Establishment Size and Employment Growth in the Canadian Urban System 1991-1994: An Exploratory Analysis

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It has become accepted wisdom today that "the role of creating jobs has moved from big companies to small business and the self-employed" (Globe and Mail 1996a). Probably the ultimate source of the accepted wisdom can be traced back to Birch's work in the late 1970's, in which he reported that 66% of net new jobs created in the US economy between 1969 and 1976 were generated by firms with less than 20 employees (Birch 1979). This result did not go unquestioned. A study commissioned by the US Small Business Administration for the 1978-1980 period found that firms of 100 employees or less only created 38% of all jobs: the same period was subsequently analysed by Birch using the same data, who obtained a figure of 70%! (Giaoutzi et al. 1988). Storey and Johnson (1987) examined these conflicting results and reported that the difference stemmed from the different treatment of firms not included in the data base: in their view, 50% of new jobs were created by companies of less than 100 employees over the period covered, while the latter employed only 38% of the labour force.

Whether or not such statistical observations could truly be construed as supporting the contention that small businesses created a disproportionate share of new jobs, "during the 1980's (the observations) had a tremendous impact on public policy" (Picot et al. 1994). The message taken by many "economic development officials (in the USA) is that job-generation begins at home ... (and that) ... efforts are best concentrated in helping local businesses expand and encouraging potential entrepreneurs to establish businesses" (Eisinger 1988). Indeed, with average unemployment rates in Canada and in many European countries rising to a seemingly irreducible 10% or so over the 1980's, small businesses have been seized upon as generators of employment.

One of the consequences of such research has been a fundamental reappraisal of approaches to regional development policy. Whereas throughout the 60's, 70's and early 80's Canadian regional policy concentrated on a variety of top down approaches such as infrastructure provision, capital investment grants, and incentive packages (Savoie 1986), there has been an increasing trend towards the promotion of local development initiatives (Economic Council of Canada 1990c; Fondation de l'Entrepreneurship 1994).[(1)]

Needless to say, statistical evidence alone is unlikely to have brought about such fundamental policy shifts. The increasing budget problems faced by most western governments have reduced their capacity to finance regional policy on a grander scale, and local development is perceived as a low cost alternative. It also fits well with the current anti-government bias in popular opinion, as local development is seen as a bottom-up approach which empowers individuals and municipalities at the local level. Thus, while local development in general, and specifically the aspect of it which stresses small businesses and entrepreneurship, can be presented as a rational response to a series of empirical observations concerning employment creation, it can also be seen as an opportune policy initiative in keeping with the generalised move towards liberal economic management experienced by western countries in the '80's and early '90's.

In the light of these developments, this paper first reviews the evidence that small companies create more jobs than larger ones, and examines the reasons why this may be so. While the evidence does appear to point this way, the policy implications are unclear for a number of reasons which are set out below. After reviewing this evidence, the results of our analysis of 59 Canadian cities are presented.

This exploratory analysis introduces a geographic dimension to the analysis of Small and Medium Enterprises (SMEs) which has hitherto been largely ignored in the literature. Indeed, while this dimension is stressed by geographers (Openshaw 1981; Bourne 1991 etc...) economists have only recently begun to take into account the spatial dimension of the phenomena that they study (Krugman 1991; Martin and Sunley 1994; Vedder and Gallaway 1996).[(2)] On the assumption that there is a link between establishment size and employment growth, as posited by much recent research, and that, furthermore, it is the smallest establishments which tend to stimulate employment most, one should observe that geographic areas with higher concentrations of smaller establishments benefit from faster growth rates. In addition, it can be expected that areas which experience faster growth in the relative number of small businesses will also benefit from faster employment growth. It is these hypotheses which the following empirical analysis seeks to verify within the Canadian urban system.

Small and Medium Size Enterprises (SMEs)

Definition

It is worth stopping for a moment in order to consider exactly what is meant by an SME. Each research team and/or government body appears to have its own definition, and to date there has been no concerted attempt at standardisation. There are reasons for this. On the one

hand, the definition is often dependent on the nature of the data gathered. If one source has data for companies in the 100 to 250 employee group and another for companies in the 100 to 199 employee group, there will necessarily be discrepancies in their definitions. On the other hand, the criteria used for defining an establishment may be different. The Quebec Ministry for Industry and Commerce, for instance, defines small goods producing companies as those employing less than 49 people and possessing less than $3,000,000 in assets. Small non-goods producing companies are those with less than 49 employees and less than $2,000,000 in assets (Groupe d'Analyse sur les PME et les Régions (GAPMER) 1994). Industry Canada (1987), for its part, defines small companies as those employing fewer than 100 people in the manufacturing sector and fewer than 50 people in other sectors. Medium size enterprises are variously defined as those employing between 50 and 199 people with between $3 million and $12 million of assets (GAPMER 1994), between 50 and 500 people (Industry Canada 1994), or as those companies of between about 10 to 500 employees with turnover below a certain threshold (French Government, as reported in d'Ambroise 1989).

D'Amboise (1989), reviews the various possible criteria of identification, and separates them out into quantitative and qualitative measures. Quantitative measures are measures such as employment, level of production, turnover, salaries, assets etc. Qualitative ones can include market penetration, geographic extent of market, level of autonomy and management practices. Further complications arise when the distinction has to be made between companies (which can include many branch plants), physical establishments, administrative (tax or payroll) establishments and so on. In addition, drawing the line between autonomous and branch establishments is no simple matter, since the distinction not only depends upon legal ownership arrangements and share holding but also on management arrangements and internal organisation. Although this distinction is important on a micro level, and can affect results when larger firms are considered, Picot et al. (1994) conclude that the distinction between establishments and companies (defined as legal entities in the taxation system) is not important when smaller businesses are being analysed since most are single establishment companies. In any case, it is not the purpose of this paper to explore in detail these possible definitions: rather, it is important to point out from the outset that without a well defined 'target', regional policies aimed at promoting small enterprise necessarily embody a large element of uncertainty.

Despite these many different approaches, a fairly pragmatic approach is usually adopted, and while some additional criteria may be used in certain industries, SMEs are primarily defined in terms of employment. This leads to another problem linked with the definition and analysis of SMEs. Industry Canada's (1987) definition includes all but 2000 of the 2.1 million businesses

in Canada. Is it really meaningful to analyse this group as a whole? Of course it is helpful to know that a disproportionate number of jobs are created by companies of less than 100 employees, which constituted 93.3% of all US establishments in the early 1980's (Birch 1987). But assuming their job creation role to be proven, not much has been learned from a policy perspective in terms of targeting intervention. For this reason, our empirical analysis looks not only at cumulative size classes (for example, all establishments of less than 100 employees) but also at discrete size classes (for example, all establishments of between 50 and 99 employees). Failure to do so can lead to erroneous conclusions and ineffective policies.[(3)]

Review of Recent Evidence Concerning the Job Creation Role of SMEs

As outlined above, Birch's initial research did not go unchallenged and only in 1987 did a study come out reconciling the contrasting conclusions of Birch and the Small Business Administration. Storey and Johnson (1987) determined that over the 1978-1980 period, 50% of new jobs were created by establishments of below 100 employees, which accounted for only 38% of total employment in the USA.

Birch (1987) extended his original analysis to cover a longer period, and reported that from 1969 to 1976 enterprises of between 0-19 employees created 66% of net employment growth in the USA, between 1977-1981 61% and between 1981-1985, 88%. In Canada the equivalent figure for the 1974 to 1982 period is reported as 55%. As an indication, enterprises in the size category accounted for 24.1% of employment in the US in 1980 and 26.7% in Canada in 1974.

P.A. Julien (1987) reviews the evidence available at the time concerning employment growth in SMEs. He reports evidence from Japan between 1971 and 1977, which shows that manufacturing firms of below 100 employees created the most jobs over the period. Similar figures are reported for the industrial sector in the British Midlands (1968 to 1975) and in France (1972 to 1984), and he concludes that since approximately 1970 small firms have created a disproportionate number of jobs.

Storey (1988) presents data covering 12 OECD countries over a period ranging from 1970 to 1983. The figures show the share of employment accounted for by small (under 20 employees) and large (over 500 employees) manufacturing firms. In no country does the proportion of employment in small companies decline, and in only one does the proportion of employment in large companies rise. In nine of the twelve countries there is either a rise in the proportion of employment in small companies, a decline in the proportion in large, or both combined. While the difficulty of international comparisons is acknowledged, the evidence

appears to indicate a rising importance of small companies in terms of employment over the 1970's and early '80's, at least in the manufacturing sector.

These results, in particular Birch's, have come under close scrutiny, principally from Davis, Haltiwanger and Schuh (1996). Indeed, they report that small firms in the USA are not creating a disproportionate number of jobs and set out a number of methodological criticisms of Birch's work. These criticisms will briefly be summarised below.

One of the first criticisms is the fact the data used by Birch (the Dun and Bradstreet files) do not cover all firms in the USA, do not provide very accurate employment counts, and do not permit a clear identification of all firm births and deaths. Another criticism is that a number of statistical phenomena are not accounted for if the rate of employment change is analysed. First of all, the fact that firms may fluctuate around a mean level of employment means that the large firm sector will contain a disproportionate number of firms which are above their long term employment level (and are thus likely to shed jobs) and that the small firm sector will contain a disproportionate number of firms which are below their long term employment level (and are thus likely to grow).[(4)] Second, the boundary conditions are such that random employment fluctuation will cause the small firm class (the lower boundary of which is zero) to display positive net job growth because the lower possible growth rates are truncated (Baldwin and Picot 1994). Finally, the rate of net job change does not take into account the number of jobs created: high growth rates in small firms may still produce lower absolute employment gains than low growth rates in large firms.

A final but important criticism is that the actual measurement of firm size has an effect on the outcome: indeed, whether a firm's size is taken to be that at the start of the period of analysis, an average of the size across the whole period, or an average over two or more years either preceding or going into the analysis period, determines the classification of a firm into a given size category and hence has an important effect on the outcome in terms of employment growth by size class.

Baldwin and Picot (1994) take the above considerations into account and analyse job creation in the Canadian manufacturing sector, while Picot et al. (1994) do so for the entire Canadian economy. For the economy as a whole, it is found that, depending on the sizing definition used, employment in firms with under 20 employees grew at an average rate of 3.3% to 8.1% per year between 1978 and 1992, and that the equivalent figures for establishments of over 500 employees are 0.1% and -1.2% (Picot et al. 1994). Broadly similar results are found when the manufacturing sector is analysed separately between 1971 and 1990, with a decrease in net employment change as one moves from firms in the 0 to 19 size class to those

in the 500 to 999 class, whatever the definition of size *except* if the average size over the full period of analysis is used (Baldwin and Picot 1994). Both studies conclude that net employment increase in Canada, as well as gross job gain and gross job loss, are disproportionately located in small firms, and that the smaller the size class the higher all of these three measures are. However, Picot et al. (1994) note that the rate of job creation for existing small firms is similar to that of large firms, and it is the fact that most new firms are small which swells their job creation effect.

Interestingly, Baldwin and Picot (1994), who perform a comparison of their results with US data, confirm to some extent Davis, Haltiwanger and Schuh's (1996) results, at least for the manufacturing sector. Indeed, when the US is considered, only one of the three types of size classification used (size of plant in the base year) shows small plants to be creating more net employment than larger ones. In Canada two of the three classification types yield fairly clear results. The third (average over the entire study period) does not clearly show either small or large plants creating more net jobs.

Another element which needs to be recognised is the general shift of employment away from manufacturing towards the service sector (Coffey and Shearmur 1996) in which firms tend to be smaller anyway (Baldwin 1994). While this has no doubt had some effect on the increasing number of jobs in small firms, it must be noted that many of the figures presented above concern only the manufacturing sector. Thus, while sectorial shifts have contributed to the phenomenon, it cannot be said that this was the only factor at work.

Another factor which may affect results is the time period analysed, and in particular the position of this period relative to the overall economic cycle. In practice, this does not seem to have had much influence on the general pattern of results. Birch's (1987) results cover the 1969 to 1985 period, but the results remain broadly similar (though variable in terms of strength) whether the period is taken as a whole or whether it is broken down into the 1969-1976, 1977-1981 and 1981-1985 periods. The Small Business Administration's results covered the 1978 to 1980 period, and Picot et al. (1994) and Baldwin and Picot (1994) cover the 1978-1992 and 1970-1990 periods respectively. The discussion surrounding establishment size and employment growth has not arrived at convincing empirical observations or theoretical arguments describing the effects of economic cycles. Neither has it dealt with the time-scale over which the effect of small establishments on employment growth is meant to take effect. Baldwin and Picot (1994) argue that the use of a twenty year period ensures that "no particular segment of the business cycle will unduly influence results". In our study, a far shorter period is being analysed, and this must be borne in mind when considering the results.

What, then, can be said about the relationship between firm size and employment growth? There is evidence that in Canada small firms have contributed disproportionately to net employment growth over the periods analysed. It must be emphasised, however, that the statistical techniques used for measuring net job creation by firm size, particularly the initial classification of establishments by size class, greatly influence the results. The fact that these statistical problems have only quite recently been analysed in depth (Armington and Odle 1982; Leonard 1986; Storey and Johnson 1987; Davis, Haltiwanger and Schuh 1996), and that they have been shown to substantially alter -- or at least call into question -- the seminal work performed by Birch, leads one to question a large proportion of the evidence put forward in support of the contention that small firms have taken over from big business. Indeed, it does not appear that the methodological questions identified above have been integrated into the results reviewed by Julien (1987) and Storey (1988). Even if, on balance, it can be argued that the statistical revisions merely temper the results without fundamentally altering the conclusions, a number of other considerations can lead to a questioning of policy stances based upon the belief that employment stimulation can focus exclusively on small businesses. (5)

Economic Cycles, Economic Sectors and Technology

It is useful to briefly consider the dynamics underlying the general statistics reviewed above. In particular, it is worth examining the principal justifications for focusing on small businesses, since they go beyond arguments based merely upon empirical observation.

Indeed, the justification often given for supporting and encouraging small businesses finds its roots in Schumpeterian economics, and particularly in Schumpeter's vision of the role of the entrepreneur: "the entrepreneur's role consists of reforming or revolutionising the production routine by exploiting an invention, or, more generally, a new technical possibility (production of a new merchandise, new process for producing an old merchandise, exploitation of a new source of primary materials or a new market, reorganisation of an industrial branch, and so on...)"(Schumpeter 1951).(6) Entrepreneurs are the dynamic element which realise new combinations of factors and are a source of innovation. Particularly in the current period of rapid technological change during which information technology has transformed work practices in almost all economic sectors, small businesses and entrepreneurs may be able not only to develop the new technology but also to find new applications for it more rapidly and efficiently than larger firms, which are hampered by hierarchical structures and obsolete working and management practices (Laurent 1989).

Following Schumpeter's logic, new technology can be used by small firms not only to develop and enter new markets but to gain a competitive foothold in markets dominated by larger corporations. However, Thomas (1988) argues that it is not possible to view matters quite so simply, and posits a sectorial approach in which a crucial element is the technological age of the industry. Thus, when a radical new idea or technological breakthrough occurs, one of the entrepreneurs' roles is that of a risk taker who develops a new product or process on the basis of this innovation (Suarez-Villa 1988). As the technology matures the successful small firms either grow and become large ones, or are taken over by larger corporations who may have been unwilling to risk investment until the innovation is proven. This is the case, for instance, in Silicon Valley, which in the 1960's and 1970's was seen as a prime example of entrepreneurial success but which is now dominated by large establishments (Ayadalot 1988). Furthermore, these large firms are not immune to subsequent radical innovation which may render their product obsolete: such was the fate of some large vacuum tube manufacturers at the onset of transistor based technology. It can thus be hypothesised that small firms may be more important in creating employment at some periods in time and less so in others, and that the timing will differ from sector to sector depending on economic and technological cycles. However, if a technological change is such that it affects most sectors of the economy, then there will be an aggregate trend of small establishments growing faster than larger ones as they implement and exploit the new technology faster and in innovative ways.

It is not necessarily the case, however, that small establishments are best able to implement new technology. An important distinction can be made between product change and process change. Product change has been outlined above, in terms of computers and transistors. Process change can be seen as a consequence of product change, since new technology, whether it be spinning jennies or CAD/CAM machine tools, bring about changes in firm organisation. These changes do not necessarily occur in 'high-tech' sectors of the economy. Indeed, Alderman et al. (1988) cast doubt upon the job-creating potential of policies aimed at the 'high tech' sector. They make the distinction between 'high-tech' sectors -- those which are directly involved in the creation and manufacture of technological innovations and which, in a Schumpeterian world, would tend to be small -- and traditional sectors. In their survey, it is establishments in the traditional sectors which integrate new technology into their production processes which show the fastest growth. Most importantly for the purpose of our analysis, they note that the larger establishments have the capacity to invest in the new technology and retrain their workforce whereas smaller firms in the more traditional economic sectors face particular problems in adapting to process innovations (Alderman et al. 1988).

Another process evolution may be operating in the opposite way, reducing employment in larger manufacturing firms and increasing the number of small firms in the service and manufacturing sectors. Sub-contracting, often made possible because small firms can now more easily master large amounts of information, entire product development and manufacture cycles, and just in-time delivery (Amirahmadi and Wallace 1995), is increasing the role of small enterprises in the production process of large firms. In this view, there is a symbiosis between small and large firms with each becoming increasingly dependent on the other. However, Harrison (1994) stresses the uneven bargaining power and the pressures put on the workforce of smaller firms in order to meet the client firm's demands.

This leads to the final consideration which is the quality of the employment being created in small firms. Picot et al. (1994) note that there is a tendency for "jobs in small firms (to) pay less on average...have fewer fringe benefits, (to be) shorter in duration and (to) more likely lead to permanent layoffs". Betcherman et al. (1994) find that small firms in Canada (0 to 49 employees) are the least likely to have innovative human resource management practices and that, conversely, those with over 250 employees are far more likely to. This means that the smaller firms tend to have less employee participation, job design programs, employer sponsored training, flexible scheduling, family benefits, and comprehensive fringe benefits than larger ones. In addition, the incidence of above industry level pay is substantially lower in the smaller firms. Harrison (1994) makes similar points as Betcherman, but also emphasizes the strong dependence of small companies upon their large clients. The client firms effectively use sub-contacting as a means of attaining productive flexibility without bearing the costs. The costs are borne by the sub-contracting SMEs and by their employees who lack job security and whose wages are often bartered down to that of the lowest paying competitor. Thus, while a small proportion of small firms may be innovative on the human resource front, the majority are not. This mirrors the picture in terms of technology, although no connection has been investigated between the two.[7]

The Position Today

A review of the evidence linking SMEs to employment growth suggests that the commonly held notion that small establishments are employment generators is not as clear cut as many commentators and policy makers seem to suggest. As Birch (1987) strongly argues, it is important to look below the aggregate statistics and realise that purported job generation by SMEs has occurred in a context of very high failure rates. Indeed, the fastest growing regions in his study are those with the highest business failure rates: the rate of establishment and employment creation is even higher than that of establishment and job loss, indicating that

employment growth in small enterprises is a function of the dynamism of the sector and not necessarily of the nurturing of each and every start-up.

Even if the small business sector created more employment than large businesses over the last fifteen to twenty years, there is little evidence to suggest that the majority of these jobs have been particularly 'good' ones in terms of wages and benefits (Economic Council of Canada 1990a; Harrison 1994; Betcherman et al. 1994) or even in terms of innovation and use of technology. In addition, if many of these small firms are in fact subcontracting for larger ones, it can be argued that the multiplier effects of large firms have increased at the same time that their share of employment has decreased, thus making them an important factor in employment creation even as their share of employment declines.

Finally, throughout this entire discussion no mention has been made of the spatial aspects of the relationship between job creation and SMEs because it is very sparsely dealt with in the literature. This dimension is crucial, however, to any policy intervention and indeed to any full understanding of the relationship. Indeed, there is a wide literature establishing the link between economic growth and space -- through the medium of agglomeration, urbanisation and localisation economies -- often linked to population thresholds -- (McCann and Smith 1991; Polèse 1994; Malmberg 1996), cumulative growth and decline processes (Kaldor 1971) and so on. Other authors highlight the relevance of proximity to large metropolitan areas (Coffey et al. 1989), the regional resource base (McCann and Smith 1991) or indeed local political factors (Mercer 1991). In this context it is important to establish whether SMEs create employment irrespective of location, whether their employment creation capacity is only evident within certain spatial contexts, or indeed whether no evidence is forthcoming that the presence or absence of SMEs affects employment creation in spatially defined markets. Such considerations are a prerequisite to applying conclusions reached at a national level to job creation proposals at a regional or local level. The following empirical analysis addresses this issue.

Establishment Size And Employment Growth

In The Canadian Urban System

The Geographic Dimension and the Canadian Urban System

Openshaw (1981) identifies some of the problems associated with levels of spatial aggregation, and spatial analysis in general. He stresses, amongst other things, that the results of any spatial analysis can be profoundly influenced by the level of data aggregation

and the geographic divisions which are chosen for analysis. Most of the results described above have been performed at the level of the nation or of large regions. It has not been established that, for local areas, high proportions of SMEs are conducive to employment growth. Thus, irrespective of the questions raised about the quality of the results on their own terms, the spatial problem does not appear to have been considered at all.

A situation could arise whereby at an aggregate level there is evidence of a link between SMEs and job creation, but where this link is due to the overwhelming effect of one spatial subdivision. In Canada, for example, the effect of a link between SMEs and employment growth in Toronto may entirely overwhelm the lack of such a relationship across the rest of the country. Furthermore, while the results of individual case studies provide invaluable understanding of the dynamics of employment creation, the combination of these studies and of the national level statistics fails to provide the basis for generalising the link between SMEs and job-creation across space. It is this gap which our exploratory analysis begins to fill.

The choice of the Canadian urban system -- represented by 59 of the largest Canadian Census Metropolitan Areas (CMAs) and Census Agglomerations (CAs) -- was prompted by a number of considerations (see Table 1). First, the CMA/CA concept lends itself to this type of analysis since, by definition, a CMA/CA constitutes an economically integrated entity. In most cases, the labour force is fairly mobile across the physical area of a CMA/CA and local multiplier effects potentially generated by the presence of SMEs should be evident within the same area. If a smaller level of spatial aggregation were chosen, a finding that areas with a greater proportion of SMEs benefit from faster employment growth would be difficult to interpret. If this growth were systematically compensated by job losses in adjacent areas SMEs would only be substituting for lost jobs. While this effect would by no means be inconsequential it would tend to indicate that SMEs are a response to economic distress rather than a motor of dynamism. By choosing to analyse CMA/CAs this type of spill-over effect will be minimised.

A second reason for choosing the urban system as object of analysis is its central place within the Canadian national economy. The Canadian urban system is often defined as all CMA/CAs (such as all integrated urban agglomerations of over 10,000 people; Simmons 1991; Coffey and Shearmur 1996). Since this group of cities represents close to 75% of Canada's population and 80% of Canadian employment, Simmons (1991) writes that "for most practical purposes the urban system is Canada". The subset of 59 CMA/CAs retained in this analysis encompass 70% of the Canadian population and about 75% of its jobs. It is clear, however, that the results can not be extended to rural Canada or, indeed, to urban areas of population below 25,000. However, if local development policies -- and in particular support for SMEs --

are expected to contribute significantly to employment creation Canada wide and to the redressing of regional imbalances (Economic Council of Canada 1990 b and c) then the effects will need to be apparent within the larger regional cities where most employment is concentrated.

Data

We obtained data from the Statistics Canada labour force survey covering the 59 Census Metropolitan Areas (CMAs) and Census Agglomerations (CAs). These data provide the annual average total employment in both 1991 and 1994. From the Statistics Canada Business Register we have obtained data covering the 59 urban areas which indicate the number of establishments in each size class for both of the years in question. 'Establishment', in these data, are defined as "the smallest operating entity capable of reporting all elements of basic industrial statistics", and the data are derived from Revenue Canada Taxation's payroll deduction account file. The data are limited to the employer portion of the business world, excluding unincorporated self-employed people. The eight size classes analysed are the following: class 1, 1-4 employees; class 2, 5-9; class 3, 10-19; class 4, 20-49; class 5; 50-99; class 6, 100-199; class 7, 200-499; class 8, over 500.

The time period analysed has been chosen for two reasons. The first is the desire to analyse recent trends. The latest compatible Business Register and labour force data available were for 1994, hence the use of this year as the end cut-off point. While Business Register data do go back to 1989, 1991 was chosen as a start year since this allows the study to cover the recovery period after the 1990 recession. The 1991-1994 period was one of slow positive growth, and one in which the slow rate of job creation despite the economic recovery became a cause for concern amongst policy makers (Globe and Mail 1996b). It is thus especially relevant to see whether there is a link between small businesses and employment growth in urban areas over this period. As discussed earlier, the position of the time period studied relative to the overall economic cycle may have an effect on the results, but as yet this effect is unknown. The evidence reviewed above tends to show small businesses contributing disproportionately to employment growth whatever the period (length and relative position) studied.

Methodology

The data described above have been transformed for the purpose of analysis. The employment data for the 1991 to 1994 period have been transformed into growth rates. Thus each urban area is associated with one rate of growth, total employment growth from 1991 to 1994.

The establishment size data have first of all been transformed into percentages. For each CMA/CA a series of eight percentages has been calculated for each of the two years, each representing the percentage of all establishments in each discrete size class. For 1991, these percentages are referred to as initial class percentages, or C. Eight size classes are analysed: C1: 1 to 4 employees; C2: 5 to 9; C3: 10 to 19; C4 20 to 49; C5: 50 to 99; C6: 100 to 199; C7 200 to 499; C8: over 500. By adding each successive percentage to the preceding ones, a second set of percentages is found, this time indicating the percentage of establishments in each cumulative size class. These percentages are referred to as CL, with CL1, less than 5 employees; CL2, less than 10; CL3, less than 20; CL4, less than 50; CL5, less than 100; CL6, less than 200; CL7, less than 500.

Finally, for each of these two sets of percentages, C and CL, growth rates have been calculated. The growth rate for C, noted I, indicates the change in the proportion of establishments in each size class between 1991 and 1994. The growth rate for CL, noted IL, indicates the change in the proportion of establishments below the previously indicated cut-off sizes.[(8)]

The analysis was performed in three stages, and although a similar technique has been used throughout, each stage is designed to answer specific questions. The first stage is a regression analysis of urban employment growth on the establishment size indicator (C,CL, I and IL).[(9)] These results provide the raw information as to whether or not there exists a link between establishment size and employment growth across the 59 cities studied.

The second stage seeks to control the first stage results by introducing some geographic variables often associated with economic development issues (for a more detailed discussion of the rationale behind using these indicators, see Coffey and Shearmur 1996 and Coffey et al. 1989).[(10)] The analysis of co-variance (ANCOVA) technique is used, with the geographic indicator as the main effect and the establishment size indicator as covariate.[(11)] Employment growth is always the dependent variable. These geographic indicators are:

- region (Atlantic, Quebec, Ontario, Prairies and BC), city size (over 300,000 people; 100-300,000; 50,000 to 100,000; and below 50,000), and
- metropolitan proximity (major metropolitan areas of over 300,000 people; cities within 100km of a major metropolitan area; and cities further than 100km from a major metropolitan area).

Each geographic indicator is analysed separately, since the reduced number of observation renders the results less robust as each degree of freedom is lost. For this reason, stage 2 results must be seen as indicative only. It will be noted that the regression results are presented without any parameter estimates: it is felt that the relatively low levels of significance combined with the small number of cases would render these parameters misleading. Furthermore, the overall argument put forward in this exploratory analysis -- which is that the relationship between establishment size and employment growth is tenuous -- does not depend on the parameter values. Only the significance levels and the direction of the relationships are given in the tables.

The stage 2 results allow us to see whether establishment size is still linked with employment growth once the effect of region, size, or metropolitan proximity has been accounted for. The stage 3 analysis seeks to determine whether the identified relationships are identical within each of the geographic sub-divisions analysed. To do this an interaction effect is added to the stage 2 ANCOVA model. If this effect is statistically significant then it can be concluded that the relationship between establishment size and employment growth differs between the sub-divisions analysed. Here again, and even more so than for the stage 2 results, the conclusions must only be treated as indications since for the number of degrees of freedom for each model is high relative to the total degrees of freedom. The analyses in stages 1, 2 and 3 have been performed using the GLM module of SAS version 6.11.

For stages 1 and 2, PROC REG of SAS version 6.11 has been used to screen the models for outliers. For each model, any outlier with a studentised residual[(12)] of over 3 has been deleted. The deletion occurs in two stages, with an initial deletion followed by a refitting of the model, itself followed by a final deletion. For stage 3, the outliers identified for stage 2 are deleted. It will be noted that in three cases (stage 1 regression of I1 on growth; stage 2 ANCOVA of I6 and Size; stage 3 ANCOVA of I6 and Size) three outliers were deleted. In all other cases two or fewer outliers have been deleted. The two most recurrent outliers are Summerside, PEI and Kelowna, BC.

One fundamental assumption behind the use of the general linear model (GLM) is that, as the name implies, each of the relationships between the covariate and the independent variable, and for each covariate within each effect, are linear. In the context of this study it is not felt that this assumption is unrealistic. Indeed, nowhere in the reviewed literature is it suggested that there exists an optimum proportion of small establishments above and below which job creation will be less marked. Thus, the expected relationships for each size class are monotonic. This type of relationship will be identified by a linear model, if not necessarily in an optimum way. Furthermore, the separate analysis of each size class will permit the identification of a possible non-linear relationship between size and employment growth across size classes. The reviewed literature suggests that the smaller the companies the more

employment they create, and that this relationship is approximately linear. It is the goal of this geographic analysis to verify whether this is the case across the urban system.

Employment Growth and Establishment Size in the Canadian Urban System, 1991-1994

Employment growth and initial proportions of establishments in each size class

Table 2 details the results of the analyses relating employment growth to the initial proportion of establishments in each size class and table 3 the results relating employment growth to the initial proportion of establishments below particular cut-off points. In each table, the stage 1 (regression) results are presented first, followed by the stage 2 (ANCOVA) results for each of the three geographic variables. The stage 3 (ANCOVA with interaction) results -- for which only the significance level of the interaction effect is given together with the increase in r^2 over the stage 2 model -- are presented below.

From the first part of table 2 it can be seen that across the urban system as a whole the initial proportion of establishments in each size class has no effect on subsequent employment growth in the CMA/CAs analysed. Indeed, the only statistically significant relationship (95%) is that linking the proportion of establishments of over 500 employees (C8) and employment decline. If the cumulative percentages are examined (Table 3) a similar conclusion can be drawn: there is a weak link between the proportion of establishments of below 200 employees (CL6) and job growth (90%), as there is for the less than 500 (CL7) category (95%), but this effect is entirely absent from the smaller cumulative size classes.

If one controls for the region in which each CMA/CA is situated neither initial size classes nor initial cumulative size classes have any significant effect on employment growth within the CMA/CAs. Region, which itself is a highly significant factor in determining the employment performance of each CMA/CA (r^2 = 0.27, 99%), overrides the depressing effect which the larger sized establishments appear to have on employment growth (Tables 2 and 4). Furthermore, the fact that the interaction effect of region and establishment size (whether cumulative or not) is in no case statistically significant at the 90% level shows that the effect of initial establishment size on employment growth is substantially similar (non existent) within each of the five regions analysed.

After controlling for CMA/CA population, establishment size does have some link with employment growth. Indeed, the higher the proportion of establishments in size classes 3, 4 and 5, the slower the employment growth. Conversely, the higher the proportion of establishments of below 10 employees, the faster the employment growth (sig=95%). The

effect of establishment size on employment growth is most strongly felt when the cumulative categories are analysed while controlling for city size: controlling for city size, employment growth is faster the higher the proportion of establishments of less than 200 and 500 employees. It should be noted, however, that while the establishment size variable is significant within the context of the model, in no case are the overall ANCOVA models or the size effect significant.

The results of the analysis of the interaction between city size and establishment size reveals that, for the smaller establishment size classes (C1 to C5 and CL1 to CL3) the relationship between city size and establishment size is substantially similar within each size class. This result leads to an apparent contradiction between the stage 1 and stage 2 results, in particular for class CL2. Indeed, if the relationships are the same within each size class then the analysis of all cities together (stage 1) should give the same results as the analysis of all cities controlling for size (stage 2). However, the stage 1 analysis shows that CL2 is not significant, whereas it becomes significant (95%) once size is controlled for. This can be explained by the fact that CL2 varies significantly across the various size classes and its relationship with employment growth only comes to light once these variations have been accounted for. The lack of interaction tells us that the nature of the relationship is similar within each of the size classes.

There is, however, strong reason to suspect that the relationship between employment growth and establishment size differs according to city size for establishment size classes CL5 and C6. For these two size classes, the interaction effect is highly significant (99%) and the ANCOVA models themselves become significant overall (95%) with the addition of the interaction term. From an analysis of the correlations between establishment size and growth within each size class (Table 4), it is clear that whereas for cities of less than 50,000 inhabitants there is a strong relationship between a high proportion of establishments in the C6 class and employment growth (R= 0.58, 95%), within the three other city size categories the reverse tends to be true (the correlation coefficients are negative but not significant at the 90% level except for cities of 50-100K). A similar analysis reveals that, for cities of less than 50,000 people, there is a significant correlation between employment decline and the proportion of establishments of below 100 people (R= - 0.52, 90%) whereas for two of the three larger city size categories there are significantly positive correlations (R = 0.44, 90% for 100-300 K; R = 0.50, 90% for 50-100K). It thus appears that employment in larger cities tends to grow the higher the initial proportion of establishments of 100 employees or less, whereas the reverse is true for cities of less than 50,000 people. It is worth noting, however, that no clear relationships emerge for the lower establishment size classes: whatever the relationship

identified, it does not strengthen systematically as we move from larger to smaller establishments.

Turning finally to the centrality variable it will be noted that controlling for tween C5 and employment growth (90%), and the significance level of CL7 remains at 95%. For the latter measure of establishment size, the ANCOVA model as a whole is significant at the 90% level. There are no significant interaction effects. Here again, we do not identify a relationship which varies systematically with establishment size, and initial establishment size bears little or no connection to employment growth.

To sum up this section, on the whole, our analysis yields no evidence to suggest that CMA/CAs with a higher initial proportion of small establishments benefit from faster employment growth. The only apparent relationship is between the percentage of establishments of below 200 (and 500) employees and faster growth, but this relationship disappears when controlling for region. This merely indicates that one or more of the Canadian regions with faster growing urban employment also has higher percentages of establishments of below 200 (and 500) employees.

There is clearly, however, an interaction between city size and initial establishment size: in particular, whereas larger cities with a higher percentage of establishments of less than 200 employees grow faster, cities of less than 50,000 people tend to grow more slowly in the same circumstances. Thus, not only have we been unable to identify a clear relationship between establishment size and employment growth within CMA/CAs, we must conclude that establishment size may relate in entirely different ways to employment growth in cities of different sizes. Any simple model suggesting that cities with more small establishments will benefit from faster employment growth must therefore be seriously questioned.

Employment growth and changes in the proportion of establishments in each size class

While it is impossible to infer causality from any statistical analysis, it would have been possible, in the light of the current theoretical framework, to suggest a causal relationship between initial establishment size and employment growth had there been any conclusive results in the analysis of initial establishment size. Not only would much of the literature support such a conclusion, the temporal sequence (first cause, then effect) would have been respected. In the current section -- for which results can be found in Tables 5 and 6 -- contemporaneous rates of change are related one to another. It is difficult in the extreme to justify assigning employment growth to a change in the establishment size distribution rather

than the reverse. The results in this section must be treated as a description of the relationships, and while some tentative conclusions can be drawn many questions are also raised.

TABLE 5 Proportional Change in Percentage of Establishments in Each Size Class and Total Employment Growth in 59 Canadian Metropolitan Areas

TABLE 6 Proportional Change in Percentage of Establishments Below a Certain Size and Total Employment Growth in 59 Canadian Metropolitan Areas

When the establishment size variables (I = % change for each discrete size class; IL = % change for each cumulative size class) are analysed separately a considerable number of statistically significant relationships emerge. It can be observed that there is a strong negative relationship (r^2 = 0.14; 99%) between I1 and employment growth. Furthermore, whereas there is no relationship linking I2 to growth, there *is* a strong negative relationship between IL2 and growth (r^2 = 0.20; 99%). In other words, CMA /CAs which saw a rapid increase in the percentage of establishments of below 10 employees saw the slowest employment growth over the period analysed.

On the other hand, higher values of I3 (90%), I4 (99%) and I5 (99%)are associated with faster growing CMA/CAs. This is reflected in the fact that there is a strong positive relationship between IL5 and employment growth (r^2=0.14, 99%). Thus, CMA /CAs which have faster growth in establishment size classes of between 10 and 100 employees also have faster employment growth. Although these results are difficult to interpret in terms of causality, they clearly show that employment growth is not simply a decreasing function of establishment size. If anything, it appears that as one moves up the size classes from class 1 to class 5, the faster that size class expands the faster employment grows. This observa- ion is opposite to that which could be expected from the literature, in which it is strongly suggested that the smaller the establishments the higher the rate of job creation.

If one controls for region, size and centrality, these basic observations hold with minor adjustments. Controlling for region eliminates the negative relationship between I1 and employment growth, but there remains a weak negative relationship (90%) between IL2 and growth. The significant and positive relationships remain between I4 (95%) and I5 (99%) and growth. None of the interaction terms are significant at the 90% level, suggesting that similar relationships hold within all regions.

Controlling for size has even less effect on the significance levels of the observed relationships, though it can be noted that there is significant interaction between Size and IL5,

as there is between Size and I6, I7 and I8. According to the correlation coefficients (Table 4) for cities of 50-100K and of less than 50K there are high positive correlations between the proportion of establishments of less than 100 employees (IL5) and employment growth (R = 0.57, 95% and R= 0.67, 99% respectively). In larger cities the relationship between IL5 and growth is not significant.

Finally, controlling for centrality also has very little effect on the significance levels of the observed relationships. Furthermore, there are no significant interaction effects between centrality and change in establishment size classes.

Discussion And Conclusion

Our review of the literature reveals a strong body suggesting that small establishments are generators of employment, and a smaller -- but growing -- body questioning this conclusion. Neither of these two currents has considered the problem from a geographical viewpoint. Most of the discussion has been based on the analysis of cohorts of establishments across time periods, with all the statistical and methodological problems that such an approach implies.

However, since an increasing number of local and regional development policies have jumped on to the small establishment band-wagon, the geographical perspective is of particular importance . There is a logical fallacy inherent in this policy approach -- quite apart from any criticism that may be levelled at the basic analyses upon which the approach is based. The fallacy lies in the assumption that results obtained either at a national level or from a series of particular case studies can be generalised into a policy which can be applied at regional or local scales.

As this study has shown, there is no evidence that CMA/CAs with higher proportions of small establishments -- with the most dynamic or competitive firm structure, to use the jargon -- are those which have grown the fastest over the 1991 to 1994 period. Neither is there any evidence to suggest that a rapid expansion in the number of very small establishments is accompanied by employment gain. In fact, the opposite appears to be true. There is some evidence to suggest that CMA/CAs which increase the proportion of establishments of around 50 to 200 employees (size classes 5 and 6) are those which have the fastest employment growth. However, an analysis of initial establishment sizes precludes the conclusion that the increasing proportion of class 5 and 6 establishments in the faster growing cities is due to fast growth of establishments which were smaller in 1991. While small establishments may have grown, this growth does not appear to be linked to their size. If it were, significant relationships would be expected between the initial proportion of establishments of below 50

employees and growth. Finally, there is strong evidence that the effect which establishment size has on CMA/CA employment growth differs according to the size of the CMA/CA. In particular, whereas it may be true that larger cities derive benefit from a higher proportion of small establishments (below 200 employees), this is not the case for cities of below 50,000 people. Furthermore, there is evidence that the changes in cities' establishment size structure differs significantly over city size categories. This result, a by product of the paper's main thrust, merits further investigation.

These results are limited by two factors. First, the small number of CMA/CAs analysed decreases the reliability of the ANCOVA analyses. However, since the ANCOVA analyses tend to confirm the univariate regression (stage 1) analyses, this does not invalidate the results. The interaction effects, in particular the effect which city size appears to have upon the relationship between establishment size and growth, deserves further study. The second limiting factor is the short time period covered. Although there is, as yet, no reason to believe that the absence of a link between establishment size and employment growth can be generalised beyond the urban system and the time period analysed, they do reveal that previous generalisations asserting that a link exists are not justified either.

Viewed in isolation, our results demonstrate that, even if the direct relationship between establishment size and employment growth is verified at the aggregate level -- as posited by Birch (1979; 1987) -- there is little reason to believe that it is relevant at the urban scale in Canada without substantial qualification. Viewed in the context of the criticisms levelled by Davis et al. (1996) and Harrison (1994), and in the light the analyses of Picot et al. (1994) and Baldwin and Picot (1994) -- which, although not so critical of Birch, do show how the points raised by Davis et al. (1996) can significantly affect the results -- our results contribute to the ongoing questioning of the role of SMEs in job creation.

Technical Note: Analysis of Covariance (ANCOVA)

The ANCOVA technique can either be approached as an extension of Analysis of Variance (ANOVA) or as an extension of regression analysis -- both techniques being special cases of the general linear model (GLM). In this paper, ANCOVA has been applied as an extension of regression analysis, and this is evident by the methodology used. A series of simple regression analyses linking two interval variables (the stage 1 analyses) have been extended by introducing a series of categorical effects (region, size, centrality). Identical results can be obtained by transforming these categorical variables into dummy variables and adding them directly to the regression model.

The stage 1 regression analyses in this paper test a model of the following type:[13],[14] **Figures 1 and 2**

In the regression perspective, the sum of squares associated with the covariate is that which is obtained after adjustment for the categorical effect, and the sum of squares associated with the categorical effect is that obtained after adjustment for the covariate.[15] In stage 2 a significant establishment size parameter therefore indicates that, after adjusting establishment size for the differences in mean size which may exist across the categorical effect, there exists a significant relationship between size and employment growth. An assumption made in the stage 2 analysis, however, is that the relationship between establishment size and employment growth is the same within each category analysed. Indeed, the model only provides for one regression coefficient relating different establishment sizes to different employment growth rates, and one further coefficient for each category analysed. These latter coefficients are in effect constants which adjust the relationship for the differences in means across each category.

The stage 3 analysis -- which studies the interaction effects -- tests whether this assumption is justified. If an interaction effect is found to be significant the relationship linking differences in establishment size to differences in employment growth rates is not the same within each category. Thus, it is not justifiable to apply a model with only one regression coefficient (other than constants associated with dummy variables) and each category should be analysed independently. This was found to be necessary for certain establishment size classes when city size was used as a categorical effect. In order to analyse each city size category independently, within-category correlation coefficients were used.

In this paper, each of the three categorical effects has been added and analysed separately, and no attempt has been made to control establishment size for the combination of region, size and centrality. This is because of the small number of observations involved. With 59 observations, the stage 1 results are robust, but the loss of three (centrality), four (size) or five (region) degrees of freedom as the categorical effects are added reduces the reliability of the results. Were the three categories introduced concurrently, eleven[16] degrees of freedom would have been lost rendering the tests inappropriate. As it is, it must be stressed again that the results are exploratory in nature and a larger number of observations would be required in order for them to be otherwise.[17]

References

Amirahmadi, H. and C. Wallace. 1995. "New Technology, Production and Regional Development". *Environment and Planning*, vol XXVII:11.

Alderman, N., P. Wynarczyk, A.T.Thwaites. 1988. "High Technology, Small Firms and Regional Economic Development", in M. Giaoutzi, P. Nijkamp and D. Storey (eds.). *Small and Medium Size Enterprises and Regional Development*. London: Routledge.

Armington, C. and M. Odle. 1982. 'Small Business-How Many Jobs?". *The Brookings Review*, vol. 1.

Ayadalot, P. 1988. "The Role of Small and Medium Sized Enterprises in Regional Development: Conclusions Drawn from Recent Surveys", in M. Giaoutzi, P. Nijkamp and D.Storey (eds.). *Small and Medium Size Enterprises and Regional Development.* London: Routledge.

Baldwin, J. and G. Picot. 1994. *Employment Generation by Small Producers in the Canadian Manufacturing Sector.* Ottawa: Statistics Canada.

Baldwin, J. 1994. *Strategies for Success*. Ottawa: Statistics Canada.

Betcherman, G., K. McMullen, N. Leckie and C. Caron. 1994. *The Canadian Workplace in Transition.* Kingston: IRC Press.

Bourne, L. 1991. "Addressing the Canadian City: Contemporary perspectives, Trends, and Issues", in T. Bunting and P. Filionpp (eds.). *Canadian Cities in Transition*. Toronto: Oxford University Press.

Birch, D. 1979. *The Job Generation Process*. Cambridge: MIT Program on Neighbourhood and Regional Change.

_____. 1987. Job Creation in America. New York: The Free Press.

Coffey, W. and R. Shearmur. 1996. *Employment Growth and Change in the Canadian Urban System, 1971-94*. Ottawa: Canadian Policy Research Network.

Coffey, W., R. Fullum and M. Polèse. 1989. *La Restructuration de l'Economie Canadienne, 1971-1991: Une Nouvelle Dynamique régionale?.* Moncton: Institut Canadien de Recherche sur le Développement Régional.

d'Amboise, G. 1989. *La PME Canadienne: Situation et Défis*. Québec: Les Presses de l'Université de Laval.

Davis, S., J. Haltiwanger and S. Schuh. 1996. "Small Business and Job Creation: Dissecting the Myth and Reassessing the Facts". *Small Business Economics*, 8: 297-315.

Economic Council of Canada. 1990a. *L'Emploi au Futur*. Ottawa: Minister of Supply and Services.

_____. 1990b. *Full Employment is Achievable*. Ottawa: Minister of Supply and Services.

_____. 1990c. *La Relance Locale*. Ottawa: Minister of Supply and Services.

Eisinger, P. 1988. *The Rise of the Entrepreneurial State*. Madison: The University of Wisconsin Press.

Entrepreneurship and Small Businesses Office. 1994. *Small Business in Canada: a Statistical Overview*. Ottawa: Industry Canada.

Fondation de L'Entrepreneurship. 1994. *L'Entrepreneurship et le Dévelop-pement Local*. Ste Hyacinthe: collection of papers from 11th Symposium.

Giaoutzi, M., P. Nijkamp, D. Storey. 1988. "Small is Beautiful", in M. Giaoutzi, P. Nijkamp and D. Storey (eds.). *Small and Medium Size Enterprises and Regional Development.* London: Routledge.

Globe and Mail. 1996. "Jobs Cut Despite Hefty Profits", Febuary 6.

_____. 1996. "Globalisation Backlash is Serious", February 16.

Groupe d'Analyse sur les PME et les Régions. 1994. *Les PME au Québec: Etat de la Situation 1992-1993.* Québec: Ministère de l'Industrie, du Commerce, de la Science et de la Technologie.

Harrison, B. 1994. *Lean and Mean*. New York: Basic Books.

Julien, P. 1987. "La PME et le Développement Micro-Régional". *Canadian Journal of Regional Science,* 10: 133-148.

_____. 1995. *PME Québecoises et Françaises face à l'ALENA et au Marché Unique*. Paris: l'Harmattan.

Kaldor, N. 1970. "The Case for Regional Policies", in F. Targetti and A. Thirlwall (eds.). *The Essential Kaldor*. New York: Holmes and Meier.

Krugman, P. 1991. *Geography and Trade*. Cambridge: MIT Press.

Laurent, P. 1989. "L'Entrepreneur dans la Pensée Economique". *Revue Internationale des Petites et Moyennes Entreprises*, 2: 57-70.

Leonard, J. 1986. *On the Size Distribution of Employment and Establishments*. Working Paper no. 1951. National Bureau of Economic Research.

Livian, Y.-F. and S. Marion. 1991. "De l'Evaluation des Projets de Création d'Entreprise au Pronostic de Succès". *Revue Internationale des Petites et Moyennes Entreprises*, 4: 107-129.

Martin, R. and P. Sunley. 1996. "Paul Krugman's Geographical Economics and Its Implications for Regional Development Theory: A Critical Assessment". *Economic Geography*, 72: 259-292.

Malmberg, A. 1996. "Industrial Geography: Agglomeration and Local Milieu". *Progress in Human Geography*, 20: 393-403.

McCann, L. and P.J. Smith. 1991. "Canada Becomes Urban: Cities and Urbanisation in Historical Perspective", in T. Bunting and P. Filion (eds.). *Canadian Cities in Transition*. Toronto: Oxford University Press.

Mercer, J. 1991. "The Canadian City in Continetal Context", in T. Bunting and P. Filion (eds.). *Canadian Cities in Transition.* Toronto: Oxford University Press.

Openshaw, S. 1981. "Le Problème de l'Aggrégation Spatiale en Géographie". *L'espace géographique*, 1: 15-24.

Polèse, M. 1994. *Economie Rurale et Urbain*. Paris: Economica.

Picot, G., J. Baldwin, R. Dupuy. 1994. *Have Small Firms Created a Disproportionate Share of New Jobs In Canada?*. Ottawa: Statistics Canada.

SAS Institute Inc. 1989. *SAS/STAT User's Guide*, version 6, fourth edition. Cary: SAS Institute.

Savoie, D. 1986. *Regional Economic Development: Canada's Search for Solutions*. Toronto: University of Toronto Press.

Schumpeter, J. 1951. "Title of schumpeter piece", in editor's name (ed.). *Capitalisme, Socialisme et Démocratie*. Paris: Payot.

Simmons, J. 1991. "The Urban System", in T. Bunting and P. Filion (eds.). *Canadian Cities in Transition.* Toronto: Oxford University Press.

Storey, D. 1988. "The Role of Small and Medium-sized Enterprises in European Job Creation", in M. Giaoutzi, P. Nijkamp and D. Storey (eds.). *Small and Medium Size Enterprises and Regional Development.* London: Routledge.

Storey, D. and S. Johnson. 1987. *Job generation and Labour Market Change*. London: Macmillan.

Suarez-Villa, L. 1988. "Innovation, Entrepreneurship and the Role of Small and Medium-sized Industries: A Long Term View", in M. Giaoutzi, P. Nij-kamp and D. Storey (eds.). *Small and Medium Size Enterprises and Regional Development*. London: Routledge.

Tabachnik, B. and L. Fidell. 1996. *Using Multivariate Statistics.* New York: Harper Collins.

Targetti, F. and A. Thirlwall. *The Essential Kaldor*. New York: Holmes and Meier.

Thomas, M. 1988. "Innovation and Technology Strategy: competitive New-technology Firms and Industries", in M. Giaoutzi, P. Nijkamp and D. Storey (eds.). *Small and Medium Size Enterprises and Regional Development.* London: Routledge.

Vedder, R. and L. Gallaway. 1996. "Spatial Variations in U.S.Unemployment

Wildt, A. and O. Ahtola. 1978. *Analysis of Covariance*. Beverly Hills: Sage.

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TABLE 1 Canadian Urban System, 1991-1994

Atlantic n=13	**size**	**location**	**Quebec n=9**	**size**	**location**
Halifax	300+	Metro	Quebec	300+	Metro
Sydney	100-300	Periph	Montreal	300+	Metro
St John's	100-300	Periph	Sherbrooke	100-300	Periph
Moncton	100-300	Periph	Trois Rivieres	100-300	Periph
St John	100-300	Periph	Chicoutimi	100-300	Periph
Fredericton	50-100	Periph	Sept Iles	25-50	Periph
Charlottetown	50-100	Periph	Rimouski	25-50	Periph
Truro	25-50	Central	Baie Comeau	25-50	Periph
Bathurst	25-50	Periph	Rouyn Noranda/Val	25-50	Periph
New Glasgow	25-50	Periph			
Summerside	10-25	Periph			
Edmundston	10-25	Periph			
Corner Brook	10-25	Periph			

Ontario n=17			**Prairies n=11**		
Hamilton	300+	Metro	Calgary	300+	Metro
Kitchener	300+	Metro	Edmonton	300+	Metro
St.Cath /Niagara	300+	Metro	Winnipeg	300+	Metro
London	300+	Metro	Saskatoon	100-300	Periph
Toronto	300+	Metro	Regina	100-300	Periph
Ottawa	300+	Metro	Medicine Hat	50-100	Periph
Oshawa	100-300	Central	Red Deer	50-100	Periph
Sudbury	100-300	Periph	Lethbridge	50-100	Periph
Kingston	100-300	Periph	Prince Albert	25-50	Periph
Windsor	100-300	Periph	Brandon	25-50	Periph
Thunder Bay	100-300	Periph	Moose Jaw	25-50	Periph

Cornwall	50-100	Central
Guelph	50-100	Central
Peterborough	50-100	Central
Brantford	50-100	Central
Sarnia Clearwater	50-100	Central
Sault Ste Marie	50-100	Periph

British Columbia n=9		
Vancouver		Metro
Matsqui	100-300	Central
Kelowna	100-300	Periph
Victoria	100-300	Periph
Chilliwack	50-100	Central
Kamloops	50-100	Periph
Nanaimo	50-100	Periph
Prince George	50-100	Periph
Dawson Creek	10-25	Periph

Number of observations by proximity to an MMA

over	n=13
100000	n=17
50000	n=15
below	n=14

Number of observations by proximity to an MMA

MMA	n=13
Central	n= 9
Peripheral	n=37

TABLE 2 Initial Percantages of Establishements in Each Size Class and Total Employment Growth in 59 Canadian Metropolitan Areas

Stage 1								
G=C, GLM model								
Class Geo effect	C1	C2	C3	C4	C5	C6	C7	C8
Sign (+/-)	+	+	-	-	-	-	-	-
Significance[1]	--	--	--	--	--	--	--	**
R^2	0.01	0.01	0.04	0.04	0.04	0.00	0.04	0.08
Stage 2								
G=Region C	C1	C2	C3	C4	C5	C6	C7	C8
C: Sign (+/-)	+	+	-	-	-	-	-	-
C: Significance[1]	--	--	--	--	--	--	--	--
Region: Significance	***	***	***	***	***	***	***	**
R^2	0.27	0.27	0.30	0.27	0.29	0.29	0.27	0.27
G=Metropolitan Size C								
C: Sign (+/-)	+	+	-	-	-	-	-	-
C: Significance[1]	--	--	*	*	**	--	--	**
Size: Significance	--	--	--	--	--	--	--	--
R^2	0.06	0.03	0.09	0.08	0.11	0.03	0.06	0.15
G=Distance from Major Metro Area (MCP) C								
C: Sign (+/-)	+	+	-	-	-	-	-	-
C: Significance[1]	--	--	--	--	*	--	--	--
MCP: Significance	--	--	--	--	--	--	--	--
R^2	0.07	0.07	0.11	0.07	0.07	0.07	0.08	0.10
Stage 3 - Interaction Effects								
G=Region C	C1	C2	C3	C4	C5	C6	C7	C8
R^2 inc.	0.04	0.04	0.04	0.07	0.04	0.03	0.06	0.04
Significance[1]	--	--	--	--	--	--	--	--
G=Size C								

R^2 inc.	0.02	0.05	0.01	0.00	0.05	0.22	0.12	0.05
Significance[1]	--	--	--	--	--	***	*	--
G= MCP C								
R^2 inc.	0.04	0.01	0.02	0.07	0.01	0.08	0.09	0.01
Significance[1]	--	--	--	--	--	--	*	--

TABLE 3 Initial Percantages of Establishements Below a Certain Size and Total Employment Growth in 59 Canadian Metropolitan Areas

Stage 1							
G=CL, GLM model[2]							
Class Geo effect	CL1	CL2	CL3	CL4	CL5	CL6	CL7
Sign (+/-)	+	+	+	+	+	+	+
Significance[1]	--	--	--	--	--	*	**
R^2	0.0	0.05	0.04	0.03	0.02	0.07	0.09
Stage 2							
G=Region CL	CL1	CL2	CL3	CL4	CL5	CL6	CL7
CL: Sign (+/-)	+	+	-	-	-	-	-
CL: Significance[1]	--	--	--	--	--	--	--
Region: Significance	***	***	***	***	***	***	***
R^2	0.27	0.27	0.27	0.29	0.28	0.27	0.28
G=Metropolitan Size CL							
CL: Sign (+/-)	+	+	+	+	+	+	+
CL: Significance[1]	--	**	*	*	--	**	***
Size: Significance	--	--	--	--	--	--	--
R^2	0.06	0.11	0.09	0.08	0.05	0.13	0.18
G=Distance from Major Metro Are (MCP) CL							
CL: Sign (+/-)	+	+	+	+	+	+	+
CL: Significance[1]	--	--	--	--	--	--	**
MCP: Significance	--	--	--	--	--	--	--
R^2	0.07	0.10	0.08	0.08	0.08	0.09	0.11
Stage 3 - Interaction Effects							
G=Region CL	CL1	CL2	CL3	CL4	CL5	CL6	CL7
R^2 inc.	0.04	0.03	0.07	0.04	0.05	0.07	0.04
Significance[1]	--	--	--	--	--	--	--
G=Size CL							
R^2 inc.	0.03	0.00	0.03	0.11	0.21	0.04	0.02

Significance[1]	--	--	--	*	***	--	--
G= MCP CL							
R^2 inc.	0.04	0.03	0.06	0.05	0.06	0.07	0.01
Significance[1]	--	--	--	--	--	--	--

TABLE 4 Pearson Correlation Coefficients Between Establishment Size Variables and Employment Growth within each of four CMACA size categories

Discrete size classes, Initial %	**Over 300K**	**100-**	**50-100K**	**< 50K**
C1 (1-4)	0.48*	--	--	--
C2 (5-9)	--	--	--	--
C3 (10-19)	-0.63*	--	--	--
C4 (20-49)	--	--	--	--
C5 (50-99)	--	-0.57**	--	--
C6 (100-199)	--	--	-0.48*	0.58**
C7 (200-500)	--	-0.55**	--	--
C8 (Over 500)	--	-0.43*	-0.47*	--
observations	13	17	15	14
Discrete size classes, Change in %				
I1 (1-4)	-0.69***	-0.41*	--	--
I2 (5-9)	0.59**	--	--	--
I3 (10-19)	0.73***	0.42*	0.46*	--
I4 (20-49)	0.56**	0.53**	--	--
I5 (50-99)	--	--	--	0.66***
I6 (100-199)	--	0.45*	-0.58**	--
I7 (200-500)	--	--	-0.59**	--
I8 (Over 500)	--	--	--	--
observations	13	17	15	14
Cumulative size classes, Initial %				
CL1 (<5)	0.48*	--	--	--

CL2 (< 10)	--	--	--	--
CL3 (< 20)	--	0.41*	--	--
CL4 (< 50)	--	0.54**	0.47*	--
CL5 (< 100)	--	0.44*	0.50*	-0.52*
CL6 (< 200)	--	0.53*	0.48*	--
CL7 (< 500)	--	0.43*	0.47*	--
observations	13	17	15	14

Cumulative size classes, Change in %				
IL1 (<5)	-0.69***	-0.41*	--	--
IL2 (< 10)	-0.64**	-0.57**	--	--
IL3 (< 20)	-0.54*	-0.56**	--	-0.58**
IL4 (< 50)	--	--	--	--
IL5 (< 100)	--	--	0.57**	0.67**
IL6 (< 200)	--	--	0.51*	0.52*
IL7 (< 500)	--	--	--	--
Observations	13	17	15	14

TABLE 5 Proportional Change in Percentage of Establishments in Each Size Class and Total Employment Growth in 59 Canadian Metropolitan Areas

Stage 1								
G=I, GLM model2								
Class Geo effect	I1	I2	I3	I4	I5	I6	I7	I8
Sign (+/-)	-	-	+	+	+	-	-	-
Significance[1]	***	--	*	***	***	--	--	--
R^2	0.14	0.00	0.11	0.23	0.25	0.01	0.02	0.01
Stage 2								
G=Region I	I1	I2	I3	I4	I5	I6	I7	I8
I: Sign (+/-)	-	-	+	+	+	-	-	-
I: Significance[1]	--	--	--	**	***	--	--	**
Region: Significance	***	***	***	***	--	***	***	***
R^2	0.27	0.30	0.31	0.34	0.33	0.28	0.27	0.32
G=Metropolitan Size I								
I: Sign (+/-)	-	-	+	+	+	-	-	-
I: Significance[1]	*	--	***	***	***	*	--	--
Size: Significance	--	--	--	--	--	--	--	--
R^2	0.08	0.03	0.22	0.22	0.27	0.07	0.07	0.05
G=Distance from Major Metro Area (MCP) I								
I: Sign (+/-)	-	-	+	+	+	-	-	-
I: Significance[1]	***	--	**	***	***	--	--	--
MCP:	--	--	--	--	--	--	--	--
R^2	0.17	0.07	0.17	0.25	0.28	0.07	0.07	0.08
Stage 3 - Interaction Effects								
G=Region I	I1	I2	I3	I4	I5	I6	I7	I8
R^2 inc.	0.10	0.09	0.02	0.05	0.05	0.07	0.06	0.05
Significance[1]	--	--	--	--	--	--	--	--
G=Size I								

R^2 inc.	0.07	0.06	0.02	0.01	0.01	0.13	0.13	0.12
Significance[1]	--	--	--	--	--	*	*	*
G= MCP I								
R^2 inc.	0.02	0.04	0.01	0.01	0.00	0.09	0.00	0.01
Significance[1]	--	--	--	--	--	*	--	--

TABLE 6 Proportional Change in Percentage of Establishments Below a Certain Size and Total Employment Growth in 59 Canadian Metropolitan Areas

Stage 1							
G=IL, GLM model2							
Class Geo effect	IL1	IL2	IL3	IL4	IL5	IL6	IL7
Sign (+/-)	-	-	-	-	+	+	+
Significance[1]	***	***	***	*	**	*	--
R^2	0.14	0.20	0.19	0.05	0.14	0.10	0.04
Stage 2							
G=Region IL	IL1	IL2	IL3	IL4	IL5	IL6	IL7
IL: Sign (+/-)	-	-	-	-	+	+	+
IL: Significance[1]	--	*	*	--	***	***	*
Region: Significance	**	*	*	***	***	***	***
R^2	0.27	0.32	0.32	0.27	0.32	0.37	0.32
G=Metropolitan Size IL							
IL: Sign (+/-)	-	-	-	-	+	+	+
IL: Significance[1]	*	***	***	--	***	**	--
Size: Significance	--	--	--	--	--	--	--
R^2	0.08	0.25	0.21	0.07	0.20	0.14	0.05
G=Distance from Major Metro Area (MCP) IL							
Sign (+/-)	-	-	-	-	+	+	+
Significance[1]	***	***	***	--	***	**	--
MCP: Significance	--	--	--	--	--	--	--
R^2	0.17	0.23	0.20	0.06	0.19	0.14	0.11
Stage 3 - Interaction Effects							
G=Region IL	IL1	IL2	IL3	IL4	IL5	IL6	IL7
R^2 inc.	0.10	0.05	0.07	0.00	0.02	0.05	0.04
Significance[1]	--	--	--	--	--	--	--
G=Size IL							

R^2 inc.	0.07	0.01	0.04	0.06	0.13	0.08	0.06
Significance[1]	--	--	--	--	**	--	--
G= MCP IL							
R^2 inc.	0.02	0.00	0.02	0.07	0.03	0.00	0.00
Significance[1]	--	--	--	--	--	--	--

Notes: 1. Significance level: *** = significance level of at least 99%, ** = significance level of at least 95%, * = significance level of at least 90%. The significance level indicated for the interaction effects is that of this effect when it is added to the model with the main effect and covariate.

2. In the GLM models G = % employment growth, C = % of establishments in size class, Region = 5 canadian regions, Size = 4 size categories and MCP = 3 proximity categories.

3. All tests have been carried out using 59 observations. Outliers have been excluded, the maximum number of outliers being 2 (except for model G=CL1, where 3 were identified). The models with more than one independent variable must be interpreted with caution since the ratio of observations to IV's is low.

4. For all of the models presented, the dependent variable is % employment growth in each metropolitan area from from 1991 to 1994.