.3625	.4406
Transport	.3224	.4834	.2634
Electrical	.3739	.3747	.4898
Non Met Mi	.2880	.2150	.2441
Rubber	.3439	.3447	.3608
Misc.	.3830	.3600	.4693

EXIT

The exit measure was calculated as the number of businesses which left the

economy over the period, divided by the number which existed in 1978. Refering to Table VIII we see that average exit rates did tend to differ between provinces. Québec had the highest exit rate (.3410). This was lower than the U.S. average rate for the manufacturing sector, which was found to be .372 (Dunne, Roberts, and Samuelson, 1988, p.503).

In terms of firm size, small businesses in Québec had a higher exit rate than those in Ontario. While medium and large sized businesses in Québec had higher exit rates than those in Ontario and the rest of Canada.

This implies that although there were more small businesses which entered the economy in Québec (as we saw above), there were few who succeeded in remaining in operation. Medium and large sized firms also seem to have had less success in Québec over the period than in Ontario and the rest of Canada. The transition matrices in Tables IX and X lend support to the hypothesis that businesses in Québec have higher failure rates. Comparing these two tables we see that 42.8% of small firms in Québec were successful over the period 1978-1986, whereas 46.3% succeeded in Ontario. The percentage of medium and large sized firms which continued to exist over the period was also higher in Ontario than Québec. We shall examine the factors behind the lack of successful businesses in Québec below. Nevertheless, the fact remains that this high rate of exit is not a healthy symptom for the province's economy.

In terms of ownership, there was also a high exodus of foreign-owned firms in Québec, although in this case the rate was only marginally higher than the exit experienced in Ontario.

TABLE VIII

Exit by Province, Size, and Ownership (1978-1986).

	Québec	Ontario	Rest of Cdn
Small	.4573	.4266	.4872
Medium	.3042	.2897	.2969
Large	.2616	.1950	.1841
Foreign	.2986	.2907	.3097
Canadian	.3834	.3168	.3357
Provincial Average	.3410	.3038	.3227

N.B. Exit was calculated as the number of firms that have exited between 1978 and 1986 divided by the number that existed in 1978.

TABLE IX

Transition matrix of Québec firm turnover between 1978 and 1986 by size (for all industries).

	Small	Medium	Large
No. of firms 1978	122844	2758	183
No. that continued	52608	1514	86
(%)	(42.8)	(54.9)	(46.9)
No. that exited	70236	1244	97
(%)	(57.2)	(45.1)	(53.1)
No. of new firms	129123	1144	24
(%)	(105.1)	(41.5)	(13.1)

TABLE X

Transition matrix of Ontario firm turnover between 1978 and 1986 by size (all industries).

	Small	Medium	Large
No. of firms 1978	172925	3531	182
No. that continued	80085	2091	95
(%)	(46.3)	(59.2)	(52.2)
No. that exited	92840	1440	87
(%)	(53.7)	(40.8)	(47.8)
No. of new firms	157837	1458	32
(%)	(91.3)	(41.3)	(17.6)

TABLE XI

Exit by Two-Digit Industry, by Province (1978-1986).

	Québec	Ontario	Rest of Cdn
Food	.3698	.3165	.2951
Leather	.4229	.3063	.3569
Wood	.3811	.3266	.4776
Paper	.2841	.3122	.3231
Printing	.2866	.2900	.2098
Prim Metal	.2906	.3133	.3694
Metal Fab.	.3343	.2729	.3207
Machinery	.3559	.2967	.3121
Transport	.3797	.2944	.3620
Electrical	.3539	.3294	.2717
Non Met Mi	.3914	.3473	.3810
Rubber	.2852	.2603	.2422
Misc.	.2977	.2830	.2735

Looking at exit rates for the individual manufacturing industries, Table XI shows high exit occurring in the leather, textile, knitting and clothing industry (especially for Québec), the non-metallic mineral products sector and the wood & furniture industry. Contrary to what Dunne and Roberts (1989) found for the U.S., our sample shows little correlation between entry and exit. For example, in both provinces the industries which experienced the least exit were the paper and allied industry, and the rubber, plastics, petroleum and chemicals industry, whereas their entry rates tended to be higher (for

example, rubber had the fifth highest entry rate in Québec). Whether this was due to the presence of particularly high barriers to exit in these industries or because they experienced above average growth remains to be seen.

TURNOVER

Turnover is measured as entry plus exit. It is an indicator of the movement in and out of an industry. Dunne and Roberts (1989) preferred this statistic to net-entry, since net-entry tends to hide the difference between industries (if entry and exit are correlated) whereas turnover accentuates this difference. From Table XII we see that Québec businesses had higher turnover than their counterparts in Ontario. For example, the provincial average for Québec was (.6686) compared to (.6368) in Ontario. Although Dunne and Roberts (1989) found an even higher average turnover rate for the U.S. (.739). Québec's small and large businesses also had higher turnover rates than in Ontario, and for large businesses Québec had a higher rate than in the rest of Canada.

Turning to turnover by ownership we see that Québec's foreign-owned firms had the lowest turnover (.4761). Whereas Canadian-owned firms in Québec had the highest rate (.8513) in Canada. This is not surprising since other studies have found that foreign firms tend to diversify or contract faced with changes in demand, rather than enter or exit. This follows from the larger investment it requires for them to start up in a foreign market.

TABLE XII

Turnover by Province, Size, and Ownership (1978-1986).

	Québec	Ontario	Rest of Cdn
Small	1.1117	1.0548	1.1300
Medium	0.4756	0.4877	0.5076
Large	0.4282	0.3455	0.3458
Foreign	0.4761	0.5031	0.5342
Canadian	0.8513	0.7636	0.8073
Provincial Average	0.6686	0.6368	0.6781

N.B. Turnover was calculated as Entry plus Exit.

TABLE XIII

Turnover by Two-Digit Industry, by Province (1978-1986).

	Québec	Ontario	Rest of Cdn
Food	.6057	.5818	.5177
Leather	.7392	.6819	.7792
Wood	.6823	.6062	.8102
Paper	.5631	.6411	.6376
Printing	.6282	.5670	.6431
Prim Metal	.6820	.7087	.7060
Metal Fab.	.5845	.5097	.5958
Machinery	.7744	.6592	.7527
Transport	.7021	.7778	.6254
Electrical	.7278	.7041	.8159
Non Met Mi	.7006	.5623	.6251
Rubber	.6291	.6051	.6030
Misc.	.6807	.6698	.7428

From Table XIII we see that the manufacturing industries in Québec with the highest turnover rates, over the period, were the machinery industry, followed by the leather, textile, knitting and clothing industry and the electrical products industry. The provincial industry with the least turnover was the paper and allied industry. In Ontario the transportation equipment industry had the highest turnover rate, while the metal fabricating industry had the least turnover.

NET ENTRY

The net entry measure is calculated as entry minus exit. This indicates the net impact of turnover on an industry, that is, whether the industry has expanded or contracted due to the flow of businesses in and out of the industry. As Dunne and Roberts (1989) pointed out, this measure can be misleading. They found entry and exit to be highly correlated in each industry in their sample, therefore the net entry varied very little between sectors. It is true that net-entry varied little between industries, but correlation seemed to be much lower in our sample. In any case, net entry does indicate whether the industry is undergoing net expansion or contraction.

Table XIV gives net entry rates by province, size and ownership. On average Québec had a negative net entry rate (-0.0172). Whereas, Ontario and the rest of Canada, experienced positive net entry rates (0.0204 and 0.0123 respectively). Once again, the U.S. average net entry rate was found to be higher, at .033 (Dunne and Roberts, 1989).

All small firms showed a positive net entry, with Ontario having the highest positive net entry (0.2016) followed by Québec (0.1805). Medium and large sized businesses, on the contrary, all experienced negative net entry, with Québec experiencing the largest net loss in the number of businesses in both categories.

In terms of ownership there was a net loss of foreign-owned businesses in all provinces, with the heaviest loss occuring in Québec (-0.1244) compared to Ontario (-.0950). This fact can be partially explained by the federal policies during this period to discourage foreign ownership in Canadian business (for instance FIRA and the NEP). The recession in 1981 is probably another factor behind the decline in foreign direct investment. Canadian-owned firms all showed positive net levels of entry but Québec had the lowest net level (.0844).

TABLE XIV

Net Entry Rates by Province, Size, and Ownership (1978-1986).

	Québec	Ontario	Rest of Cdn
Small	0.1805	0.2016	0.1557
Medium	-.1342	-.0916	-.0862
Large	-.0949	-.0544	-.0406
Foreign	-.1244	-.0950	-.1253
Canadian	.0844	0.1244	0.1358
Provincial Average	-.0172	0.0204	0.0123

N.B. Net entry was calculated as Entry minus Exit.

TABLE XV

Net Entry Rates by Two-Digit Industry, by Province (1978-1986).

	Québec	Ontario	Rest of Cdn
Food	-.1339	-.1287	-.0726
Leather	-.1065	0.0693	0.0370
Wood	-.0799	-.0469	-.1450
Paper	-.0050	0.0167	-.0086
Printing	0.0050	-.0129	0.1397
Prim Metal	0.0846	0.0820	-.0805
Metal Fab.	-.0841	-.0360	-.0457
Machinery	0.0627	0.0658	0.1284
Transport	-.0573	0.1889	-.0986
Electrical	0.0200	0.0453	0.1637
Non Met Mi	-.1245	-.1323	-.1368
Rubber	0.0587	0.0844	0.1186
Misc.	0.0853	0.0502	0.1958

The Québec industry that contracted the most over the period was the food, beverage and tobacco industry (Table XV) followed by the non-metallic mineral products industry. This was also the case in Ontario. The strongest sign of expansion was in Québec's miscellaneous manufacturing sector (0.0853) and in Ontario's transportation equipment industry (0.1889).

VOLATILITY

Volatility is a measure developed by Dunne and Roberts. It is calculated as turnover minus the absolute value of net entry. This indicates how much turnover is in excess of changes in demand conditions. As Dunne and Roberts remarked:

"If the volatility rate is high then there is significant producer turnover in excess of what might be reasonably ascribed to changes in demand. Low volatility implied little change in the identity of producers beyond that due to growth or contraction of the overall market."[11]

Table XVI indicates that on average Québec had a higher volatility (.4624) than Ontario (.4481), while the average U.S. volatility rate was once again found to be higher (.583). From what we have seen above it comes as no surprise to find that volatility is highest for small businesses. Here again Québec had a higher volatility (.7618) than Ontario (.6934). Québec medium sized businesses showed lower volatility than in Ontario and the rest of Canada. While in the large firms category Québec had the highest volatility (.3153) compared to Ontario (.2573) and the rest of Canada (.1850).

Among the foreign-owned firms, those in Québec tended to be slightly more volatile than those in Ontario, but in this instance the difference was marginal.

TABLE XVI

Volatility by Province, Size and Ownership (1978-1986).

	Québec	Ontario	Rest of Cdn
Small	.7618	.6934	.8513
Medium	.3160	.3791	.3888
Large	.3153	.2573	.1850
Foreign	.3245	.3239	.3907
Canadian	.5933	.5660	.5804
Provincial Average	.4624	.4481	.4907

N.B. Volatility was calculated as (Entry + Exit) minus the absolute value of Net Entry.

TABLE XVII

Volatility by Two-Digit Industry, by Province

(1978-1986).

	Québec	Ontario	Rest of Cdn
Food	.4082	.3905	.3828
Leather	.4594	.5246	.6079
Wood	.4566	.4193	.5721
Paper	.3964	.4829	.3897
Printing	.4839	.3962	.4660
Prim Metal	.4581	.5162	.5796
Metal Fab	.3675	.3319	.4398
Machinery	.5510	.4287	.5560
Transport	.5067	.5243	.4335
Electrical	.4882	.4466	.6166
Non Met Mi	.4832	.4141	.4673
Rubber	.4677	.4829	.4554
Misc.	.4871	.4601	.4637

In terms of specific industries, Table XVII shows Québec's machinery industry to be the most volatile followed by the transportation equipment industry and the electrical products industry. In Ontario the most volatile industry was the leather, knitting, clothing, and textile industry followed by the transportation equipment industry and the primary metal industry. The least volatile industry in each province was metal fabricating.

SUMMARY

Before beginning the statistical analysis (in order to test the significance of some of these comparisons) we shall summarize some of the main points found from these descriptive statistics. We have seen that Québec had the lowest number of foreign-owned firms, and the lowest entry rate and turnover rate of foreign-owned firms. There was a net loss of foreign-owned firms in all provinces over the period. However, the net loss was higher in Québec than in Ontario. This corresponds with the fact that Québec experienced a decline in foreign investment over the period, and had a growing dependence on domestic firms.

Québec also depended heavily on small firms. It experienced the highest percentage increase in small firms of any province, and had a larger percentage of small firms than Ontario. At the same time Québec underwent the highest percentage decrease in the number of medium and large sized firms.

Québec experienced an average negative net-entry of firms over the period, whereas Ontario and the rest of Canada experienced positive net-entry. Whether this is a sign that the province's economy was in contraction, or was simply due to increasing returns to scale can not be decided since coresponding data on shipments is not available.

A final point with respect to specific industries is that there was a net contraction over the period in a number of industries not only in Québec, but across Canada. These industries included the food, beverage and tobacco products industry, the wood and furniture industry, the metal fabricating industry and the non-metallic minerals industry. This comes as no surprise since these industries are generally known to be declining sectors of the economy. However, there were three other industries which underwent a net contraction in Québec but not in Ontario. These industries included the leather, textiles, knitting and clothing industry, the paper and allied industry and the transportation

equipment industry.

So from this analysis we have seen some of the differences in the trends in entry, exit, net expansion and volatility of domestic and foreign owned firms in Québec and Ontario. In the next section we test whether these differences were significant.

PART FOUR: METHODOLOGY AND STATISTICAL ANALYSIS

METHODOLOGY

The aim of this statistical analysis is to verify whether or not industrial adjustment was different in Québec, Ontario, and the rest of Canada over the 1978 to 1986 period. One would expect them to differ since these provinces under-went very different changes in their political, institutional and economic climate (more on these theoretical aspects below). In this statistical analysis we try to verify whether industrial adjustment differed significantly between provinces, by comparing patterns of entry, exit, net-entry, turnover, and volatility.

The entry equation is written as:

$$ENTRY_i = a_0 + a_1\, RDEXP_i + a_2\, DSM_i + a_3\, DQUE_i + a_4\, DCAN_i + a_5\, INV_i + e_i$$

where ENTRY is measured as above. RDEXP is the average expenditure on R&D over the period (by industry). DSM is a dummy variable which controls for firms with less than 20 employees. DQUE is a dummy variable to control for firms in Québec. DCAN is a dummy variable which equals one for domestic firms and zero for foreign-owned firms, and INV is capital expenditure by province and by industry for 1985. A priori we would expect RDEXP to be negative since it would act as a barrier to entry. DSM should be positive since small firms typically have higher rates of entry. DCAN should be positive since it is easier for domestic firms to enter than for foreign-owned firms. INV should be negative since industries with high levels of capital investment are harder to enter (this follows from the symmetry hypothesis). We also expect DQUE to be positive with higher rates of entry in Québec.

The exit equation is written as

$$EXIT_i = b_0 + b_1\ RDEXP_i + b_2\ DCAN_i + b_3\ DQUE_i + b_4\ DSM_i + b_5\ INV_i + e_i$$

where EXIT is measured as above. In this case RDEXP should also be negative, acting as a barrier to exit. The coefficient on DCAN is expected to be positive since it is less costly for domestic firms to exit than for foreign-owned firms (who have incurred a larger investment in entering the industry). DSM is also expected to be positive due to lower sunk costs and lower competitiveness. INV should act as a sunk cost, thus decreasing exit. We would expect DQUE to be positive, with a larger proportion of firms closing in Québec over the period.

The turnover equation is written as:

$$TR_i = c_0 + c_1\ INV_i + c_2\ DSM_i + c_3\ DCAN_i + c_4\ DQUE_i + e_i$$

where TR is calculated as above. DSM should be positive since small firms tend to enter and exit much more frequently. The same can be said for domestic firms as opposed to foreign-controlled firms. We would expect DQUE to be positive, with Québec firms having experienced higher levels of entry (since the province has a larger proportion of very small firms) and higher levels of exit (given the changes in the institutional, economic and political climat of the province between 1978 and 1986).

Two other equations were tested, which shed a different light on industrial adjustment. The equation for volatility was written as:

$$VOL_i = d_0 + d_1\ DCAN_i + d_2\ DQUE_i + d_3\ DSM_i + d_4\ INV_i + e_i$$

where VOL is measured as above. This equation was used to test whether Québec firms were more volatile than their Ontario counterparts. A priori we would expect them to be more volatile, we would also expect small firms and domestic firms to experience more volatility.

Finally, a net-entry equation was tested as:

$$NER_i = f_0 + f_1 RDEXP_i + f_2 DQUE_i + f_3 DCAN_i + f_4 DSM_i + f_5 INV_i + e_i$$

where NER is also measured as above. RDEXP and INV should be negative, acting as barriers to entry. DCAN and DSM have ambigous signs, since there is no theoretical reason to say that domestic firms or small firms should have experienced net-expansion. However, we would expect Québec firms to have experienced net-contraction over the period.

These equations were first regressed on the whole sample (pooled, and ommitting the Québec dummy variable) to obtain the total residual sum of squares (SS_1) and then for Québec, Ontario, and rest of Canada separately from which we obtain SS_{11} , SS_{12} , and SS_{13} respectively. A Chow test was then calculated in the form:

$$F = ((SS_1 - (SS_{11} + SS_{12} + SS_{13})/k)/(SS_{11} + SS_{12} + SS_{13})/(N_1 + N_2 + N_3 - 3k)$$

(where F is normally distributed with $k, N_1 + N_2 + N_3 - 3k$ degrees of freedom). This was used to test the null hypothesis that the coefficients were the same in all provinces.

STATISTICAL ANALYSIS

The first test which was undertaken to compare Québec, Ontario, and the rest of Canada, was an F-test comparing the standard errors of the five independent variables in each province. This was done without taking into consideration other factors such as size, ownership, or industry, in order to verify seperately the importance of the province of operation (ceteris paribus). Tables XVIII and XIX contain the F-test results for the comparison of Québec-Ontario and Québec-rest of Canada respectively. In Table XXVIII, group 1 is Québec and Group 2 is Ontario. From this table we note generally, that provincial averages are not significantly different. The largest difference in standard deviation between the two provinces occured in the exit rates. The means of the other rates were slightly different between the two provinces, however the differences were not large enough to be significant. This indicates that overall provincial averages of turnover between Québec and Ontario are not significantly different.

TABLE XVIII

F-test Results Comparing the Variance of the Independent Variables in Québec and Ontario

GROUP 1 - DPROV EQ 1.00
GROUP 2 - DPROV EQ 2.00

VARIABLE		NUMBER OF CASES	MEAN	STANDARD DEVIATION	STANDARD ERROR	F VALUE	2-TAIL PROB.
ENTRY	NEW FIRMS DIVIDED BY TTL						
	GROUP 1	76	.3257	.324	.037	1.06	.809
	GROUP 2	76	.3286	.315	.036		
EXIT	BANKRUPTCY DIVIDED BY TTL						
	GROUP 1	78	.3410	.136	.015	1.26	.309
	GROUP 2	78	.3038	.121	.014		
TR	ENTRY PLUS EXIT						
	GROUP 1	76	.6686	.414	.047	1.11	.646
	GROUP 2	76	.6368	.392	.045		
NER	ENTRY MINUS EXIT						
	GROUP 1	76	-.0172	.277	.032	1.04	.852
	GROUP 2	76	.0204	.271	.031		
VOL	TR MINUS ABS NER						
	GROUP 1	76	.4624	.280	.032	1.11	.645
	GROUP 2	76	.4481	.265	.030		

TABLE XIX

F-test Results Comparing the Variance of the Independent Variables in Québec and the rest of Canada

GROUP 1 - DPROV EQ .00
GROUP 2 - DPROV EQ 1.00

VARIABLE		NUMBER OF CASES	MEAN	STANDARD DEVIATION	STANDARD ERROR	* * *	F VALUE	2-TAIL PROB.
ENTRY	NEW FIRMS DIVIDED BY TTL							
	GROUP 1	74	.3452	.315	.037	* *	1.06	.796
	GROUP 2	76	.3257	.324	.037	* *		
EXIT	BANKRUPTCY DIVIDED BY TTL							
	GROUP 1	78	.3227	.164	.019	* *	1.47	.093
	GROUP 2	78	.3410	.136	.015	* *		
TR	ENTRY PLUS EXIT							
	GROUP 1	74	.6781	.424	.049	* *	1.05	.828
	GROUP 2	76	.6686	.414	.047	* *		
NER	ENTRY MINUS EXIT							
	GROUP 1	74	.0123	.262	.031	* *	1.11	.648
	GROUP 2	76	-.0172	.277	.032	* *		
VOL	TR MINUS ABS NER							
	GROUP 1	74	.4907	.336	.039	* *	1.45	.115
	GROUP 2	76	.4624	.280	.032	* *		

In Table XIX, Group 1 corresponds to the rest of Canada and Group 2 is Québec. We see from this table that provincial averages of firm turnover are generally not significantly different between Québec and the rest of Canada either.

The analysis of the variance of these five independent variables was then undertaken in order to determine if the composition factors in the two provinces led to significantly differences in industrial adjustment. In doing this the variance of firm entry, exit, turnover, net-entry, and volatility between Québec and Ontario, was divided into four effects. Variation was broken down first by province, size, industry and ownership, although the industry factor was also significant, the provincial factor was insignificant. The two-way interactions of size and industry, size and ownership, and industry and ownership were also significant. Table XX shows the results of the analysis of the entry measure. This indicates that most of the variance in entry can be contributed to size and ownership, and to a lesser extent to industry.

However, Table XXI shows that in the case of variance in exit rates the provincial dummy is important and significant. Size and ownership of firms are also significant factors in the variance of exit. However, the industry factor is no longer important, indicating that exit was more a result of factors affecting all sectors of the provincial economy rather than changes in the competitiveness of individual industries.

In the variation of turnover (Table XXII) all four factors were significant at the five percent level. In this case all the two-way interaction terms were also significant (except the province-industry interaction effect). Nevertheless, size continued to account for the largest variation.

The analysis of the variance in net-entry is shown in Table XXIII. Once again size is a very inportant factor as well as ownership. The industry effect is also significant. While the provincial effect was only significant at the 17% level. This is not surprising, since the net-entry measure tends to reflect more what is occuring at the industry level.

The analysis of the variance in volatility (Table XXIV) resembles net-entry. Again size and ownership were the most important direct effects, industry was also significant (at the 5% level), while the provincial effect was not significant. However the two way interaction of province and size was very significant. This is due to the fact that small firms, as we saw above, tend to be much more volatile and Québec has a larger share of small firms than other provinces.

The variance in both net entry and volatility (Table XXIII and XXIV respectively) was more related to ownership and size, rather than the province of operation.

The analysis of variance seems to indicate that industrial adjustment differs between provinces mainly due to the different composition in the size of firms, the ownership composition, and the industry composition which characterize these provinces.

TABLE XX

Analysis of Variance of Entry, for Québec and Ontario

	ENTRY	NEW FIRMS DIVIDED BY TTL
BY	DPROV	PROVINCIAL DUMMY
	DSIZE	FIRM SIZE DUMMY
	DIND	INDUSTRY DUMMY
	DCAN	OWNERSHIP DUMMY

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	10.703	15	.714	64.612	.000
DPROV	.001	1	.001	.134	.715
DSIZE	7.232	2	3.616	327.417	.000
DIND	.555	11	.050	4.570	.000
DCAN	2.754	1	2.754	249.359	.000
2-WAY INTERACTIONS	3.681	49	.075	6.802	.000
DPROV DSIZE	.038	2	.019	1.708	.187
DPROV DIND	.166	11	.015	1.369	.202
DPROV DCAN	.008	1	.008	.738	.393
DSIZE DIND	.630	22	.029	2.592	.001
DSIZE DCAN	1.886	2	.943	85.406	.000
DIND DCAN	.507	11	.046	4.177	.000
EXPLAINED	14.384	64	.225	20.351	.000
RESIDUAL	.961	87	.011		
TOTAL	15.345	151	.102		

TABLE XXI

Analysis of Variance of Exit, for Québec and Ontario

	EXIT	BANKRUPTCY DIVIDED BY TTL
BY	DPROV	PROVINCIAL DUMMY
	DSIZE	FIRM SIZE DUMMY
	DIND	INDUSTRY DUMMY
	DCAN	OWNERSHIP DUMMY

SOURCE OF VARIATION		SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS		1.494	15	.100	15.914	.000
DPROV		.055	1	.055	8.717	.004
DSIZE		1.239	2	.620	98.996	.000
DIND		.121	11	.011	1.761	.074
DCAN		.097	1	.097	15.573	.000
2-WAY INTERACTIONS		.473	49	.010	1.541	.039
DPROV	DSIZE	.017	2	.009	1.377	.258
DPROV	DIND	.057	11	.005	.827	.614
DPROV	DCAN	.029	1	.029	4.675	.033
DSIZE	DIND	.148	22	.007	1.076	.388
DSIZE	DCAN	.066	2	.033	5.251	.007
DIND	DCAN	.130	11	.012	1.894	.051
EXPLAINED		1.967	64	.031	4.910	.000
RESIDUAL		.545	87	.006		
TOTAL		2.511	151	.017		

TABLE XXII

Analysis of Variance of Turnover, for Québec and Ontario

	TR	ENTRY PLUS EXIT
BY	DPROV	PROVINCIAL DUMMY
	DSIZE	FIRM SIZE DUMMY
	DIND	INDUSTRY DUMMY
	DCAN	OWNERSHIP DUMMY

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	19.099	15	1.273	82.969	.000
DPROV	.074	1	.074	4.823	.031
DSIZE	14.245	2	7.122	464.110	.000
DIND	.701	11	.064	4.155	.000
DCAN	3.887	1	3.887	253.315	.000
2-WAY INTERACTIONS	3.975	49	.081	5.285	.000
DPROV DSIZE	.101	2	.051	3.296	.042
DPROV DIND	.163	11	.015	.965	.484
DPROV DCAN	.068	1	.068	4.450	.038
DSIZE DIND	.709	22	.032	2.099	.008
DSIZE DCAN	1.836	2	.918	59.813	.000
DIND DCAN	.673	11	.061	3.986	.000
EXPLAINED	23.074	64	.361	23.493	.000
RESIDUAL	1.335	87	.015		
TOTAL	24.409	151	.162		

TABLE XXIII

Analysis of Variance of Net-Entry, for Québec and Ontario

	NER	ENTRY MINUS EXIT
BY	DPROV	PROVINCIAL DUMMY
	DSIZE	FIRM SIZE DUMMY
	DIND	INDUSTRY DUMMY
	DCAN	OWNERSHIP DUMMY

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	5.295	15	.353	18.331	.000
DPROV	.038	1	.038	1.977	.163
DSIZE	2.697	2	1.349	70.020	.000
DIND	.651	11	.059	3.075	.002
DCAN	1.815	1	1.815	94.246	.000
2-WAY INTERACTIONS	4.332	49	.088	4.591	.000
DPROV DSIZE	.009	2	.004	.228	.797
DPROV DIND	.284	11	.026	1.339	.217
DPROV DCAN	.007	1	.007	.339	.562
DSIZE DIND	.847	22	.039	2.000	.012
DSIZE DCAN	2.068	2	1.034	53.699	.000
DIND DCAN	.603	11	.055	2.844	.003
EXPLAINED	9.628	64	.150	7.811	.000
RESIDUAL	1.676	87	.019		
TOTAL	11.303	151	.075		

TABLE XXIV

Analysis of Variance of Volatility,

for Québec and Ontario

	VOL	TR MINUS ABS NER
BY	DPROV	PROVINCIAL DUMMY
	DSIZE	FIRM SIZE DUMMY
	DIND	INDUSTRY DUMMY
	DCAN	OWNERSHIP DUMMY

SOURCE OF VARIATION	SUM OF SQUARES	DF	MEAN SQUARE	F	SIGNIF OF F
MAIN EFFECTS	8.613	15	.574	40.899	.000
DPROV	.019	1	.019	1.359	.247
DSIZE	5.718	2	2.859	203.648	.000
DIND	.317	11	.029	2.054	.032
DCAN	2.523	1	2.523	179.724	.000
2-WAY INTERACTIONS	1.302	49	.027	1.893	.005
DPROV DSIZE	.161	2	.080	5.727	.005
DPROV DIND	.113	11	.010	.734	.703
DPROV DCAN	.001	1	.001	.040	.842
DSIZE DIND	.233	22	.011	.754	.771
DSIZE DCAN	.379	2	.190	13.500	.000
DIND DCAN	.255	11	.023	1.651	.099
EXPLAINED	9.915	64	.155	11.035	.000
RESIDUAL	1.221	87	.014		
TOTAL	11.136	151	.074		

We now present the regression results for the equations which were run to compute the Chow tests. First the whole sample was run (pooled, and leaving out DQUE) to get the pooled residual sum of squares (SS_1). Then the five equations were run seperately for Québec, Ontario, and the rest of Canada, from which we obtained SS_{11}, SS_{12}, SS_{13} respectively.

Tables XXV through XXVIII show the regression results of the pooled and individual regressions. Examining these tables we note that the variables tended to be significant, with correct signs. The small size dummy was positive and significant (at the 5% level) in each of the equations, as expected. The domestic ownership dummy was also positive and generally significant (except for two of the exit equations). Investment was generally negative, although it was not always significant.

The exception to the expected results was the R&D expenditure variable, which was generally positive, and for Ontario it was sometimes significantly so. Schwalback (1987), Baldwin and Gorecki (1983), and Highfield and Smiley (1987), also lacked success in testing R&D as an entry barrier since they also found it to be positive and sometimes significant. This result might be explained by the fact that industries which are able to attract higher amounts of R&D are more vibrant, thus offering better future prospects of expansion and profits. Therefore these industries would tend to attract more entry.

TABLE XXV

Regression Coefficients for Chow Test, Pooled

	ENTRY	EXIT	TR	VOL	NER
RDEXP	.0002[2]	-.0001			.0003[2]
	(.0001)	(.0001)			(.0001)
DSM	.4687[1]	.2018[1]	.6686[1]	.4620[1]	.2686[1]
	(.0254)	(.0141)	(.0291)	(.0220)	(.0289)
DCAN	.2756[1]	.0461[1]	.3144[1]	.2418[1]	.2362[1]
	(.0241)	(.0133)	(.0276)	(.0209)	(.0275)
INV	-.00003	-.00003[2]	-.00005[3]	-.00002	-.0000
	(.00002)	(.00001)	(.00003)	(.00002)	(.00003)
Const.	.0185	.2493	.2896[1]	.1939[1]	-.2381[1]
	(.0233)	(.0126)	(.0247)	(.0187)	(.0266)
$\bar{R}^2$	.6734	.4857	.7430	.7149	.4126
F	116.9	56.1	217.9	189.0	40.5
Durbin W	2.33	1.93	2.47	2.26	1.99

N=234

Significantly different from zero at the 1%[1], 5%[2], and 10%[3] levels.

TABLE XXVI

Regression Coefficients for Chow Test, Québec

	ENTRY	EXIT	TR	VOL	NER
RDEXP	.00014	.0000			.00014
	(.0002)	(.0001)			(.0002)
DSM	.4745[1]	.1744[1]	.6523[1]	.4421[1]	.2969[1]
	(.0457)	(.0226)	(.0488)	(.0314)	(.0534)
DCAN	.2884[1]	.0893[1]	.3755[1]	.2667[1]	.2004[1]
	(.0431)	(.0213)	(.0459)	(.0296)	(.0504)
INV	-.00001	-.00015[1]	-.00014	-.00004	.00013
	(.0001)	(.00005)	(.0001)	(.00007)	(.0001)
CONST	.0086	.2674[1]	.2863[1]	.1878[1]	-.2568[1]
	(.0415)	(.0204)	(.0403)	(.0259)	(.0485)
$\bar{R}^2$	.6688	.5198	.7677	.7895	.3785
F	38.86	21.84	83.63	94.79	12.42
Durbin W	2.30	1.88	2.37	2.09	2.06

Significantly different from zero at the 1%[1], 5%[2], and 10%[3] levels.

TABLE XXVII

Regression Coefficients for Chow test, Ontario

	ENTRY	EXIT	TR	VOL	NER
RDEXP	.0005[2]	.00005			.0005[2]
	(.0002)	(.00009)			(.0002)
DSM	.4614[1]	.1843[1]	.6405[1]	.3775[1]	.2812[1]
	(.0454)	(.0191)	(.051)	(.0369)	(.049)
DCAN	.2501[1]	.0223	.2694[1]	.2457[1]	.2332[1]
	(.0432)	(.0181)	(.0485)	(.0351)	(.0467)
INV	-.0001	-.00007[1]	-.0001	-.00006	.00003
	(.0001)	(.00003)	(.00006)	(.00004)	(.00007)
CONST	.0029	.2512[1]	.2952[1]	.2121[1]	-.2565[1]
	(.0421)	(.0172)	(.0451)	(.0326)	(.0455)
$\bar{R}^2$	.6457	.5658	.7109	.6685	.4395
F	35.16	26.08	62.46	51.41	15.704
Durbin W	2.41	2.20	2.43	2.29	2.30
N	78				

Significantly different from zero at the 1%[1], 5%[2], and 10%[3] levels.

TABLE XXVIII

Regression Coefficients for Chow test, Rest of Canada

	ENTRY	EXIT	TR	VOL	NER
RDEXP	.0001	-.0002			.00023
	(.0002)	(.0001)			(.0002)
DSM	.4698[1]	.2467[1]	.7081[1]	.5641[1]	.2316[1]
	(.0427)	(.0279)	(.0521)	(.0431)	(.0490)
DCAN	.2872[1]	.0258	.3025[1]	.2125[1]	.2720[1]
	(.0408)	(.0264)	(.0498)	(.0412)	(.0469)
INV	-.0001	.0000	-.0001	-.00003	-.00004
	(.00003)	(.00002)	(.00004)	(.00003)	(.00004)
CONST.	.0511	.2419[1]	.3067[1]	.1998[1]	-.2066[1]
	(.0410)	(.0257)	(.0479)	(.0396)	(.0471)
$\bar{R}^2$	.6903	.4991	.7461	.7232	.4126
F	41.68	20.18	72.52	64.58	13.82
Durbin W	2.26	1.94	2.58	2.39	1.67
N	78				

Significantly different from zero at the 1%[1], 5%[2], and 10%[3] levels.

All the F statistics for the regressions were significant, allowing us to reject the null hypothesis that all the coefficients except the constant are equal to zero. The adjusted R^2 statistics were also robust in comparison to those found in other studies, which were often substantially lower. While the Durbin Watson statistic, used to check for first-order serial correlation in the error terms, was always close to two, as one would hope.

The results of the Chow test are shown in Table XXIX. From this table we see that for the exit and volatility equations we can reject the null hypothesis that the coefficients are the same across regions (at a confidence level of greater than 1%). The net-entry equation also hints at a difference in coefficients across provinces, however the confidence level is less reasuring.

So our results, although far from being conclusive (ideally the results should be verified with a wider variety of tests, one of these being the Zellner Sure Test), do seem to support the hypothesis that industrial adjustment did differ between provinces over the 1978 to 1986 period. More specifically, the Chow tests indicate that the factors affecting firm exit and volatility in Québec, Ontario, and the rest of Canada were significantly different.

We shall now examine some of the possible explanations for why these differences exist.

TABLE XXIX

Chow Test Results Comparing Québec, Ontario and the rest of Canada.

	ENTRY	EXIT	TR	VOL	NER
F	.9659	5.621[1]	1.253	3.661[1]	1.609[3]

d.f. 5,219

Significantly different from zero at the 1%[1], 5%[2], and 10%[3] levels.

PART FIVE: REGIONAL FACTORS

In comparing industrial adjustment patterns between provinces we have found significant differences in factors affecting firm exit, volatility and to a lesser extent, net-entry rates. This can be combined with our finding that there were fewer foreign-owned firms in Québec, and that investment was much lower in Québec ($184.12 million) than Ontario ($347.05 million).

These differences in industrial adjustment are simply indicators of underlying economic problems. In the same way as investment should not be considered as a cause of economic problems but, as Caves (1990) pointed out, rather a signal of the underlying economic factors. Therefore, while the analysis has shown that industrial adjustment differs between Québec, Ontario and the rest of Canada, it has not told us why.

Given the limits in the scope of this research, and the limits in available data, the answer given here to the final question of why industrial adjustment differs will have to remain at the speculative level. The actual testing of these hypothesis (and the challenging search for the necessary data in order to do so) will have to be left for further analysis.

Among the various possible factors behind higher exit, lower capital expenditure, and lower foreign investment in Québec we propose two. First is the political instability which the province underwent during this period, since it coincided with the Québec referendum over whether or not to seperate from Canada (in 1980). The separation question in Québec has posed an ongoing uncertainty for the province's future. This has lead to head office movement out of Montréal (and to Toronto[12]), less foreign investment for Montréal[13], and consequently less growth in the provincial economy[14].

This was combined with changes in institutional factors, such as language regulation. While many businesses have taken these changes in stride, others have undoubtedly felt the complications these new regulations imposed on marketing,

advertising, and day to day operations. For foreign investors, the language regulation was often seen as a constraint which could be simply avoided by starting up their business in another province.

These two facets of the atmosphere in Québec combined to create a climate of economic uncertainty, which also helped to distinguish industrial adjustment in Québec from that of other provinces. Economic uncertainty typically leads to reduced capital expenditures and foreign investment, creating a climate of even greater uncertainty.

These three facets are more related to the economic atmosphere in Québec over the period in question. However, besides differences in the economic atmosphere, provinces also differ by the way their firms adjust to these factors. For example, the whole of Canada might be experiencing a recession (as we did in 1981) but the industrial adjustment of firms in Ontario is likely to be very different from how firms adapted to this situation in Newfoundland. This is a particularly difficult factor to quantify but is important nevertheless. The speed and efficiency of the industrial adjustment of firms depend among other things, on the experience, foresight, creativity, and ingeniousness of entrepreneurs. It can be argued that the best entrepreneurs are located in the most successful firms which are able to attract them with the highest salaries. In which case we would expect industrial adjustment to be most efficient in the areas of the country where the most successful firms are located.

Examining the distribution of businesses in Canada, we see that there are three main concentrations of business activity: Toronto, Montréal, and Vancouver. The other provinces have clusters of business activity of lower intensities.

Therefore, we can conclude by saying that we would expect different regions to adjust differently to changes in their economic environment due to two main factors. First, this discrepancy can be explained by the difference in the economic environment itself between provinces (something which Canada is witnessing at the present moment with the

overheating in Toronto, and the economic stagnation in many other parts of Canada). This can be caused by differences in the economic, political, demographic, and institutional make-up of provinces. A second cause of differences in industrial adjustment is related to the concentration of qualified entrepreneurs in a region.

CONCLUSION

The aim of this analysis was to test whether industrial adjustment was significantly different in Québec, Ontario, and the rest of Canada over the 1978 to 1986 period. This was undertaken through a four-fold approach. First, we undertook a comparison of descriptive statistics in the three regions. Secondly, an F-test was used to compare the standard deviations of the turnover measures in these three regions. Thirdly, an analysis of variance of the turnover measure was run to test the importance of differences in the provincial industrial composition. Finally, regression analysis was undertaken on the pooled sample and then by region to perform a Chow test.

Results of the descriptive statistics showed that Québec was distinguished from other provinces in various respects. In terms of the size of firms, Québec had the highest proportion of small firms (which is not altogether good, since these firms are the most volatile). At the same time the province underwent the largest loss of medium and large sized firms.

With respect to ownership, Québec had the lowest percentage of foreign-owned firms. It was also the province with the lowest entry, and turnover rate of foreign-owned firms. By the same token, Québec was more dependent on domestic firms (which also tend to be more volatile than foreign-owned firms).

In terms of economic expansion, Québec experienced a negative net-entry rate over the period, whereas Ontario and the rest of Canada experienced positive net-entry of firms.

Results of the F-test indicated that the industrial adjustment of firms using overall provincial averages was not significantly different between Québec and Ontario or the rest of Canada.

Results of the analysis of variance in the turnover rates (broken down by province, size of firm, industry of operation, and ownership) showed that provincial

compostion was often a significant factor in accounting for variance in industrial adjustment. The main factors in this respect were size, ownership, and the industry of operation. While the provincial dummy was a significant source of variation in the exit, turnover and volatility rates.

Results of the Chow test (comparing the pooled regression analysis and the regional equations) allowed us to reject the null hypothesis that the coefficients were the same for each region. This was true for the exit and volatility equations (at a confidence level of 1%) and for the net-entry equation (at a confidence level of 10%).

In order to explain these differences in industrial adjustment we proposed two main factors. The first factor is the difference in the economic, political and institutional make-up of these regions. This difference can give rise to very distinct economic environments within the same country. The second factor is the difference in the concentration of economic activity. This leads to an uneven distribution of entrepreneurial talent.

The conclusions, while robust in themselves, should be interpreted with caution since many of the barriers to entry which were used in other analysis at the national level were not available at the provincial level. Dunne and Roberts (1989) found that the most important aspect for the type of equations tested in this analysis is the availability of panel data at the individual firm level, which automatically allows us to control for their size, ownership, and industry. In fact they found these dummy variables to be more important than the classical barriers to entry which other researchers have typically used (MES, advertising intensity, capital-output ratios...) in capturing industry specific affects. This evidence renders the omission of these variables somewhat less culpable, but one would still prefer to have tested their importance just in case.

These results do not render the national estimates (mentioned earlier in the introduction) meaningless, since more research will be required in testing the strength of the results found in this research. However, the conclusions do suggest that certain aspects

of industrial adjustment should be looked at more from the provincial point of view, when possible. When this is not possible, at least an allusion should be made to the fact that factors influencing industrial adjustment are not necessarily the same in each province, nor are the ways in which firms adjust to these factors.

FOOTNOTES

(1) Magun et al. (1987) p.79.

(2) W.G. Watson (1987) p.250.

(3) see F. Martin (1988) for a discussion of some of the other shortcomings of the national models.

(4) For example some of the dependent variables used were: new firms which created plant, new firms acquiring plant, continuing firms which created plant, continuing firms which acquired plant, (continuing firms which created plant/total firms which created plant), (continuing firms which acquired plant/total firms which acquired plant), (new firms/new plants), (new firms/acquired plants), (continuing firms/new plants), (continuing firms/acquired plants), and analogous variables for exit as well.

(5) Baldwin and Gorecki (1989), p.3.

(6) Because larger plants who have over 250 employees have an additional plant identification number which does not change with changes in ownership.

(7) Dunne and Roberts (1989)

(8) Dunne and Roberts (1989)

(9) Statistics Canada's Business Microdata Integration and Analysis departement charges for this data, however they can offer a very detailed cross-section of the data.

(10) An ALU is a calculated measure of employment, based on the average employment of the 3- digit industry to which the business belongs. The calculation of the ALUs for a given business is given by: the annual total payroll of the business divided by Average annual earnings per employee of the 3-digit industry

This measure may be biased since the industry average is not always an accurate proxy. Factors to consider in this regard are 1) the size of the business vs. the industry average, 2) its use of part-time rather than full-time labour, 3) the ratio of professional to

unskilled employees, and 4) differences in wages paid to a group of workers.

(11) Dunne and Roberts (1989).

(12) See Proulx and Proulx (1990) pp. 53-54.

(13) See Proulx and Proulx (1990) pp. 24-25.

(14) See Francis and Proulx (1989) for a reference on the importance of international cities on the economic growth of a region.

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