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Employment Growth in the Canadian Urban System from 1971 to 1994: Factors and Policies

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Summary

The subject of this thesis is employment growth in the Canadian urban system. The questions which it sets out to answer are twofold: first, is there reason to believe that there exists a relationship between certain factors and urban employment growth? Second, are policy approaches based upon the manipulation of these factors likely to have an effect on the spatial distribution of economic activity, in particular on local employment growth?

The second question provides a framework and a point of reference from which to explore the first question in some detail. After introducing the topic and providing some basic definitions (e.g. for 'urban system' and 'employment'), the second chapter provides an overview of a variety of theories which have in common the attempt to explain the distribution of economic activity over space. The third chapter examines the current policy context in Canada and explores the various ways in which the theories have been used to shape policy intervention. It is noted that a variety of the factors identified as growth factors in theory have been focused upon in practice as national and local governments attempt to influence the spatial distribution of employment.

The spatial distribution of employment cannot, however, be considered in isolation from other trends in the labour market. The fourth chapter considers some of the wider issues - such as new technologies, the evolving production systems, national level policies - which can affect employment growth and distribution (not only spatial). These wider issues also have spatial repercussions which may well overwhelm the more specific spatial factors previously identified.

Given this context, and the various theories and policies which have been relied upon to understand and/or influence the spatial distribution of employment, the empirical part of the thesis sets out to test whether certain identified factors appear to be connected with employment growth across the Canadian urban system. Following a brief chapter which introduces the data used and comments upon the methodology, there are four chapters, each examining different factors and/or factor combinations. The basic question in each is the following: does employment growth in Canadian cities appear to be related to the factor(s) analysed? In most cases the answers are not clear cut, and it is necessary to consider why, given these empirical results, policies have been implemented which assume the existence certain relationships. Certain possibilities are suggested, but interesting further research can be done in this area.

Since each of the four empirical chapters has been previously published as an article most of the conclusions are contained within the empirical chapters themselves. The final chapter draws the thesis together by extracting some of the general themes and further areas of research which have emerged.

Sommaire

Le sujet de cette thèse est la croissance d'emploi dans le système urbain canadien. La question à laquelle elle s'adresse est double. Premièrement, y a-t-il raison de croire qu'il existe une relation entre certains facteurs et la croissance d'emploi urbaine? Deuxièmement, les politiques d'emploi basées sur la manipulation de ces facteurs pourront-elles avoir un effet sur la distribution spatiale de l'activité économique, en particulier de l'emploi?

La seconde question constitue en fait un cadre et un point de référence à partir desquels la première question peut être explorée en détail. Après l'introduction et la définition de certains concepts (tels 'le système urbain' et 'l'emploi'), le second chapitre donne un survol d'une série de théories qui ont en commun le but de chercher une explication de la répartition spatiale de l'activité économique. Le troisième chapitre décrit le contexte actuel de politique de développement spatial au Canada et relève les diverses manières par lesquelles les théories ont servi à modeler les interventions. On y note en particulier qu'une série de facteurs qui sont isolés comme facteurs de croissance au sein des théories ont été retenus par les gouvernements nationaux et provinciaux lorsque ceux-ci ont essayé d'influencer la localisation spatiale d'activités économiques.

La distribution spatiale de l'emploi ne peut être analysée sans tenir compte des évolutions plus générales du marché de l'emploi. Le quatrième chapitre présente certaines de ces évolutions - notamment celles concernant les effets des technologies nouvelles, les systèmes de production en mutation, et les politiques macro-économiques - toutes ayant des effets important sur l'emploi. Ces évolutions générales ont des répercussions spatiales qui pourraient même surpasser les effets des facteurs plus spécifiquement spatiaux identifiés dans les chapitres qui précèdent.

Etant donné ce contexte, ainsi que les théories et politiques qui ont influencé la compréhension et/ou la répartition spatiale de l'emploi, la partie empirique de cette thèse tente de vérifier si certains des facteurs de croissance identifiés sont liés à la croissance d'emploi dans le système urbain canadien. A la suite d'un bref chapitre dans lequel les données et la méthodologie sont présentées, se trouvent quatre chapitres, chacun examinant des facteurs ou des combinaisons de facteurs différents. La question qui sous-tend chacune des analyses est la suivante; la croissance d'emploi dans les villes canadiennes est-elle liée au(x) facteur(s) analysé(s)? Dans la plupart des cas les résultats ne sont pas concluants. Il devient donc nécessaire, compte tenu de ces résultats empiriques, de se demander pourquoi des politiques ont été élaborées qui prennent pour acquis des relations qui ne semblent pas vérifiées. Certaines possibilités sont avancées, mais il est clair que des pistes de recherche intéressantes sont ouvertes.

Comme les quatre chapitres empiriques ont été publiés séparément en tant qu'articles, la plupart des conclusions se trouvent à la fin de chaque chapitre. Le dernier chapitre conclut donc brièvement en faisant ressortir les thèmes et conclusions généraux ainsi que les questions de recherche qu'ouvre cette analyse.

Résumé

Le sujet de cette thèse est la croissance d'emploi dans le système urbain canadien. Une tentative y est faite de déterminer quels facteurs, parmi ceux identifiés dans la littérature et qui ont fait l'objet de politiques de développement, sont les plus fortement liés à la croissance d'emploi dans les villes canadiennes. Bien que le sujet soit la croissance d'emploi, l'approche adoptée n'est pas en mesure de fournir une *explication* définitive de la répartition du phénomène parmi les villes canadiennes. Par contre, l'étude décrit les relations qui existent entre facteurs et croissance d'emplois, et, partant de cette description aboutit à certaines conclusions quant à l'efficacité potentielle de politiques de développement basées sur la manipulation des facteurs analysés.

Il existe plusieurs manières d'aborder le sujet de la croissance d'emploi du point de vue spatial. D'une part, il est possible de s'inspirer des théories de croissance économique. Ces théories se proposent d'expliquer le processus de croissance *absolue* et de répondre à la question de savoir comment une économie (en général nationale) peut croître (Ray, 1998). Il est possible d'élargir ce type d'approche et de l'appliquer à des économies régionales, voir locales (Richardson, 1969). D'autre part, il est possible de se pencher non pas sur le problème de la croissance *absolue*, mais sur celui de la croissance *relative*. Pourquoi les régions ou villes croissent-elles à des rythmes différents? En particulier, pourquoi le nombre et le type d'emploi diffèrent-ils selon la localisation. Ce sont plutôt les géographes ainsi que les chercheurs en sciences régionales qui ont élaboré des théories qui tentent d'expliquer la répartition spatiale de l'activité économique (et spécifiquement de l'emploi), et ce sont ces théories qui informent la partie empirique de cette thèse.

L'approche adoptée dans cette étude, approche statistique qui consiste à mettre en rapport à travers le système urbain les chiffres de croissance d'emploi d'un côté et les indicateurs de 'facteurs de croissance' de l'autre, ne fait pas unanimité parmi les géographes. Les théories sur lesquelles l'approche se base, qui mettent en avant l'espace comme facteur causal des inégalités spatiales, ont été critiquées comme étant réductrices et trop déterministes. En particulier Massey (1995), qui a aussi étudié la répartition spatiale de l'emploi et les facteurs de croissance, met en avant l'argument que la répartition spatiale des activités économiques serait autant le reflet de processus sociaux plus larges qui se *répercuteraient* sur l'espace que l'aboutissement d'un processus de causalité spatial.

Ces critiques soulèvent des points très importants. D'abord, elles portent l'attention sur des processus non-économiques et aspatiaux. Les facteurs spatiaux qui sont analysés dans cette étude se situent dans un contexte plus large, et reflètent eux même ce contexte: cela n'ôte pas, cependant, l'intérêt de les analyser, surtout si elles peuvent faire l'objet d'interventions politiques. Ensuite, ces critiques soulignent les limitations importantes des études statistiques: ces études ne peuvent à elles

seules établir des liens de causalité et ne peuvent analyser que des éléments quantifiables. Mais à partir du moment où cela est reconnu, qu'il est convenu que les études statistiques ont pour but premier la description d'une certaine partie d'un phénomène plus large - phénomène plus large qui est décrit et analysé dans les premiers chapitres de la thèse - alors l'utilisation de ces méthodes peut-être d'un grand apport.

Les théories géographiques portant sur la répartition de l'emploi ne forment pas un ensemble cohérent: un grand nombre de mécanismes et de processus y sont décrits, chacun expliquant une partie de la réalité spatiale. Certains expliquent le phénomène d'agglomération spatiale, d'autres celui de la dispersion, d'autres encore l'importance de telle ou telle caractéristique locale, des institutions, de la distance, des coûts de transports ou encore de la hiérarchie urbaine. Ce manque de cohérence n'est pas nécessairement un défaut, mais plutôt le reflet de la diversité bien réelle qui nous entoure. Certains économistes, comme Krugman (1991; 1995), tentent actuellement de formuler une théorie générale de la répartition spatiale des activités économiques, mais pour l'instant les simplifications nécessaires à cet exercice en limitent la portée. Ces diverses approches et théories font l'objet du deuxième chapitre de la thèse.

Malgré la diversité de théories expliquant la répartition spatiale de l'activité économique, les pouvoirs publics, locaux et provinciaux, mettent en oeuvre des politiques de développement. Ces politiques s'inspirent en général d'une théorie particulière et parfois isolent un ou deux facteurs sur lesquels elles peuvent avoir une influence afin de promouvoir le développement. Tandis que des années 60 aux années 80 le gouvernement fédéral a mis en oeuvre des politiques de développement régional, depuis la fin des années 80 il y a eu basculement et ce sont maintenant les gouvernements provinciaux et locaux qui sont les seuls à élaborer de telles politiques: les politiques fédérales ont encore des impacts spatiaux importants, mais il n'existe plus de politiques à ce niveau dont le but est explicitement le développement régional. Dans le chapitre trois nous notons en particulier que les petites et moyennes entreprises (P.M.E.), le secteur de la haute-technologie et l'éducation font aujourd'hui l'objet de politiques de développement de la part de gouvernements locaux et provinciaux.

Les théories géographiques portant sur la répartition de l'emploi, et les politiques qui s'en inspirent, ne peuvent être appréhendées sans tenir compte de l'évolution du sujet d'étude, c'est à dire de l'emploi lui même. Les nouvelles technologies de production, les nouvelles formes d'organisation spatiale de l'entreprise, la dichotomisation croissante entre 'bons' et 'mauvais' emplois, les politiques et idéologies macro-économiques - toutes sont en train de faire évoluer la nature de l'emploi et ces effets se superposent et façonnent ceux de l'espace. Il n'est pas possible de faire un tour complet de

ces phénomènes, mais le chapitre quatre en décrit certains, avec une attention particulière portée sur le rôle de la technologie et de la façon dont l'idéologie peut définir ce rôle.

La revue de la littérature et le discussion concernant les politiques de développement fait ressortir certains facteurs mentionnés plus haut. Dans la partie empirique, ces facteurs - P.M.E., concentration sectorielle (en particulier haute technologie), et niveau d'éducation - sont testés afin de voir dans quelle mesure ils sont liés à la croissance d'emploi dans le système urbain canadien. Une première analyse inclut ces trois variables ainsi que certains autres facteurs (région, taille urbaine, distance par rapport à un grand centre urbain) qui eux sont plus difficilement influençables par des interventions politiques. Deux conclusions importantes en ressortent: i) le fait que c'est la région d'appartenance d'une ville qui est le facteur le plus déterminant et ii) le fait que la nature des liaisons facteur-croissance d'emploi diffère selon la période d'étude.

Les trois analyses qui suivent regardent séparément la relation entre P.M.E., secteur de haute technologie, niveau d'éducation et emploi. Malgré les interventions politiques qui mettent en avant le rôle moteur des P.M.E. et du secteur de la haute technologie, les analyses empiriques ne mettent pas en évidence de lien entre ces facteurs et la croissance d'emploi. En ce qui concerne l'éducation, bien qu'un lien fort existe entre niveau d'éducation et emploi, ce lien est fortement lié à la hiérarchie urbaine car les populations les plus éduquées ont tendance à vivre dans les plus grandes villes. Il est donc possible que la mise en oeuvre de politiques qui mettent l'accent sur ces facteurs soit inspirée autant par des phénomènes de mode, d'idéologie ou d'opportunisme que par l'effet que ces facteurs auraient sur l'emploi.

En effet, il est important d'avoir à l'esprit que, dans une approche néo-libérale (approche qui a dominé en occident depuis le début des années 80), l'accent est mis sur l'individu. L'individu est responsable et doit se rendre 'employable' ou créer son propre emploi. Dans ce contexte, mettre l'accent sur l'éducation et sur les P.M.E. prend tout son sens. Le secteur de haute technologie - qui n'est pas un secteur a forte création d'emploi entre 1971 et 1991 - comprend des entreprises multinationales importantes qui peuvent influer les politiques, et cela explique peut-être la focalisation politique sur ce secteur. Quoi qu'il en soit, ces possibilités ne sont qu'hypothèses qui découlent du fait que la relation facteur - croissance d'emploi qui justifieraient ces approches politiques ne ressort pas des études empiriques.

Cette thèse, qui décrit la relation entre certains facteurs et la croissance d'emploi, aboutit a un questionnement de certaines approches politiques au développement. Ce questionnement permet la mise en avant de diverses hypothèses qui sont autant de nouvelles questions de recherche.

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for

Yasmin and Sara

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Part 1

Chapter 1: Employment Growth in The Canadian Urban System: Factors and Policies

1.1 Introduction

The subject of this thesis is employment growth in the Canadian urban system. In it an attempt is made to determine which factors, from amongst a number which are highlighted in the literature and which have been the object of policy approaches, are the most closely related to employment growth in Canadian cities. Although the focus of the study is upon employment growth, the approach which is adopted is not one which will provide any definitive *explanation* of the phenomenon's distribution throughout Canadian cities. Rather, the study describes the relationship between factors and employment growth, and from this description draws some conclusions as to the effectiveness of policy approaches based upon the manipulation of the analysed factors. In short, two related questions underlie this study. First, is there reason to believe that there exists a relationship between certain factors and local employment growth? Second, are policy approaches based upon the manipulation of these factors likely to have an effect on the distribution of economic activity, in particular on local employment growth? Although the primary focus of this thesis is upon the first question, describing the extent to which certain factors are related to job growth, the context within which it is explored and the underlying motivation is framed by the second question. The remainder of this section will briefly outline this context.

The distribution of economic activity in Canada has been an important political consideration since the nation's birth in 1867. The constitution now places a responsibility upon the federal government to ensure that the country's regions[1] share equitably - to the extent that this can be defined - in the nation's growth and prosperity (ECC, 1990a). In response to persistent regional divergence in income and employment (ECC, 1977; Cohen, 1991), and in keeping with the welfare state ideology which prevailed after the second world war - partly in reaction to the devastation caused by the depression of the 1930's - a series of explicitly regional policies were implemented during the 1960's and 1970's. But as the prevailing

[1] Throughout the thesis 'region' will be used in a generic way to indicate any sub-national spatially defined area. Thus, any description of 'regional' effects or 'regional' characteristics includes 'urban' effects and 'urban' characterictics. In cases where a distinction needs to be made between the spatially more extensive regions and the smaller 'localities, or 'urban areas' this will be made clear.

ideology shifted from one of socialised to one of laissez-faire capitalism (Harvey, 1994), so the impetus to design policies aimed at reducing regional imbalances disappeared. By the late 1980's there no longer existed any federal body explicitly concerned with regional development (Rowlands, 1994).

This is not to say that the spatial distribution of economic activity has not been a political issue prior to the 1960's or after 1987. Indeed, for the first century of Canada's existence, industrial policy was implicitly spatial. One of the federal government's first major projects was the construction of the transcontinental railroad which opened up the prairies, and later on the west coast, to economic activity based upon their natural resources (ECC, 1977; Pomfret, 1981). Indeed, all policies which directly or indirectly relate to the resource sectors have spatial implications: not only is Canada's economy still geared towards the exploitation and export of natural resources, the dependence on such exports differs substantially across provinces (Cohen, 1991). Similarly, industrial policy relating to the automobile sector has important spatial connotations since this industry is primarily concentrated in Southern Ontario (Holmes, 1991).

The distribution of economic activity and employment has also been a focus of explicit policy intervention over most of the twentieth century at different spatial scales. Regional and local governments have attempted to maintain and encourage growth within their respective jurisdictions. As settlement expanded to the west, and notwithstanding the obvious importance of centrally funded transport infrastructure, self-reliance was part of the 'frontier' mentality. To the east, in the early 1930's, the ideas which currently underpin much of local development theory were made explicit in the Antigonish movement (Lamontagne, 1989). In fact, it is argued by some that the very purpose which underpins most local political activity is the promotion of economic growth (often for the benefit of the local rentier class, not for the community at large) (Logan & Molotch, 1987/1996).

More recently, as central government has retreated from explicit attempts at the spatial redistribution of economic activity, the efforts of local governments to influence the location of economic activity have come to the fore again (Galaway & Hudson, 1994). This phenomenon is not uniquely Canadian, and the increased relevance of local initiatives has become evident, since the late eighties, in most western countries (Keating. 1993; Eisinger, 1988). However, a question to which no satisfactory answer

has yet been found relates to the effectiveness of policies, whether national or local, to actually influence the location of economic activity.

There exists a wide body of theories which explain certain aspects of the spatial distribution of employment and economic activity, but the purely spatial theories tend to be piecemeal, focusing on one particular aspect of the empirically observed spatial distribution without fully accounting for other facets. Other 'wider' theories, often in reaction to the partial nature of spatial theory, attempt to incorporate space into a wider understanding of society's evolution.

Indeed, the spatial distribution of employment[2] reflects a diversity of social and economic phenomena. Massey (1995), for instance, argues that the way in which employment is distributed across space both reflects and reinforces trends in capitalist methods of production and exploitation. The evolving nature of this distribution, the differential rates of growth and decline across space, cannot therefore be understood without reference to the changing nature of class, gender and racial relations as they are crystallised in the process of accumulation. The *régulationistes* - the proponents of regulation theory (Amin, 1994; Elam, 1994) - similarly argue that the spatial configuration of employment both reflects and enables the efficient implementation of new production technologies. For them also, the changing nature of production cannot be understood without reference to the wider social and political arenas which, at any one time, provide the institutional and tacit framework within which accumulation can occur. Researchers who study the relationship between the global and infra-national economies stress the importance both of initial industrial structure (Cohen, 1991) and local characteristics (Scott, 1996) in the determination of employment outcomes: here also, spatial outcomes are seen to be the result of wider processes.

In the light of these diverse positions, policies to influence the location of economic activity may appear largely irrelevant. The factors which determine employment distribution are operating at such a level - cultural, ideological, social, global - that policy intervention can only have a very marginal effect. For instance national governments, especially in an era of increasing globalisation, can only have a very limited influence upon modes of regulation and social structures of production: these

[2] It will be argued below that the distribution of employment is an indicator of the distribution of economic activity. Thus both terms are used in the introduction: 'economic activity' is used when the general concept is discussed, 'employment' when the research referred to has focussed specifically upon the employment component of economic activity.

are increasingly determined at a global level by market forces. Even if national economies were closed, the move from a capitalist to an alternative system is difficult to conceive. The apparent failure of the socialist experiment and the lack of any alternative[3] preclude any 'easy' shift, even if one were desired. At the local level, it is even more unlikely that policies could influence the wider social structures. Similarly, if a more restricted economic perspective is taken, it can be argued that market vagaries are not within the power of nations or localities to control.

Nevertheless, policies *are* implemented, at a national[4] and increasingly at a local level. These policies are frequently premised upon an understanding of the conditions which are necessary to encourage the flowering of local activity or the conditions which may attract outside activity to the area in question. The public *justification* for such policies is often the creation of jobs, whether directly for the unemployed, or indirectly by multiplier effects (Logan & Molotch, 1987/1996). The actual *motivation* may be quite different: local 'growth coalitions', which gather local business people and politicians, can seek to implement local policies or attract national level intervention in order to further their own interests (such as the increase in land value, the widening of local markets, building infrastructure etc...)(Logan & Molotch, 1987/1991; Cox, 1995; Leitner, 1990); others may implement policies with the genuine intention of creating jobs for the local workforce in order to increase the welfare of the local population (Galaway & Hudson, 1994).

In this thesis the prevailing social and economic structures will be taken as given. This pragmatic position in no way precludes the possibility that the actual spatial distribution of labour, and its evolution over time, may be closely related to the wider frameworks mentioned above. But if one accepts that, whatever the fundamental underlying causes of differential employment outcomes, policy makers must operate in the prevailing economic system, then it is important to focus upon those factors of differential employment growth which are *claimed* to have an effect within that system. These factors are often selected because they have been identified within an economic theory as being related to employment growth. Furthermore, case studies or statistical analysis (generally at a very aggregated level) have tended to confirm the

[3] Alternatives have been suggested, such as Daly & Cobb's (1994) ecologic economics. Their critique of the current system is profound, and their attempt to extract the economic debate from the socialist / liberal dichotomy opens up new possibilties, but such an approach has yet to gain widespread recognition and momentum.

[4] This is especially the case in the European Economic Community. In North America explicit federal regional policies are no longer in practice.

importance of these factors for employment growth. Thus, without losing sight of the external constraints and the possibility of mixed policy motives, it is relevant and useful to explore whether certain factors are related to urban employment growth, whether the theories and aggregate level studies adequately portray the employment growth dynamic at an urban level.

In the chapters which follow, some of the theory which underlies the identification of factors of employment growth, and the subsequent development of regional and local employment policies, will be explored. The effect of wider economic forces on employment in cities will be described, and this will be followed by an examination of the policy framework which is currently in place: regional policies will be alluded to, but the focus will be on local initiatives. The wider changes which are occurring within society cannot be ignored, and further to the discussion of the spatial and policy issues, some of the changes currently being experienced in the production process and the wider economy will be described. Following this, the empirical work will be presented: in it, a series employment growth factors are explored and analysed across the Canadian urban system in order to assess their likely relevance in a policy context. The essence of this empirical work is primarily descriptive, describing the relationships observed between factors and employment growth. Placed in the wider context of policy and politics, these descriptions lead to questions and observations which go beyond the scope of the empirical analyses.

The rest of this chapter will outline some of the basic concepts central to the proposed thesis and briefly explain the relevance of some of the specific choices (e.g. period covered by the study) which have been made.

1.2 Why Employment?

It is legitimate to wonder why employment has been chosen for analysis. After all, if economic activity is of interest, GDP type measures would be a far better indicator. If employment is of central interest per se, then the 'quality' of employment - salary, benefits, length of contract etc... - should also form part of the study.

The reason for choosing 'employment' as the key variable is two-fold. First, employment can be considered a proxy for GDP type indicators. "The local labour market has become for many geographical researchers the *best* analytical lens

through which the structure of the contemporary spatial system should be conceived" (Clark, 1986, p416). The sectoral distribution of a labour force is a "reasonable first approximation to the relative specialisation" of geographical areas. Whilst Coffey (1996, p44) makes this statement with reference to countries, it is all the more relevant for sub-national units for which GDP measures are usually unavailable. The labour market is often the only way of assessing the distribution of economic activities within an urban unit, and even Massey (1995), who shuns much of traditional spatial and sectoral analysis, relies on spatial analyses of the sectoral distribution of employment[5] as a starting point for her wide ranging exploration of the spatial divisions of labour. Therefore, the study of employment not only has relevance in its own right (for welfare and political purposes), it also serves as a way of studying the distribution of economic activity across the country - distribution which may itself reflect wide ranging social processes. The primary purpose of the empirical studies in this thesis is to provide a description of the changing distribution of employment (as a proxy for industrial structure) as it relates to certain growth factors.

The second reason for choosing employment as a variable is that employment is of itself an issue of considerable political importance as outlined above. At a national level, development policies have traditionally sought to address regional employment issues (Brewis, 1969) and today there is an increasing trend for local governments to become involved in job creating projects (Galaway & Hudson, 1994). Whilst it is undeniable that most of these policies have been implemented with a genuine view to promoting employment, the political appeal of employment policies must not be underestimated. The political system in Canada is territorially based, and there is evidence that ever since the implementation of regional development policies in the early sixties considerable importance has been attached to which level of government (federal or provincial) gets 'credit' for policy implementation (Lithwick, 1986; Rowlands, 1994). Policies with widely differing aims can be made palatable to the electorate if they are presented as job creating (Logan & Molotch, 1987/1991; Cox, 1995; Leitner, 1990). The focus on employment enables policy approaches to be assessed in terms of an commonly recognised measure of spatial disparity (Cohen, 1991). Whether or not this indicator relates to the underlying motivation (which can range from the

[5]See, for instance, Massey (1995) chapter 4, in which the spatial structure of the electronics, clothing and service industries are analysed in detail. Although the underlying *causes* of the distribution range far beyond spatial factors, and the relationship between space and social processes is seen to be complex, the starting point for much of her analysis is the basic distribution and changes in employment patterns across the UK.

consolidation and enrichment of local elites to vote gathering) is another question; indeed, Rowlands (1994) identifies "one of the most enduring evaluative difficulties [of regional development programs as] the failure of governments to identify clearly the objectives ... and identify quantitative measures of success and failure" (p 390). This lack of clarity may not be entirely accidental.

1.3 Employment Growth

Employment growth can be considered from a variety of different perspectives. From a point of view in which the number of jobs is the principal concern it is useful to consider two basic approaches. Each depends upon the geographical scale of enquiry and upon the assumptions made.

The first approach is that which is implicit in most of the literature on economic growth (see Ray, 1998; Solow, 1970; Hacche, 1979). Here, employment is treated as both by-product of and input for output growth. In a closed economy, assuming that the production function remains unchanged, the growth of output[6] and of employment are closely related. In general, output increases at the same rate as the workforce expands, but in the event of unemployment - an occurrence which is not envisaged but which may conceivably occur if people who previously did not wish to work suddenly decide to enter the workforce - employment can be increased only by expanding output. Improvements in *per capita* output occur only as a consequence of qualitative changes in technology, management and market structure[7]. This approach seeks to explain the mechanisms whereby a closed economy can generate more output and jobs.

The second approach - and the one which will be adopted in this thesis - is to assume that the overall level of employment in an economy is determined by exogenous factors. The questions relating to whether or not the economy is producing enough employment in aggregate to meet the needs of the population are not of primary

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[6] As measured by a GDP type indicator. See Straussfogel, 1997 and Daly & Cobb, 1994 (ch 3) for a discussion of this type of indicator and for suggestions as to how it can be improved in order to take into account wider welfare and ecological concerns.

[7] These concepts will be referred to in subsequent chapters. Briefly, as technology improves, so the output per unit of labour increases. The production process can be made more efficient, by the division of labour and specialisation for instance, as can market structure (increased trade can lead to a more efficient use of factors of production). In chapter 2 the division of labour and basic trade theory are discussed; chapter 3 introduces the notion of competitive advantage, and chapter 4 discusses the link between employment and technology.

concern. Rather, given the demand for jobs, the question to be addressed is that of distribution: how will the jobs generated in the economy under study be distributed? The dimensions over which jobs can be distributed are almost limitless - gender, age, race, class are all important aspects, as are issues relating to the quality of jobs created. In this study, it is the spatial distribution - and specifically the way in which new jobs are distributed across the urban system - which is of primary concern. This approach is fundamentally different from the first one: employment 'growth' is now a relative, not an absolute, term. In a context of overall employment decline, there may be some geographic areas which benefit from employment growth. Even in a context where *all* geographic areas witness employment decline or increase, the *rate* of growth may differ from place to place.

Logan & Molotch (1987/1996) argue that "local growth does not make jobs: it only distributes them" (p321), and the presentation of the two approaches made in the preceding paragraphs implicitly espouses this position. However, the relationship between overall employment growth and its distribution - in this case spatial - is not as clear cut as the dichotomisation suggests. Indeed, Logan & Molotch (1987/1996) themselves suggest that growth in some localities may be less costly than in others because of underused infrastructure, lower migration costs and so on (p319). A distribution of employment which is not governed by gender, class or race norms could likewise engender increased efficiencies if it enabled a better match between individual abilities and employment. This issue - the link between distribution and overall job creation - will not be directly addressed in this thesis although it will be referred to at various points, for instance when the diseconomies associated with urban concentration and the inefficiencies of inter-urban competition for jobs are mentioned.

1.4 The Canadian Urban System

The concept of a 'system' is one of considerable complexity. It suggests a group of entities which interact both with each other and with the 'outside' world. The behaviour of any one entity over time is dependent upon the initial conditions of the system as a whole, of the entity in question, the behaviour over time of the other entities and, perhaps crucially, on stimuli from outside the system (see Prigogine, 1993, ch1). The study of systems presupposes a non-deterministic approach: the effect of outside stimuli is not predictable, and the way in which these are reflected throughout two

supposedly identical systems can be affected by minute differences and by the fact that systems evolve in a probabilistic fashion; an outcome for the system as a whole, and for individual entities within it, can be assessed as more or less probable, but cannot be predicted. These general properties of 'systems' refer to systems in the physical sciences, but there is an increasing convergence between the study of systems in the human and physical sciences (Prigogine & Stengers, 1979; Allen, 1997; Ormerod, 1994). The adoption of physical models by the human sciences has often been deplored (Massey, 1995, p50), in particular because the physical sciences have traditionally focused upon static equilibrium and reproducible experiments (Prigogine, 1993) with deterministic outcomes. However, systems analysis in the physical sciences is increasingly drawing upon notions - such as cumulative causation and sustained disequilibrium - which have long been recognised in the human sciences (Prigogine & Stengers, 1979, p252 et seq). Thus, although this thesis will not directly make use of the models developed in physics, the definition and properties of systems which are currently developing in physics and chemistry usefully formalise the notions which are - usually - implicit in the urban systems literature.

"Economic growth in any given country is increasingly articulated through the nation's set of cities", leading to "a particular type of urban system organisation" (Bourne, 1975). This organisation will be returned to in chapter 2. For the purposes of this introduction it is useful to note the fact that urban systems have been highlighted as important elements in the structuring of a national economies. In this thesis, the Canadian urban system is defined - following Simmons (1991) and Coffey & Shearmur, (1996) - as the set of 152 urban units each comprising at least 10,000 people in 1991. So defined, the urban system comprises over 75% of the Canadian population and 80% of the jobs. The choice of the urban 'system' as focus of analysis presupposes that, in some ways at least, this set of urban units is related. Various types of relationships may exist between them: hierarchical, complementary, competitive, and an understanding of these relationships may assist in understanding the behaviour of each individual unit (Bourne & Simmons, eds, 1978; Yeates, 1980). However, the system as a whole as well as each urban unit is also in contact with elements external to the system - both international and in the 'rest' of Canada - and these links must also be considered when analysing the system.

The definition of an 'urban system' is to some extent arbitrary: Yeates (1980) studies all North American cities - Canada and USA. Sassen (1991/1996) examines the cities

at the top of the global (world-wide) urban system. The choice of minimum population size, which is usually used to limit the size of the system, is also fairly arbitrary: Yeates (1980), for example, adopts the definitions given by census-gathering organisations, and limits his analysis to CMAs and SMSAs[8], as do Noyelle & Stanback (1984) who limit their study to the USA. Other methods for defining the system can be used, however. For instance Sassen (1991/1996) adopts a functional approach and defines the principal elements of her system as those with a particular set of functions. Whatever the exact specification of the system, the analyses of urban systems have in common the fact that they consider each urban unit as having a function within the system analysed, and the purpose of the analysis is to understand how these functions interrelate, and how the world outside the system affects the behaviour of the system's elements. Although the 'system' need not be spatially limited, national systems are often studied (see Bourne, 1975, quoted supra) due to the political cohesiveness of the systems thus defined. From a policy perspective, the nation is still a useful unit of analysis since, whether or not specifically urban or regional policies are implemented at that level, the general regulatory framework is still defined by national governments. The power of national governments may be eroding (Held, 1993), there may be a 'hollowing out' of the state (Jessop, 1994), but as yet no other legitimated structure of political organisation has emerged.

1.5 The Period of Study, 1971 to 1994

The period studied - 1971 to 1991, with some data extending to 1994 - is of particular interest since it covers the period during which Western economies in general, and the Canadian economy in particular, have undergone some major transformations - transformations which, some argue (e.g. Harvey, 1994), have not yet ended. Indeed, the immediate post war years were a period of strong and sustained economic growth, with nearly full employment and increasing prosperity across the western world (Amin, 1994; Fourastié, 1979; Singh, 1997), but the early seventies witnessed a series of upheavals. The oil shock of 1973 precipitated a series of instabilities which had been gathering momentum since the early sixties (Harvey, 1994), in particular the inability of national governments to continue the implementation of keynesian demand management policies destined to maintain full employment (Martin, 1986, p239). The Bretton-Woods agreements on foreign exchange had already collapsed in 1971,

[8] CMA's: Statistics Canada Census Metropolitan Areas; see definition in chapter 5. SMSA's (Standard Metropolitan Statistical Areas, now called MSA's) are the US Census Bureau equivalent

trade, which had been relatively restricted in the immediate post-war years was growing in importance, and the power of large multinational firms was becoming more apparent (Drucker, 1968).

One of the reasons sometimes put forward for these sea-changes is the fact that post-war reconstruction was completed, and in most western countries the demand for basic manufactured goods such as cars, televisions and various kitchen and sanitary equipment was tailing off (Fourastié, 1979; Galbraith, 1958). At the same time, automation and computerisation were beginning to change production methods, increasing labour productivity and introducing the possibility of a more flexible approach to manufacturing (Tomaney, 1994). This more flexible approach opened up the possibility for producers to relocate factories according to cost and labour considerations (Amirahmadi & Wallace, 1995), to operate on a truly global scale (Barnet & Cavanagh, 1994), and to facilitate international co-ordination (Dicken, 1992). In addition, these same technologies led to the possibility of smaller production runs, smaller establishments, and the appearance of territorially based production networks (Garofoli, 1992; Digiovanna, 1996).

To some extent these trends - globalisation on the one hand, territorialisation and small scale production on the other - are contradictory, and it has been pointed out that neither has clearly become dominant (Martinelli & Schoenberger, 1992; Gertler, 1988, 1992). It is maybe the appearance of such a fundamental contradiction that has prevented a stable 'new order' (see Corm, 1993) from appearing, even after nearly thirty years of upheaval. These various trends will be referred to again: but suffice it to say here that an understanding of employment trends, and particularly of their geographical impact, over 1971 to 1991, is an important element in understanding how Canadian cities have been affected by these various upheavals.

Other trends were also underway during this period, trends which had less to do with economic transformations and more to do with social evolution. The change which maybe has the strongest impact upon employment profiles is the increased feminisation of the workforce and the consequent increase in participation rates. This dimension may have both spatial and sectoral effects (Massey; 1995; Nelson, 1986), and although the spatial effects will tend to operate at an intra-metropolitan level, such social considerations are also an important underlying aspect of employment changes since the 1970's.

1.6 The Thesis

Bearing in mind the short discussion above, the thesis will be set out as follows. The second chapter will present some of the theories relating to the spatial distribution of economic activity. There is no single unifying theory, but a series of concepts are introduced which are then referred to throughout the remaining chapters. These concepts are outlined in order to inform the subsequent discussion on policy approaches and employment, but no attempt is made to be exhaustive or to describe the considerable degree of refinement to which some of these concepts have been taken. Although the theories may have been refined, it is usually the basic concepts which have informed policy approaches, and the factors of employment growth can be identified by reference to the theoretical framework given.

The third chapter will cover some of the policy approaches which affect the spatial distribution of economic activity. A distinction will be made between comparative and competitive advantage - the latter concept incorporates a wider latitude for policy intervention. The nature of competitive advantage, but also the risks of relying on such a concept, will be examined. Although regional policies will be discussed, the focus will be primarily on policies which are developed at the sub-national level since, particularly in North America (Eisinger, 1988; ECC 1990), it is at this level that development policies are currently being implemented.

The relationship between economic activity and employment is changing, and in the fourth chapter the nature of some of these changes will be explored. It is argued by some that economic activity is decreasingly reliant on labour and increasingly so on automated production techniques. This argument will be examined, and its sectoral implications drawn out. The changes in the nature of employment also have a geographic effect - partly in relation to the changing sectoral structure of employment, partly in relation to the spatial division of labour. Whilst both of these are dealt with in preceding chapters, the role which technology plays in these processes is examined here in some detail.

The fifth chapter briefly describes the nature of the data used in the empirical analyses. Some general methodological considerations are also set out - detailed

descriptions of the research methodology are included in each of the relevant chapters.

In the sixth chapter, some factors of employment growth are assessed over the 1971-1981 and the 1981-1991 periods. Several factors are identified which are correlated with employment growth - and an assessment is made of the theories which emphasise the factors analysed.

The three following chapters examine in more detail some of the growth factors included in the analysis of chapter six. The analyses highlight a series of 'popular' factors of employment growth, factors which are fairly uncontroversial and have often informed employment policy approaches. This lack of controversy is often based upon studies conducted at the national level, upon case studies, and perhaps most importantly upon a certain ideological consensus which renders these particular factors 'acceptable'. The location of high-tech industries - both manufacturing and services - is analysed in chapter seven, with particular emphasis on the characteristics of the urban units which have a high concentration of such employment. The image of "the jet-setting microchip scientist/inventor/entrepreneur" (Massey, 1995, p132) and the tendency to glorify the capacity of technological progress to improve the human lot (Daly & Cobb, 1994) may be contributing factors to the lack of controversy surrounding the job generating potential of this sector.

The relationship between establishment size and employment growth is examined in chapter eight. In chapter nine, the link between the educational level of an urban unit's population and employment growth in different economic sectors is examined. The highlighting of small establishments and education as factors of employment growth have in common the transferral of responsibility for employment growth from society to the individual - both factors arguably emphasise the fact that unemployment is attributable to personal failings, either in terms of entrepreneurial or educational skills. This insistence on individual responsibility dovetails neatly with the prevailing neo-conservative agenda and the withdrawal of government from social affairs - the emerging "Schumpeterian workfare state:" (Jessop, 1994, p263 et seq.). Here again, the results obtained in chapter six are expanded upon in these more detailed analyses, and an attempt is made to assess the actual relationship between these factors and employment growth in Canadian cities.

These chapters systematically review the standard arguments put forward for emphasising these factors of employment growth and proceed to perform an empirical analysis in order to describe the link between each 'growth factor' and employment growth itself. Comments are then made with regards to the connection between the status of each factor as a 'job generator' and the empirical findings.

Each of the four chapters in which an empirical analysis is presented have been published separately as independent articles: therefore, each contains not only a review of the recent literature pertaining to the factor studied, but also a conclusion in which the implications of the results are discussed. For that reason, the tenth chapter, which concludes the thesis, is relatively brief: detailed conclusions have already been drawn, but some of the more general points to emerge from this study are summed up.

Chapter 2

Theories of Employment Distribution and Growth Across Space: a Review of Some Basic Concepts

Differential rates of employment growth can occur across space for a variety of reasons. New jobs may be created more rapidly in some areas than others. Multilocational companies may choose to locate establishments in some areas rather than others. Employment loss may be slower in some places than in others. In this chapter, some of the basic explanations for differential employment growth will be outlined. The intention is not to provide a comprehensive and detailed analysis of regional economics or of location theory: rather, some of the basic concepts which inform much of the discussion surrounding differential job growth will be presented.

The decision to keep to 'basics' has been made for two reasons. The first is that, in order to cover each of the concepts in detail, to examine the variants of each theory and their latest derivations, would require a thesis in itself. The second is that, notwithstanding the considerable subtlety of the more complete theories, the identification of employment factors which are then translated into policy approaches is usually premised upon the basic concepts outlined below. Although the more complex iterations of the theories presented can be of considerable use in understanding the mechanisms involved in differential growth over space, the operative concepts are generally those highlighted in the more straightforward formulations.

There is considerable debate surrounding the extent to which regional economics and location theory are able to grapple with the problem of employment location and growth. The assault on such approaches has been spearheaded by Massey (1995): according to her, these approaches are unable to get to the root causes of differential growth patterns since the patterns reflect not only, or even principally, economic phenomena but wider social forces. The first section of this chapter will therefore outline Massey's position - a difficult task due to "the complexity of the book" (Massey, 1995, p314). Although the debate has moved on since the publication of "Spatial Divisions of Labour" in 1984, the fundamental points raised therein are as relevant today as they were fourteen years ago.

2.1 "Social Structures and the Geography of Production"[9]

It is not possible in this short section to do justice to the complexity and extent of Massey's (1995) argument. For that reason, a brief summary of her basic position will be outlined, based primarily on her own introduction to the book's second edition. A somewhat more detailed examination will be made of her objections to traditional location theory, regional economics, and to the idea of causality.

According to Massey (1995, p1 et seq)

> "uneven development - perhaps the central concept of economic geography's field of enquiry - is still most frequently discussed as if it were only a matter of more development in some places than others; more jobs/investment/income here than there. Implicit in this is a notion of economic space as an undulating surface, with successful high-points and less fortunate lows. The argument [in "Spatial Divisions of Labour] is that space can be more helpfully conceptualised as the product of the stretched-out, intersecting and articulating social relations of the economy. Not only does this integrate 'the social' and 'the spatial' from the moment of initial conceptualisation, it also introduces - directly into space itself - the issue of social power..... To try to interpret economic space through the distribution of unemployment numbers (or to interpret any space simply through distributions of such phenomena) is to underestimate the complexity of social space; most particularly it is to evade reading it relationally... I want to argue [that] what construct economic spaces as relational are the social relations on which those objects/jobs themselves depend.... So the existence of variation in kinds of jobs bears witness to the geography of the social relations of the economy. Each new spatial division of labour represents a real, and thorough, spatial structuring. It marks a new form of regional problem: and more basically it marks not a new re-organisation of relations *in space*, but *the creation of a new space*".

This basic position is explored and developed throughout the book. The spatial divisions of labour observed in the UK both *reflect* and *structure* social relations. Thus space is both an input to and an outcome of social relations, which, in the current capitalist system are based upon relations of class, gender and race. In terms of

[9] This title is the sub-title to Massey's (1995) "Spatial Divisions of Labour"

labour, spatial distributions are related to the internal structure of establishments. Massey distinguishes three types of internal structure

- i) *locationally concentrated*, with management and all processes located in one place;
- ii) *cloning branch plant*, with management located in one place and branch plants incorporating the entire production process located in various places across the country;
- iii) *part process spatial structures*, in which management is located in one place, and each plant incorporates only one step of production. The output of each plant is input for another.

Massey (1995) is careful to point out that other types of production organisation exist, in particular variations on the second (e.g. sub-contracting) and third (e.g. just-in-time) structures. The point she is making is that these various forms of firm structure represent particular forms of capitalist accumulation and *enable* different spatial distributions of classes (owners, top managers, middle managers, foremen, workers etc...). It is important to emphasise that the spatial distributions are not *determined* by the production processes, but that as soon as production is broken down into component parts, then location decisions can be taken in relation to spatial characteristics of different locations. It is also important to appreciate that changes in production processes may be a *result* of class conflicts: for instance, a move from the first to the second type of structure may be caused by a desire on the part of management to defuse a unionised workforce by enabling production to switch from plant to plant. The third type of structure may be instituted in order that 'upper echelon' employees (those in R&D and top management, for instance) live and work in isolation from those in the 'lower ranks'. Similarly, location decisions can be taken in order to exploit certain types of labour (such as cheaper, feminine labour), but this exploitation may only have been rendered necessary because of demands made elsewhere by a more organised workforce.

From this perspective the search for spatial 'causal' factors of location, or for purely economic models of employment growth, is futile. The causes which underlie the changing spatial distribution of labour are complex, interrelated, and go far beyond the characteristics of local areas (Massey, 1995, p50). In particular, the positivism which dominated economic geography in the 1960's saw local uniqueness "as something to be normalised away, reduced to conformity... There was a search for empirically-

generalisable laws and an obsession with the quantitative (p50)". "One of the commonest empirical methods was (and unfortunately still is) the simple confrontation of two maps, one representing cause, the other effect... the data on the two maps were then correlated and the production of significant coefficients was assumed to effectively (after all the usual caveats) imply cause (p12)". This criticism is most damaging for location theory, which tends to rely on such an approach. Regional economic theories, such as those of cumulative causation and of regional equilibrium (see below), are also subject to criticism: each can only explain one aspect of regional growth/decline, but it is clear that both cumulative and equilibrating forces are at work, with different outcomes in different regions. Furthermore, neither deals with the changing nature of regional economies (Massey, 1995, p118).

Faced with such a coherent and well argued attack, it is legitimate to wonder why the discredited location theories, regional economics and correlation techniques are relied upon in this thesis. Surely, in order to explain employment growth across the Canadian urban system either a holistic approach of the type undertaken by Massey should be used, or in-depth case studies should be performed in order to disentangle the complex and interrelated causal factors.

A number of points can be made in defence of the approach adopted in this thesis. To begin with, the opposition which Massey creates between her own approach and the approaches she criticises can be questioned. Although she quite clearly goes beyond "map on map" correlations in order to understand the causal factors behind the spatial divisions of labour, her entire book is aimed at explaining certain patterns identified by simple statistical descriptions of employment distribution and growth. Whilst her criticism of such techniques, and of the SIC type classification of economic activity, is wholly justified, chapter 4 of her book, entitled "Some Changing Spatial Structures in the United Kingdom" rests strongly upon the results of 'classical' spatial analysis of traditionally defined sectors. This is not surprising: such analyses provide the raw patterns which Massey then tries to explain. Sectors can be broken down into component parts and functions, and spatial patterns can be construed as both a reflection and a cause of certain social processes: but such important and necessary refinements hardly justify abandoning the basic techniques of analysis. This being the case, it would appear that Massey's criticism ought to be directed towards the *claims* made for the correlation approach rather than towards the approach itself.

Likewise, despite roundly criticising traditional location theory, 'labour', for instance, is still analysed as a location factor (p135 et seq). Of course, labour characteristics are not seen by Massey as *determinants* of industrial location, but rather as *enablers*. Nevertheless, a legitimate research question which correlation type techniques can investigate, and one which is addressed in this thesis, is the degree to which particular 'enabling' factors are actually related to the distribution of economic activity. The division of labour which Massey identifies in industry also operates in academia: the output from quantitative map on map analyses, the simple identification of spatial patterns and regularities, can serve as input to analyses which seek to identify causation.

As mentioned above, it would appear that the criticisms levelled at the techniques and theory adopted in this thesis are directed more at the claims made for them than at the techniques and theory themselves. What claims are therefore being made for the theories and processes described and relied upon in this thesis? As will be seen, there is no attempt to suggest that the various location and regional economic theories constitute a unified theory of employment distribution and growth. Rather, a variety of approaches is presented, each of which is useful in understanding the spatial distribution of labour from an economic perspective. The fact that many employment policy approaches are premised upon these theories makes them of considerable importance, whether they are good theories or not. The fact that many of these theories overlap and complement a more global, social approach, suggests that they have something to offer even if this falls short of a complete causal analysis.

From a policy perspective it is important to remain pragmatic: an approach such as that put forward by Massey no doubt delves deeper into the causes of differential employment outcomes and therefore indicates the directions which may be taken in order to effect changes in this outcome. These changes, however, touch at the heart of the capitalist and class systems, and are therefore difficult to implement in the short or medium terms. Policy makers wishing to influence the spatial distribution of the location and growth of employment may, even if fully aware of the more complex arguments and causal processes, be reduced to relying on partial theories and incomplete causal models. Traditional location theory, regional economics, and the more recent theories which place more emphasis on local culture and versatility, whilst maybe not getting to the root of the problem, do highlight some factors over which policy may have some control.

At another level, the partial nature of the approaches and theories described in this thesis may serve the policy makers' purpose by their very partiality: by focusing on 'the economic' and implying that local (or even individual) characteristics are causal, attention is diverted from wider social issues. The neo-conservative agenda can more readily be implemented if the social outcomes desired by the current ruling élites can be imputed to geographic 'causes'. This agenda, which has been quite successful in justifying the withdrawal of national governments from both social and spatial redistributive functions (Jessop, 1994), can now point to location factors or regional economic theories as being behind differential spatial outcomes. If a region or locality has slow growth, or if it can only compete with other localities by reducing wages and regulatory protection for its workforce, then this can be imputed to the 'causal' factors highlighted by traditional theory, thereby masking the social structures which perpetuate the dominance of the economic élite.

It is with this in mind that map on map techniques can also serve a critical purpose beyond their important descriptive and theory-testing role. Should patterns and correlations which are identified justify the claims made by the élites (whether local or national), then Massey's criticisms come to the fore: only *patterns* have been identified, and the underlying *causes* must be closely scrutinised. In any case, strong correlations, associated with a coherent theoretical explanation, are often as close as one can get to an operational understanding of causes in a policy context. But if the map on map techniques fail to identify patterns which corroborate the claims made, then this casts doubt upon the claims themselves. If, for instance, it can be shown that a particular location factor does not operate in the way which serves the purpose of the policy makers then this opens the door to a critical assessment of policy stances.

The remainder of this chapter will therefore set out some of the basic ideas which underpin classical location theory and regional economics. These ideas have been chosen in order to establish the various concepts from which explanations of the spatial distribution of economic activity have been derived and upon which policy approaches have relied. No claim is being made that these concepts provide comprehensive explanations of the spatial distribution of labour. It is probable that the researchers who developed and refined these ideas did not make such claims either. But the concepts introduced are central to the elaboration and justification of regional

and local policy stances and to the identification of factors upon which these policies attempt to operate, and it with this in mind that the chapter must be approached.

2.2 Elements of Classical Location Theory and Regional Economics

There is a wide body of literature which sets out to explain the effect which various local and regional characteristics have upon the distribution of economic activity: however, no single theory emerges, and a series of separate ideas and mechanisms, each explaining one aspect of the spatial outcome, are presented. Some attempts have been recently made to create a unified theory (Krugman, 1991; 1995) of the spatial distribution of economic activity, but one of the principal problems lies in the very nature of the topic: the distribution of economic activity is often approached by way of empirical analyses, and each simplifying assumption made in order to theorise abstracts from the real world - whether the assumption is that of a homogeneous plane (made by Christaller, see Dicken & Lloyd, 1990) or that of a single underlying market structure (Krugman, 1995). Whilst the simplifications serve to isolate the particular aspect of spatial distribution being analysed, they also detract from the general validity of any one approach.

A variety of the basic approaches are described below, beginning with the concepts which relate to the distribution of economic activity throughout an urban system.

2.2.1 Urban Systems

There is a wide and varied literature which introduces and analyses the concept of urban systems (see, for instance, Bourne, 1975; Bourne & Simmons, 1978). Certain general characteristics of systems have been described in the opening chapter, and these will not be returned to here. Many empirical analyses have been performed in order to understand the distribution of activities between cities within urban systems, and some of these are described in appendix 1. This section will introduce some of the concepts which underlie much of the urban systems literature, in particular those of hierarchical and functional complementarities. A brief discussion of some of the more general theories which underpin urban specialisation, and of the consequences of external factors upon urban units within the system will conclude this section.

2.2.1.a Christaller's Functional Hierarchy: Central Place Theory[10]

Developed by Christaller and published in 1933 (Richardson, 1969, p88 et seq.; Krugman, 1995, p38 et seq.; Dicken & Lloyd, 1990, ch1), central place theory sets out to explain the fact that within most countries certain types of economic activity (final demand goods and services) are not distributed uniformly over space. On the contrary, a persistent pattern emerges with a hierarchy of cities being formed.

For reasons which will become evident in the following sections, Christaller makes the assumption that the providers of final demand goods and services will tend to cluster into limited areas - points in space called central places (which correspond to urban areas). To explain the formation and spatial distribution of an urban hierarchy, he then makes the assumption of an isotropic plane - a plane with the same properties in all directions, and one in which the population is spread evenly.

For a given product or service, there exists a range beyond which people will not travel to purchase it: for instance, people may not wish to travel more than 5 miles to buy a loaf of bread. There also exists a market threshold below which a baker cannot function: for the bakery to operate profitably it may be necessary that all the people within a 4 mile radius purchase their bread from him. If the range is greater than the threshold, then a bakery will operate. On the other hand, if the threshold for the bakery is greater than the range, then no bakery will open. Assuming that bakeries can function then the optimum distance between bakeries is twice the threshold - bakers can operate without making excess profits. This reasoning is valid if the bakeries are strung out along a line, but, in a homogeneous plane - in order for the entire plane to be covered - it is convenient to approximate the circular market area to a hexagon, and for a bakery to be located at the centre of each hexagonal market area.

From this basic argument the logic of a hierarchy of urban areas can be deduced. All products with a similar market threshold as bread will locate in the same way as bakeries do - and this 'bundle of goods', or 'function' will characterise one level of the urban hierarchy. Another bundle of goods - such as kitchen hardware - may exist for which the market threshold is wider than bread's. Then these goods will be found in fewer central places, since people are willing to travel further to purchase them. Cars

[10] This explanation follows Dicken & Lloyd, 1990, ch1.

may be a higher order good still, to be purchased at even fewer places, and opera, for instance, may only be available at one central place, with people willing to travel from across the country to attend. However, each central place provides all the goods and services of places below it in the urban hierarchy, but not those of places above it.

There is in fact an inverse relationship between the frequency of purchase and the market range: each individual purchases bread often, and hence will not travel far for it. On the other hand, each individual may attend the opera twice a decade - but each time will be willing to travel a long way. For this reason, the threshold for opera will be wider than bread's: it may take one million people each attending twice a decade to keep an opera house running, but only three hundred people making daily purchases to keep a bakery in business. Christaller's geometric solution relies upon the assumption of an even distribution of population, but the basic idea remains valid if population is concentrated within the central places.

This theory has been very influential in the literature on urban systems - but it has limitations. On the one hand, it only explains the location of markets, but not of production or residence (Richardson, 1969, p91). Another limitation is the fact that each level of the hierarchy has identical market functions (Capello, 1998, p50), and empirical evidence clearly suggests that cities of a similar size tend to specialise - although this may be related to the fact that specialisation occurs more for exportable products than for local services.

2.2.1.b Lösch: a More Complex Hierarchy

Lösch, starting from Christaller's basic ideas, attempted to extend the idea of the urban hierarchy to encompass the possibility that urban centres at the same hierarchical level can specialise in various *production* activities. If they do, then some interaction (trade) between cities of the same level occurs - horizontal as well as vertical interaction is possible. "In Lösch's scheme, functional mixture and hierarchical position are not synonymous" (Dicken & Lloyd, 1990, p33).

Such specialisation led Lösch to consider the importance of transport routes for the relative location of production, and the consequent effect upon the concentration of population (entailing a 'distortion' of Christaller's regular market areas). Whereas Christaller, in the geometric configuration of his hierarchy, attempted to minimise

transport distances as one moved up and down the hierarchy, Lösch also took account of transversal transport routes when working out the spatial configuration of his centres. He developed a hierarchy in which radial routes emanating from the highest level central place, and transversal routes between lower level central cities, combine to distort Christaller's configuration.

More activities tend to cluster around the radial routes, and this creates areas of activity rich and activity poor central places. This, in turn, affects the distribution of population, and market ranges and thresholds must be adapted to cater for varying population density.

Lösch's urban hierarchy is more flexible and more 'realistic' than Christaller's: but by introducing some more realistic assumptions, it also renders the theory considerably more complex. The configuration and evolution of the urban system under these assumptions can more readily be assessed by iterative methods (Prigogine & Stengers, 1979; Allen, 1997) than by static geometric reasoning, but even in the advanced urban systems modelling which can be conducted today, the basic elements of analysis are those put forward by Lösch and Christaller.

2.2.1.c The Division of Labour and Comparative Advantage

Lösch and Christaller developed their theories specifically in the context of urban systems, but the idea that production can be divided into constituent processes, that these processes can occur in different establishments, and that there are efficiency gains in spatial specialisation are grounded in classical economic theory.

One of the principal engines of growth identified by Adam Smith was the division of labour (Economist, 25/5/96; Letiche, 1960). Indeed, according to Smith specialisation improved "skill, dexterity, ... judgement ... and ... virtually all of technological progress, ... even the expansion of new investment" (Smith, 1776/1981, p112). As the production process is broken down into components, each labourer can become a master at performing a particular task. Specialisation improves the labourer's skills; as each labourer improves his/her efficiency at performing one particular task, the whole production process is speeded up. In addition, the actual organisation of production becomes more efficient: even if a labourer masters all aspects of the production process perfectly, he/she will have to lay down his/her tools after completing one

process and pick up new tools for the next, thus losing time. Finally, as labourers specialise and output increases, there will be a demand for new tools (new technology) which will become economically viable given the increased output.

Smith also emphasises that this idea need not be limited to a single production process. It can be generalised to the entire economy: "if we examine ... the belongings of a common labourer in a civilised and thriving country ... and consider what a variety of labour is employed about each of them, we shall be sensible that, without the assistance and co-operation of many thousands, the very meanest person in a civilised country could not be provided..." (Smith, 1776/1981; p117). Specialised trades and companies evolve in order to better perform the variety of tasks necessary to supply the wide range of goods and services available in an advanced economy.

As a consequence of increased specialisation, Smith emphasised the crucial importance of trade: "the surplus part ... of production ...must be sent abroad and exchanged for something which is in demand at home" (Smith, 1776/1981, p472). This idea led Smith to formulate a theory of international trade based on the idea of *absolute* advantage (Ormerod, 1994, p16) which postulates that under a free trade regime a country will specialise in the production of goods for which it has an absolute advantage, i.e., goods which it can produce more efficiently than any other nation. By extension, therefore, the acquisition of absolute advantage would ensure economic growth.

Ricardo elaborated upon Smith's ideas and introduced the idea of *comparative* advantage. According to Ricardo, nations would specialise in the production and export of goods which they can produce at a lower *relative* cost than other nations (see Nyaholo & Proulx, 1997, ch4; Ormerod, 1994). The idea has since been widened to cover a variety of factors of production: the Heckscher-Ohlin model (Nyaholo & Proulx, 1997, ch4) which makes similar assumptions as does Ricardo concerning the immobility of factors of production, posits that it is relative factor costs and availability which determine the location of economic activities. It can be noted that, despite the widespread acceptance of the Ricardian analysis, the assumption of factor immobility is hardly tendable today when capital can move in and out of countries with great rapidity - this has led Daly & Cobb (1994) to suggest that in some cases mobile economic activity will seek out locations which benefit from *absolute* advantage, leading potentially to uneven rates of development.

These basic models can inform the understanding of urban systems. Of course, there is more factor mobility between cities than between nations, but the idea that the division of labour can operate between localities within a country, that production efficiency can be enhanced if certain regions specialise in certain functions, can supplement Lösch's and Christaller's spatial analysis. Similarly, the benefits associated with trade, and the location of economic activity in accordance with relative (or absolute) factor prices and availability, can apply in principle to a system of cities as well as to a system of nations.

There is a conflict, however, between enhanced efficiency of the system as a whole and efficiency for each individual unit of the system. As technologies evolve, as different combinations of factors are required, and as the demand for certain products and services fluctuates, so economic activity in each unit of the system will fluctuate. There will be unequal outcomes depending on the function of each unit - in particular, differential rates of employment growth will be observed across the units of the system as demand for the factors available, the processes performed, and the products and services produced in each unit changes. Whilst specialisation may improve overall system efficiency, generalisation may reduce fluctuations and improve stability for each individual unit. The conflict will be returned to in chapter 3 as the relative merits of national and local development policies are discussed. In appendix 1, the results of some empirical studies of urban systems and a discussion of the differential regional and local outcomes of national and international economic fluctuations are described.

2.2.2 Agglomeration economies

'Agglomeration economies' is a general term which encompasses a number of related concepts - all of which tend to explain the concentration of economic activity within urban centres. It is this set of concepts which can serve to justify Christaller's initial assumption that markets will tend to be concentrated within a set of 'central places', and Lösch's similar assumption regarding production.

It is useful to distinguish between certain kinds of external economies which firms can derive within a city. Localisation economies are those which a producer derives from locating in close proximity to other producers of similar goods or services. Urbanisation

economies are those which are derived through scale economies - some internal and some external to the firm.

2.2.2.a. Localisation economies

There is a marked tendency for firms in similar industries to locate in close proximity to one another, for industrial clusters to form. This can be illustrated by the fact that the mere mention of some place names conjures up images of an industry: Detroit (automobiles); Sheffield (cutlery); Silicon Valley (electronics and computers); the City (finance) and so on. The basic logic underlying such behaviour is the existence of "economies of scale which are external to the firm but internal to the industry" (Richardson, 1969, p73). These economies of scale occur for the following three basic reasons, first set out by Marshall in 1920 (Krugman, 1991):

i) establishments in a given industry tend to require labour with similar skills. A cluster of such industries will thus engender a large enough pool of skilled labour to meet the demands of each firm: skilled labour will tend to gravitate towards the cluster in the knowledge that there is a high probability of obtaining a job there.

ii) establishments in a given industry tend to require similar inputs, so a network of suppliers will develop around the cluster. In particular, the suppliers will gain in efficiency since they will be able to produce on a large scale, providing supplies to more than one firm.

iii) finally, there will be intangible benefits such as technological exchange, market information and so on to locating in close proximity to firms in a similar industry.

Each of these factors of localisation economies can operate in various different ways. In particular, each can have an effect both on location decisions made by outside actors (firms and labour) as well as by local ones.

The presence of a large labour pool may attract firms from the outside who wish to open a plant specialising in the industry, but this is not the only effect it may have. A local entrepreneur is likely to be aware of the availability of labour skilled in a particular area, and may even be part of the labour force before he/she sets up his/her own company. The availability of labour and the knowledge of that industry will increase

the likelihood of new firms starting up in related fields. Similarly, as the industrial cluster develops, labour with the requisite skills will be more likely to locate in proximity.

Suppliers which provide inputs or services to the basic industry - particularly those with widespread sales networks - will be aware of the industrial concentration and will be more likely to open up a sales point in an area where the industry is concentrated. If large quantities of supplies are regularly shipped to the same place, transport costs will probably be reduced and transport networks themselves may adapt to the specific requirements of the concentrated industry. But entrepreneurial opportunities will also exist on the supply side. Entrepreneurs who become aware of supply deficiencies, of new inputs which will be required by the industry or of new markets for its outputs will benefit from the large numbers of potential clients. Since local entrepreneurs will not have to cover transportation costs, they will have an advantage over out of town suppliers: this will tend to lower the price of inputs for the client industry.

Finally, knowledge spill-overs can occur in numerous different ways. Entrepreneurs can emerge from the skilled workforce and exploit the knowledge acquired within the industry. As labour moves from one establishment to another through the natural process of career evolution, and as new labour is attracted from outside, new processes - managerial as well as productive - will spread between local companies. Informal contact between persons working in the same industry will also lead to the spread of knowledge. The importance of knowledge will be returned to below, as "learning regions" (Florida, 1995) and the "informational economy" (Castells, 1989) are currently considered to be increasing in importance with regards to locational choices (Malmberg, 1997).

Localisation economies are an important factor in explaining Lösch's modifications to Christaller's basic theory: both manufacturing and higher order service industries will tend to benefit from the process, and it is unlikely that the consideration of market area alone will determine their location. Local specialisation will emerge within the hierarchical urban system, and Lösch integrates this into his urban system model.

2.2.2.b Urbanisation economies

It is not only specific industries which cluster together. In most regions and countries, a relatively small number of large cities contain a very large percentage of all economic activity (Richardson, 1969, p70; Krugman, 1991, p14 et seq.). One explanation advanced for the general phenomenon of agglomeration is that economic activity will tend to locate in proximity to markets or to principal transportation nodes which link it to markets. In most industries economies of scale exist, and the larger the market they can serve whilst keeping transport costs to a minimum the higher the internal economies of scale (Richardson, 1969, p71; Krugman, 1991, p14 et seq.). Thus firms will be attracted to areas with a large market and good infrastructure: once an area has achieved these advantages, it is likely to become even more attractive to firms - and to people seeking jobs. The advantages linked to such areas of concentrated economic activity are called urbanisation economies.

Urbanisation economies encompass:

> "access to a larger market; the development of urban labour markets and pools of managerial talent; the presence of commercial, banking and financial facilities (including cheaper capital); economies connected with transport services ...; communication economies (i.e. opportunities for face to face contact with specialist services such as accountants, business consultants and advertising firms); the existence of social cultural and leisure facilities which influence location decisions; and economies of scale in public services..." (Richardson, 1969, p72)

At first sight, some elements of this list seem to overlap with the previously defined localisation economies; but the distinction between economies due to clustering of firms in the same industry and those due to the general agglomeration of economic activity is worth preserving. Thus, for an individual firm, the existence of an urban labour market is of benefit for two different reasons: first, the firm can choose from a wider pool of labour and benefit from intra-industrial exchange of knowledge. Second, the large city provides general infrastructure (health, education, transport...), large markets, and a variety of personal and leisure services which a single-industry concentration is unlikely to support. These will attract and maintain the labour force.

The list above highlights the importance of inter-sectoral activity - in particular the links between high order services and other activities. Since the early 1970s in particular, there has been a tendency for large firms to 'vertically disintegrate', with increased contracting out of legal, accounting, managerial and even technical expertise (Daniels, 1986, p298; Hansen, 1994). Whilst not the only reason for the fast growth of high order services, such disaggregation has been a contributing factor. In this context, the presence of a large variety of high order service providers has become an added attraction to locating in central areas (Coffey & Shearmur, 1998). These services will themselves tend to locate in large cities since they are able to take advantage of the centralised transport and communication infrastructure to export their expertise, and of the large local markets.

The credit and financial institutions also tend to locate centrally, and, as Richardson (1969) points out, this can lead to lower interest rates. Bradfield (1988, p112) produces evidence which suggests that interest rates do vary across regions in Canada, with lower rates prevailing in the more urbanised areas. There are no universally accepted explanations for this, but one possible reason for interest rate disparities is bankers' familiarity with the areas in which they live and work. This local knowledge and the higher frequency of credit applications from large urban centres makes risk assessment more straightforward and reduces uncertainty. Lack of local knowledge of small urban areas can lead to risk averse behaviour of centralised lending institutions, and hence either to credit restrictions or to higher interest rates outside the larger cities.

2.2.2.c Limits to Agglomeration Economies

There are a number of interrelated reasons to explain the agglomeration of economic activity, but, viewed in isolation, they suggest that agglomeration will continue indefinitely. This is not the case, however, because the advantages of agglomeration must be set against its disadvantages (Polèse, 1994; Capello, 1998).

As activity becomes increasingly concentrated within large urban areas, the costs of agglomeration become more obvious: pollution, environmental damage, congestion and so on (Jacobs, 1992, p254). In theory, therefore, there should exist a city of optimum size: this optimum will be defined as the size at which the difference between agglomeration economies and diseconomies is at a maximum. However, as Capello

(1998) points out, there are many problems with this definition. Are economies and diseconomies to be measured for an individual or for society as a whole? Are they to be measured for the population already within the city, or for potential immigrants? The intractability of these problems - in particular the fact that benefits accrue to immigrant individuals at city sizes well beyond the optimum size for residents (Capello, 1998; Polèse, 1994) - render discussions of optimum size somewhat academic.

According to Capello (1998), there can be no 'optimum' city size, since cities differ according to their function. As the size changes, so does their function, and the more dynamic cities are able to devise ways of adapting to the challenges posed by growth. Agglomeration diseconomies only become unmanageable in situations where cities are poorly governed and lack the capacity to innovate (Capello, 1998, p57). Historically, this arguments is verified: as sanitation technology and medical understanding have improved, so cities have been able to grow to sizes which would have previously been considered unmanageable. On the other hand, smaller cities continue to exist, and the Canadian urban system in particular is characterised by many medium sized urban agglomerations. The question may therefore not be one of optimum size, but rather whether smaller cities can remain economically viable, given the importance of agglomeration economies. The interdependence of cities, their organisation as an interdependent network rather than as a strict hierarchy, may be a way of preserving the viability of smaller towns (Capello, 1998, p55) - but this structure also has its limitations in particular in a context of inter-urban rivalry. These issues will returned to in the following chapters.

2.2.3 Factors of location

Above we have considered the location of economic activity in a fairly abstract way. Underlying the discussion have been the actual decisions made by economic actors, and it is by considering location factors that some of these decision processes can be highlighted. The basic assumption to be made is that firms will seek to maximise profits and, as a corollary, will seek to minimise costs. This assumption is not necessarily a true reflection of reality: managers may display 'satisficing' behaviour - they will be satisfied with any location which meets certain cost criterion. Managers may have other aims, such as maximum market penetration, maximum corporate size: these could either be part of a long term cost reduction strategy (immediate location costs are offset against future savings due to market penetration) or part of a strategy

motivated by factors other than profits (for example political power). Such considerations are crucial for capturing the limits of a cost minimisation approach, but the assumption throughout the following discussion will be that cost minimisation is the primary aim.

A useful distinction can be made between activities which primarily have a marketing function (to which Christaller's theory applies) and those which have primarily a production role. A theory of the location of production activities was developed by Weber at the turn of the century. Unlike central place theory, in which a homogeneous distribution of resources is assumed, Weber supposes that resources are available at given points in space which do not necessarily correspond to where the markets are (Dicken & Lloyd, 1990, ch2; Bailly & Béguin, 1990, p139). The problem faced by a producer is to locate at the point which minimises total transport costs. Assuming that transport is a linear function of distance and weight, then the best location is the one which verifies the following conditions:

$$T_x = \min \sum_{i=1 \text{ to } I} w_i d_i$$

where T_x = total transport costs from point X for bringing in inputs and for sending output to market
w_i= physical weight of inputs / output to be transported to/from point i
d_i= distance from point X to point i

Weber's approach to the location problem can be widened to include factors other than transport costs. It can be posited that all inputs to production will be distributed in an uneven way over space. Thus, the best location will be, as a direct extension of the above argument, one at which

$$O_x = \min (T_x + L_x + F_x + I_x + e_x)$$

where O_x = cost of production at point x including profits
T_x = total transport costs from point x for bringing in inputs and for sending output to market
L_x = total labour cost at point x
F_x = finance cost at point x
I_x = cost of other inputs at point x
e_x = other costs (or benefits) associated with location x

Here too, whilst the particular formulation may be more appropriate for manufacturing sectors, there is no reason why a cost minimisation approach cannot apply to certain service industries, specifically those which cater to intermediate demand. But for these sectors it may be the e_x term which is most important, and this term will be discussed further below.

This more complex location function introduces the possibility of substitution between various factors of production. Not only is there a possibility that expensive labour in one location may be replaced by cheaper labour elsewhere, the possibility that there may be substitution between, say, labour cost and transport cost is introduced. Location models have been developed which elaborate on this idea; in particularl Isard has performed work in the area of substitution analysis and Smith has extended and refined the notion of profit maximisation in a spatial context (Dicken & Lloyd, 1990). According to Dicken & Lloyd (1990, pp93 and 100), neither Smith or Isard fundamentally modify the theoretical implications of the Weberian model, but both considerably enhance the analytical power of the theory. In the context of this discussion, where the intention is a description of a wide range of basic concepts, these more refined iterations will not be further explored.

Having said that, some remarks can be made with regards to the extended 'Weberian' equation presented above. Some of these remarks, in particular in so far as they relate to production functions, cover some of the ideas put forward by Isard.

2.2.3.a Location and Markets

When considering the solution to the above equation, it must be borne in mind that location decisions do not only have an effect on inputs. They also affect the proximity to and extent of markets. Issues of scale must therefore be introduced, because, depending on the scale of production, the lowest cost locations may differ. For example, the lowest cost location for producing shoes for the Montreal market may be the location within the Montreal urban area which the combines low labour costs and good highway access. Locating in Newfoundland, despite dramatically lower labour costs, will not be efficient since the lower labour costs will be counterbalanced by the high transport costs. However, it may be that the shoe maker wishes to serve all of North America: in this case, the excess transport costs from Newfoundland to all points in North America may not be greater than the savings procured by using

cheaper labour. Depending on the market (location and extent) to be served, the lowest cost location can change.

The serving of a larger market may also bring about economies of scale at the plant level: the additional cost of individual inputs at any given location may be offset by the scale of the market served. Even if a shoe producer in Newfoundland has higher input *and* transport costs than the shoemaker in Montreal, economies of scale at the plant level may still make him/her more productive: the sunk costs in the Newfoundland plant combined with the economies of scale may prevent relocation to a place at which costs would be cheaper. In theory, given these circumstances, a new shoe producer would enter the market at the lower cost location: but the barrier to entry constituted by the large producer's economies of scale may prevent this unless the new competitor can immediately derive similar economies.

The solution to the cost minimising location equation is thus not merely dependent upon the characteristics of locations themselves: firm strategy and the specific production function faced by each industry can also have an important effect on location decisions. The complexities which considerations of scale introduce into locational analysis are well recognised (Dicken & Loyd, p201): "the question of scale generates much dispute and proves difficult to handle in any model, whether designed by geographers or economists". The example given above highlights this complexity.

2.2.3.b The Firm's Production Function

A production function is "a simple mathematical description of how various inputs (such as capital, land, labour and various raw materials) are combined to produce output" (Ray, 1998, p91). Such a function summarises the relationship which exists between outputs and inputs - whether one can be substituted for the other, the technology used in the production process, and the increasing or decreasing returns to scale.

If such a function is constant over space, then only the considerations raised in the previous sections need be considered: whether or not one location, for whatever reason, permits increasing returns to scale to be better exploited than another or whether the inputs and transport necessary for production are cheaper. However, it is unlikely that all inputs are of the same quality over space. Thus, depending on the

location considered, different combinations of inputs may be more efficient at producing the same output.

Labour

Labour is one of the principal factors which varies over space. Assuming labour is available, it can differ in a number of ways. It can be more or less qualified, more or less unionised, it can cost more or less, it can be more or less healthy and so on. One can imagine a firm faced with two alternatives: locate in Canada, where labour is expensive but well qualified, or locate in a developing country where labour is cheaper but less well qualified. Production cost may be identical in both locations (assuming that it requires fewer qualified people to do the job), and in this case the location choice will not be dependent on costs alone. In general, costs will not be identical, and the choice of location will depend upon the rate of substitution of qualified for unqualified labour in the firm's production function *as well as* the relative cost of labour.

Technology

A similar argument can be made with regards to technology. Assuming that the labour force has identical qualifications in two locations, it may be that a particular productivity-enhancing technology can only be implemented at one location. This could be due to the availability of the technology itself, or, more likely, to the availability of an adequate support structure for the technology. Once again, it will not be the costs of inputs per se, but the different production techniques and support services available in different places which will determine location.

Labour and Technology

By combining labour and technology, it can be seen how two firms can be equally profitable in different locations. A firm in a low wage country may produce shoes, for instance, with labour intensive, low technology, techniques. This firm could compete on equal terms with a shoe producer in a high wage country who uses less labour and more efficient technology. This simple example illustrates the pitfalls of a cost-minimising approach if it is not combined with careful consideration of other factors: whilst firms no doubt seek to minimise costs, the multitude of different factor

combinations which can lead to a similar result in terms of cost must make one wary of judging a location's 'efficiency' by merely looking at input costs, whether labour, capital or others.

2.2.3.c Other considerations

It is maybe in the term labelled e_x , other costs (or benefits) associated with location x, that the key to the cost minimisation approach lies, in particular for service industries. As we have just seen, labour qualifications and technological availability can play an important role in determining a location's efficiency, and neither can be fully understood by considering costs alone.

Local institutions (Lewis, 1955), the capacity of a region to attract and disseminate information (Florida, 1995), environmental factors (Savoie, 1986a, p141) - all of these can have an impact on location decisions which can far outweigh the more standard cost-related considerations. These will be discussed below. Without entering into a discussion on these topics at present, it is nevertheless possible to point out that different types of industry will, in all likelihood, react in different ways to the various factors mentioned.

Although production functions can vary within the same industry, it is nevertheless the case that industries do go through cycles (Bradfield, 1988). At each point in the cycle, producers tend to face similar trade offs between labour, technology, capital and other inputs. There will be a tendency for the more labour-intensive, lower-tech industries to favour low wage locations, and the more capital-intensive ones to favour higher wage areas (Polèse, 1994). This cannot be fully explained by technological factors, since even a capital-intensive industry would presumably benefit from paying lower wages. However, the necessity of being aware of all the technological innovations, of being able to draw upon the required skills, suppliers and maintenance organisations, will tend to draw the capital intensive firms to an agglomeration (Bradfield, 1988, p230). These firms will be the more dynamic and innovative ones: developing new products, investing in new processes and so on.

These same firms can increasingly rely on improved communications to spatially disaggregate their functions (Amhiramadi & Wallace, 1995): it is now possible for a single firm to co-ordinate production over large areas, with each component seeking

out the least-cost location. Thus, for example, the research and development section can locate in an urban core, in order to respond to new ideas and markets, whereas the production section, whether labour intensive or not, can seek out locations which minimise cost in a more 'classical' way. Somewhat paradoxically the same force (technological innovation) which is leading to an increase in the importance of intangible factors of production such as information and knowledge is also increasing the importance of the more traditional cost considerations as firms are able to consider increased flexibility in the location their constituent parts.

2.2.3.d Weberian Location Theory and the Service Sectors

The Weberian approach to the location of economic activity can only be applied to services with considerable reservation, for a number of reasons.

In general, final demand services are tied to market areas as described by Christaller. Beyond the market range, another service provider will be able to establish itself, and the extent of the market ranges will depend on the *client's* willingness to travel. Thus, the only services for which the location problem arises in the Weberian sense are intermediate services, services which cater to other businesses and which can be exported in the same way as manufactured products (such as secretarial work, telephone answering services and so on. Howland, 1996). Within this group of services, a further distinction can be made between back-office functions and high-order service activity. The location of these two types of intermediate service follow very different logics. The location of back-office functions can be understood in a Weberian type cost-minimisation framework. The optimal location is that at which appropriate labour is available at the lowest price and which possesses a sufficiently good telecommunication to 'transport' the inputs (instructions, raw information, phone calls) and outputs (typed reports, processed information, structured databases, phone calls). The framework described in the preceding sections can be adapted to this sort of activity.

High order service functions, on the other hand, have entirely different location requirements: despite their allegedly 'footloose' nature they tend to be very sensitive to agglomeration economies. Such services will often place paramount importance on the accessibility of their location for and to potential clients (Léo & Phillippe, 1991). The availability of complementary services, both high-order (lawyers, banks,

consultants), and low-order (photocopying, binding, courier service etc...), will also be determining factors; however, a balance must be struck, particularly for the smaller high order service establishments, between the availablility of these complementary services and access to the market which they service (Léo & Phillippe, 1991). The minimisation of cost is often not of great importance in such service sectors: competition is on the basis of reputation and image, and price only plays a secondary role. All in all, it is unlikely that high-order services follow a cost-minimising approach to location decisions; empirical evidence, reviewed in appendix 1, suggests that the location of high order services is closely related to the national (Coffey & Shearmur, 1998) and even international (Sassen, 1991/1996) urban hierarchy and to the agglomeration economies, particularly those of localisation, associated with cities towards the top of the hierarchy.

2.2.4 Export Bases, Import Substitution and Growth Poles

The factors which influence the location of economic activity are of paramount importance in understanding an urban unit's pattern of employment distribution and growth; but an urban unit's industrial structure may be just as important in determining its evolution. As we have seen when discussing agglomeration economies, locational choices and industrial structure are not independent, and in this section we shift our attention to two theories which elaborate on the explanatory power of the latter.

2.2.4.a Export Base (and Import Substitution) Theory

The export base theory "assumes that the basic impetus for development is the foreign demand for a country's (or a region's) major exports" (Bradfield, 1988, p30). Thus, for a region to grow it must support its export industries and foster the growth of new industries to capture new external markets

A region's 'basic' industry can be of any kind, provided that it be exportable. Thus, particularly in Canada, many areas rely on the export of natural resources such as timber (Northern British Columbia), fish (Newfoundland[11]) or oil (Alberta). Other regions depend upon a more varied base of tradable manufactured goods: Montreal, for instance, is a manufacturing centre. Still others are more service oriented, and it is

[11] The depletion of this natural resource is one of the principle causes of Newfoundland's current unemployment problems.

these sectors which form their economic base (Ottawa exports government services, Toronto financial services).

Export base theory posits that a region's income is directly proportional to the volume of its exports. Income from these exports is redistributed throughout the local economy in various 'rounds' of spending. First, the revenue derived from exports is distributed by the exporting industries as salaries and as payment to suppliers. However, there can be 'leakage' if, for instance, supplies are obtained from outside the region or if profits are paid to shareholders from elsewhere. The salaries and payments to suppliers are then spent in their turn, to purchase consumer goods and services or to pay other suppliers. Here again, leakages occur as part of the 'second' round of spending is used to purchase goods from other regions, to take vacations in foreign lands and so on. This process continues until all of the initial income from exports has leaked out. During this time, new exports have occurred, so the whole process can start again and can be sustained so long as exports remain at the same level.

The ratio of income to exports is called the export base multiplier. To take a simple example, if there is systematically leakage of 25% for each round of spending, then the multiplier will be:

$$m = 1 / (1- 0.75) = 4$$ [12].

From this perspective it is sufficient to stimulate an economy's export sector in order for the entire economy to grow: a one unit increase in exports will lead to an m unit (in this example m = 4) increase in regional income. As can be readily seen, the validity of the export base concept crucially depends upon the extent of the leakages, and this depends on the nature of local industry and the size of the region considered. In a large region with a varied economy many services and goods will be provided locally and leakage will be small. In a highly specialised economy leakage will be high since it unlikely that local industry will be able to supply the consumer goods and services required by the workers, or the supplies required by the basic industry.

[12] The sum of a geometric progression of the type $S = a + ar + ar^2 + ... + ar^{n-1}$ is $S = a (1 - r^n) / (1 - r)$. In this case, a is the income from exports, r is the ratio of the income kept within the region to total regional income, and n tends to infinity (an infinite number of rounds of spending can occur). From this equation, as n tends to infinity it can be seen that the sum tends to 1/ (1-r) which is the equation used to calculate the multiplier above.

However, the larger the area becomes the less likely it is that the export base model will apply (Bradfield, 1988, p40). The assumption that the 'outside world' will have an infinite capacity to absorb the produce of an area's export industry is only valid if that area is relatively small. Furthermore, at a world-wide scale, all exports and imports must balance: economic growth nevertheless occurs, and it is in this context that economic growth theories come into their own. For small economies, however, the assumption that local production will not have a large or immediate effect on world markets is justified.

As exports (and hence local income) rises, it is unlikely that imports will remain at the same level: the assumption that the propensity to import is constant is only valid in the short term. As consumers have more money, there will be a tendency to purchase a wider variety of goods: some of these may be locally produced, but others will be from outside the small economy in question. For most small geographic areas, increases in consumption will lead to proportionally greater increases in imports since the variety of goods and services produced locally will be limited. In the same vein, the assumption that inputs for the export industries are acquired locally is not justified in most cases: the reliance on inputs from further afield will reduce the multiplier effects of increases in exports.

Thus, the export base model, whilst it highlights an import process, is severely limited: it may apply to small regions, but the high leakages reduce the multiplier effect, and as the regions become larger, although the leakages will be reduced, the assumption that a market exists for increased exports must be called into question. Export led growth, despite its current popularity, is severely constrained, particularly by the vagaries of world markets. In appendix 1, some examples are given of the way in which economies which rely on exports can be severely dislocated by changes in demand patterns and variations in exchange rates.

Even within the limits imposed by the export base model, it is clear that an alternative exists to increasing exports: the degree of leakage does not necessarily remain constant. Indeed, Jacobs (1984, p212) argues strongly for import substitution as opposed to export generation. As the propensity to import declines, so the amount of leakage is reduced. In our example, if the leakage is reduced from 25% to 20%, then the export multiplier, and hence regional income, rises from 4 to 5. Reducing the

leakage by way of import substitution may be just as effective as increasing exports in terms of growth generation.

Despite the similarity between the effects of import substitution and export generation, current orthodoxy clearly emphasises the latter (Porter, 1990; Baghwati, 1985). This preference would appear to stem from ideological positions against the reduction in trade which would ensue from import substitution, and maybe to the local empowerment which it would bring about (Daly & Cobb, 1994).

Notwithstanding current preferences, and despite the criticisms that can be levelled at this simple model, it nevertheless expresses an important fact about small regions and urban units: whatever the precise multiplier effects, each unit is an open economy which is dependent on both imports and exports. To the extent that the demand for an urban unit's output is growing or its reliance on imports diminishing, then there will be a tendency for employment to grow within that urban area. Furthermore, if an urban unit is seeking to grow, then it can seek to promote export oriented industries or encourage import substitution which will generate a multiplier process. The concept of growth poles is closely related to the export-base facet of this idea.

2.2.4.b Growth poles

In a growing and evolving economy, all industries do not grow at the same rate: at any one point in time some sectors will grow faster than others, if only because technological changes have occurred within this industry. Perroux (1955/1986) elaborates on this idea and sets forth the notion that, in any growth context, there are some industries which act as engines and others which follow. The engines of growth increase output by introducing new technologies and reaching new markets. In so doing they generate income which can stimulate demand in other unconnected industries. In addition, as Kuznets (1968, p28) points out, by introducing new processes and thus increasing the economy's overall productivity these growth poles can free up resources which can be devoted to other activities.

These ideas were put forward in order to shed some light on the general process of economic growth (Perroux, 1955/1986, p27), but regional economists have been attracted to the growth pole concept, and have given it a spatial connotation. Richardson (1969, p72) writes of "the growth pole concept.... according to which rapid

economic growth requires a concentration of diverse, though interrelated activities in a few large centres". Within these geographic 'poles', the concentration of fast growth industries will lead to economies of localisation. This will lead to even faster growth within the industry, which will generate jobs, tax revenue, and the creation of a network of local suppliers.

Within the geographic area concerned, there will then be a local multiplier effect (Richardson, 1969, p31): as salaries are spent on housing, food and personal services, as the local suppliers themselves create jobs, as the local authorities gather tax revenue which will be spent locally, the initial effect of having a concentration of fast growing industries will permeate the whole local economy leading to faster growth in many different sectors. But this mechanism can only function in the longer term if the fast growing industry can find a market for its products: exports from the local area will be necessary, and thus the growth pole concept - as it is applied geographically - is closely related to export-base theories of regional growth.

2.2.5 Cumulative growth or Convergence?

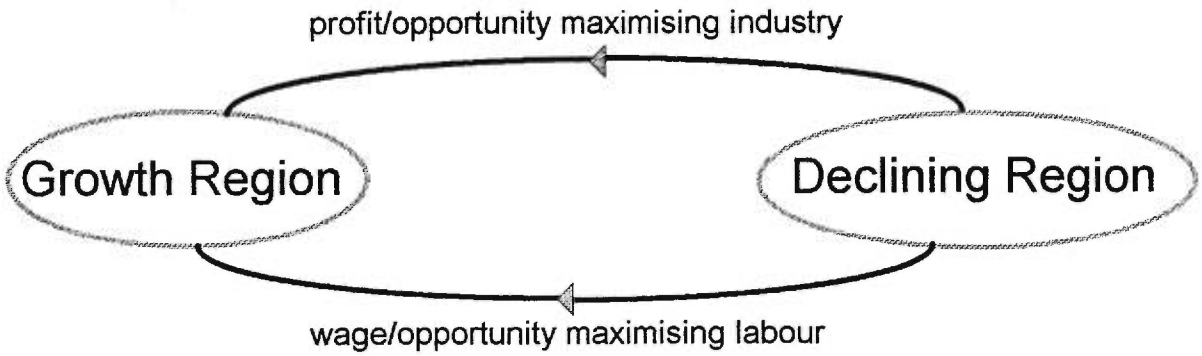
The various theories described so far have been static in that they take a region's characteristics to be given and examine whether or not the location of economic activity will be affected by them. The theories outlined in this section introduce a dynamic element: the location of economic activity is not just affected by regional characteristics, it can in turn influence these characteristics. Two simple feedback mechanisms with divergent spatial outcomes are described below. Neither can fully describe spatial outcomes but there is reason to believe that the combined effects of both may lead to a state of 'dynamic equilibrium' of economic activity across space (Prigogine & Stengers, 1979), a state which will tend to evolve only as external shocks (such as technological changes, market fluctuations, political upheaval) disturb the spatial system.

2.2.5.a The Cumulative Process

At any given point in time, the location of economic activity can be explained - at least partly - by reference to a combination of the above principles: agglomeration, functional differentiation and location factors. Growth can occur due to increased demand for an urban unit's exports, import substitution, the presence of fast growing

sectors or the 'correct' combination of factors. Embedded within these principles are the seeds of an important dynamic process, that of cumulative growth and decline. Myrdal (1959) is one of the first, if not to express such an idea, at least to clearly describe the process. In effect, he makes a general argument about a category of social processes which are self-reinforcing (Myrdal, 1959, ch 2). When applied to urban growth, the argument is that the urban units which already benefit from high levels of economic activity will tend to attract more activity in a virtuous spiral of growth. Conversely, poor regions will not be attractive to new activity, so there will be a tendency for their poverty to be exacerbated. This process is illustrated in figure 1; the 'growth region' is attractive to both industry, which seeks to minimise costs by being close to markets and by benefiting from urbanisation economies, and to labour, which seeks to maximise employment opportunity and salary. As economic activity and labour move towards the growth region the advantages of this region are reinforced, thereby continuing the process, particularly since the migration of labour will tend to be selective, the younger and better qualified workers being more mobile than others.

Fig 1. A Schematic Illustration of the Cumulative Growth Process



Characteristics of Growth Region	Characteristics of Declining Region
Urbanisation economies	Few external economies
Localisation economies	Few suppliers/markets
Knowledge, finance, services	Little contact
Skilled + varied labour pool	Unskilled labour
Jobs and higher salaries	Unemployment, low salaries

According to Kaldor (1970/1989, p316), "the fact that in all known historical cases the development of manufacturing industries was closely associated with urbanisation must have deep-seated causes which are unlikely to be rendered inoperative by the invention of some new technology or new source of power". Regions which have

gained an initial advantage benefit from a more efficient division of tasks between firms and industries (Kaldor, 1970/1989, p316), which can in turn lead to the adoption of more efficient technology within each branch.

The opening of trade between two urban units may lead to further growth in the advanced one at the expense of the more backward one. The advanced one benefits from more efficient technology and economies of scale which will be enhanced by the widening of its markets. Empirically this process is verified to the extent that in most countries there are areas which remain chronically underdeveloped (such as Atlantic Canada, Brittany, the Appalachians) and others which, although subject to certain fluctuations, tend to be the motors of growth (the Quebec-Windsor corridor, south-east England, the Paris region) (Polèse, 1994). However, the argument of cumulative growth and decline is not uniformly accepted, and we will now turn to examine an alternative argument.

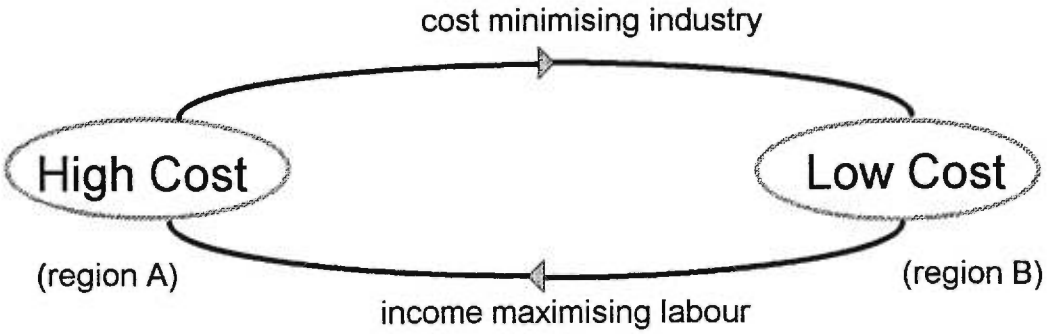
2.2.5.b The argument for convergence

The arguments for convergence over time rely upon the neo-classical assumptions regarding price mechanisms and markets (Courchene, 1986 a and b). An important assumption which underpins much of neo-classical economics is that of perfect markets: individuals (by this is meant all economic actors) possess perfect information. They make rational decisions in a way that will maximise their returns. Transaction costs are negligible. Given these assumptions, full employment is a necessary corollary (Bruton, 1960, p252), since an over-supply of labour will lead to a bidding down of wages, and an under-supply to a bidding up until equilibrium is reached.

Over space, these assumptions translate into the assumption of perfect factor mobility: "capital and labour move in response to differentials in factor return" (Richardson, 1969, p52). If the cost of labour is higher on region A (see figure 2), then firms will tend to move in order to exploit the cheaper labour in region B. Conversely, labour will move to region A in order to obtain the higher salaries. Thus, any differential in factor costs between regions will automatically correct itself. In a dynamic situation this means that no region will enter into a process of cumulative growth: at the very least, *per capita* levels of income will be equalised across all regions of a closed economy. This process is illustrated in figure 2; industry is shown to move towards the low cost

region (in order to maximise profits) and labour is seen to move in the opposite direction to maximise salary.

Fig 2. A Schematic Illustration of the Regional Convergence Process



Scarcity of labour
Land pressure
Congestion

Unemployment
Unused infrastructure
No congestion

Just as the cumulative growth arguments logically lead to a perpetual upward spiral of growth, so the convergence argument leads to the unrealistic conclusion of homogeneous per capita income across a nation. Faster per capita growth in one region can only be an aberration, and this will be corrected as wages rise, labour from outside moves in and capital moves out. Two key assumptions can be questioned: first, it is assumed that there is identical technology across the country. But for a given product, a high wage location may still be profitable if more efficient technology is available there: so the neo-classical model therefore assumes perfect technology diffusion. Second, labour and capital mobility is far from frictionless: in general there is imperfect knowledge and high moving costs (both monetary and psychic, Polèse, 1994), particularly for labour, which mean that factor mobility is not a function merely of differentials in returns but also of the costs and risks of moving.

Finally, this model does not incorporate the insights gained from a more geographical analysis, namely that there are economies of agglomeration, that transport costs and market ranges affect locational choices and so on. The convergence argument does serve to highlight an important mechanism whereby the spiral of cumulative growth may be limited: factors, whilst not perfectly mobile, do respond to sufficiently large and persistent differences in return. However, empirical considerations lead one to suspect that, at the very least, there are thresholds below which factors remain immobile

despite regional differences in return. If this is so, then the observations relating to persistent differences in regional per capita income (Brewis, 1969; Polèse, 1994) are not theoretical aberrations but wholly understandable consequences of friction to mobility and imperfect technological diffusion.

2.2.6 Geographical Economics

Most of the discussion so far has relied upon ideas and models which have emanated from either geography or regional science. Little has so far been said about the treatment of the location of economic activity within the discipline of economics. This is partly because economists have, until recently, not been overly preoccupied with spatial issues. Krugman (1991), in the introduction to his book 'Geography and Trade', writes that "[he found himself] gravitating towards ... a style of model in which factors of production were perfectly mobile but in which there were costs to transporting goods. In other words, he found himself doing something closer to classical location theory than to international trade theory". Furthermore, he recognises that much of his contribution to the field of economics has already been covered in various guises by authors in the field of economic geography (Krugman, 1995, p34), and that his principal contribution is in providing a formalised econometric rendition of the insights of location theory (Krugman, 1995, ch2). In particular, he emphasises the fact that he makes explicit all his assumptions about market structure (Krugman, 1995, p46). Whilst this has important implications as far as modelling is concerned, the principal relevance of Krugman's work in this thesis is that it provides a good overall picture of the basic principles of location theory and a link between this and economic growth theory.

There is considerable controversy over the place that Krugman's (1991,1995) models of regional growth should be assigned: "according to Baldwin (1994), Krugman's analysis represents a genuinely new location theory. In actuality, not only does it echo Ohlin (1933), Hirschman (1958) and Myrdal (1957), it strongly resembles Weber's (1929) model of overlaying transport costs on agglomeration economies" (Martin & Sunley, 1996). The Krugman model will be outlined below not because it adds much more to the discussion, but because it is the most recent formulation in a long tradition of regional models.

Krugman (1995, p90) begins by positing that there are two basic types of force which determine the location of economic activity in space. The centripetal forces are agglomeration economies which "emerge from the interaction between increasing returns at the level of the individual production facility, transportation costs, and factor mobility" (Krugman, 1995, p90). Increasing returns to scale lead to the concentration of production in a few locations, and these locations tend to be those with good access to markets and suppliers. A cumulative process is then engaged since access to markets and suppliers will be at those points where production has tended to concentrate and has "drawn mobile factors of production to its vicinity" (Krugman, 1995, p91).

The centrifugal forces are those set up by immobile factors of production, and these work against agglomeration: Krugman only includes here facilities set up to serve an agricultural hinterland (Krugman, 1995, p91), but he mentions that land rents could also be included, as could, no doubt, resource deposits, lower wages, less unionised workforce and so on. These centrifugal forces are thus linked to market ranges and thresholds - since activities which are not subject to agglomerative pressures nevertheless require a certain level of lower order servicing.

Krugman recognises that all of these ideas are current in the geographic literature (Krugman, 1995, p93), but argues that they lack "microeconomic foundations". In other words, as he repeatedly mentions in 'Geography and Trade' (1991), the geographic insights cannot be adequately modelled because they do not make explicit assumptions about market structure. He therefore introduces some assumptions about market structure which allow for imperfect competition and increasing returns, and his modelling effort derives from these market assumptions (Krugman, 1995, p94). Amongst these hypotheses are the existence of two types of labour, immobile (farmers) and mobile: the latter "are assumed to move towards locations that offer them higher real wages" (Krugman, 1995, p96).

Krugman does not solve his model algebraically, but tests it by varying the parameters (transport costs, strength of economies of scale, share of manufacturing in the economy, mobile and immobile workforce) and by feeding in random initial conditions of resource allocation. Over time, Krugman's model predicts a reinforcement of initial advantage, just as the proponents of cumulative growth processes predict. However, it also predicts the growth of secondary centres: the principal centre is the one which

has the initial advantage, but the secondary centre emerges not because it had the second-best initial advantage but because of its position relative to the principal one. In effect, the secondary centre emerges because it lies outside the shadow of the principal centre - an outcome reminiscent of that described by central place theory. Even though these results are not reproduced all of the time, there is a strong tendency for central places to emerge "roughly evenly across the landscape" (Krugman, 1995, p 108).

A number of other interesting insights can be derived from Krugman's model. For instance, the effect of transport costs upon geographic concentration is shown to be somewhat counter-intuitive: *below* a certain threshold, it is worthwhile for manufacturers to concentrate in order to realise economies of scale. If transport costs are above this threshold, the economies are cancelled out (Krugman, 1995, p103). This has important implications regarding the effect of improved communications and transport upon economic activity in smaller urban centres since it suggests that increased accessibility may serve to *reduce* economic activity rather than stimulate it.

As noted above, in one sense Krugman (1991, 1995) does not offer any radically new insights into location theory, and Martin & Sunley (1996) point out the many areas in which his ideas do not take into account some recent trends in geographic literature, in particular those which link spatial outcomes with wider social processes (e.g. Massey, 1985). In another, his work can be seen as innovative since he is seeking to formalise a series of rather piecemeal ideas which have characterised location theory. These efforts at formalisation rest upon some general assumptions regarding market structure - and we have already discussed some of the problems involved in making such assumptions - not least the fact that they tend to get buried deep in models and are rarely questioned. Thus what Krugman sees as a disadvantage of the location theory literature may in fact be an advantage, since market structure is one of the key elements which is left open to debate.

Krugman's modelling efforts do manage to synthesise in a single model a variety of the disparate approaches which occur in the geographic literature. If in so doing he is able to bridge the gap which still exists between location theory on the one hand and economic growth theory on the other then his work could turn out to be a major importance in opening a dialogue between economists and geographers. But if the result of these efforts at modelling is excessive focus on the models at the expense of

their relevance to actual spatial outcomes, if they divert attention from the wider social and political issues by over-formalising, then it is likely that the disciplines will remain at odds.

2.3. Recent Ideas Relating to the Spatial Distribution of Economic Activity

In this section a few recent ideas relating to the spatial location of economic activity will be reviewed. None of these adds much to the basic mechanisms described above. Indeed, some are rediscoveries of older principles: but they do provide a means of putting the theoretical considerations into a contemporary context. Also, by an increasing insistance on the relevance of production processes and institutions these approaches begin, albeit in a limited fashion, to integrate some of the issues raised by Massey (1995).

2.3.1 The Importance of Knowledge

The relevance of knowledge to economic growth has long been recognised: the mercantilists - among the first to have analysed the causes of national growth - highlighted the importance of technological innovation and skilled labour (Bruton, 1960) as factors conducive to growth. Castells (1989) argues that since the 1960's the role of knowledge has been changing. Previously knowledge has led to technological progress and growth through its action upon matter: new ideas led to a more efficient production of *material* goods. The new 'informational mode of development' is characterised by *knowledge* as the outcome of the application of knowledge (Castells, 1989). New technology serves to speed up the processing of information, to increase its quantity and quality. Computers and telecommunication technology ease the flow of information. Genetic engineering is a process of decoding information. And the newly acquired information is then embodied in goods and services, altering the *quality* rather than the *quantity* of output.

These ideas have led to a body of work which considers their regional consequences. "By the mid 1990's, there was a marked turn towards the study of the role of knowledge in sustaining industrial competitiveness, and the role of location in the process of learning" (Malmberg, 1997, p). It has been argued that in an increasingly globalised economy, with factors increasingly mobile, certain types of knowledge and learning processes are 'sticky' (i.e immobile, place specific, Markusen, 1996). "In this

new economic environment, regions build economic advantage through their ability to harness knowledge and ideas" (Florida, 1995, p532).

The ability of regions to harness knowledge and ideas rests on a variety of factors. Florida (1995) emphasises the manufacturing infrastructure, the human infrastructure and the physical and communications infrastructure. A 'learning region' is characterised by particular types of industrial organisation - a high dependence on outside suppliers and close connection between clients and suppliers, enabling a rapid flow of information, particularly relating to innovative techniques. The population of such a region must not only be well educated, but more importantly flexible and capable of 'life-long learning'. The educational system must meet these requirements. Finally, the physical and communications infrastructure must be such that it can tap in to new ideas from around the world, and permit rapid contact with clients at a world-wide scale.

Malmberg (1997) suggests a slightly different, but related, list of characteristics for 'the learning region': the 'industrial configuration', the 'technological infrastructure', and the 'culture and institutions'. The first item overlaps Florida's 'industrial structure'. The second one, 'technological infrastructure', includes both the physical presence of universities and research centres and their ability to interact and collaborate with local firms. Malmberg's third item includes - but goes well beyond - human capital and education. A region's local culture includes its labour practices - which must be conducive to experimentation and entrepreneurship; its attitude to work; its institutions (local government, business associations, unions ...) and so on. All of these must be attuned to gathering and exploiting new information and skills.

2.3.2 Industrial districts

An idea which is related to the 'learning region', but which predates it by a few years, is that of industrial districts. In many ways, it is a reiteration of the importance of agglomeration, and particularly localisation, economies. The re-emergence of this idea is linked with the Fordist/post-Fordist debate. It is not intended here to explore this debate in detail, but suffice it to say that one of the arguments put forward is that the 'mode of production' has undergone of major change in the 1970's (Amin, 1994). From a production system characterised by large centralised production units, relying on Taylorist production line techniques (the 'Fordist' mode of production), there has been

an evolution towards a more fragmented production system, characterised by agglomerations of inter-related small and medium sized firms (Harrison, 1994). End products are no longer designed and produced by one single company, but are the result of the flexible co-operation of numerous small producers: each of these producers specialises in a particular process, and temporary 'coalitions' of producers are created to manufacture products as demand conditions dictate.

The geographical context of this type of production system is crucial, since such close co-operation depends on a degree of mutual trust, on the rapid and informal flow of information, and on institutions capable of evening out the uncertain short term employment prospects faced by many individuals within such a district (Harrison, 1994). It is not only institutions which are important. The flexibility of the small firms in industrial districts depends upon the introduction of new production technology which allows numerous different items to be designed and produced on the same equipment. The communication network with the outside world is also of importance, since it is through this that the new production techniques can be identified and, perhaps more importantly, market niches found and exploited.

As can be seen, there are many similarities between this idea and that of the 'learning region' - the latter being a more general expression of the idea of industrial districts. One of the principal differences though is that the 'learning region' approach is not based upon a wider theory which attempts to relate production modes with social evolution. 'Industrial districts' have been identified empirically and the idea has gained currency outside the framework of regulation theory: but the shift of the 'industrial district' from a constituent element of a general social theory to a type a spatial production mode only observed in certain places has detracted from its generality (Tickell & Peck, 1992; Gertler, 1992).

2.3.3 Company size structure

Both of the 'new' approaches mentioned above have in common the importance of 'flexibility' - and, in a local context, such flexibility usually includes the presence of a large number of small companies. Jacobs (1984) was amongst the first to make explicit the potential relevance of company size distribution to urban growth: small firms carry with them the potential for "improvisation and innovation" which preserve the dynamism of local economies. Jacobs argues that a city with many small firms will

be better able to substitute imports as each imported item represents a potential market which small firms are best suited to exploit.

Underlying Jacobs' theory is the fact that small firms play a distinctive economic role. The theoretical underpinnings for this argument can be traced back to Schumpeter, who, in 1934, set out a growth theory which highlights the role that entrepreneurs play in the process of economic growth. These ideas only gained currency in the 1970's and 1980's as the traditional 'Fordist' companies ran into difficulties. In Schumpeter's view, entrepreneurs play a key role in economic growth since they are the individuals who carry out the "new combinations of means of production" (Schumpeter, 1934, p74). Whilst new scientific discoveries may occur, and whilst there may be a workforce and demand for new products, these do not gather spontaneously to produce economic output. It is the entrepreneur who uses his/her skill and vision to identify markets and to combine these various factors in order to meet the market demands. Jacobs (1984) extends this reasoning to urban units, arguing that those units with more small companies will be more responsive to market opportunities.

From an urban perspective, Schumpeter's argument is not as clear cut as it first appears. Entrepreneurship is not, according to Schumpeter (1934, p78), a lasting condition, and individuals may fall in and out of an entrepreneurial role according to the nature of the activities which they are currently undertaking. However, certain conditions are likely to be conducive to entrepreneurship, amongst them the availability of credit, the existence of profitable opportunities, and an economic situation which allows "tolerably reliable calculations" to be made (Schumpeter, 1934, p214). These conditions are not present uniformly over time, and hence Schumpeter argues that entrepreneurial activity will tend to be cyclical because "the appearance of one or a few entrepreneurs facilitates the appearance of others" (Schumpeter, 1934, p228). There is a cumulative effect as entrepreneurship becomes more acceptable, finance more available, and economic activity in general more buoyant. However, not everyone is born to be an entrepreneur: eventually, the stock of people with the right attributes diminishes (Schumpeter, 1934, p228), and new combinations are slowly exhausted in each industry. Thus, after a period of time, entrepreneurship becomes more risky, and fewer people are available to take up new opportunities. Furthermore, as the older enterprises which have been subjected to attack by the new entrepreneurs die out, the new companies grow internally and exploit the new combinations, drawing people once more into non-entrepreneurial activities. These

companies will themselves eventually reach obsolescence, and a new generation of unexploited combinations will be accruing as entrepreneurial activity is 'out of fashion'. The cycle will then begin again with a new phase of creative destruction and growth.

Three important points emerge from this discussion of Schumpeter's theory. First, nothing in this theory indicates the spatial scale over which these mechanisms take place. The 'creation' may occur in one city and the 'destruction' in another: his theory therefore has as much to say about urban decline as it does about urban growth. Second, the relevance of entrepreneurship is cyclical: entrepreneurs are not necessarily factors of growth at every point in time, and it can be expected that at some stages in the economic cycle the larger companies will be the engines of growth. Finally, the emergence of entrepreneurs depends upon "certain conditions" (see above) which may not prevail in equal fashion over space. These conditions are to some extent determined by institutions, and thus entrepreneurship by itself is not sufficient.

It must be pointed out that there is a difference between 'entrepreneurs' as defined by Schumpeter and the more general concept of "small firms" employed by Jacobs (1984, p39). Taken literally, a small firm can be anything from a corner store to a high-tech start-up: the generalisation of Schumpeter's idea from entrepreneurs - defined quite restrictively - to small firms - defined very widely - has occurred to some extent as a consequence of the literature on industrial districts and of Jacobs' analysis of urban economies. This extension is not theoretically justified. It has been made possible because of a series of empirical analyses which tend to confirm, at an aggregate level, the link between small firms and employment growth (Storey; 1987; Julien, 1988). These empirical analyses have in turn directly influenced local policy initiatives (Alonso, 1989), although the validity of these studies is now being questioned (Davis et al, 1996).

2.3.4 High Technology Industries

There are many examples of urban growth policies which rest upon the creation of technopoles (Castells & Hall, 1994; Massey et al, 1992). This concept is derived from the idea of localisation economies, growth pole theory and, to a lesser extent, Schumpeter's ideas on entrepreneurs as key links between science and markets. In many ways, the technopole approach is very similar to the industrial district approach

except that a 'growth pole' industry (Perroux, 1955/1986) is focused upon. High-technology firms are seen as being amongst today's growth sectors, and it is argued that the attraction of high technology industries will generate a series of localisation economies such that a process of cumulative growth will occur. A regional multiplier will enter into effect as the high-tech industries export their produce and rely on local suppliers, and as highly qualified employees attracted to the region engage in local consumption.

At a local level, the conditions for the creation of technopoles have been widely discussed: the presence of a university, of good communications (road, air and electronic), government research labs, private research facilities and high-tech firms to exploit the ideas and opportunities generated by these institutions - all of these are put forward as necessary preconditions (Castells & Hall, 1994; Massey et al, 1992). However, empirical research suggests that the technopole idea does not function in the way described above. Massey et al, (1992) in a detailed examination of technopoles in Britain, conclude that there is relatively little cross-fertilisation of ideas between universities and the private sector, or between private sector firms. If successful, technopoles such as the Cambridge Business Park tend to become prime real estate locations attracting high paying international companies who are poorly integrated into the local economy. Leading examples of such spatial poles - Silicon Valley, Highway 128 and the M4 corridor - can be explained more readily through historical factors such as the location of important defence contractors (Markusen et al, 1991/1996) than through location theory.

Despite the difficulty in verifying the effectiveness of technopolitan *policies*, the *example* of successful agglomerations of high technology industry (Teitz & Shapira, 1989), combined with location theories which seem to explain it, have made this industry a focus of both national and local policies (Castells & Hall, 1994).

2.3.5 Plant closures

Finally, one aspect of the distribution of economic activity which has not often been treated relates not to the 'positive' analysis of where activity will arise, but rather to the 'negative' one of how decisions are taken to close plants. Such considerations are not as recent as the ideas set out above, though it is only in the late 1970's and early 1980's that plant closures began to loom large with regard to employment distribution.

This is probably due to the fact that, throughout the post war years and up to the 1970's, manufacturing employment had been rising. As the principal 'basic' industry, growth in manufacturing almost automatically ensured growth in services. Whilst plants did close, the effect on overall employment distribution was minimal. Since the 1970's not only has manufacturing employment been stagnating or even declining (Coffey & Shearmur, 1996), there have also been some major structural changes in the economy as older industries have declined and newer ones have reorganised internally to cope with global competition and evolving technology (Fothergill & Gudgin, 1982; Martin & Rowthorn. eds, 1986). Some of these structural considerations are illustrated in appendix 1.

The decision to shut down a *firm* is usually taken for internal reasons: low profitability, bankruptcy and so on. For an individual firm, it is unlikely that, faced with these problems, relocation to a more 'efficient' area will be an option. Similarly, if a firm is able to compete from its current location, the motivation to move to a more 'efficient' location will generally be lacking. But in a context in which sizeable segments of the economy are dominated by large multinational firms (Dicken, 1992), the *plant* closure decisions of multi plant firms can have important effects on employment in local areas, particularly if the plants form part of an area's economic base.

In a recent article, Kirkham and Watts (1997) explore the decision making process of multi-locational firms when it comes to the choice of which plant to close. One of their specific research interests is to evaluate to what extent this decisions is motivated by location factors (of the type described in this chapter). According to them, there are two distinct phases in the plant closure decision making process. First, a decision is made that a plant must be closed. Second, a choice is made as to which plant. The need for a plant closure is usually dictated by the wider economic context and is not related to location factors: a firm may need to reduce overall capacity, it may wish to build a new plant in another location, or it may wish to consolidate production by investing in one plant and closing another (Kirkham & Watts, 1997, p1562). The decision as to which plant to close is usually made with respect to factors internal to the firm and not with respect to the 'efficiency' of its location. Often it is the smallest plant, one with a narrower product range and older buildings and machinery which will be the first to go, irrespective of its location. Labour considerations (skills, unionisation) do not often enter into the decision making process - unless there is a history of particularly difficult labour relations.

Whilst this evidence relates to a study made in England - and may not be reproducible in Canada - it serves to highlight two important points which can often be overlooked when taking a geographic approach to employment. First of all plant *closures* can, in some contexts, have an impact on urban growth which is just as strong as plant *openings*. Second, the decision making process with regards to plant closures would appear to be very different from that assumed for plant location: in particular the 'cost minimising' approach needs to be seriously reconsidered, if only because financial accounting is often not performed at plant level (Kirkham & Watts, 1997, p1592). Even if costs were to be minimised, many firms would be unable to ascertain which plants are the least efficient.

2.4 Conclusion

In this chapter a variety of approaches to understanding the spatial distribution of economic activity, and employment, have been discussed. A first approach was presented which tended to minimise the relevance of an economic analysis to the issue, preferring to emphasise the interrelation between social, political and spatial processes. The causality implicit in economic models is criticised for being at best partial, at worst for masking the 'true' processes which determine the distribution of economic activity.

The wide ranging discussion in the foregoing sections presents a variety of economic[13] explanations and theories regarding differential spatial outcomes. Whilst these economic approaches have traditionally tended to underplay the wider social fabric, there is evidence that the more recent approaches pay attention to factors other than cost, economies of scale and market areas. However, the basic economic factors remain of crucial importance in interpreting the relevance of the wider social phenomena: spatial divisions of labour may indeed owe more to class relations than to geographic considerations, but these spatial divisions, whatever their cause, can be exacerbated or minimised by the economic factors and dynamics described above.

In the case of Canada, even simple Weberian models which emphasise transport costs can be extremely relevant: the heavy dependence of the economy on resource

[13]The ideas have not always emanated from economists. But their focus is clearly upon economic explanations for the observed spatial distributions.

extraction (Brewis, 1969; Pomfret, 1981; Cohen, 1991) has not only shaped the distribution of economic activity over space; it also has very important regional effects as commodity prices rise and fall in response to world markets. Whatever the wider social issues which such a spatial distribution of activity may be related to (for example, the possible exploitation of peripheral regions by the more central ones, Bradfield, 1988), and whatever the spatial distribution of functions within the extraction and farming industries, the basic relevance of geography, and even its causal effect in terms of regional differences, cannot easily be denied. That factors outside the realms of economic or geographic analysis play a role in determining spatial outcomes is undeniable, and Massey (1995) highlights not only their relevance, but in some cases their *overriding* relevance in understanding spatial outcomes. But to deny that geographic factors can, and sometimes do, play an important causal role, a role which in some cases may be generalised, is to overlook possible structuring factors without which an understanding of spatial outcomes is almost impossible.

The economic approach adopted in the models and explanations described is partial, and this partiality is usually recognised by geographers. As mentioned in chapter 1, partial explanations, particularly if they isolate the effect of factors over which policy may have some control, are nevertheless useful and relevant. This usefulness and relevance must not, however, disguise the partial nature of the explanations and it can be argued that today, particularly in the realm of economics, this modesty has been forgotten. The arguments put forward by Massey (1995), by regulationists (Elam, 1994), by many local development practitioners (Galaway & Hudson, 1994), and by some economists (Daly & Cobb, 1994) emphasising the limits of economics can be construed at least partly as a reaction towards the hegemony which economic discourse currently exerts over most aspects of life. Polanyi (1944) was already pointing out that in capitalist society, "instead of economy being embedded in social relations, social relations are embedded in the economic system" (quoted in Daly & Cobb, 1994, p8).

Notwithstanding these arguments, economic analysis is not irrelevant. As Daly & Cobb (1994) argue "many [economic axioms] can continue to function, only with more recognition of their limits" (p 8). The regional and locational economic concepts presented above are useful. Each highlights and attempts to explain a particular pattern or process which has been observed empirically. That no unifying theory is as yet forthcoming in regional economics, Krugman (1995) notwithstanding, has been a

recurring theme in regional literature. Brewis, in 1969, notes the "absence of an adequate theoretical framework for the study of regional questions" (p6) and Savoie (1986), seventeen years later, writes that "there is no consensus on the appropriate theoretical approach to the [regional] question" (p5). Arguably, this has enabled regional economists and economic geographers to remain open to the diversity of factors, economic, social, political and spatial, which influence regional economies, and to remain acutely aware of the limitations inherent in any one of their theories or explanations. The fragmented nature of the theoretical framework presented in this chapter and the weight attached to the presentation of an alternative view point reflect this lack of theoretical unity which is due to the complex nature of the regional problem.

It can also be noted that the lack of consensus with regards to the theories and determinants of the spatial distribution of economic activity leaves the policy arena open to considerable political influence. This is not necessarily a disadvantage, since the political 'consensus' which seems to surround economics, founded upon the dominance of free-market and trade theories amongst economists themselves (Maris, 1993; Lipietz, 1994; Daly & Cobb, 1994), has tended to stifle legitimate democratic discourse with regards to alternatives. A variety of approaches to regional and local development policies will be reviewed in the following chapter.

Chapter 3

Policy Approaches to Local and Regional Development

As the title of this chapter suggests, the intention here is not to enter into detailed discussion regarding *particular* policies which may or may not be implemented. Rather, with passing reference to particular policies for illustrative purposes only, this chapter sets out to discuss the policy *approaches* open to national and local governments if they wish to influence the distribution of economic activity across space. The discussion of policy approaches is not only relevant in itself (the theories outlined in chapter 2 often underpin development policy intervention - policies can therefore be construed as practical applications of these theories), it also serves to highlight some of the practical problems inherent in operationalising many of the concepts referred to in the previous chapter. This discussion also highlights the central role which politics and governments can play in differential regional outcomes.

The focus of the chapter will primarily be on policies which can be implemented at the local and urban level. This is in recognition of the current policy context within Canada and most of the industrialised world: the rise of the "neo-Schumpeterian workfare state" (Jessop, 1994), the disengagement of national governments from many social and redistributive policies in the wake of the neo-liberal 'hegemony' (Jonas, 1996) which characterises politics and economics today, has meant that explicit development policies are now rarely implemented at the national level (ECC, 1990a; Savoie, 1986; Keating, 1993).

This does not mean, of course, that national policies do not have important regional repercussions, nor does it mean that an argument can't be made for a more explicit interest by national government in the distribution of economic activity. The place that national intervention could play, even in a context within which local development predominates, will be made clear. But in a context where such an interest is not forthcoming, more emphasis will be put upon the degree to which local governments can affect the distribution of economic activity over space.

The first section of this chapter will introduce the idea of competitive advantage. This idea intersects many of the concepts put forward in the preceding chapter and emphasises the important policy role which governments (national and local) can play.

As well as providing a useful framework for the discussion of policy approaches, it is worth noting that this idea - which has only recently been applied to territorial units (it emanates originally from the business literature on firm strategy) - appears to contradict the idea that governments should withdraw from the regional policy arena. Porter (1990), who is not known as a particularly radical economist, is therefore putting forward arguments from within the mainstream[14] which fly in the face of the prevailing hands-off approach to government: his acceptance by the mainstream is most probably due to the fact that emphasis is put upon trade and upon competitive spatial strategies.

The second section of this chapter will briefly review some of the justifications for regional policies and the types of regional policy which national governments have explicitly or implicitly implemented. The third section, dealing with local development, will review the emergence of local development as the principal arena for explicit development policies and explore the various policy approaches which are implemented at that level.

The conclusion will summarise the current situation and emphasise some of the problems which the withdrawal of national governments and the prevalence of spatial competition may bring about.

3.1. Competitive Advantage

In chapter 2 the idea of comparative advantage was briefly introduced: it suggests that economic activity will react to factor costs and that each nation (or region) will tend to specialise in the production of goods for which the necessary factors are relatively cheaper. A nation (or region) will then export its (relatively cheaper) product of specialisation and import the (relatively cheaper) products of specialisation from other regions. The idea of competitive advantage extends this concept beyond factor costs to include 'intangibles' such as institutional framework, human capital, localisation economies, amenities and so on. Each geographic area possesses certain combinations of attributes which are attractive to certain types of industry because they enable this industry to compete more effectively in wider markets: maybe the

[14] Mainstream economics in academia is dominated by formal modelling (Krugman, 1995). Clearly, Porter does not fall into this 'stream'. He is mainstream in the sense that his background is in business and management studies and he remains a respected figure in these disciplines.

principal difference between comparative and competitive advantage is that the latter recognises that local attributes can evolve over time and that the capacity to adapt is just as, if not more, important than the initial attributes themselves. Geographic areas will tend to specialise in those industries for which they are best suited, and the gains of trade will ensue in the same way as they do under the comparative advantage approach. As the areas adapt, so the competitive advantage may shift from one geographic area to another.

The idea of the competitive advantage of geographic areas is basically an extension of the theory of the competitive advantage of firms which evolved in the context of business and management economics. Porter (1990), who has provided a recent description of the principles and consequences of spatial competitive advantage, begins by discussing the concept as it relates to firms. At its most basic, this theory postulates that a region (or firm) can *create* and *maintain* certain conditions which are conducive to the attraction and growth of economic activities. Furthermore, whereas some of these conditions are particular to certain industries, others are more general and can make the region as a whole more competitive.

In answer to the question "why does a nation achieve international success in a particular industry?" Porter (1990, p71) lists four factors:

> "1- *Factor conditions.* The nation's position in factors of production, such as skilled labour or infrastructure, necessary to compete in a given industry.
> 2- *Demand conditions.* The nature of home demand for the industry's product or service.
> 3- *Related and supporting industries.* The presence or absence in the nation of supplier industries and related industries that are internationally competitive.
> 4- *Firm strategy, structure and rivalry.* The conditions in the nation governing how companies are created, organised, and managed, and the nature of domestic rivalry" (Porter, p71)

Porter (1990) emphasises the importance of commitment by national actors (private and public) to ensuring that these conditions are met. Rather than seeing factor allocation as passive, he emphasises the role which governments can play in ensuring that the right combination of factors obtains in a given nation. "Factor conditions are affected through subsidies, policies towards capital markets, policies towards

education, and the like" (Porter, p127). Even though, according to Porter, government cannot *create* competitive advantage it can act as an important enabling factor.

It is possible to distinguish between different types of factors. For instance, 'basic factors' include "natural resources, climate, location, unskilled and semi-skilled labour and debt capital. Advanced factors include modern digital communications infrastructure, highly educated personnel .... and university research institutes...." (Porter, 1990, p77). Apart from some of the basic factors, few factors are inherited by nations: in particular it is the advanced factors - those most significant for competitive advantage in the new information economy - which are most amenable to being influenced through government policy. Another distinction is between what Porter calls 'generalised factors' - such as the highway system and well motivated employees with college education - and 'specialised factors' - which are factors which relate to a specific industry (Porter, 1990, p78). It is the industry-specific factors which are most likely to lead to long-term competitive advantage since it is more difficult to replicate a pool of highly specialised labour, for instance, than a pool of literate and numerate employees.

There is, however, an important dynamic element in this theory - and it is here that the theory differs most from that of comparative advantage: in today's economy where technology and products are continually changing, the specialised and advanced factors of production - those most likely to provide a nation with a sustained competitive advantage - must be continuously maintained and updated. This is reminiscent of the "learning region" ideas put forward in chapter 2 and of Capello's (1998) remarks regarding the importance of dynamic and adaptable institutions in cities faced with agglomeration diseconomies.

Porter's arguments echo ideas which have been developed in literature dealing with the intra-national geography of economic activity. As Clark pointed out in 1988 when discussing the literature on regional development policy,

> "in the next few years there will be yet another round of change in the literature, this time driven by a concern for system-wide global competition between economies..... For instance Florida and Kenney (1989) suggest .... that one reason that the US is now very vulnerable to foreign competition is its failure to

> sustain more than just one or two geographical enclaves of entrepreneurship, venture capital, innovation and technological change" (Clark, 1988, p553).

The notions of human capital, competitive firm size structure, infrastructure provision and so on, together with those of agglomeration and localisation economies all of which have been discussed in chapter 2, have also been identified by Porter (1990) as being constitutive of a nation's - and indeed a region's[15] - competitive advantage. Economic and business theory are beginning to link up with geography as space and its related attributes are integrated into their analytical framework. Whilst Porter (1990), like Krugman (1991,1995), does not offer geographers or regional scientists any major new insights, like Krugman he has arrived at ideas familiar to geographers from an entirely different perspective. In addition, in a context in which the role of government is often questioned, Porter (1990) emphasises its role in creating and sustaining the right conditions for competitive advantages to be created. It is to the role of government that we will now turn.

3.2 National Governments and Development Policy

National governments, and the Canadian government in particular, have a long record of implementing policies which either explicitly or implicitly have regional impacts. Variations in regional and urban growth rates have been, and still are, affected by policies implemented at the national level, and this section reviews the nature of such policies. The discussion is divided between explicit and implicit regional policies; but prior to discussing policies, the rationale behind attempting to redistribute economic activity over space is briefly explored.

3.2.1 The Rationale Behind National Level Regional Policies?[16]

In Canada, the motivation behind explicit national policies has been the enduring disparities which exist between regions. Brewis (1969) highlights the fact that

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[15] Porter's ideas can be applied to regions as well as to nations: there is nothing in the basic idea of competitive advantage which prevents it. The regional application of the idea of *comparative* advantage is more problematic, since the assumption of factor immobility in the Hecksher-Ohlin model is clearly untenable within a nation, or between nations in a globalised economy. For the purposes of this thesis, in which comparative advantage has served to illustrate a mechanism of relative specialisation (see chapter 2), a detailed criticism of the concept is not required. Daly.H and R.Goodland (1994) and Cobb & Daly (1994) provide a discussion of the limitations of the theory of comparative advantage.

[16] A good discussion of these issues can be found in ECC, 1977 and Brewis, 1969.

disparities in per capita income have remained fairly constant across Canadian provinces from 1926 to the 1960's. Polèse (1994) makes clear that the trend has continued throughout the 1970's and 1980's. Until the second world war, explicit regional policies were not on the agenda: industrial and infrastructure policies clearly had regional effects, but there was no moral 'urge' to equalise income and employment opportunities across the nation. The great depression of the 1930's and the impact of the second world war - during which the considerable effect which Keynesian-type policies could have in terms of reflating the economy were in evidence (Galbraith, 1987) - gave national governments both the moral justification and a model to follow in order to effect explicit redistributive policies.

Spatial distributive justice, although an attractive ideal, is very difficult to define. Brewis (1969, ch4) highlights some of the problems inherent in the concept. To begin with, how are regional disparities to be measured? Per capita income is one indicator, but to what extent is this dependent on age and sex distribution, for instance, rather than on inherently regional factors? Household income may provide a better measure of inequality in terms of welfare. Income itself may not be all that relevant if the cost of living differs across regions - low incomes in regions where the cost of living is low may in fact lead to higher standards of living (see Ray, 1998). In addition, higher salaries in certain regions may compensate for the disamenties linked with residing and working there: income disparities may reflect the costs and benefits of living in different regions (Daly & Cobb, 1994).

The spatial scale at which inequalities are measured may provide starkly different pictures of inequality: as Brewis (1969) points out income differences *within* cities may be substantially greater than income differences *between* these cities. If the problem which regional policies seek to address is that of low incomes, a more effective type of intervention may be direct incomes policy. This argument is reminiscent of the point made by Massey (1995), that spatial outcomes may actually reflect wider social phenomena without having any causal relation to space. Another important point which relates directly to space is the definition of areas which will receive aid from the national government. If aid is narrowly focused upon areas with the most 'need' (say, with the highest unemployment or lowest income), then nearby areas with only marginally lower unemployment or income will cry foul. If the aid is spread more widely, then it may be easier to manage politically but far less effective. Another problem arises with regards to the criteria for selecting areas which will receive aid: is

selection to be based upon 'need' or is it also to take into account 'potential': some very needy areas may lack any identifiable growth potential and government aid may have no effect.

If attention is diverted away from income to employment opportunities (the other principal focus of regional policies), very similar problems arise. Why should the regional distribution of employment matter? Workers can migrate to regions where there is more employment. And if employment is created in 'disadvantaged' regions, who benefits? Logan & Molotch (1987/1996) argue that there is enough labour mobility for workers to be attracted to faster growing regions, thus perpetuating high unemployment rates - or even exacerbating them if too many mobile workers are attracted to any one locality. A review of the literature with regards to employment growth in metropolitan areas leads Bartik (1993) to conclude "that local job growth does have important effects on the labour force participation of local residents..... [and that] ....these effects provide a possible rationale for national or regional governments to adopt regional job growth policies" (p309). But this study does not enable one to determine whether those individuals unemployed prior to the employment growth are the ones who benefit. Here again it can be seen how social phenomena which may better be addressed by explicit policies aimed at the unemployed can be used to justify regional policy. According to Hansen (1996), "the evidence simply indicates that non-spatial policies directed at specific disadvantaged groups are likely to be more efficient and more effective [at promoting equity]" (p117).

The rationale behind regional policies at the national level may therefore be *motivated* by social considerations but cannot be justified by reference to these. Rather, the importance of preserving communities (a goal emphasised by Daly & Cobb, 1994, in a different context), of preventing selective migration from depressed areas, of ensuring that the entire national territory is occupied, must complement the employment and income rationales to justify national level intervention.

There also exist barriers to mobility which prevent many individuals from taking up jobs in different areas and which can justify a policy approach. Quite apart from cultural considerations and attachment to community - considerations which tend to be trivialised in neo-liberal accounts of regional convergence - there are cost implications to mobility which may lead economically 'rational' individuals to remain in depressed regions. For instance, there is a great deal of uncertainty associated with migration:

even if there is a good probability of finding a job after migration, the risk of remaining jobless in an unknown area may outweigh the possible gains. Even if a higher paying job is known to be available in another region, house prices and moving costs may be so high that they represent a barrier to mobility. These considerations become especially relevant for people who own an (unsaleable?) house in a depressed region and who have other sunk costs. The very notion of sunk costs can be extended to all the social infrastructure of the area: roads, buildings, hospitals all function at below capacity in depressed areas, whereas there is often congestion in the faster growing ones. It may be more efficient, from a social perspective, to direct economic activity to areas in which social investment (whether in terms of infrastructure or human capital) have already been made.

Finally, as mentioned in chapter 1, national politics in most countries is territorially based. Each member of parliament represents a territorially bounded constituency. There is thus an in-built tendency for space to be an important issue at the national level, as each politician seeks to draw investment and policy assistance towards his or her region. The current parliament sitting in Ottawa is a case in point: the political parties are clearly regionalised. Reform represents the western provinces, the Liberal party basically represents Ontario, the Bloc Québécois represents Quebec, and the NDP is primarily based in the Atlantic provinces. Thus even though there are no explicit regional policies general policy debate in Canada incorporates important regional dimensions.

From this brief synopsis it can be seen that the rationale behind regional policies is ambiguous: community, the efficient use of social capital, political power and territorial occupation may be underlying motivations, but the policies are often justified on the basis of income and employment equalisation. To some extent these two factors, in particular employment, can be seen as means to the various ends listed.

3.2.3 Explicit Regional Development Policy Approaches[17]

Despite the variety of bodies which have administered regional development policies, and considerable variation in the actual areas covered (Savoie, 1986), the basic approaches to regional development policy have been fairly limited. In Canada,

[17] This section follows Brewis (1969) and Savoie (1986b).

regional policies have tended to focus upon four areas (Brewis, 1969): capital formation, labour force and education, industrial mix and regional exports.

Amongst the factors influencing the distribution of economic activity identified in the preceding chapter were accessibility and local amenities. The importance of private investment has been implicit throughout the discussion, since it is private investment which will usually lead to economic activity and jobs. Some policy approaches have therefore focused upon the need for capital investment, both public and private. Public investment has been directed towards infrastructure such as highways and schools, and projects which create the infrastructure necessary to exploit natural resources, such as hydro-electric dams. This type of project creates short term economic activity as the work progresses, and, theoretically, should provide long term economic activity by reducing location costs, increasing the target area's attractivity to private capital, and, in the case of major resource projects, providing the target area with an industrial base which will generate long term multiplier effects. Private investment has been targeted by various forms of investment grants, capital write-down facilities and other such incentives destined to reduce the cost and/or risk of investing.

Such approaches, whilst politically popular because they can lead to visible effects in the short term (Brewis, 1969), do not always have the desired long term effects. Transport infrastructure may just as easily open up the region to imports as encourage industry to locate there, and other types of social infrastructure only come into their own if there are sufficient jobs to make use of the increased supply. Once completed, infrastructure such as hydro dams or pipelines generate very few jobs and have limited multiplier effects. Private capital incentives may improve regional output whilst *reducing* employment, since they encourage the substitution of capital for labour. Furthermore, as soon as the capital subsidies are phased out economic activity which relies upon it must overcome the regional disadvantages which made the incentive necessary in the first place. Unless the public and private capital formation programs are well co-ordinated and sufficiently long lasting to generate agglomeration or localisation effects, then the effects of such policy approaches are unlikely to endure.

Another series of policy approaches focuses directly upon labour. This has the advantage of directly addressing one of the sources of the inequality which policies seek to redress. There is considerable evidence that jobs are requiring an increasingly

skilled workforce[18] (Brewis, 1969; McMullen, 1997). Bearing this in mind, some regional policies have focused upon increasing the labour force's skills in order to make it more attractive to industry. Increased skill levels also lead to increased labour mobility, so it is important to combine this approach with a more explicit job creation policy if it is to have a determining effect on regional employment.

Despite the importance of skills, it is often the cost of labour which has been targeted by regional policy: rather than subsidies on capital investment, which may lead to increased capitalisation of industry at the expense of labour, subsidies on jobs created will, by reducing the relative cost of labour, have the opposite effect. In the short term this may produce good results, but it may also have the effect of encouraging industries to put off the introduction of new technologies - making the region less competitive in the longer term. In addition, such subsidies, unless applied indefinitely, require the generation of wider regional advantages to prevent the disappearance of the subsidised jobs when the true cost is met by the employer.

Policies which focus on industrial mix attempt to alleviate fluctuations in employment and income due to an over concentration of seasonal activities, or of other activities which are subject to wide variations or long term declines in demand. Policies similar to those described above can be put in place but targeted at economic sectors which are complementary to those in which the region specialises. Similarly, policies which attempt to build up export sectors within a region focus subsidies and grants upon industries which are likely to generate high regional multiplier effects. Again, the actual policies implemented can focus either on the capital or the labour requirements of such industries, and can function through direct subsidies, tax abatements or other forms of incentive. Industrial mix and export base type policies are often combined: for example, Castells & Hall (1994) relate how the Japanese and South Korean governments have set up 'technopoles' in some of the more remote parts of their countries as part a national drive to expand the high-tech industries, but also as a way of stimulating activity in underdeveloped regions. The emphasis on high-technology can be construed both as an attempt to change the industry mix in predominantly rural areas, and as an attempt to expand these areas' export bases.

[18]This hypothesis will be studied in more detail in chapters 4 and 8

The policy approaches outlined above have been behind most national level regional development programmes; but government policies not explicitly focused upon regional disparities can also have very large regional effects.

3.2.3 Implicit Regional Policy Approaches

Almost any government policy can have regional effects, and the extent to which these effects are intentional or not is open to debate. These implicit policies will not be described in detail, since this would require a review of all government action and spending. Rather, a few examples will be referred to merely to illustrate the point being made.

In the USA in particular, Markusen et al (1991/1996) have described the major distributive effects of military procurement. Defence policy has been instrumental in generating the oft cited technopoles in Silicon Valley and Route 128, and has also been one of the factors behind growth, over the 1970's and 1980's, in sunbelt cities in the USA (Markusen, 1987/1996). Procurement decisions were taken for a variety of reasons unrelated to concerns over regional equity ranging from political boosterism, the locational choices of defence contractors, to the existing location of military facilities.

In Canada, unemployment (or employment) insurance programs have marked regional effects. As payments made under the scheme are cut back, so areas with higher levels of unemployment will see transfer payments reduced. Furthermore, the rules pertaining to the obtention of benefits discriminate between regions: in areas such as Newfoundland where the seasonal nature of unemployment leads to wide annual swings in unemployment rate, rules pertaining to the minimum number of weeks' work required before insurance is acquired will have a larger effect than in provinces with more stable employment trends.

The Canadian government sometimes uses the location of its own facilities as a lever for regional development. The federal tax office in Shawinigan, for instance, can be seen as a means of injecting stable employment - employment which will lead to consumption multipliers - into a more peripheral city.

Policies which affect the exchange rate (such as the setting of interest rates - which is not strictly speaking within the government's power, but the Bank of Canada's) can have regional effects: the exact effect upon each region will depend on the degree to which each region relies on foreign exports (see appendix 1 for a more detailed discussion on exchange rates). International trade policy will also have a differential effect on regional employment. In appendix 1 the discussion of the auto manufacturing sector highlights some of these effects. In general, the effect of trade policy on each region will depend upon the international competitiveness of the industries which are located there and upon the competitiveness of the regions themselves.

Energy and resource policies have key regional effects, particularly in Canada where much economic activity is resource driven (Cohen, 1991; Mansell, 1987). Oil, in particular, has been the subject of nation-wide policies - in the wake of the 1973 and 1978 oil shocks the National Energy Program was introduced with the intention of keeping energy prices low. This had the effect of transfering wealth from the oil producing regions to the oil consuming ones. Mansell (1987) provides a detailed description of the various energy policies and their regional effects, but for the purpose of this section it is sufficient to note the marked regional effects that energy policies can have, be they policies which focus on oil (produced in Alberta and to a lessere xtent off newfoundland), hydro-electricity (Quebec and Newfoundland) or indeed any other energy source (or ressource) not distributed evenly across the canadian territory.

A final example of national policies which can have regional effects are those targeted not at specific industries, but at specific types of company. Thus, policies which focus upon small and medium sized establishments, for instance, will have a disproportionate effect in areas with higher concentrations of such firms. In addition, Bartik (1993) points out that such establishments "have less access to national labour markets" (p309) so that the jobs generated tend to benefit local workers. Therefore, even if small establishments do not actually generate more jobs than larger ones, from a regional perspective they may be a more effective way of funnelling assistance to local areas.

In short, almost all government policies have regional effects, and the detailed analysis of the influence which central government policies still have upon differential

regional development, despite its withdrawal from explicit regional policy, merits detailed study. The purpose of this section has been to highlight this effect.

3.3. Local Governments and Development Policy

When discussing local development policy, it immediately becomes apparent that many of the policy initiatives involved resemble those which have been implemented from a national level. The creation of regional competitive advantage, which underlies much of the thinking behind local policies, is in some ways what national governments have attempted to perform by acting upon location costs, industrial mix and labour markets. Regional policies have tended to overlook the aspects of competitive advantage associated with local institutions and culture, and their tendency to apply similar approaches to all of the targeted regions has made them a rather blunt tool: but the basic thinking behind nationally implemented regional policies has been to create in depressed regions the conditions necessary for economic activity to flourish there.

Some of the new approaches to regional and local development, emphasising the role of local institutions, local populations, and local initiatives have been described towards the end of chapter 2. This chapter opened with a description of the idea of competitive advantage which incorporates these into the matrix of factors which can lead to regional and local growth. It must be understood that in moving from a discussion of national to local development policies we are also moving from the discussion of the policy context of the 1960's and 1970's to that of the late 1980's and 1990's. The change in spatial scale is thus a chronological move from discussing 'yesterday's' approaches to today's. In the concluding section of this chapter we will argue that a national regional policy may in fact not be as *passé* as governments' attitudes suggest.

Porter (1990), when describing the notion of competitive advantage as it applies to spatial units, does not directly consider units at below the national scale: it is the regional scientists and geographers who have tended to concern themselves with intra-national economic policies. In the context of increased globalisation, it is useful to consider the role which local governments - in particular governments at the urban level - are increasingly taking on. As the burden of economic development has shifted from central governments to regional and municipal ones over the 1980's (Savoie, 1986a; Eisinger, 1988; ECC, 1990a), so policy approaches have evolved which are

specific to the requirements of small open economies. These are generally referred to as local development policies (as opposed to regional ones which have historically been implemented by national governments) and it is these which often seek to apply the idea of competitive advantage at a sub-national level. The emergence of localities (a classification which includes urban units) as important actors on the development scene will first be outlined, and then some actual policy approaches will be described.

3.3.1 Local Development[19]

Since the mid to late 1970's, at least partly due to fiscal constraints brought about by market pressure, national governments have progressively withdrawn from the arena of economic development. Although this has coincided with the rise of neo-liberalism as the dominant ideology (Jonas, 1996), it must also be recognised that the empowerment of local governments is attractive to a wide variety of different political approaches. Neo-conservatives can construe this as positive because it is evidence of the withdrawal of heavy state bureaucracy - municipalities and small regions are far closer to the libertarian concept of 'communities' which emerge through negotiation within a minimal state (Nozick, 1973). Left-leaning sensibilities are reassured by the more open democratic processes this can entail and by the fact that local social, environmental and other issues can more readily be incorporated within the political process.

Gough & Eisenchitz (1996) and Polèse (1994) both make this point. The former analyse this process in detail, and suggest that local economic initiatives are a means which *enable* the neo-liberal agenda of capital mobility to be realised: local economic initiatives are seen by them as a way not only of pacifying potentially rebellious labour and of providing basic infrastructure and amenities, but also as a way of creating investment opportunities for capital to exploit. Thus, without these local initiatives, there would in effect be nowhere for capital to go - and this ties in with Cox's (1992,1995) point that capital needs to become immobilised in order for new value to be created. In Cox's view, however, not only are local areas important to mobile capital, capital also becomes far less mobile once it has become rooted in a particular locality.

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[19] This discussion follows Shearmur (1998)

These opposing views - one of highly mobile exploitative capital, the other of localities able to tie capital down - are crucial in determining the overall effect of local development policies. Broadly speaking, these policies can be divided into two categories: those which seek to attract footloose industries and those which seek to create an environment conducive to growth from within the locality. More often than not localities will deploy a range of policies from both of these categories, and the two approaches will now be described.

3.3.1.a The Attraction of Footloose Industries

In order to attract footloose industries, a variety of local policy measures are implemented. They have in common an attempt to reduce the cost of locating in an area and in this respect are reminiscent of national level regional policies. Thus, subsidies are often offered to establishments willing to locate in particular places (Markusen, 1994; Brenner, 1997; Teitz, 1994; Reese & Fasenfest, 1996). These subsidies take various forms. Tax abatements are very common, as are 'contributions' in terms of infrastructure and property requirements. Direct subsidies - such as wage subsidies or indeed loan guarantees and direct grants - are also used to reduce location and operating costs and hence attract outside plants.

Another approach whereby an area can be made more 'competitive' is to loosen up or to abolish altogether various regulatory constraints. At a local level it is not always easy to modify health and safety regulations - which are often set at a national level - but local authorities often have jurisdiction over planning matters and certain aspects of the environment (in particular matters concerning pollution which, at a local level, often boil down to either planning or property disputes). Thus, local areas can make themselves more conciliatory towards the requirements of footloose industry.

Another approach to local development is the provision of infrastructure. The infrastructure can be of many kinds, and although this type of policy often conjures up images of civil engineering projects, there is increasing inter-jurisdictional competition in the provision of high-tech communications facilities (Pennington, 1995). A further advantage of this type of policy is the possibility of awarding infrastructure development contracts to local companies.

This type of inter-jurisdictional competition is often criticised as being counterproductive and wasteful (Brewis, 1969; Logan & Molotch, 1987/1996). Yet it is very common (Teitz, 1994; Keating, 1993). One of the reasons for the continued, and indeed the increased, use of such policies can be found in the nature of local politics. As Keating (1993) puts it, "to argue against growth appears irrational, and opponents are often reduced to supporting whatever growth strategy is chosen in the hope of extracting limited benefits from it". Thus, if a local coalition is formed which decides to promote economic development through cost and regulatory incentives it is very difficult for opponents to be heard. This difficulty arises from the fact that "growth coalitions" often comprise local governments and businesses who have ready access to the local media and can thus generate support from wavering constituents (Logan & Molotch, 1987/1996; Cox, 1995; Leitner, 1990). In such coalitions the interests of local government - to increase the tax base - complement those of business - to generate new opportunities, in infrastructure development for example. And, as Cox (1995, p215) puts it, "the general picture, therefore, is one in which there is significant redistribution from immobile communities to mobile business", even if some specific localised interests (e.g. local developers) also benefit.

It is worth noting that these policies appear to be appreciated by businesses themselves: in 1994 *Site Selection*, the real estate magazine, reported the results of a survey which purported to identify the ten most important location factors for businesses. The two first are classic market proximity factors (proximity to clients and access to interstate highways), but the three next ones are directly impacted by local policies, i.e.: real estate costs, availability of skilled workers and, the most relevant in terms of our discussion, "pro-business government officials". The survey's overall conclusion is reported to be that "the solution for the site selection equation is much the same in 1994 as it was a generation ago: finding the most profitable location" (Coffee, 1994, p34). The relevance of these results lies not so much in whether they are accurate or not - the short article does not provide enough information to evaluate them - but rather in the fact that a prominent real estate magazine clearly lends them credence.

3.3.1.b The Promotion of Growth from Within

Inter-jurisdictional and inter-regional competition is an unfortunate trend, in that space is increasingly construed as a commodity, as a force of production (Swyngedouw,

1992), and as such as something which is eminently substitutable. This can lead not only to the dislocation of communities as capital moves in and out, but also to high financial costs to society as investments and incentives undertaken to create appropriate local conditions are replicated in many localities and are often either unused or used only for as long as better packages are unavailable elsewhere. There are, however, reasons to believe that some opposite trends are at work. Cox (1992; 1995) expresses scepticism regarding the arguments relating to the commodification of space. First of all, he points out that it is misleading to set up a simple opposition of 'community' versus 'capital' because whereas communities often have multiple and conflicting goals, capital is focused uniquely on the pursuit of profit. There may well be local actors in the community who are eager to attract capital, either because it will further their own local agenda or because they are tied, in some way, to interests at a different scale. For example, it is quite feasible that a business executive living in a particular locality would identify far more readily with the interests of a trans-national corporation than with those of the town in which she/he lives.

Cox's second point, which ties in directly with the growth from within arguments, is that localities are *not* infinitely substitutable. He makes the distinction between weak and strong inter-firm competition: weak competition is competition on the basis of cost reduction and strong competition is that on the basis of gaining and maintaining an edge by revolutionising production. For Cox (1995, p218), inter-jurisdictional competition is based upon the assumption that all inter-firm competition is of the weak sort - a position which is logically untenable because in a perfect market all firms would be able to identify the lowest cost combination of factors[20]. Thus, whilst market imperfections do make weak competition viable in the short term, real advantage is gained by engaging in strong competition. And, for Cox (1995, p218), "strong competition entails a spatial embedding, a territorialisation of economic activity.... In other words, firms become anchored down, locally embedded, by the conditions which give them the unique edge that allows them to appropriate super-profits". Amongst these local conditions are a specifically skilled labour force and a trusted and reliable network of suppliers: and this type of spatial embedding is exemplified by the just-in-time production processes which are rising in prominence today. Fujita and Child-Hill (1995), without specifically using Cox's framework of analysis, basically argue that

[20] It was seen in chapter 2 that the argument is in fact more complex, particularly if scale, sunk costs and barriers to entry are considered. Arguably these can form part of Cox's "local conditions" which lead to embeddedness and strong competition.

trans-national Japanese firms do tend to become locally embedded in the way that Cox describes.

In practice, these considerations lead to policies intended to promote growth from within. Of particular importance are workforce skills (Huggins, 1997) and the encouragement of business start-ups, either by providing incubators or by providing subsidies in the form of property, start-up loans or grants. As mentioned above, small firms and start-ups are not only more likely to draw directly from the local labour market, they are also far more likely to be attached to the local area, to be less mobile than branch plants and subsidiaries of larger corporations. Another aspect of policies which encourage growth from within is emphasis upon the provision of information for local firms regarding technologies and markets, and even attempts to insert the local firms into larger networks (Hansen, 1996). Local culture is an important factor in the promotion of local growth, and many community development projects put considerable effort into promoting a co-operative and entrepreneurial attitudes into local populations. Ideally, therefore, such policies are focused on exploiting a locality's full potential - often with no immediate concern for the outside context but rather concern for the local social, environmental and distributional consequences of growth.

3.3.2 The Merging of the Two Approaches

It is interesting to note that the distinction between policies destined to attract footloose industries and those intended to promote growth from within relate more to policy intentions than to policy action. Indeed, Coffey & Polèse (1984, 1985) in two articles which discuss the conditions necessary for 'growth from within', conclude that local development policies need to concentrate on the creation of "local comparative advantages". These depend crucially upon local culture and institutions - in particular attitudes towards entrepreneurship, information, human capital and leadership: these conditions closely resemble those required to create a regional competitive advantage for the attraction of outside firms. These conditions are also very similar to the 'new' location factors outlined towards the end of chapter 2. 'Learning regions' and 'industrial districts' gather factors and conditions which can lead to both endogenous growth *and* to the attraction of outside industry.

Phelps & Tewdwr-Jones (1998) and Phelps et al (1998), in the discussion surrounding a case study of the location of 'footloose' industry in Southern Wales, emphasise the

direct link which exists between local policy measures (town planning decisions, development policies, workforce training) and the competition between localities for the attraction of foreign direct investment. Malecki (1994) seeks to unravel the role of entrepreneurship in local development and concludes that "small firms and new firms cannot be considered the sole base of an economy. Large firms continue to dominate production and employment throughout the world". In terms of scale, this can clearly be interpreted as recognition of the fact that production, and economic growth, are occurring at various inter-related scales, not just the local. Similarly Martinelli & Schoenberger (1992) emphasise the fact that large trans-national corporations are alive and well, and question whether the 'industrial district' idea can be generalised from the relatively small number of well documented examples.

In fact, Gertler (1988; 1992) and Tickell and Peck (1992) underline the fact that the idea of industrial district leads to conceptual problems if it is taken as a blueprint for endogenous growth. They point out the need to position such districts in a wider economic context, in which decisions and markets are often dominated by large firms. In the same vein, Harrison (1994) points out how reliant industrial districts in Italy often are on a small number of clients from outside who can easily dominate the networks of small establishments.

It can thus be seen that there is a fine line - if a line exists at all - between the policy approaches which will create a 'competitive advantage' such that mobile capital will be attracted to an area and those policies which seek to promote local growth from within.

3.3.3 Local Development Policies

A convenient compartmentalisation has been used in the preceding sections as a way of distinguishing two different types of local development policy. But as can be seen, these compartments are far from watertight. With respect to policy approaches, it is clear that most local development agencies use combinations of both types, and the approaches themselves overlap.

A good example of a local development agency which has incorporated a wide variety of different policy approaches is the Welsh Development Agency (WDA), as presented by Huggins (1997). The reason for choosing a Welsh example is the fact that one local authority has implemented a wide array of different policies. It has been

emphasised that both approaches to local development cannot easily be separated conceptually: the Welsh example provides an illustration of how the policies become enmeshed in practice. A further reason for choosing the WDA is the availability of a recent series of detailed studies on the area (Huggins, 1997; Phelps & Tewdwr-Jones, 1998; Phelps et al, 1998)

The WDA began, in the early 1980s, by seeking to attract outside investment into Welsh areas which had been devastated by mine closures (Phelps & Tewdwr-Jones, 1998). These policies sought to actively encourage the location of trans-national corporations in targeted sectors - most notably automotive components and consumer electronics. Amongst the initial attractions of south Wales were some basic cost factors - such as direct financial assistance and low wages. Whilst this was the WDA's initial approach, it began to implement policies aimed at creating favourable conditions for the development of local firms with "programmes aimed at promoting local sourcing and supplier development amongst SMEs and foreign-owned plants" (Huggins, 1997). A further refinement was the setting up a "Collaborative Training Consortium" in close collaboration with business, and, even more specifically, the "Aiwa Skills Training Partnership" aimed at raising "the quality of components and services sourced to the consumer electronics firm by its Welsh suppliers" (Huggins, 1997). Broadly similar policy approaches are found in German Lander (Brenner, 1997, p296), Canadian regions and municipalities and across the United States (Eisinger, 1988; Markusen, 1994; Cox, 1995), but not necessarily combined in the same way.

It is worth noting, though, that in Wales at least, the attempts to build and support clusters of local firms and the focused training programmes were introduced primarily as a response to the success of 'spatial competition' policies, and it has yet to be seen if, now that the clusters and the trained workforce are there, agglomeration economies will be such that the region will sustain its growth. This consideration is crucial, because by combining the notion of competitive advantage and that of agglomeration and localisation economies, it can be surmised that once a region has gained a competitive advantage in a particular sector a process of cumulative growth could ensue. There are indeed a number of authors who emphasise the importance for regions and localities to gain first mover advantage (e.g.: Storper and Scott, 1995; Florida, 1995) and some dire predictions as to the possible consequences, for laggard regions, of intensified inter-regional competition.

3.4 Conclusion

3.4.1 Policies

The discussion in this chapter suggests that there was a certain logic other than ideological expediency in the move from centralised to local development policies. Although the actual policies implemented at the national level resembled those now applied at the local level (focus upon human capital, subsidies, specific economic sectors, infrastructure), the myriad of political and definitional problems which face policy makers at the national level disappear once policies are developed and implemented locally. There are fewer political 'jealousies' between regions or localities since each is now responsible for its own development. The actual definition of development no longer need be homogeneous: each community can define its own criteria. The identification of potential, and the weight to be attached to local social and environmental factors can better be determined locally then centrally. In short, many of the classic problems identified with centrally planned economies (Hayek, 1944) are alleviated if policy making is decentralised.

There is, however, a negative aspect to the generalisation of local development initiatives. Although local communities can in theory become involved, it is argued by some that development policies are often devised by and for the local élites: development criteria are fixed according to their economic interests, and the costs can be spread across the community. There is thus a transfer of wealth from the local taxpayers to the local élites and to the businesses, local or otherwise, which benefit. Another problem is that of inter-jurisdictional competition. If each locality implements the type of local development policy described above, then mobile plants will be in a position to play one locality against another. This will have the effect of eroding the power of localities to raise taxes from industry and could eventually lead to increases in residential taxes or decreases in local services. However, it is these local services - such as education, public amenities, and infrastructure which lie behind competitive advantage in the first place: intensive inter-jurisdictional competition carries within it the seeds of its own demise. At the very least, agglomerative and cumulative processes, once set in motion in the more successful areas, will render futile many of the competitive strategies implemented by laggard regions.

Such competition between localities will also lead to inefficiencies at the national scale. Infrastructure and other investments (such as promotion and marketing) will be replicated by many localities and only a few will be able to attract the desired mobile industries: the investments made by other localities will be wasted. Whilst a certain degree of competition may be desirable, there would appear to be a need for this competition to be regulated in some way.

It is in this context that a new role can be foreseen for national government, a role not only of regulation but also one of promoting the local conditions necessary for 'growth from within'. A national government could set standards relating to the types of incentives which local governments can offer, the incidence of these incentives on local taxpayers and could establish a framework to determine the responsibilities of firms which benefit from local incentives. Whilst each locality is relatively powerless in the face of firms which elaborate a location strategy, the national government is in a position to set some conditions which harness and regulate the competitive strategies of both localities and firms.

In regions where there is some growth potential, Hansen (1996) suggests that central government could also play an active role in the dissemination of information, whether process, market, financial or other. In the new information economy, active attempts to disseminate such information would provide entrepreneurs in these localities with some of the basic material necessary for identifying and exploiting opportunities. Such relatively low-budget policies could in fact be implemented *prior* to determining a region's growth potential. If areas have no potential even after attempts at generating local growth, then, in order to promote the welfare of residents in these areas, a national government could consider a system which would assist their mobility. Such a policy would go some way towards recognising the insights of the neo-liberal approach to regional problems whilst reducing the costs and uncertainty which can inhibit migration due to economic distress. It is worth noting that in 1990 the Economic Council of Canada (ECC, 1990) came to very similar conclusions with regards to the role which central government could play in a context where local development initiatives predominate.

As Hansen (1996) puts it, "national governments have typically addressed national competitiveness in sectoral terms, yet it has become increasingly apparent that the conditions that underlie national competitiveness are often localised. If one wants to

start understanding differences in national growth rates one should start examining the differences in regional growth" (p116). Although the analyses in this study focus upon the *distribution* of employment growth across the urban system, the distinction between this and aggregate employment growth is not clear cut: a national government concerned with aggregate employment levels should actively consider the effect and consequences of the spatial distribution of activity.

3.4.2 Growth Factors

Despite the many attempts by governments to influence the location of regional activity, and the on-going political pressures to do so, there is little evidence that the plight of Canadian regions has evolved, in relative terms, over time. Income disparities between provinces have remained broadly similar since at least the 1920's, whether or not policies have been put in place. The largest fluctuations are those associated with the Prairies (Brewis, 1969; Coffey & Shearmur, 1996) which rely heavily on resources for which world demand can fluctuate quite considerably. Despite this, theories, evidence, and policies suggest that 'growth' regions have certain factors in common. It may be that, in Canada at least, analysis at the regional or provincial scale is not appropriate for capturing the effect which location factors have. Labour pools are not defined at the provincial but at the urban level. Information, infrastructure, knowledge, is also situated at the urban and not the provincial level. It does not therefore follow that because provincial disparities remain fairly constant over time, individual urban areas which possess certain characteristics have not fared better than others. The empirical analyses which are performed in the following chapters examine whether the effect of certain factors, factors which have been identified in theoretical discussions and around which policy approaches have developed, are discernible at the urban level. Such an investigation will contribute to the debate surrounding urban employment growth in general, and possible avenues of policy intervention in particular.

Before moving on to the empirical analyses, however, chapter 4 will examine the evolving nature of labour markets, and the impact which technology is having on labour and on production processes. Although the distribution of economic activities and the various policy approaches have been discussed in general terms, the primary focus of the analyses is upon employment. Thus, an understanding of the evolving

relationship between economic activity and employment will assist in focusing the discussion upon the specific aspect of economic activity which is central to this thesis.

Chapter 4.

Employment, Growth and Technology

In the preceding chapters the connection between employment growth and the location of economic activity has been discussed. However, two important concepts have been introduced, and it is these which this chapter will deal with. The first concept is that of employment: urban systems and growth have been discussed, but the employment market itself is undergoing changes which require further examination. The second - and related - concept is that of technology. It is technology which, Castells argues (1989), is behind the move towards the 'informational' economy. It is labour saving technology which contributed in part to the decline in employment in US auto manufacturing. And it is technology which enables the co-ordination of production facilities across the globe, the concentration of high order services and so on.

A general account will first be given of employment evolution in industrialised nations over the last thirty years or so in order to situate the discussion on technology and labour. After describing these general labour-market considerations, the specific connection between labour and technology will be explored. Two effects will be distinguished: the direct effect of labour-saving technologies on employment, and the indirect effect which technological changes have on labour through their effect upon the production system. The inevitability or otherwise of job losses and the effect of technology on workforce qualifications will then be addressed.

Finally, a more detailed consideration will be given of employment policy options at the national level. It will be seen that these policies may be having a direct impact on the uses currently made of technology and on the rate of adoption of new technology. In particular, they may be determining whether a 'high road' or a 'low road' to growth is being followed (Chapman, 1994a).

4.1 Employment and Economic Growth

For the first thirty years or so following the second world war, most economies in the Western world operated at or near full-employment (Galbraith, 1987; Singh, 1997). A number of explanations can be put forward for this: the post-war reconstruction led to

sustained increases in demand, as did Europe's attempt to catch up with the material living standards of the USA. But one of the characteristics of this period was an acceptance by all of the actors within society - labour, government and industry - of the necessity for government intervention and regulation within the economy (Amin, 1994; Singh, 1997). The world currency markets were stable, with predictable exchange rates and limited capital flows (Strange, 1994; Swyngedouw, 1996). Wages kept pace with growth in productivity. Governments did not hesitate to engage in public spending and policy intervention when demand tailed off in order to sustain growth and employment. When regional disparities occurred, polices were implemented which attempted to even out both income and employment disequilibria. This 'Keynesian' management of national economies apparently had spectacular results - leading to 'thirty glorious years' of sustained growth in employment and output (Fourastié, 1979).

During the 1970's the situation changed: major external shocks - in particular the increase in oil prices, but also mounting pressures on international currency exchange - destabilised the system which was in place. The potential for such shocks had been growing, and there are basically two approaches to understanding them. The first is to argue that the system of regulation which was in place - government policies, unions, social security - was somewhat too rigid, and that a willingness to renegotiate the existing institutions could, if not have prevented, at least have mitigated the consequences of the upheaval in the 1970's. The second is to argue that the building up of such pressures is an inevitable effect of any attempt to manage the economy, and that the market, if left to itself, would automatically, through the action of the 'invisible hand', have prevented such pressures from building up (Singh, 1997).

The overwhelming response to the crisis in the 1970's was the espousal of the second response. Since the late 1970's Thatcher and Reagan have led the way into a market-led system, presiding over the deregulation of financial markets, the whittling down of the negotiating power of labour, and the withdrawal of government from as many spheres as possible. In this view, the ideal role of government is the maintenance of law and order and the preservation of property rights: all other human and social interactions are best left to the market which, if uninhibited, is the best possible mechanism for resource allocation (Hayek, 1944; Nozick, 1973).

One important result of this change in approach has been a new way of looking at the labour market: from a system of negotiated consensus (Singh, 1997) labour market management moved, in the 1980's, to one of market competition. This entails the belief that "unemployment occurs because wages are too high .... Alternatively, if wages are too low skill shortages will arise" (Chapman, 1994b). Supply-side policies are advocated to solve unemployment problems.

> "Unemployment is an equilibrium outcome but demand or supply policies might be used to move the economy towards full employment. In the 1980's it became fashionable to argue that the only permanent method of increasing employment was through the supply-side .... In general more workers would be willing to work at a given wage and there would also be a lower reservation wage, the wage at which workers will withdraw their labour. According to this view ... unemployment can be reduced by the adjustment of wages to the equilibrium rate (Chapman, 1994b, p268).

Such adjustment policies carry with them the risk identified by Keynes that a decrease in wages will not lead to increased employment but rather to a decrease in aggregate demand and thence to slower economic growth (Keynes, 1936, ch19). Other problems also exist: the concept of a reservation price is understandable in a market where goods can be stored: but workers generally depend on their wages to survive on a day to day basis. With no alternative means of support the reservation wage for workers will ultimately be a shade above zero - anything which will cover the worker's costs of getting to and from work will suffice in securing his/her labour if the alternative is no income at all. Thus supply-side policies aimed at reducing the reservation wage (abolishing legal minimum wages, reducing unemployment benefits ...) can, in the face of weak unions, drive wages down to below subsistence level - and many argue that, in the United States in particular, such a mechanism is in place (Pollin & Zahrdt, 1997).

Another questionable assumption with regards to the market approach to labour is that substitution is possible between capital and labour. It is this view which leads to the belief that a reduction in labour costs will lead to higher employment as employers substitute labour for capital: but there is no reason to believe, particularly in the light of the new production technologies, that this will occur. Indeed, it could be the case that the introduction of new labour saving capital reduces the demand for labour, thus

driving the price of labour down. It is unreasonable to suggest that, owing to the lower cost of labour, the producer will then substitute cheaper labour for his/her new machine. Other producers then may choose not to implement the new technology because of the lower wages: but this will serve to hold back the introduction of new technologies, and will slow down growth at the same time as salaries are driven down. The substitution of capital for labour (and vice versa) only makes sense if technology is held constant, and this central problem will be addressed in the next section.

There is much recent empirical evidence to suggest that the new approach to managing labour markets has not led to desirable outcomes, if by desirable is meant close to full employment and wages keeping pace with GDP growth. As the ILO writes (ILO, 1996) "the persistence of high jobless rates in industrialised economies and massive underemployment in developing economies only reinforces the strong economic and moral case for "reinstating full employment as a primary policy objective".

In order understand the current discussions surrounding the labour market, however, it is not sufficient to consider the broad issues of economic management. A wide array of factors may have an influence over the employment - growth nexus, and one of those which has already been singled out is technology. The recent ideas on the spatial distribution of economic activity, whether embodied in industrial districts, learning regions or technopoles, all place considerable emphasis on the role which new technology can play in the job creation process. The division of labour theories are dependent upon a certain understanding of the place which technology occupies in current industrial restructuring. This echoes the conclusions of economists who see in technological and managerial improvements the ultimate source of economic growth (Solow, 1970; Hacche, 1979; Ray, 1998). The specific issue of new technology also leads to the consideration of distributional outcomes - who reaps the benefits of new technology?

4.2 Recent Evolution in the Labour Market

4.2.1 Job loss and technology

Many of the current issues relating to technology and the labour market are raised by Rifkin (1996) in his book, 'The End of Work'. Although his arguments are somewhat

sensationalised, and need to be read critically, in taking an overall view of the current labour situation Rifkin provides a useful starting point for a discussion of the subject.

According to Rifkin (1996), new production technology is leading to the increased substitution of capital for labour. This will ultimately lead to 'good jobs' for approximately 20% of the population - for Reich's (1991) symbolic analysts who are in positions of power within the global economy and who manipulate the information required for its running. The remainder of the population will be in lower paying service employment, or entirely marginalised. Rifkin (1996) argues that we have entered a third industrial revolution: the first witnessed a transfer of employment from agriculture to the manufacturing industry and the second from manufacturing to services. These differ fundamentally from the one which we are currently undergoing since in the first two new types of employment were forthcoming. At present, computerised and automated production technology are leading to the loss of qualified jobs not merely in the manufacturing sector but also in the service sectors (secretaries, supervisors, office staff...). No new economic activity is emerging to replace the lost service jobs. Eventually, only a small number of highly qualified jobs will remain in conjunction with large numbers of temporary and/or poorly paid menial employment.

These ideas reflect some more considered arguments put forward elsewhere: Spencer (1995) makes a similar initial assumption to Rifkin (1996) - that "the previous technological revolutions have eventually created more jobs than they destroyed" (Spencer, 1995, p713) - and then attempts to justify the special nature of the technological changes currently under way. For Spencer, micro-electronics differ fundamentally from previous technologies because they directly impact upon the essence of what differentiates human work from the work of machines, that is to say the control function. He argues that previous technologies merely substituted machines for workers' muscle power, and labour was thereby transferred towards control functions, both the control of machines (manufacturing jobs) and of systems of production (service jobs). Today, however, micro-electronics can replace these control functions and "we can no longer expect to discover or to create new control functions which only humans can fulfil" (Spencer, 1995, p722). According to Spencer, even creative functions are increasingly circumscribed by powerful 'design' software.

Volti (1988) lends a note of caution to these ideas concerning job loss caused by new technology. He recognises that there are many examples which support the thesis of

technology induced job loss, but according to him this is not a new phenomenon and it is important to recognise that jobs are also created. New technologies are, he says, essentially neutral: they neither create nor destroy jobs. He recognises, however, that the introduction of new production technologies can lead to major economic restructuring. If, as suggested by *The Economist* (11/2/1995) these dislocations can take a number of generations to resolve, the fact that in the long term full employment will eventually return is of little practical relevance. The continuous and accelerating nature of change can lead one to imagine a process of continual restructuring and adjustment - with labour always one step behind the latest technological improvement.

One important qualifier can be made to the argument that new technology eventually creates sufficient new jobs, particularly if that argument is based on historical analogy. In the western world, the first industrial revolutions did indeed create jobs, but not enough to cater to the growing workforce. Until the second World War there was a steady out-migration of people from Europe to the USA and to colonies (Kuznets, 1968, p16). Within the colonies there was a movement of people towards unsettled land and employment was sustained by exploiting these new resources. Economic growth was accompanied by increases in employment, but it is misleading to claim that sufficient new jobs were created *by the implementation of technology*. Technology appears rather to have displaced people who were able to find employment only through expansion of the economy's physical frontiers.

It can be argued that in the post-war years, emigration and physical expansion were replaced by the expansion of consumption (Galbraith, 1958): again, the frontiers were being moved out in such a way that the effects of vastly improved production technology on jobs was not apparent. Since the 1970's, the frontiers have ceased to expand as fast: the basic material requirements have been met in most Western households (Fourastié, 1979), so consumption has not expanded. Excess labour has not been able to migrate or apply itself to the massive production of consumer goods, so there has been no outlet for the excess workforce. This line of argument calls into question the basic assumption that new production technology has, by and large, replaced the jobs which it has displaced. Of course, a counter argument to this may be that there is no reason for consumption not to expand: but instead of the material well being of households being the driving force - instead of the manufacturing industry driving growth - there is now room for improvement in services, both public and

private[21] (Rifkin, 1996; Galbraith, 1958). Although this counter-argument is valid to the extent that it identifies new areas of demand, it fails to address the problems inherent in the widening productivity gap between services and manufacturing. This issue is addressed in the following section.

In all events, the precise effect of technology on job creation is very difficult to assess - neither the pessimistic arguments positing the end of work, nor the optimistic ones purporting to demonstrate, by reference to history, that technology always creates new jobs, are entirely convincing. One reason for this is that technology alone may in fact be neutral, and the real issues lie in the political and social decisions made with regards to its implementation and use.

4.2.2 The production system

In this respect, an important determinant of current labour market conditions is the restructuring of the production system - made possible by the implementation of new technologies. A large number of researchers (Reich, 1991; Houseman, 1995; Gunderson & Riddell, 1995; Norcliffe, 1994; Harrison, 1994; Gertler, 1988; ECC, 1990b) point out that there is an increasing segmentation of labour markets into 'good' jobs and 'bad' jobs. The introduction of new methods of production - made possible by improved communications between clients and sub-contractors as well as by the introduction of programmable machine tools and computers - has accompanied changes in the occupational structure, with a reduction in the number of stable well paid jobs and an increase in the prevalence of short term contract work, often low paid and devoid of medical and social insurance (Betcherman et al, 1994). As can readily be seen, such an evolution is also in keeping with the supply-side approach to labour markets: increased 'flexibility' should, in the light of this theory, lead to rapid convergence upon the market clearing wages, thus reducing unemployment. Long term work contracts and protection in case of job loss are seen as market imperfections.

This increase in flexibility - whether caused by 'neutral' technology or encouraged by macro-economic and social policies - is not only made effective by the introduction of

[21] Daly & Cobb (1994) argue that the economy has now reached a point where further physical expansion (whether geographic or by consumption) will go beyond the capacity of the world's ecosystem to sustain it. They argue against further growth and for qualitative improvements which do not consume non-renewable ressources.

new machines, but also because of the vastly accelerated information flows. This has enabled 'just-in-time' production processes to be implemented, where output is an almost direct function of present demand: fluctuations in demand are immediately felt throughout the production chain, and employment 'flexibility' enables employees to be hired and fired in accordance with these fluctuations. To cope with this type of production chain, companies are increasingly organised around a central core of full-time employees and a variable number of temporary staff (Gertler, 1988, p421; Norcliffe, 1994, p8; Webster, 1995, p151).

It is not only the internal organisation of companies which is thus being reorganised: the entire industrial system is similarly being restructured around a central core of large multinational firms and a multitude of 'temporary' SMEs. This is reflected on the one hand by the impressive longevity of many multinationals (Webster, 1995, p156), and on the other by the very high bankruptcy rate amongst SMEs (Birch, 1987; Picot et al, 1994). In this perspective, the good job creation record of SMEs, if this record is empirically justified, is a consequence of the large corporations' decisions to increase sub-contracting and externalise the cost of flexibility (Pollert, 1988, quoted in Gertler, 1988, p425; Shearmur, 1997). Employment in SMEs is more unstable and wages are lower than in larger corporations (Betcherman et al, 1994; Picot et al, 1994). Furthermore, productivity in small establishments is often lower than in larger companies (Baldwin, 1995). Whilst it can be argued that new technologies enable shorter production runs and more production variety - making it easier for entrepreneurs to seize new opportunities by reducing the need for new capital investments - it can equally well be argued that new technology is being implemented in a way which furthers macro-economic policies whose aim is to restore labour market efficiency by encouraging increased competition. In the first case, the new technologies are positive factors in terms of job creation because new companies can be created with ease, whereas in the second case the new technologies can be viewed as a means of furthering control over the labour force.

4.2.3 Does New Technology Necessarily Lead to Employment Loss?

Despite Rifkin's (1996) arguments, it is unlikely that new technology, in and of itself, leads to employment loss. A number of counter-arguments can be put forward, the most recurrent of which is based upon the historical progression of employment as outlined above. Volti (1988) and *The Economist* (11/2/1995) both put forward this

argument: technological progress necessarily involves structural evolution, and employment loss in older industries is inevitable. Indeed, Schumpeter (1934), Kuznets (1968), Easterlin (1996) all emphasise the fact that changes in industrial structure are an integral element of economic growth - and the transition will inevitably lead to the decline of certain industries. This will have regional effects, as we have seen, and these arguments emphasise the importance for regions and urban units of creating a flexible and innovative climate in which younger industries can prosper.

At a general level, the optimistic argument is that, until now, the introduction of new technologies has never failed to introduce new jobs in sufficient numbers to employ most of the workforce. Today, even if the replacement of manufacturing jobs has slowed due to new production technologies, it is in the service industries that new jobs are being created. According to Krugman (1994, quoted in *The Economist*, 11/2/95), these new service jobs are not necessarily highly qualified ones. On the contrary, he argues that expert systems will increasingly be able to replace professional jobs such as accounting and law, but will be unable to replace jobs where exceptions are the rule and where social contact is necessary - jobs such as gardening and hairdressing. Reich (1991) puts forward a similar argument when he identifies a series of low-skill service jobs which gravitate around the "symbolic analysts". As these analysts focus more of their efforts upon the creation of ideas they will have increasing needs for personal services such as cleaning, child care and so on. Despite this, Reich (1991) admits that a third class of workers will exist, those in unstable and low paying jobs on the periphery of the global economy.

The idea that manufacturing jobs will be replaced by service jobs is an attractive one: not only are there reasons to suggest that the demand for services will increase, but service productivity, it is argued, progresses at a slower rate than manufacturing productivity (Illeris, 1996, p38). This argument, inspired by David Bell and his idea of a 'post-industrial' society (Webster, 1995, ch2; Illeris, 1996, p37), does not take into account another effect of the relative decrease in the productivity of services. As Gershuny & Miles (1983) point out, the effect of this productivity decrease is a rise in the relative cost of services. Indeed, wages for unskilled labour, whether in services or in manufacturing - are either set by the market or by minimum wage legislation. If the wages in unskilled services and manufacturing are similar, and productivity increases are only evident in manufacturing, then the relative cost of services increases. This leads to the commodification of services: the 'symbolic analysts', who according to

Reich (1991) and Krugman (1994, in *The Economist*, 11/2/95) create the new demand for services, will actually tend to substitute manufactured goods for services. For instance, they will purchase a combined washing/drying machine instead of resorting to the cleaners, and will purchase micro-wave dinners rather than eating out every night. Thus, whilst the emergence of an elite workforce is a distinct possibility - notwithstanding Krugman's argument it is doubtful that much legal work, or even accounting, can be fully automated - a concomitant increase in the demand for personal services is far from certain.

An argument which may mitigate Rifkin's (1996) pessimistic outlook relates to the actual implementation of new technologies. It can be argued that Rifkin (1996) idealises the potential of new technology, and that human beings can not, in fact, be replaced as efficiently as he maintains. It is undeniable that robotic technologies replace people - but most concrete examples of this emanate from the automobile industry (Gertler, 1988, p423). The real world implementation of new technologies often occurs far more slowly than imagined, and there is usually a prolonged debugging process involved (Gertler, 1988, p424). With the exception of a few manufacturing sectors, it can be argued that the central premise of Rifkin's (1996) argument is exaggerated.

Another approach to understanding the employment impact of new technologies is to take into account their relatively limited penetration, in particular amongst SMEs. Despite the fact that manufacturing establishments in Canada are increasingly using advanced technology, only 16% of them (in 1993) used it in the actual assembly process (Baldwin et al, 1995; Baldwin & Diverty, 1995). Rather, new technology is used for engineering and development functions (24%), and for inspection and communication functions (19%). Furthermore, it is generally the larger establishments which integrate new technologies into their production processes and which use the new technologies in combination: if one analyses shipments by value, one sees that most Canadian manufacturing output emanates from the few (large) companies which use multiple new technologies.

It is SMEs - the companies least well equipped with new technologies - which appear to create most jobs in Canada (Picot et al, 1994; Baldwin & Picot, 1994). This confirms Rifkin's argument to the extent that within the larger firms jobs seem to be displaced by technology, but mitigates it since technology penetration is not as widespread as

he suggests: the 'end of work' is not yet upon us. However, the segmentation of the workplace and of the production process is supported by these results: employment is created in the type of establishments least likely to integrate new technologies, and therefore most likely to compete by lowering costs. It is empirically verified that SMEs have lower wages, more short term work and less social insurance (Picot et al, 1994; Betcherman et al, 1994; Baldwin et al, 1997).

Large establishments, at the same time as they are reducing their number of employees, are integrating more new technologies and are increasing their dominance of production in Canada. Despite the fact that no causation has been established, these circumstances lend credibility to the ideas put forward in the preceding section relating to the link between orthodox macro-economic thinking and the use of new technology. There is currently a drive towards workforce 'flexibility' and trade liberalisation - both in the name of increased market efficiency and ultimately of increased aggregate world production (Singh, 1997). In search of economic efficiency large companies are introducing the new production techniques and, at the same time, are seeking to ensure capacity utilisation (Gertler, 1988, p427). The repercussions of changes or fluctuations in demand are externalised, and it is the SMEs who absorb this uncertainty. Faced with such risks, SMEs may be reluctant to invest in new technology, and may tend to offer short term contractual work in order to avoid paying out wages when demand is low.

In sum, whilst it is possible to have some doubts regarding the 'end of work' scenario the notion that there is a segmentation of the labour market is more difficult to refute. In addition, it is unclear to what extent the high rates of unemployment endemic since the mid to late seventies are a consequence of technology and to what extent they can be explained by the neo-liberal approach to economic policy. In any case, there are good reasons to believe that the use to which new-technology is being put, in particular in the context of labour markets, is not unrelated to the current economic orthodoxy - which is itself not unconnected with the influence of the managers of the world's larger corporations (Petrella, 1997; Clarke, 1996).

4.2.4 Technology and Work Force Qualifications

It is often argued that the introduction of new technologies tends to increase the demand for a qualified workforce since higher skill levels are required in order to

interact with the more sophisticated machinery. A counter argument runs along the lines that new technology reduces required skill levels since new machines can take over skilled work and reduce labour to a menial supervisory role. At present there are the beginnings of a consensus surrounding these arguments: McMullen (1997), after reviewing the literature in this area, concludes that there is a tendency for new technologies to require a more skilled workforce. Baldwin et al (1995) come to similar conclusions on the basis of an empirical study.

This consensus rests, however, on a restricted analysis of the problem. Even if one accepts the fact that the workers directly involved with the new technologies do tend to be more highly qualified, this does not entail that more skilled workers are required economy-wide. It may be that *fewer* skilled workers are required because there are a smaller number of (more highly) skilled jobs available. The research referred to above which highlights the increasing role of low-technology SMEs in the production process, and the role of low skill service jobs in the 'post-industrial' society, tends to suggest that there may actually be a reduction in the absolute demand for skilled labour.

Notwithstanding the emerging consensus, it is not a forgone conclusion that new technologies necessarily require a more highly skilled (albeit smaller) workforce: according to Muszynski and Wolfe (1989) the effect which new technology has upon workforce skills depends to a large extent on the managers' culture. In Anglo-Saxon countries - where relations between management and the workforce have traditionally been confrontational - new technologies are being introduced in order to reduce workers' autonomy and independence. In Japan and Germany, on the other hand, countries in which more co-operative traditions prevail, the implementation of new technologies serves to encourage employee initiative. The introduction to the empirical analysis on education and jobs (chapter 9) will elaborate in somewhat more detail on this subject, but it is important to point out here the fact that the introduction of new technology does not have a predetermined effect upon workforce skills.

4.3 Labour Markets and Policy

There are a number of reasons to believe that the apparent effect which the introduction of new technology is having on employment is not a consequence of the technology itself, but rather of the ideological framework within which this introduction is taking place. And whilst it is not the intention here to minimise the structural

transformations which changing production techniques involve, it is useful to point out that certain policy decisions have been made which amplify rather than attenuate the inevitable workforce dislocation.

As we have seen above, for Volti (1988) technology is essentially neutral. It is the decisions taken by society with relation to its utilisation which determine its effect. Heilbroner (1967) argues that although there is no technological determinism, the impact of technology upon society can not easily be mitigated in a capitalist system "in which the forces of technological change are unleashed". Volti (1988) extends this line of thought when he says that "technology itself is a product of social, economic, political and cultural forces. The types of technology found in any particular society reveal much on the nature of that society". Thus not only the applications but even the nature of new technology is not unrelated to the prevalent ideology.

In the context of our discussion regarding the effects of technology on jobs, we have seen that economic choices have combined with new technology to create considerable upheaval in the job market. In a market-based system the only stabilising mechanisms are price related - and in the current situation these mechanisms have tended to drive down wages. The increased 'efficiency' of the labour market has led to rising employment insecurity. The low wages and insecurity may, in keeping with Keynes' analysis (1936/1953), be depressing consumer confidence - workers are, after all, consumers - and this may be feeding back into the economy by way of a lowering of aggregate demand (Tarling & Wilkinson, 1997). At present, low employment and low growth at a national level may have become self-perpetuating, as employers bid wages down still lower in the belief that economic stagnation can be resolved by supply-side measures. Were a different ideology to prevail, then measures to sustain aggregate demand and consumer confidence could be implemented in an attempt to put the economy on a path of steady growth and full employment - self sustaining growth rather than decline. The technology itself need not be different: but the benefits of increased productivity would need to be more evenly shared so that the increased output could have a more direct effect on aggregate demand[22]. When Ford argued that he needed to pay his workers a decent salary so that each of them could afford a model-T he was expressing a similar idea.

[22] This argument abstracts from the ecological considerations put forward by Daly & Cobb (1994). In their view increased consumption is a very short term solution to under-employment, and is somewhat akin to burying one's head in the sand. Fundamental changes in society and in man's relationship with nature are needed to address the distributional and ecological imbalances created by the economy, and

The bidding down of wages has a further consequence beyond the Keynesian slump in demand: it can have the perverse effect of slowing down the rate of introduction of new technology (Tarling & Wilkinson, 1997, p112). Downwards wage flexibility may lead employers to postpone the introduction of new technology, deciding to compete by pushing wages down even further: such an approach has been dubbed the 'low road' to growth. This would not occur if the concept of 'reservation wage' were applicable to labour markets: but without substantial and widespread savings, or without a social safety net which permits workers to withdraw from the market at the reservation wage, there is no reason why wages cannot be bid down to subsistence level. Trade unions - by co-ordinating wage negotiations and by providing income in the case of labour disputes - enable a reservation wage to be established: but the labour market policies of the last twenty years have been geared towards the dismantling of unions and the weakening of social safety nets (Henry & Lee, 1997; Chapman, 1994b). In the long term this may be slowing down the rate of introduction of new management and production techniques, and therefore slowing down economic growth.

An argument often used to support the liberalisation of labour markets - and to counter the arguments for the institutional settlement of wage disputes - is the fact that inflation may ensue. This argument is based upon the notion of the Non Accelerating-Inflation Rate of Unemployment (NAIRU) - i.e. that there exists a natural rate of unemployment, and that should unemployment fall below this level inflation shall ensue (Chorney, 1998). The basic mechanism of NAIRU was worked out by Phillips in the 1950's (Begg et al, 1987), a period when most western economies were functioning at close to full capacity. In this context, high wage settlements would indeed lead to inflation since there is no capacity to cater to the demand introduced by the wage increase. Another way of looking at the same mechanism is to argue that if unemployment falls below NAIRU (the rate at which the economy can smoothly function at full capacity), then wages would be bid up, leading to inflation - thus, to avoid inflation, a certain amount of 'frictional' unemployment is deemed necessary and it is 'dangerous' to let unemployment levels fall too low.

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whilst demand-side polices may alleviate social distress they will do little, by themselves, to address the wider ecological problems. Although this thesis has consciously adopted a 'pragmatic' approach, the wider implications of the arguments put forward deserve to be emphasised.

In the short-term, and in a context of full capacity utilisation, the concept of NAIRU has some merit. It has become more difficult to argue for the validity of the NAIRU mechanism in the context of unemployment rates of about 10% - although it is sometimes claimed that NAIRU has shifted because of changes in the supply and demand conditions of the labour market (Tarling & Wilkinson, 1997). In a context of involuntary unemployment, policies to reduce the rate of unemployment could lead to inflation-free growth. For if the unemployment is truly involuntary then the newly employed workers will spend in order to assuage their pent-up demand: the extra employment will be matched by extra demand and by extra production. Whilst some temporary inflationary pressures may be created, it is unlikely that spiralling inflation would ensue[23]. The reluctance of governments to contemplate vigorous employment creation policies is due in part to their own prevailing ideology, in part to the power that financial markets have of sanctioning policies which depart from the current economic orthodoxy. If government intervention (whether this be in the form of spending, labour market legislation, trade regulations ...) is required to initiate expansion, or if interest rates are reduced to encourage investment, then a run is likely on the currency. To counter the currency speculation, higher interest rates would need to be reinstated to compensate for the 'risk' of increased employment and government policies brought into line with the financial market's expectations. In other words, to prevent a panic reaction in financial markets to policies likely to encourage employment these same policies need to be withdrawn!

These problems are only exacerbated by the mobility of production plants: in a globalised economy without tariff barriers, companies quite rationally seek out the lowest cost locations, in accordance with the various opportunities and constraints highlighted in chapters 2 and 3. This initially led to the international division of labour, whereby low value added production activities located in low wage countries, and high value added service, development and control activities remained located in the 'wealthier' countries. However, as Coffey (1996) points out, a 'Newer' International

[23] The growth would not, in all likelihood, be inflation free, since bottlenecks would emerge as all parts of the economy would not be growing at the same speed. However, inflation due to bottlenecks can be viewed as a necessary adjustment mechanism permitting relative prices to fluctuate in a context where price or wage *reductions* are accepted with difficulty: it could be called 'frictional' inflation and treated with the same philosophical resignation as 'frictional' unemployment.
Such inflation should be viewed differently from inflation which is due to price pressures which emerge within an economy functioning close to full capacity. As can be seen, the principal problem lies in defining the point at which an economy is functioning at full capacity - some economists argue today that full capacity is achieved at around 10% unemployment, whilst others claim that no argument can justify frictional unemployment rates of over 3 to 5%, rates which were sustained over long periods in the 1950's and 1960's (see Chorney, 1998).

Division of Labour has now becoming evident. The low-wage countries have themselves begun investing in their own manufacturing industries and in the education of their own workforce. The higher order back-office activities can now also relocate to low wage countries since the argument relating to skills no longer holds. In such a context, there is increasing pressure on the traditional industrialised nations to lower production costs, and this brings about the danger of wages in these nations being competed downwards even further.

The prevalence of low wages today, especially in the more 'liberalised' economies such as the UK (Henry & Lee, 1997) and the USA (Pollin & Zahrt, 1997), leads to another paradox: since the social and healthcare safety nets have not been entirely abolished in either country, the lowest paid workers often receive some form of income supplement, housing aid and/or free health care. Even if health care is provided for all people, as in Canada, the link between poor health and poverty suggests that the 'working poor' (Houseman, 1995) are more likely to require the offered services. In effect, then, the inefficient industries which employ very low paid workers in order to remain competitive are being subsidised by government: government is subsidising the most inefficient industries by making it possible for them to pay very low wages. A cynical response to this problem could be to cut the safety net entirely: a more humane, and not necessarily less efficient response would be to impose some form of 'living' minimum wage and assist the low-efficiency industries in converting to more efficient processes or into growing markets.

4.4 Conclusion

This brief analysis of labour markets, with emphasis on technology and macro-level policy, has highlighted a number of more general issues surrounding employment growth. In particular, it has served to emphasise two of the limitations relating to the analysis of employment figures. The labour market segmentation which is observed at a national and international scale most probably has an urban dimension as well: this dimension cannot be picked up through a sectoral analysis of labour distribution. The effect of technology, which, in some industries at least, is driving a wedge between prosperity in terms of output and prosperity in terms of jobs, also has regional effects: urban units in which high-output industries are located do not necessarily benefit from high levels of employment growth.

Another important consideration to emerge from this chapter is the relevance of macro-level political decisions to employment issues and to the way in which new technologies are adopted. In chapter 3 the effect which national level policies can have on regions was discussed, and some concrete examples of this are given in appendix 1. In this chapter the effect which national policies can have on the aggregate demand for labour has been emphasised: even the most effective local policies can only provide relative benefits when operating under certain macro-economic conditions, although national growth is not unconnected with regional and local growth in the longer term (Hansen, 1996). In a context of absolute employment decline, effective local policies may merely slow this decline. Also, by setting the overall ideological context within which the employment debate takes place, national and even international political activity tends to define the parameters of the regional employment debate. For instance, little or no mention is made today of national level regional policies, or of the equity argument for equalising employment opportunities between different cities. This reflects the ideological position adopted by national governments in the 1980's and 1990's which has led to a withdrawal from most forms of direct intervention in markets: policies aimed at influencing industrial location or encouraging local development are no longer implemented at the national level in Canada, and thus only policies which can be implemented at the urban level are usually referred to today in discussion relating to the distribution of economic activity.

The issues raised in this chapter relate to those which Massey (1995) raises, although they have been considered here largely in isolation from their spatial dimensions. As I have argued in chapter 2, the partial analyses which follow cannot be dismissed merely because they fail to integrate every possible social and labour dimension. An attempt has been made in the present and preceding chapters not only to throw light upon the theory underlying the empirical analyses which follow, but also to outline in some detail the *limits* of the theory and analyses. The analyses are, indeed, map on map type correlations and they do imply a geographic causality which may not be warranted. But such general pattern finding approaches are not without utility, as Massey (1995) herself makes clear by relying upon them as a background to her wide ranging analysis. Whilst implacable geographic causality is clearly to be rejected - as the discussion surrounding policies, employment, and Massey's work have made clear - there is no good reason to ignore the partial causal relationships which may link spatial characteristics to local employment outcomes. No correlation-type analysis will ever establish causality. Nor will it capture, even remotely, the complexity of the 'real'

world. But the discovery of patterns, as well as the absence of expected patterns, can provide invaluable pointers towards understanding some of the relationships which link phenomena together over space.

It is with this in mind that we can now turn to a presentation of the data and methodology. followed by the empirical analyses themselves.

Part II

Introduction

The second part of this thesis applies some of the theoretical notions developed in the first part to the empirical analysis of employment growth in Canadian cities from 1971 to 1994. It consists of five chapters. The first describes the data used and highlights some of the data limitations and some of the pitfalls of statistical analysis. The remaining four are a series of empirical analyses which have been published in academic journals over the last twelve months.

The first of these empirical analyses establishes the relative strength of the connection between urban employment growth and a variety of location factors. Three of these factors are to a large extent inherited by urban units: the region in which it is located is externally imposed. Population size, as a proxy for agglomeration economies, only evolves very slowly over time. Location relative to a large metropolitan area - as a means of assessing proximity to markets - is also an inherited characteristic. To the extent that these three variables are found to be closely connected with employment growth policies at the urban level will have only a marginal effect on employment growth.

Three other factors, more amenable to policy intervention, are also tested. An index of industrial diversity is constructed: if higher concentrations in particular sectors are found to be connected with fast growth, then this will tend to support the growth pole theories and localisation economies. If greater diversity is connected to urban growth, then the inter-industrial aspects of agglomeration economies will apparently carry more weight. In either case, urban level policy intervention - to encourage local economic specialisation or diversity - is feasible.

An indicator of establishment size is introduced in order to test empirically the argument that smaller enterprises - by their adaptable and entrepreneurial capacities - can have a positive influence on employment growth. If a relationship is found, then urban level policies focusing on small establishments may indeed be conducive to faster employment growth. Finally, an indicator of human capital is entered in order to test the proposition that a good supply of qualified labour is conducive to employment growth.

After testing the *relative* strength of these factors, the three 'policy amenable' factors are explored in more detail. The hypothesis that industrial concentration, that growth poles, can lead to urban employment growth is tested not at a general level, but specifically for the high-tech industry. This analysis explores whether there is a process of spatial concentration or dispersal of such activity and whether the presence of high-tech employment has wider impacts on urban economies.

The hypothesis that small establishments are conducive to economic growth is also explored in more detail. The establishment size indicator used in the general analysis is rather crude, and the connection between employment growth and establishment size classes is investigated in the second detailed analysis. This permits non-linear relationships between establishment size and employment growth to be investigated, and the study of the interaction between 'inherited' factors and establishment size leads to a better understanding of the way in which the effects of these factors and establishment size combine with relation to employment growth.

The last empirical study examines in some detail the effect of education upon employment growth. Results covering an extended time period are introduced, and the choice of education indicator is explored. Considerable attention is paid to the variety of effects which education levels have upon urban employment growth in different economic sectors.

Before presenting the results of these analyses, the data sources will be described and some general methodological issues will be discussed. The more specific issues raised by each analytical approach are discussed in the chapters which describe the results.

Chapter 5

Data and Methodology

In this chapter the data upon which the empirical analyses are based will be briefly described, as will the methodology employed. However, since data and methodology are further discussed within each of the empirical studies, this chapter, after describing the data, will deal primarily with some more general issues. These concern the limitations inherent to the data set and the statistical approach to studies in urban employment growth.

5.1 Data[24]

5.1.1 Census employment data 1971, 1981,1991

The principal data base which supports the analyses comprises employment information by place of residence for the Canadian urban system for the years 1971, 1981 and 1991. These data are drawn from the Statistics Canada censuses. The basic concept underlying these data is that of "employed labour force": those persons who held a remunerated job during the week immediately preceding census day (on or near June 1st) of the relevant year. These data have been standardised to control for changes in sectoral definitions and modifications in boundaries of the spatial units that may have occurred between the 1971 and 1991 censuses.

The Canadian urban system (see appendix 2) comprises 152 urban areas, each with a population of at least 10,000[25] in 1991. Three types of statistical unit are included:

1. 25 census metropolitan areas (CMAs) ranging in size from Toronto (3.9 millions inhabitants) to Thunder Bay (124,000). A CMA consists of a "core" city having a population of at least 100 thousand, plus surrounding individual municipalities that are characterised by "a high degree of social and economic integration with the core". Together the 25 CMAs include 16.7 million people representing 61 percent of the population of Canada and 78.8 percent of the population in the urban system.

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[24] See Coffey & Shearmur 1996. The description of the census data is adapted from this text.

[25] Two of the urban areas, Selkirk (Manitoba) and Weyburn (Saskatchewan) had populations of slightly under 10,000, at 9800 and 9700 respectively. They are included because their population had risen above 10,000 in 1981.

2. 115 census agglomerations (CAs) ranging in size from Kingston, Ontario (136,400 inhabitants) to Weyburn, Saskatchewan (9,700). CAs are defined using principles similar to that of CMAs; they consist of a smaller "core" municipality (usually with a population of 10,000 or more, but less than 100,000) plus surrounding municipalities which "have a high degree of social and economic integration with the core city". The 115 CAs account for 4.4 million inhabitants, representing 15.8 % of the national population and 20.3 percent of the urban system population.

3. 12 census subdivisions (CSDs) with populations of at least 10,000. The CSDs are individual municipalities and range in size from Nanticoke, Ontario (22,700 inhabitants) to Kapuskasing, Ontario (10,300). Together the 12 CSDs contain a population of 167,800, which is only 0.6% of Canada's population and 0.8% of the urban system's.

Thus in 1991 the urban system contained 21.2 million inhabitants, representing 77.4% of the Canadian population. The urban system therefore includes a major proportion of the national population and many observations concerning this set of places may be more generally applied to the nation. Appendix 2 contains a complete enumeration of the elements of the urban system ordered by region and province.

5.1.2 Labour Force Survey, 1991-1994

In addition to the census employment data, and in order to bring the analysis as up to date as possible, data from the Labour Force Survey have been included for 1991 and 1994. These data are not strictly compatible with the census data since they result from the average, over one year, of the results of the Labour Force survey carried out every month. This survey, which each month surveys 50,000 people from across Canada, is used to identify trends in the labour market.

In the analyses which follow the period 1991 to 1994 is always analysed separately and there is no attempt to mix the census and the survey data: when the 1994 data is included it is always the 1991 survey data which is used for comparison.

It is to be noted that Labour Force survey data was only available for 59 urban areas, identified in appendix 2. Most of these areas have populations of over 25,000, and this group of cities includes over 70% of the Canadian population.

5.1.3 Census 2A and 2B profiles

For 1981 and 1991 socio-economic data has been obtained for the 152 urban areas. These data are from the 2A and 2B profiles, and cover a wide variety of information including population by age and sex, percentages of movers and migrants, participation and unemployment rates by age and sex, education levels, income characteristics and so on.

5.1.4 Establishment Size Data 1991-1994[26]

Finally, data has been obtained on the frequency distribution of establishments by size of workforce from the Canadian Business Register. The major sources of information for the Business Register are updates from the Statistics Canada survey program and from Revenue Canada Taxation's payroll deduction account file. These employer accounts assist in creating the universe of business entities having paid employees in Canada. The Business Register data is therefore "limited to the employer portion of the business world .... an activity such as a corner store that is owner-operated. with no paid employees, would be excluded from these counts".

An 'establishment' is "the smallest operating entity capable of reporting all elements of basic industrial statistics. The statistical establishment should not be confused with the legal entity or place of business". Thus, one multilocational legal entity can be counted as one establishment if its payroll deduction accounts are submitted at the company level. Alternatively, a large multi-departmental firm which operates out of a single site may nevertheless be counted as more than one establishment if payroll deduction accounts are submitted at the departmental level. As will be seen in chapter 8, the definition of small enterprises is fraught with difficulty, and there is no ideal way of capturing the concept. The advantage of the definition used here is that it reflects certain managerial decisions - large firms with centralised bureaucracies are considered to be less 'market oriented' than firms which have introduced pseudo-markets within their internal organisation. In addition, Picot et al (1994), who use data from the same source to conduct their longitudinal analysis, emphasise that for small businesses (of less than 100 employees), there is little divergence between the figures for establishments as defined above and those for single establishment companies.

[26] information from Statistics Canada letter of 15/2/95

Ultimately any data on company size will embody a particular definition of 'company', and this definition must be borne in mind when the data is interpreted.

5.1.5 Sectoral Classification

The employment data which are used is subdivided into 160 economic sectors. The concept of "economic sector" is conventionally used to subdivide an economy into relatively homogeneous groups of activities. Individual firms, and thus their employees, are assigned to economic sectors on the basis of the "finished product" that results from each firm's activity. Thus, an individual *establishment* (and its employees) within a mining or manufacturing firm - a head office or a research laboratory, for example - will be classified, along with the rest of the firm (and the rest of the firm's employees) in the primary or manufacturing sector, even though the establishment itself (and its employees) may, in reality, be more correctly regarded as fulfilling a high-order service function. Important classification problems can emerge: is the output of firms specialising in computer programs a manufactured good (the CD-ROM, the instructions and packaging), or is it a service (an intangible product enabling a computer to run). A distinction is sometimes made between goods which can be stored - manufactured goods - and those which can't - services, but here again the distinction is of no help in classifying computer programs. Conceptually, therefore, the classification of industries with relation to their end-product is fraught with problems. It is probable that any attempt to classify employment and economic sectors, whatever the criteria used, will face problems of a similar nature (Massey, 1995). These classification problems must therefore be recognised, and the limitations which they may impose on the analysis must be remembered: but, given the sectoral definitions established in a clear way by Statistics Canada, either one accepts these limitations and proceeds, or one must abandon any attempt to analyse employment distribution and growth in Canada.

The census data from 1971, 1981 and 1991 comprise employment data broken down into 160 economic sectors. Certain of these sectors represent "major groups", i.e. 2 digit level of the 1970 Standard Industrial Classification (SIC), while others represent 3 digit SIC classes. Note that in order to ensure compatibility between the 1971, 1981 and 1991 Census data it has been necessary to employ the 1970 SIC rather than the 1980 version. In the analyses which follow, these sectors have been aggregated to form broader industrial categories.

The 1991 and 1994 Labour force data has been obtained at the 2 digit SIC level, and employment is broken down into 52 sectors. The classification system used is the 1980 SIC code: although this is not strictly compatible with the 1970 SIC code, changes at the 2 digit level have been very minor. Furthermore, the Labour Force data and the Census data are always analysed separately, so the change in classification systems has not inhibited the analyses in any way.

5.2 Data Limitations

As with all data sets, there are limitations to the data described above. Whilst it is generally not possible to overcome these limitations, it is important to be aware of them in order that the results may be interpreted with due caution. There are three principal limitations to the data; data suppression, lack of information on the self-employed and lack of information on 'quality' of employment.

5.2.1 Data Suppression

In order to protect confidentiality Statistics Canada has a policy of rounding data in a probabilistic fashion, to the nearest multiple of five. In practice this means that if, in Summerside, the real number of jobs in Livestock Farms (SIC code 011) in 1971 was 23, then the number reported in the census database will be either 20 or 25. There is a 60% probability that the reported number will be 25 and a 40% probability that it will be 20. This probabilistic approach reduces the *probability* of the rounding errors compounding each other and increases the *probability* that the provided data will approximate the true data.

However, this data suppression can become problematic in geographic databases such as the ones used in this study, because, particularly in small cities, some sectors are nearly absent. In the example given above, depending on the direction of the rounding, an error of +9% or of -13% will be introduced.

When studying the overall geographic distribution of employment, such errors are not too important: for analytic purposes, whether a city has 20, 23 or 25 jobs in a particular sector is fairly irrelevant. But when rates of growth are analysed, such rounding can lead to sizeable errors. To return to our example, consider the following table.

Table 1. Example of rounding error in growth rates

	Actual figures	Possible figures in database after probabilistic rounding (the probability, x, of each value appearing in the database is indicated as p = x)			
1971 employment	23	20 (p=0.4)	20 (p=0.4)	25 (p=0.6)	25 (p=0.6)
1981 employment	21	25 (p=0.2)	20 (p=0.8)	25 (p=0.8)	20 (p=0.2)
1971 to 1981 growth	-8.70%	+ 25%	0%	0%	-20%
Probability of reported growth rate:		p= 0.08	p= 0.32	p= 0.48	p= 0.12

As can be seen from the table, in our example there is an 88% probability that an actual employment decline of 8.7% will be reported as zero or positive growth. The example also illustrates that the closest approximation of reality - the 0% growth rate - has an 80% probability of being reported. Obviously, as the number of jobs rises, the size of the error diminishes, and significant employment growth or decline will be adequately approximated by the rounded off data. In order to reduce the size and likelihood of spurious growth rates due to probabilistic rounding, observations with fewer than 100 jobs in the initial year are excluded from growth rate analysis.

It can be objected that a problem still remains: most of the following analysis is conducted on aggregate sectors (the 160 sectors are reduced to 15 or so depending on the analysis) and these rounding errors may compound each other. This risk does exist, but it is very small: the probabilistic nature of Statistics Canada's data suppression is such that the rounding errors are far more likely to cancel each other out. In addition, sectoral totals were obtained for the Canadian urban system as a whole, and it has therefore been possible to ascertain that the totals for the suppressed data do not diverge significantly from the real totals.

5.2.2 Lack of Information on the Self-Employed

Although self-employed people are included in the census employment totals, they are specifically excluded from the Business Register data which only record establishments if they have at least one *employee*. Thus, the analyses of the effect of establishment size on employment growth are incomplete: and particularly over the

period studied the 1980's and early 1990's (chapters 6 and 8), self-employment has risen quite substantially in Canada.

This problem does not invalidate any of the analyses, but it does limit their scope to some extent, since it is feasible that employment growth has been a consequence of increasing numbers of self-employed people. If this is the case, it would be a great interest to explore the intrinsic difference between the role of self-employed people and that of micro-enterprises (one to four employees), since the studies do not reveal any strong job creating propensity amongst the smallest employer establishments. However, the figures for self-employed people are not included in the databases used, and it must be borne in mind that the following studies can only pick up the possible relationship between establishments *with employees* and overall employment growth (including the self-employed).

5.2.3 Lack of Information on Job 'Quality'

In the light of the discussion in chapter 4 on employment, and of Massey's (1995) ideas discussed in chapter 2, the lack of information on job 'quality' is an important limiting factor on the following studies. Employment 'quality' - length of contract, part time or full time, salary level, benefits - is a crucial issue in evolving job markets which can potentially have important urban repercussions. The issue is not new, however. In 1937 Joan Robinson described disguised unemployment as follows:

> "In a society in which there is no regular system of unemployment benefit, and in which poor relief is either non-existent or 'less eligible' than almost any alternative short of suicide, a man who is thrown out of work must scratch a living somehow or other by means of his own efforts.... Thus, except under peculiar conditions, a decline in effective demand which reduces the amount of employment offered will not lead to 'unemployment' in the sense of complete idleness, but will rather drive workers into a number of occupations - selling match-boxes on the Strand, cutting brushwood in the jungles, digging potatoes on allotments - which are still open to them." (Robinson, 1937, quoted in Eatwell, 1997, p79).

Our databases do not distinguish between the newspaper vendor at the University/Pine intersection and the person selling Rolex watches in a boutique on

Sherbrooke Street in Montreal. Each is in the retail sector and differences of salary, work conditions and social status are suppressed in the data used. Whilst the implicit assumption in the following analyses is that employment creation is 'good' - that it is a desirable outcome which urban policies may influence - this assumption needs to be qualified bearing in mind the definition of employment embedded in the databases.

This limitation can only be reported and emphasised. The geographic distribution of jobs of varying 'quality' is a subject of great interest and importance, particularly in the current period where there is every reason to believe that the countries with the lowest unemployment rates are those with high numbers of low quality service jobs (Pollin & Zahrt, 1997). The general evolution of employment towards a 'good jobs' - 'bad jobs' segmentation (Reich, 1991; Houseman, 1995; ECC, 1990b) underlines the importance of this consideration in any analysis of job creation trends, and a study of the distribution of such jobs within the urban system would be of particular interest.

This limitation is probably the most relevant - the limits which it imposes on the current analysis cannot be described as technical - but is also fruitful to the extent that it opens up further research paths.

5.3 The Use of Statistics

It is easy to criticise the use of statistical analysis in the study of social phenomena, and some of Massey's (1995) broad criticisms have already been addressed in previous chapters. Within the discipline of geography there is a sometimes heated debate over the place which statistical analysis should occupy (Philo et al, 1998). The arguments against the use of statistics often take the form of criticisms about its failure to integrate non-quantifiable aspects. "Clear lines of demarcation are today still widely recognised as separating quantitative geographers who count, calibrate, map and model the thing-world from qualitative geographers who converse, consort, engage and empathise with the people-world" (Philo et al, 1998, p191).

This debate is partly addressed in this section but it must be admitted that the case for statistical studies of social phenomena has not been helped by academic studies which appear to pay no head to the limitations inherent in a quantitative approach. A recent study by Barro (1997) on factors of national economic growth illustrates this point. The research problem addressed is in many ways similar to the one addressed

in this thesis, although he is studying the 'national' system and the factors which may be instrumental in causing national economies to grow. A number of serious problems are evident in his study, a few of which are listed below as examples.

- The regression analyses rely upon data from approximately 100 countries. The quality of this data (particularly for developing countries) is questionable.

- The basic regression models used in the study typically have eleven or more variables for 90 or so observations (Barro, 1997, p13; p34; p38; p64).

- The 'independent' variables used in the explanatory model of economic growth are clearly inter-related. For instance, the variable recording male education levels and the variable recording life expectancy are, in all likelihood, indicators of development level (GDP): all three variables (education, life expectancy, initial GDP level) are used as independent variables to explain GDP growth.

- A measure of government consumption is included as an independent variable - and this variable is constructed by adding together defence and education spending. But education levels are also included as a separate independent variable - presumably as a measure of human capital. Is education conceptualised as a cost or an investment?

Barro's (1997) analysis does not even stand up to scrutiny on its own (statistical) terms. The type of objections which Massey (1995) highlights in relation to the *interpretation* of correlation results assumes that the statistical analyses are performed competently. When results are published which not only *interpret* statistical results abusively but do not even pay heed to some basic technical limitations inherent in correlation techniques, then the case for purely qualitative approaches is considerably strengthened.

Despite this, I have argued that correlation techniques can be justified and can be useful if their limitations are understood: every attempt has been made in the following analyses to avoid the statistical pitfalls identified above and to maintain an awareness of the general limitations - particularly in terms of causal relationships - of statistical techniques. Indeed, it is hoped that the approach used by Kuznets will be closer to that found in this thesis.

> "First and foremost is Kuznets' interest in measurement. The overriding objective is to establish the facts.....
> Second is the notion that measurement should not be a blind collection of numbers, but a search for theoretically meaningful measures based at least in part on the concepts of economic theory....
> A third distinctive feature of Kuznets' approach... is the comparative study of populations ... via international cross-sectional comparisons of developed and developing countries and through time series comparisons of the historical experience of developed countries ... It ... provided a breadth of perspective ... that ensured one against over generalising the current experience of contemporary developed market economies...
> Fourth is the logical progression of Kuznets' research...
> Fifth is the reliance on simple statistical methods ... One will not find ... in Kuznets' ... work ... the regression techniques so common in economics today, let alone more 'sophisticated' methods. Why ... ? The answer lies in two concerns of Kuznets - first, the importance of establishing facts, and, second, the need for awareness of the *variety* of experience." (Easterlin, 1989, pp4-5)

This approach has not been followed to the letter: but it is hoped that the key elements - high quality data, guidance by theoretical considerations, comparative analysis (in this case of cities and not of countries), logical progression and relatively simple statistical treatment can be found in the next few chapters.

The key element of Kuznets' approach is maybe his "awareness of the variety of experience". Clearly, statistics, when used cautiously, can tell part of the story. But to understand the process of economic and employment growth it is necessary to go well beyond statistics - and the general statistical results must be informed by and confronted with both theoretical considerations and, perhaps even more importantly, surveys and case studies which alone truly grasp the way in which growth actually occurs in 'real life'.

Provided that the results presented herein are construed as part of a wider picture, and provided that the methods used have been adequately applied and interpreted, there is no reason to think these statistical analyses are in any way less (or more)

worthy of attention than any other methodological approach to problems of employment.

Chapter 6

Factors and Correlates of Employment Growth in the Canadian Urban System, 1971-1991

article by: William Coffey & Richard Shearmur (1998)
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Abstract

The objective of this paper is to examine a number of hypotheses concerning the factors or correlates of employment growth in the Canadian urban system -- a set of 152 urban areas having populations of more than 10 thousand inhabitants which comprises 77.4 percent of the national population. Do observed patterns of sectoral employment growth obey some sort of underlying logic? More specifically, do the rates of employment growth that are found in individual urban areas vary significantly according to one or more of the following attributes of an urban area?: a) the region in which it is located; b) its population size; c) its relative proximity to a major metropolitan area; d) its firm size structure; e) the level of diversity of its economic structure; and f) its socio-economic characteristics. While approaches involving a, e and f yield promising results, it is clear that there are few immutable laws that permit one to predict where employment growth will occur within the urban system. Perhaps the most fundamental characteristic of the analyses conducted involves the instability of the results from one decade to another; one decade's category of winners is often the other decade's category of losers.

1. Introduction

As Canada approaches the beginning of a new century, it is clear that both the nation and its individual urban areas have been caught up in a major transformation -- a "Non-Industrial Revolution", many would say -- which may well rival the earlier Industrial Revolution in terms of its impacts upon society. Between 1971 and 1991, almost five million jobs were added to the Canadian economy, of which over 85 percent were in the service sectors. During the same period, manufacturing employment declined or, at best, stagnated, depending upon which half of the period is considered. Moreover, in goods-producing industries as well as in the service sectors, there has been a marked shift toward white collar occupations, which has increased the share of such jobs from 20 to 28 percent of the nation's employed labor force. Closely associated with these developments have been important changes involving the reorganization of corporate structures, the increasing prominence of not-for-profit and public sector activities, and some fundamental modifications in the nature of work.

There is considerable controversy in Canada (and in other developed countries) over this pattern of job growth. This controversy is reflected in two contrasting schools of thought. The first perspective may be characterized as one of "deindustrialization", viewing these trends as highly negative, and often emphasizing the loss of goods-producing activities to newly industrializing countries. The second perspective views the relative shift of activity out of manufacturing and toward services as the "natural evolution" of advanced productive systems and of the manner in which society produces. This latter school of thought appears to be more realistic than the former, given that, in absolute terms, developed countries are not becoming deindustrialized; rather, they are producing more manufactured goods than ever before. In spite of manufacturing's declining importance in Canada in terms of its *relative* share of both GDP and total labor force, its growth has continued in *absolute* terms, albeit at a rate inferior to that of services (Coffey, 1994).

As painful as this shift may be to certain communities that have historically specialized in goods production, it must be recognized that -- contrary to popular belief -- not all of the job growth outside of the goods-producing sector has been in poor paying or part-time

work. Much of the expansion of employment in the business services, health services, transportation and communications services, and in the public sector has been in activities with relatively high wage rates. Moreover, these service industries rely on increasingly sophisticated capital goods that enhance efficiency and allow the range or scope of service functions to change over time (Beyers, 1989). There has also been much concern with "replacement" jobs for those displaced in the traditional goods-producing industries. Conventional wisdom has it that the same individuals cannot (or do not) shift from employment in manufacturing to employment in business services, at least not without considerable retraining.

Urban areas, particularly the larger metropolitan areas, may be justifiably regarded as the focal points of the restructuring process itself. The widespread economic and political dislocation of the late 1970s and 1980s rather abruptly modified the nature of the emerging "modern" city and of the entire urban system in which it was embedded. The dynamics that underlie the emergence of what some have called a "post-modern" city are beginning to take shape. Among these dynamics, one can identify the following: 1) an economic restructuring based upon service activities, upon the adoption of both new flexible methods of production and advanced technologies, and upon a new social division of labor between large firms and small firms (Beyers, 1989; Fujita, 1991; Picot et al, 1994); 2) the transformation of urban cultural and leisure activities from pastimes into economic activities (Allen, 1992); 3) the rediscovery of the quality of the built environment and of "sense of place", and of their role in corporate investment and location decisions (Rapoport, 1990; Coffey, 1994); 4) the emerging role of information and communication technologies in supporting processes of organizational restructuring associated with the globalization of production and distribution (Warf, 1995; Office of Technology Assessment, 1995); 5) the commodification of information and the increasing "informationalization" of the urban economy (Castells, 1989; Longcore and Rees, 1996); and 6) a new wave of suburbanization consisting of high-order office functions (Garreau, 1991; Stanback, 1991). These trends are modifying both the internal economic geography of urban areas and the manner in which the latter are linked to the broader global economy.

The above dynamics are visible around the world, and individual urban economic landscapes are increasingly being shaped by forces operating at a global rather than a national scale (Warf and Erickson, 1996; Knox, 1996). At the same time, however, the particular forms of urban economies that are emerging are also being shaped by the historically specific circumstances of individual cities set within their specific regional/local and economic/cultural contexts.

The process of economic restructuring that has occurred over the past decades thus has profound implications for Canada's urban areas. In particular, patterns of job growth and decline have been highly uneven across space. During certain periods, job growth has occurred in some places but not in others. Why is this so? The present analysis attempts to shed some light upon this issue.

In previous work (Coffey, 1995; Coffey and Shearmur, 1996), we presented a detailed examination of employment growth and change within the Canadian urban system over the period 1971-1991. (As employed in the present paper, the term "urban system" refers to 152 urban units -- census metropolitan areas, census agglomerations, and municipalities -- having more than 10,000 inhabitants; see Maps 1A and 1B. In 1991, the urban system contained 77.4 percent of the national population.) Table 1 indicates, the broad dimensions of this evolution. While our previous work presented a considerable quantity of specific information, little effort was made to detect any broad organizing principles or factors that might be embedded in the observed results. The objective of the present paper is to fill this void by attempting to determine if the observed patterns obey some sort of underlying logic. In particular, we wish to verify whether the rates of employment growth that are found in individual urban areas vary significantly according to one or more of the following attributes, all of which are explicitly identified in the literature on urban economic growth:

1. the region in which an urban area is located;
2. the population size of the urban area;
3. the relative proximity of an urban area to a major metropolitan area;
4. the firm size structure found in an urban area;
5. the level of diversity of an urban area's economic structure;

6. an urban area's socio-economic characteristics.

In the following section, we present the logic underlying the choice of these attributes, and we discuss our method of operationalizing these constructs. After introducing a number of methodological considerations in section 3, we then present the results of our analysis. The research presented here joins a growing literature on the growth and restructuring of national urban systems (see, for example, Noyelle and Stanback, 1984, Beyers, 1989, Pollard and Storper, 1996, for the U. S.; Léo and Philippe, 1996, for France; and Simmons and Bourne, 1989, Simmons, 1992, Coffey, 1994, and Bourne and Flowers, 1996, for Canada).

2. Factors and correlates of employment growth

The literature on urban economies poses a number of hypotheses concerning variations in the relative level of employment growth among cities. The following sections describe the logic underlying these hypotheses, and identify the specific variables used to operationalize the concepts employed.

2.1 Region

The "regional factor" often exerts an important influence upon job creation (Landis, 1987). Certain regions may be characterized by a higher proportion of rapid-growth activities (expressed by the "structural effect" in shift-share analysis), while others may serve as "gateway cities" (Drennan, 1992) that link dynamic regional economies with the rest of the nation or with other countries. In the Canadian context, it has been long been accepted as an integral part of the national identity that, from a regional economic development perspective, the Atlantic Provinces generally perform well below the national average, while the performance of Ontario (certain temporary downturns notwithstanding) is generally well above average; Quebec and the Western Provinces, except in the context of the latter's oil booms, have tended to situate themselves between the two extremes.[27]

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[27] See Economic Council of Canada (1977), Lithwick (1978), Coffey and Polèse (1987b), Anderson (1988), Bradfield (1988), and Savoie (1992), for example, for more information on the long-standing disparities between Canada's regions.

Does a similar (or alternative) logic hold in the case of the performance of the individual elements of the urban system? In order to answer this question, our analysis considers the variation of urban employment growth rates across Canada's five traditional major administrative regions: Atlantic Provinces, Quebec, Ontario, Prairie Provinces, and British Columbia.

2.2 Population size

Another recurrent theme in the urban economics literature (see, for example, Richardson (1975; 1978), Bish and Nourse (1975), Evans (1985), Heilbrun (1981), Hirsch (1973), Thompson (1965)) is that the population size of an urban area can exert an important influence on economic performance. The basic argument is that a large population size confers certain advantages upon an urban area -- advantages that manifest themselves on both the supply side and the demand side of economic activity and that are usually referred to in terms of economies of scale and agglomeration economies. (The full argument goes on to state that the advantages of size can become disadvantages once a certain size threshold is passed, i.e. that diseconomies of scale and of agglomeration can eventually emerge. In the Canadian context, however, where even the largest Census Metropolitan Areas (CMAs) are quite modest in size, we would not expect diseconomies to be an issue.) We examine the influence of urban size upon employment growth rates using six size categories: million+; 300,000-million; 100,000-300,000; 50,000-100,000; 25,000-50,000; 10,000-25,000. We have chosen to employ these six categories, rather than considering urban size as a continuous variable, since our previous research (Coffey and Shearmur, 1996) has indicated that the relationship between size and employment growth is not a linear one.

2.3 Metropolitan proximity

In previous studies, (Coffey and Polèse, 1988; Coffey and McRae, 1989; Coffey *et al,* 1989), we have found that urban size alone is not sufficient to understand patterns of economic performance. According to the reasoning advanced in these studies, major metropolitan areas (defined here as those having populations of 300,000 or more

inhabitants) may be viewed as economic centers surrounded by functionally dependent urban fields. Within the urban field of a given large CMA there may exist an "urban shadow effect" that can inhibit individual smaller urban areas from developing certain types of activities (e.g., specific high-order functions may be acquired directly at the nearby CMA) or, conversely, that can stimulate the level of economic activity found in these smaller places (e.g., the nearby presence of a major market may increase the quantity and the range of the goods and services that would normally be produced). Using the criterion of a 100 km radius around each major CMA (the distance corresponding to an automobile trip of approximately one hour's duration -- a critical threshold according to the market research literature -- and approximating the extent of the urban field), urban areas with less than 300,000 inhabitants are classified as "central" or "peripheral" according to whether or not they are located within 100 km of a large (300,000-million or million+) CMA. Thus, our analysis in this section is based upon three classes of urban areas: major metropolitan areas (i.e., CMAs having a population above 300,000 in 1991), central units and peripheral units, as defined above.

2.4 Firm size structure

The hypothesis that an economy composed of a large number of small firms will grow more rapidly than one composed of a small number of large firms was originally proposed by Jane Jacobs (1969; 1984). Jacobs' argument that the existence of many firms within a given sector will foster competition and thus create an environment that is more conducive to growth, although never tested empirically by the author herself, has been subsequently reinforced by the work of Porter (1990) and Glaeser *et al* (1991). In addition, the path-breaking (if now somewhat tainted) work by David Birch (1987) on the role of job creation by small firms, has placed considerable emphasis upon the relative size distribution of firms within an urban economy as a factor of employment growth.[28] As an indicator of firm size structure, we employ a "competition index" (Glaeser *et al*, 1991): the number of firms in a given sector divided by the number of workers in that sector; this

[28] Subsequent research has demonstrated that Birch's approach was methodologically flawed, and that the importance of small firms is not nearly as clear-cut as Birch argued. See Davis and Haltiwanger (1990) and Davis *et al* (1994), for example, who show that the growth of small firms is not more rapid than that of large firms when one accounts for the higher failure rates of the former.

indicator measures the extent to which inter-firm competition reigns within an individual sector, within an individual city. Higher index values indicate that, in a given urban area and a given sector, employment is distributed across a larger number of firms.

Information on the distribution of firms by size category has been obtained from special tabulations from the Canadian Business Register (CBR), a repository of statistics on all businesses in Canada. The major sources of information for the CBR are updates from the Statistics Canada survey program and from Revenue Canada Taxation's payroll deduction account file. Ideally, one would like to be able to analyze the growth performance of individual urban areas over a given period in function of the firm size structure observed at the beginning of the period (e.g., firm size structure in 1981 for growth over the period 1981-1991). Since the Business Register data are not available before 1989, however, it is not possible to follow this approach. We have therefore chosen to utilize the 1991 CBR data. This provides us with information on the firm size structure of urban areas at the end, rather than the beginning, of the 1981-1991 period -- a situation that is less than ideal. The competition index is therefore not used as a variable in our analyses of the 1971-1981 period.

2.5 Diversity of economic structure

It was Jane Jacobs (1969; 1984), once again, who originally suggested that the most dynamic urban economies are those that are diversified, rather than specialized, in structure. Jacobs argument is that the prime "engine" of economic growth is the externalities associated with knowledge transfers. Since the most significant knowledge transfers have historically been those of an inter-sectoral (rather than intra-sectoral) nature, she reasoned, more diversified urban economies will have a higher likelihood of developing growth-inducing spillovers. Jacobs' hypothesis has received empirical support from the work of Glaeser *et al* (1991) in the context of the U. S. metropolitan system. We examine the influence of urban structural diversity upon patterns of employment growth and change using the well-known index of specialization, a measure of the extent to which a given urban area's economic structure is relatively diversified or specialized across all sectors of activity. The value of the index of specialization is taken at the

beginning of each 10 year period (e.g., the 1971 value for 1971-1981); higher values indicate that an economy is more specialized.

2.6 Socio-economic attributes

A final approach to identifying the correlates of growth and change involves an analysis of the socio-economic attributes that characterize the individual elements of the urban system. Stated in other terms, this approach reflects a "supply-side" perspective on the characteristics of local labor markets. The underlying logic here is that job creation will be highest in those areas where the most suitable labor force for rapid-growth activities (generally high order services and high value-added manufacturing) is to be found. Our analysis utilizes the series 2A and 2B urban area profile data from the census of 1981. From over 500 specific socio-economic characteristics available in the urban area profiles, we chose to focus our attention upon a set of 46 variables that logically might be expected to have some sort of relationship to an urban area's level of economic performance (i.e., as cause or effect of the latter, or simply as co-variate).[29] A preliminary analysis of the data indicated that certain of these variables represented variations on the same theme; i.e., certain groups of variables tend to assume values that are inter-related in a predictable manner across the urban system (e.g., total population, total male population, male population 15 years and over, male population 25 to 54 years, total female population). In these cases, the behavior of the entire group of variables can be effectively represented by the use of one single variable (e.g., total population in the preceding example). Therefore, we reduced the total number of variables by performing a regression analysis. More precisely, we selected one variable in those groups where the correlation coefficients between all pairs of individual variables are greater than 0.9, thus reducing the original set of 46 variables to 27. Among this latter set, the variable that is most strongly and significantly related to the growth rate of total employment is the percentage of the population with a university degree. This variable has thus been retained for use in the models presented in section 4.

[29] For example, variables concerning religion, mother tongue, and marital status are considered as irrelevant in the present context.

Due to data availability, as noted above, we employ data from the census of 1981 only, i. e. the beginning point of the 1981-1991 period, but the end point of the 1971-1981 period. Since we are dealing with relative data (i.e., with percentages) that have not changed significantly over the period 1971-1991, in the absence of the 1971 data, we see no major difficulty in basing the 1971-1981 analyses on the 1981 end point data.

3. Methodological considerations

The analyses contained in this paper mainly utilize data collected by the 1971, 1981 and 1991 Censuses of Canada. The basic concept underlying these data is that of the "employed labor force": those persons who held a remunerated job during the week immediately preceding Census Day (on or near June 1st) of the relevant year. These data have been standardized to control for both changes in sectoral definitions and modifications in the boundaries of spatial units that may have occurred between the 1971 and 1991 Censuses.

In addition, we employ data from the series 2A and 2B urban area profiles of the 1981 and 1991 Censuses. These data cover a wide variety of information including population by age and sex, percentages of movers and migrants, participation and unemployment rates by age and sex, and income characteristics. Finally, information on the frequency distribution of firms across employment size categories has been obtained from the 1991 Canadian Business Register.

In order to make the presentation of results more manageable, and to remain within the article length constraints of this journal, we are unable to present results pertaining to each of the 18 groups of activities identified in Table 1. Rather, our results will be limited to eight groups: total employment and sub-totals for goods-producing and service-producing sectors, as well as five individual "key" economic sectors: manufacturing, wholesale trade, the FIRE sector (finance, insurance and real estate), business services, and other producer services. Our analyses have been conducted using the GLM (general linear models) procedure of SAS. For each analysis, we have eliminated outliers -- urban units for which the studentized residuals (i.e., the residual divided by the standard error)

of employment growth rates have values greater than 3.0; the number of outliers per analysis varies between one and six urban units out of a total of 152. In addition, in order to eliminate biases introduced by Statistics Canada's data rounding procedures, in our sector by sector analysis we have eliminated those urban areas where the initial employment level at the beginning of a period was less than 100.

4. Empirical results

Are the attributes identified in section 2 significantly related to the employment growth rates observed in the Canadian urban system over the periods 1971-1981 and 1981-1991? Table 2 permits us to answer this question. For the period 1971-1981, when the five attributes (recall that available data do not permit the calculation of a competition index for this period) are considered individually ("individual variables" columns), region emerges as the most consistently significant variable, being so for all eight groups; this variable yields the highest individual R^2 value in six of the eight cases. The specialization index also proves to be significant for five groups, and provides an R^2 value that is higher than that of region in two cases: manufacturing and business services. Among the other variables, the percentage of university degree-holders proves significant for two groups, and size for one group; the R^2 values of these latter two variables are very small, however. Metropolitan proximity is not significant for any group. Where the full model is considered ("full model" columns), region and the specialization index are again the most consistently significant variables, being so in the case of seven and five groups, respectively; region drops below the 90 percent significance level in the case of business services. Size and university degree are each significant in two cases, and metropolitan proximity in none. All models are significant, with seven of the eight exceeding the 99 percent level.

For 1981-1991, the results are less clear-cut. In particular, the influence of region is manifestly less important than it was in the preceding period. When the variables are considered individually, region is significant in six of the eight cases, but its R^2 value is generally lower, except in the case of business services, where it is now twice as high (0.30). The specialization index is significant in six cases, while size, proximity and

university degree are significant in five cases each, and the competition index in four cases. Note, however, that region displays the highest R^2 value for three of the eight groups; each of the five remaining variables presents the highest value for an individual group. Thus, it is clear that a wider range of factors come into play in the later decade. This observation is reinforced when the full models are considered; even taking into consideration the fact that six variables are being employed rather than five, the number of significant variables appearing in the models has increased substantially in the case of seven of the eight groups; in one case it has remained the same. For the period 1981-1991, the R^2 values of the full models remain the same as in the preceding period for three groups, decrease in the case of two groups, and increase for three groups. The largest change in the R^2 value occurs in the case of business services, where it increases from 0.29 to 0.54.

The signs of the three continuous variables are also instructive. The sign of the university degree variable is consistently positive (except in the case of manufacturing for 1971-1981), indicating that higher employment growth is associated with a higher proportion of university degree-holders among the population. Similarly, the sign of the specialization index is generally negative (with the exception of wholesale trade and business services for 1981-1991), indicating that highest growth rates are found in urban areas that are less specialized (i.e., more diversified) at the beginning of a period. Finally, the sign of the competition index variable is consistently negative (with an exception: the goods producing group), indicating that high growth rates tend to be found where employment is more concentrated among a smaller number of firms. While the first two relationships accord well with conventional wisdom, the latter result is contrary to the hypothesis advanced by Jane Jacobs (1969; 1984), and to the empirical verification of this hypothesis by Glaeser *et al* (1991). Further, this finding represents another refutation of the "small firms as engines of job growth" school of thought initiated by Birch (1987).

In a multivariate context such as the present one, it is also possible that it is the interactions between variables, rather than the individual variables themselves, that exerts an important influence upon employment growth. For example, in the case of the size and region variables, when size is considered individually, the implicit assumption is

that the effect of size is similar across all regions, which may not necessarily be the case; rather, size may indeed prove to be significant in all regions, but in a positive direction in some and in a negative direction in others. We have therefore chosen to examine the influence of the interaction of individual pairs of variables upon the full models displayed in Table 2. The results of this analysis are shown in Table 3. Across the eight sectoral groups, 16 pairwise interactions (out of a possible 80) prove to be significant in 1971-1981, and 15 (out of a possible 120) for 1981-1991. The most frequently significant interaction in the earlier period is between region and university degree, which appears five times, but not at all in the later period; in 1981-1991 it is the interaction between region and the competition index (3 times) which is the most frequent combination; this latter combination does not appear in the earlier period due to the absence of the competition index. Overall, the most recurrent variables in the significant interaction pairs are region and university degree (10 occurrences each) in 1971-1981, and the competition index (7 occurrences) in 1981-1991. From a sectoral perspective, other producer services is characterized by the largest number of significant interactions in 1971-1981: five, four of which involve region. In 1981-1991 the goods producing sub-total is characterized by nine significant interactions; interestingly, the six variables each appear three times here. Finally, we note that the addition of the individual interaction effects generally improves the R^2 values of the full models on the order of 0.02 to 0.08 points, except in the case of the other producer services group in 1971-1981, where the improvement ranges between 0.24 and 0.28 points.

5. Conclusion

This paper has presented an enormous quantity of information concerning the patterns of employment growth in the Canadian urban system. In this section, we attempt to reduce this mass of information to a more readily digestible form. We first consider the six urban area attributes, and then make some general observations.

Region. The region in which an individual urban area is located appears to exert a statistically significant influence upon the latter's employment growth rates. The nature of this influence is not constant from one decade to another, however, the relationship being

less strong in the 1980s. In addition, the influence of region is not constant across all sectoral groups. In general, these results reinforce the notion that the economic performance of an individual urban area is intimately related to the performance of the broader regional economy in which it is situated. The most vivid example of this relationship is the performance of urban areas in the Prairie provinces during the regional resource boom of the 1970s, characterized by the highest growth rates in the nation, and their subsequent "reversal of fortune" during the "bust" of the 1980s, characterized by the lowest growth rates. Thus, being located in one of Canada's regions rather than in another confers no absolute and enduring advantage upon an urban area. Much depends upon the economic performance of the region (province, multi-provincial zone, or even sub-provincial zone) to which an individual urban area has its most important functional linkages. Thus, the growth prospects of an individual urban area must always be considered within a larger regional (and even national) context.

Population Size. The population size of individual urban areas, too, appears to exert some degree of influence upon employment growth rates. This influence does not, however, conform to the simple linear relationship (diseconomies of scale and of agglomeration notwithstanding) posited by the urban economics literature, since widely differing size categories have relatively similar growth rates (e.g., the largest places and the smallest places have comparable growth rates). In general, we note that: a) the influence of size upon growth rates is much less clear than the influence of region; and b) there is an appreciable difference between decades, with the relationship between size and growth rates being stronger in the 1980s. The differences between the two decades are very likely related (at least in part) to the fact that the 1970s were especially marked by the growth of activities that were often situated in smaller places (e.g., goods-producing functions), while the 1980s were more characterized by the growth of activities that tend to be disproportionately located in larger places (e.g., business services).

Metropolitan Proximity. In order to more specifically examine the influence of relative proximity to a major metropolitan area upon employment growth and change we identified three classes of places: major metropolitan areas, central urban areas, and peripheral urban areas. Employment growth rates vary significantly across these three categories,

although the relationships are both stronger and more significant in the 1980s. In the 1970s, the growth rate for total employment is highest in the major metropolitan areas and lowest in the central urban areas. This order is not necessarily preserved across the individual economic sectors, where considerable variability exists. In the 1980s, the total employment growth rate is highest in the central units and lowest in the peripheral units. Across the individual sectors of activity, however, the relative ordering of growth rates more directly follows that of total employment. Thus, in the 1970s a location in the "urban shadow" of a major metropolitan area is associated with growth rates that are lower than in the other two classes, while in the 1980s a similar geographic position is associated with growth rates that are higher than for the other two classes. The better performance during the later decade on the part of those urban areas located in proximity to a major metropolitan area may well be related to the "new suburbanization" (Stanback, 1991). This phenomenon, first observed during the 1980s, involves the decentralization of employment (office employment, in particular) to the metropolitan periphery. In the view of several observers (Cervero, 1989; Hartshorn and Muller, 1989; Stanback, 1991; Garreau, 1991), the new suburbanization is arguably the most significant process currently underway within the North American urban system, and is presently imposing fundamental changes upon the economic geography of the majority of the continent's large metropolitan areas.

Firm Size Structure. Here, we sought to test Jacobs' (1969; 1984) hypothesis that growth will be more rapid in those urban areas where employment is distributed over a larger number of small firms, rather than being concentrated in a smaller number of large firms. In addition, we sought to offer some evidence concerning the debate over the role of small firms in employment creation. The use of a "competition index" for the 1981-1991 period proved to be significant in the case of the services sub-total and of three individual sectoral groups. The nature of the relationship indicates, however, that contrary to conventional wisdom, growth is more rapid when employment is distributed among a smaller number of larger firms. This finding complements our previous results (Coffey and Shearmur, 1996) that show that high rates of employment growth are associated with the presence of firms in the middle size range (i.e., 100-199 employees, in particular); a high percentage of firms either above or below this range is generally associated with lower

growth rates. Together, these results reinforce the "post-Birch" studies that have shown that small firms are not necessarily the engines of growth that they were once considered to be.

Diversity of Economic Structure. The use of this variable was motivated by Jacobs' (1969; 1984) hypothesis that the most dynamic urban economies are those that are diversified, rather than specialized, in structure. For both periods, the relationships between the sectoral specialization index and employment growth rates are generally significant, and are in the direction hypothesized by Jacobs: higher growth rates are found in more diversified urban economies. The diversity/specialization variable is second only to region in its performance in the models. These results complement our previous findings (Coffey and Shearmur, 1996) involving an analysis of the relationship between sectoral location quotients and sectoral growth rates, in which we found that the growth rate observed in a given sector in a given urban area is inversely related to that sector's level of specialization in the urban area. In other words, in individual cities across the urban system, the highest growth rates tend to occur in those sectors in which the urban area is relatively non-specialized compared to the national system. Thus, both approaches to the question of specialization and diversification confirm that growth is positively related to diversity -- whether measured globally, as in the case of the specialization index, or specifically, as in the case of sectoral location quotients.

Socio-economic Attributes. Our analysis of socio-economic data provides a supply-side perspective on the characteristics of local labor markets. In a preliminary analysis, we found that the strongest relationships between employment growth and socio-economic attributes involve education variables, in particular the percentage of university degree-holders in an urban area. In the 1980s, especially, the relationship between employment growth and university education is both wide-spread and significant, although its strength is lower than in the case of region and the specialization index. The nature of the relationship is positive, reinforcing the conventional wisdom concerning the role of education in economic growth.

Discussion. What lessons can we draw from this exercise? In spite of the enormous amount of information involved, a number of valid generalizations may be made. First, there appear to be few immutable laws that permit us either to target employment growth or to predict where it will occur within the urban system. Perhaps the most fundamental characteristic of the analyses conducted here involves the instability of the results from one decade to another; one decade's category of winners is often the other decade's category of losers. This observation suggests that many of the urban area attributes examined here (e.g., region, population size, metropolitan proximity, etc.), while often statistically significant as co-variates of growth rates, cannot be regarded as the underlying causes of the changes that have occurred. If causal factors are to be sought, they generally need to be sought elsewhere (e.g., in fluctuations in the global demand for certain goods and services, and other macro-economic trends). Having said this, however, we note that the approaches involving region, relative degree of structural specialization, and supply-side characteristics (in particular, percentage of university degree-holders in an urban area) appear to come much closer than the others to the "holy grail" of causality. It would probably be fruitful to concentrate further research efforts in these areas.

Second, across the various analyses, we have often discovered that the tertiarization of urban economies proceeds most slowly among those urban areas that are already the most highly tertiarized. This phenomenon appears to be due to a combination of a "catch-up" effect on the part of those urban areas whose structures lag behind the rest of the economy to the greatest extent, and of a "saturation" effect on the part of those urban areas that are the most advanced in this area. These findings are entirely consistent with our previous observations (Coffey and Shearmur, 1996) that the overwhelming trend within the individual elements of the urban system is towards a more diversified economic structure, both sectorally and occupationally.

Third, it is necessary to underscore the distinction between absolute growth and relative growth. The analyses conducted here have focused upon relative growth (i.e., growth rates) in order to standardize for the differences in the size of the employed labor force across the individual urban areas. The highest growth rates may be associated with small

absolute change, however, if the initial employment in a given sector (the "principal", using the analogy of a savings account) is small, while more modest growth rates may be associated with very large absolute employment increases if the "principal" is sufficiently large. Thus, while specific sectors in smaller urban areas may be experiencing very rapid growth, the latter may actually be losing ground, in terms of absolute employment levels, to larger places with more modest growth rates, at least in the short term.

Finally, what can be said concerning the processes underlying the observed results? In our view, *explicit* regional policy plays a very minor role here. Indeed, explicit regional policy has been virtually absent from the Canadian context since the early 1980s. On the other hand, sectoral policies (e.g., in the energy, automobile, biotechnology and aerospace sectors), with their *implicit* impacts upon different regions and different levels of the urban hierarchy, play a far more important role, as do constitutional and cultural/linguistic issues that, for example, have dampened economic growth in Quebec since the mid-1970s. Overlaying the policy landscape are a host of more general trends that have touched the majority of developed nations: the rise of high order services as a major activity and of information as the principal "raw material" in modern economies; the increasing globalization of even small local economies (e.g., "the global assembly line"), in large measure due to new information and telecommunications technologies; and new methods of production based upon a new social division of labor between large firms and small firms. Urban areas in different regions, of different sizes, and characterized by different economic structures, for example, have reacted differently to the opportunities and constraints presented by these trends. In sum, the issue of differential levels of employment growth among urban areas is a complex one, and analyses of this phenomenon must take into account the multiple factors and influences that are at work.

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Table 1
Sectoral structure,
Canadian urban system, 1971-1991

Sector	1971 (000)	1971 %	1981 (000)	1981 %	1991 (000)	1991 %	1971-1981 absolute growth (000)	1971-1981 growth rate %	1981-1991 absolute growth (000)	1981-1991 growth rate %	1971-1991 absolute growth (000)	1971-1991 growth rate %
Primary	163.5	2.8	266.3	3.1	287.4	2.9	102.8	62.9	21.2	7.9	123.9	75.8
Manufacturing	1330.0	23.0	1665.6	19.6	1462.3	14.6	335.6	25.2	-203.3	-12.2	132.3	10.0
Construction	370.3	6.4	513.0	6.0	574.7	5.8	142.7	38.5	61.7	12.0	204.4	55.2
SUB-TOTAL: GOODS PROD.	1863.8	32.2	2444.9	28.8	2324.4	23.3	581.1	31.2	-120.5	-4.9	460.7	24.7
Transport & communications	448.9	7.8	623.8	7.4	664.4	6.6	174.9	39.0	40.6	6.5	215.5	48.0
Public utilities	66.8	1.2	97.7	1.2	112.9	1.1	30.8	46.1	15.2	15.6	46.1	68.9
Wholesale trade	283.5	4.9	444.7	5.2	465.5	4.7	161.2	56.9	20.8	4.7	182.0	64.2
Retail trade	707.2	12.2	1054.0	12.4	1274.5	12.8	346.8	49.0	220.5	20.9	567.3	80.2
Consumer services	321.9	5.6	472.8	5.6	656.5	6.6	150.9	46.9	183.7	38.9	334.6	103.9
Accommodation & food serv.	232.6	4.0	459.6	5.4	618.9	6.2	227.0	97.6	159.4	34.7	386.4	166.1
Finance, insurance, real estate	311.3	5.4	530.3	6.3	669.2	6.7	219.0	70.3	138.9	26.2	357.8	114.9
Business services	131.8	2.3	293.9	3.5	497.9	5.0	162.1	123.0	204.0	69.4	366.1	277.8
Other producer services	50.8	0.9	120.8	1.4	186.4	1.9	70.0	137.9	65.6	54.2	135.6	267.0
Education	442.3	7.6	587.1	6.9	732.2	7.3	144.8	32.7	145.1	24.7	289.9	65.5
Health & social services	419.5	7.2	667.9	7.9	953.2	9.5	248.4	59.2	285.3	42.7	533.7	127.2
Public administration	506.4	8.8	686.4	8.1	835.1	8.4	180.0	35.5	148.8	21.7	328.7	64.9
SUB-TOTAL: SERVICES	3923.0	67.8	6038.9	71.2	7666.7	76.7	2115.9	53.9	1627.8	27.0	3743.7	95.4
TOTAL	5786.8	100.0	8483.8	100.0	9991.2	100.0	2697.0	46.6	1507.3	17.8	4204.3	72.7

Table 2
Factors and Correlates of Employment Growth Rates,
Canadian Urban System 1971-1991*

A. TOTAL EMPLOYMENT

	1971-1981				1981-1991			
	Individual Variables		Full Model		Individual Variables		Full Model	
	R^2	Signif.	R^2	Signif.	R^2	Signif.	R^2	Signif.
Region	0.30	0.99		0.99	0.01			0.95
Size	0.01				0.09	0.99		
Proximity	0.01				0.06	0.95		0.99
Competition	n.a	n.a.	n.a.	n.a.	(-) 0.01		(-)	
Specialization	(-) 0.11	0.99	(-)	0.95	(-) 0.10	0.99	(-)	0.99
University	(+) 0.02		(+)		(+) 0.13	0.99	(+)	0.99
FULL MODEL			0.33	0.99			0.36	0.99

B. SUB-TOTAL: GOODS PRODUCING

	1971-1981				1981-1991			
	Individual Variables		Full Model		Individual Variables		Full Model	
	R^2	Signif.	R^2	Signif.	R^2	Signif.	R^2	Signif.
Region	0.33	0.99		0.99	0.05			0.99
Size	0.01				0.01			
Proximity	0.02				0.01			
Competition	n.a	n.a.	n.a.	n.a.	(+) 0.00		(+)	
Specialization	(-) 0.13	0.99	(-)	0.95	(-) 0.10	0.99	(-)	0.95
University	(+) 0.02	0.90	(+)		(+) 0.07	0.99	(+)	0.99
FULL MODEL			0.37	0.99			0.26	0.99

C. SUB-TOTAL: SERVICES

	1971-1981				1981-1991			
	Individual Variables		Full Model		Individual Variables		Full Model	
	R^2	Signif.	R^2	Signif.	R^2	Signif.	R^2	Signif.
Region	0.29	0.99		0.99	0.10	0.99		0.95
Size	0.02				0.10	0.99		0.95
Proximity	0.01				0.16	0.99		0.99
Competition	n.a	n.a.	n.a.	n.a.	(-) 0.03	0.95	(-)	
Specialization	(-) 0.01		(-)		(-) 0.00		(-)	0.90
University	(+) 0.00		(+)	0.95	(+) 0.08	0.99	(+)	
FULL MODEL			0.33	0.99			0.33	0.99

D. MANUFACTURING

	1971-1981				1981-1991			
	Individual Variables		Full Model		Individual Variables		Full Model	
	R^2	Signif.	R^2	Signif.	R^2	Signif.	R^2	Signif.
Region	0.13	0.99		0.99	0.13	0.99		0.99
Size	0.01			0.90	0.03			
Proximity	0.00				0.01			0.90
Competition	n.a	n.a.	n.a.	n.a.	(-) 0.01		(-)	
Specialization	(-) 0.18	0.99	(-)	0.99	(-) 0.07	0.99	(-)	0.99
University	(-) 0.00		(-)	0.95	(+) 0.04	0.95	(+)	0.95
FULL MODEL			0.31	0.99			0.31	0.99

Table 2 (continued)

E. WHOLESALE TRADE

	1971-1981				1981-1991			
	Individual Variables		Full Model		Individual Variables		Full Model	
	R^2	Signif.	R^2	Signif.	R^2	Signif.	R^2	Signif.
Region	0.19	0.99		0.99	0.06	0.90		
Size	0.05	0.90		0.95	0.06	0.90		
Proximity	0.00				0.16	0.99		0.99
Competition	n.a.	n.a.	n.a.	n.a.	(-) 0.21	0.99	(-)	0.99
Specialization	(-) 0.00		(-)		(+) 0.03	0.95	(+)	0.95
University	(+) 0.00		(+)		(+) 0.01		(+)	0.90
FULL MODEL			0.25	0.99			0.38	0.99

F. FINANCE, INSURANCE, REAL ESTATE

	1971-1981				1981-1991			
	Individual Variables		Full Model		Individual Variables		Full Model	
	R^2	Signif.	R^2	Signif.	R^2	Signif.	R^2	Signif.
Region	0.22	0.99		0.99	0.14	0.99		0.99
Size	0.00				0.03			
Proximity	0.01				0.08	0.99		0.99
Competition	n.a	n.a.	n.a.	n.a.	(-) 0.00		(-)	
Specialization	(-) 0.05	0.95	(-)		(-) 0.03	0.95	(-)	
University	(+) 0.00		(+)		(+) 0.00		(+)	
FULL MODEL			0.23	0.99			0.23	0.99

G. BUSINESS SERVICES

	1971-1981				1981-1991			
	Individual Variables		Full Model		Individual Variables		Full Model	
	R^2	Signif.	R^2	Signif.	R^2	Signif.	R^2	Signif.
Region	0.16	0.95			0.30	0.99		0.90
Size	0.06				0.12	0.99		
Proximity	0.03				0.11	0.99		0.90
Competition	n.a	n.a.	n.a.	n.a.	(-) 0.24	0.99	(-)	0.99
Specialization	(-) 0.21	0.99	(-)	0.95	(+) 0.15	0.99	(+)	0.99
University	(+) 0.06	0.95	(+)		(+) 0.04	0.95	(+)	0.99
FULL MODEL			0.29	0.99			0.54	0.99

H. OTHER PRODUCER SERVICES

	1971-1981				1981-1991			
	Individual Variables		Full Model		Individual Variables		Full Model	
	R^2	Signif.	R^2	Signif.	R^2	Signif.	R^2	Signif.
Region	0.24	0.90		0.90	0.11	0.90		
Size	0.01				0.17	0.99		0.90
Proximity	0.02				0.01			0.95
Competition	n.a	n.a.	n.a.	n.a.	(-) 0.15	0.99	(-)	
Specialization	(-) 0.00		(-)	0.90	(-) 0.02		(-)	0.90
University	(+) 0.01		(+)		(+) 0.03		(+)	
FULL MODEL			0.40	0.90			0.34	0.99

* Note: Only significance levels of 90% or more are indicated in the Signif(icance) column.

Table 3
Variable Interaction Effects, Employment Growth Rates,
Canadian Urban System 1971-1991*

A. TOTAL EMPLOYMENT

	1971-1981		1981-1991	
	Signif.	Change in R^2	Signif.	Change in R^2
Region*Specialization	0.90	0.04		
Region*University	0.95	0.05		
Size*University	0.90	0.03		

B. SUB-TOTAL: GOODS PRODUCING

	1971-1981		1981-1991	
	Signif.	Change in R^2	Signif.	Change in R^2
Region*Specialization			0.90	0.05
Region*Proximity			0.90	0.08
Region*Competition			0.95	0.06
Size*Proximity			0.90	0.03
Size*Competition			0.95	0.05
Size*University			0.95	0.05
Proximity*Specialization			0.90	0.03
Competition*University			0.99	0.04
Specialization*University	0.90	0.02	0.99	0.05

C. SUB-TOTAL: SERVICES

	1971-1981		1981-1991	
	Signif.	Change in R^2	Signif.	Change in R^2
Region*Specialization	0.95	0.05		
Region*University	0.99	0.07		
Size*University	0.95	0.05		
Competition*University			0.95	0.02

D. MANUFACTURING

	1971-1981		1981-1991	
	Signif.	Change in R^2	Signif.	Change in R^2
Region*University	0.90	0.04		
Region*Competition			0.90	0.05

E. WHOLESALE TRADE

	1971-1981		1981-1991	
	Signif.	Change in R^2	Signif.	Change in R^2
Size*University	0.90	0.04		
Size*Proximity	0.95	0.05		

Table 3 (continued)

F. FINANCE, INSURANCE, REAL ESTATE

	1971-1981		1981-1991	
	Signif.	Change in R^2	Signif.	Change in R^2
Region*Competition			0.90	0.05

G. BUSINESS SERVICES

	1971-1981		1981-1991	
	Signif.	Change in R^2	Signif.	Change in R^2
Region*University	0.90	0.10		
Competition*Specialization			0.90	0.01

H. OTHER PRODUCER SERVICES

	1971-1981		1981-1991	
	Signif.	Change in R^2	Signif.	Change in R^2
Region*Proximity	0.90	0.24		
Region*Size	0.90	0.24		
Region*Specialization	0.95	0.25		
Region*University	0.95	0.28		
Size*University	0.90	0.15		
Size*Specialization			0.95	0.10
Proximity*Specialization			0.95	0.08

*Note: Only significance levels of 90% or more are indicated in the Signif(icance) column.

Chapter 7

La distribution des secteurs 'High-Tech' dans le système urbain canadien

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Résumé

Le secteur High-Tech fait actuellement l'object à la fois d'attention médiatique et politique. Ce secteur est perçu comme un secteur d'avenir, et sa promotion d'importance primordiale pour la santé économique nationale. En particulier, on fait souvent allusion aux emplois qui peuvent être créés dans ce secteur, et les provinces et municipalités, sur lesquelles repose de plus en plus la responsabilité du développement économique, portent leur attention sur les industries de ce type. Cette étude a pour but d'analyser la distribution géographique du secteur dans le système urbain canadien et de tracer l'évolution de celle-ci. De plus, la performance en termes d'emplois de ce secteur est analysée de près. Il s'avère que les industries High-Tech ont des tendances de localisation centripètes, qu'elles ne sont pas nécessairement associées avec de 'bons' indicateurs socio-économiques, et que leur performance en termes de création d'emplois est inférieure à la moyenne canadienne sur la période d'étude. Ce sont plutôt les *services* High-Tech qui sont en forte croissance, les manufactures n'étant pas créatrices d'emplois.

1.0 Introduction

La distribution spatiale des secteurs d'activité économique dits 'High-Tech' mérite que l'on s'y penche pour plusieurs raisons. La première, et peut-être la plus immédiate, est que, dans une période de *'jobless recovery'* (de croissance économique sans création d'emplois) comme celle que nous traversons actuellement, les secteurs 'High-Tech' sont perçus comme les secteurs d'avenir, porteurs d'espoir pour la création d'emplois directs et indirects. En effet la politique du gouvernement québécois, qui investit dans la recherche et le développement, et qui dirige son intervention vers les secteurs dits 'High-Tech' (Bernard Landry, Ministre des Finances, Gazette, 25/10/96) montre l'emprise de cette perception, tout comme, d'ailleurs, la politique du gouvernement fédéral canadien qui a monté un fonds de Partenariat Technologique, et qui vient d'investir $87millions dans le secteur aéronautique québécois (Vancouver Sun, 24/10/96). Ces politiques, que l'on retrouve aussi dans la plupart des pays européens, espèrent recréer une 'base' économique exportatrice qui générera des emplois locaux à la fois dans les industries 'High-Tech' elles mêmes et par un effet de multiplicateur local (Massey et al, 1992).

A un autre niveau, certains gouvernements espèrent que 'la révolution High-Tech' permettra aux régions isolées de se développer (J-C Perrin, 1988). Cette notion est fondée sur plusieurs idées, notamment celles de la synergie locale, des systèmes de petites entreprises (Garofoli, 1992), de la désintégration verticale de la production (Scott, 1988) et de l'abolition des contraintes de distance grâce aux télécommunications (Pollard et Storper, 1996). Une étude de la distribution spatiale des secteurs 'High-Tech' devrait donc permettre de tracer le parcours spatial de ces industries et de réfléchir à la pertinence de politiques de développement régional basées sur ces secteurs.

Finalement, il est utile de voir si les industries dites 'High-Tech' bénéficient réellement d'une croissance d'emploi supérieure à la moyenne, et si les villes dans lesquelles elles se situent possèdent des caractéristiques communes qui pourraient aider à formuler certaines hypothèses sur les critères de localisation de ces industries.

Afin d'explorer ces diverses questions, notre analyse débutera par une discussion des problèmes entourant une définition des secteurs 'High-Tech'. Un choix de définition est fait en fonction des données disponibles et des classifications sectorielles tirées d'autres

études, mais notre définition du secteur n'a rien d'absolu, et pour certains notre secteur 'High-Tech' ne représentera qu'une sélection d'industries de ce genre.

A partir de cette définition, nous établissons une classification des villes canadiennes selon la concentration d'emplois dans les industries 'High-Tech' en 1991. Une description détaillée de la composition des diverses classes de villes est effectuée, et cette description nous permettra d'appréhender la distribution spatiale du phénomène 'High-Tech' au sein du système urbain canadien. Afin de comprendre l'évolution dans le temps de cette distribution spatiale, le parcours de classe en classe de chaque ville est suivi de 1971 à 1991.

Une fois cette classification établie, une brève analyse est faite portant sur certaines données socio-économiques. Cette analyse n'a rien d'exhaustif, mais elle permet de constater que les villes dans chaque classe ont autre chose en commun que leur structure d'emploi dans les secteurs 'High-Tech': nous trouvons que la classification des villes selon les caractéristiques de leur secteur 'High-Tech' fait ressortir des classes de villes à caractères socio-économiques différents.

Mais, pour commencer, il nous faut cerner plus précisément ce que sont les industries 'High-Tech', et quelles sont les théories et observations portant sur leur localisation spatiale.

2.0 Les industries[30] 'High-Tech'

Fernand Braudel (1981), dans son oeuvre 'Capitalisme et Civilisation', nous apprend que les historiens de la technologie sont confrontés à un problème fondamental, à savoir la définition même de leur domaine d'analyse. En effet, toute tentative de cerner le domaine technologique souffre du fait que soit on doit limiter son champ d'étude, soit ce champ tend à englober la société toute entière: ceci pour la bonne raison que "l'histoire de la technologie est celle de l'histoire humaine dans toute sa diversité".

Il devient alors plus facile de comprendre pourquoi les géographes, sociologues et économistes qui se sont penchés plus récemment sur le domaine de la haute technologie

[30] Dans cet article, nous nous servons du terme *industrie* pour définir les sous-catégories du *secteur* 'High-Tech'. Le *secteur* 'High-Tech' regroupe donc certaines *industries* qui ont des caractéristiques en commun.

sont loin d'avoir arrêté une définition standardisée de leur champ d'étude. Presque chaque étude du phénomène dit 'High-Tech' (Aydalot et Keeble, 1988; Massey et al, 1992; Castells, 1985; Pollard et Storper, 1996...) est précédée d'une discussion de ce que peut bien être ce 'secteur'.

Aydalot et Keeble (1988) articulent quatre types d'approches qui ont servi à définir ce qu'est une industrie 'High-Tech': l'approche qui se réfère à l'opinion d'experts et/ou à celle de l'opinion publique, l'approche qui définit le 'High-Tech' comme étant tout secteur à forte croissance (voir Birch, 1987), l'approche qui se penche sur les dépenses en recherche et développement (R&D), et, finalement, l'approche qui étudie la composition (pourcentage d'ingénieurs et de scientifiques) de la main d'oeuvre des secteurs.

Massey et al (1992) divisent aussi les définitions du secteur 'High-Tech' en quatre groupes, mais ces groupes sont définis selon des critères un peu différents: soit par le produit final, soit par l'occupation des employés, soit par les dépenses en R&D ou soit par la composition de la main d'oeuvre.

Les critères de définitions 'classiques', dont un certain nombre ont été présentés ci-dessus, ont ceci en commun qu'ils se penchent en général sur les intrants (main d'oeuvre, R&D) ou sur les extrants (produits finaux). Un autre ensemble d'approches (Amirahmadi & Wallace, 1995; Walker, 1985; Camagni, 1988) se penche à la fois sur les intrants et extrants, mais aussi sur les procédés de production. Ce type d'approche se prête beaucoup moins à une analyse par secteur économique classique (type CAE) car il se peut fort bien que des entreprises avec des intrants et des extrants semblables emploient des procédés de production entièrement différents. De plus, des entreprises dans les secteurs traditionnels (telles la métallurgie, la construction automobile) peuvent employer des méthodes de production à très haute technologie.

Finalement, dans la plupart des études précitées, les industries 'High-Tech' sont, par définition, des industries manufacturières. Or, certains auteurs (Butchart, 1987, cité dans Keeble, 1988; Saxenian, 1985; Coffey et Polèse, 1987) élargissent la notion de 'High-Tech' pour y inclure aussi certains services. En effet, il n'y a aucune raison pour ne pas appliquer les critères de définition cités dans les paragraphes précédents aux secteurs de services. Certains secteurs, comme celui de la programmation et du conseil informatique, ont à la fois des intrants, des procédés et des extrants qui sont 'High-Tech'

(emploi des personnel qualifié, emploi de matériel de production sophistiqué, production des programmes ou de conseils à haut contenu scientifique), et ils sont étroitement associés aux activités manufacturières à haute technologie.

Comme nous pouvons l'entrevoir, la diversité des critères de définition mène à une certaine diversité des définitions elles-mêmes. Cela dit, la plus grande différence se trouve entre les définitions portant sur les procédés de production et ceux portant sur les intrants et extrants. Bien sûr, certaines définitions sont plus larges que d'autres, toutes ne se recoupent pas entièrement, mais il y a quand même un certain consensus sur un groupe d'industries qui font presque toujours partie du secteur 'High-Tech'.

Nous n'avons pas tenté de produire ici une nouvelle conceptualisation de ce qu'est une industrie 'High-Tech'. Pour certains, notre secteur 'High-Tech' ne représentera qu'une sélection d'industries de ce type, et non le secteur dans sa totalité. Pour d'autres, l'inclusion de certains services sera questionnée. Pour d'autres encore, le fait que nous nous basons sur des secteurs industriels définis selon la classification CAE (c'est à dire selon le produit final) réduira de beaucoup la portée de nos conclusions. Quoi qu'il en soit, face aux limitations imposées par notre base de données[31], et face à la multitude d'approches que nous trouvons dans la littérature, nous avons retenu les industries suivantes comme faisant partie de 'notre' secteur 'High-Tech':

'High-Tech' manufacturier: CAE 1970

CAE 318	Fabrication de machines pour le bureau et le commerce
CAE 321	Fabricants d'aéronefs et de pièces
CAE 335	Fabricants d'équipement de télécommunication
CAE 374	Fabricants de produits pharmaceutiques et de médicaments
CAE 391	Fabricants de matériel scientifique et professionnel

'High-Tech' service: CAE 1970

CAE 853	Services d'informatique
CAE 864	Bureaux d'études et services scientifiques

[31] Les limitations dues aux données seront expliquées plus longuement dans la section 4.0. Ceci dit, notre base est définie selon la Classification des Activités Economique de 1970, et son degré de précision ne dépasse pas la classification à trois chiffres.

CAE 867 Bureaux de conseil en gestion et en organisation

Mis à part le dernier secteur, 'conseils en gestion', la liste d'industries manufacturières ainsi que les deux industries de services correspondent d'assez près à une idée 'courante' de ce qui constitue le secteur 'High-Tech'. Pollard et Storper (1996), qui explorent trois définitions possibles du secteur High-Tech, classent l'ensemble des secteurs manufacturiers définis ci-dessus dans la classe 'industries basées sur l'innovation' (c'est à dire dans leur classification des industries 'High-Tech' basée sur le produit final), et les trois services dans leur classe 'd'industries basées sur le capital intellectuel' (c'est à dire classées par le niveau de qualification des employés)[32].

La définition du secteur 'High-Tech' de Santa-Clara donnée par Saxenian (1985) coïncide[33] presque avec celle que nous avons retenu, y compris l'inclusion de services informatiques et d'études scientifiques (*research and development labs*). Seule l'inclusion du secteur des conseils en gestion ne s'y retrouve pas. De même, la liste d'industries 'High-Tech' retenue par Keeble (1988) comprend l'ensemble des industries que nous avons retenues, services informatiques et services scientifiques (*research & development*) compris, mais sans les conseils en gestion[34].

Donc, mis à part l'inclusion des services de conseil en gestion, l'ensemble des industries que nous avons retenues afin de constituer notre secteur 'High-Tech' correspond d'assez près à la définition qu'en font nombre d'auteurs - plus précisément le groupe d'auteurs qui se base sur la nature des produits et, dans une moindre mesure, du capital intellectuel, de ces industries. L'inclusion de l'industrie 'conseil en gestion' repose sur l'analyse de Coffey et Polèse (1987) qui a identifié trois industries de service 'High-Tech' dans le contexte canadien, les services informatiques, les services scientifiques et les services de conseil en gestion. Ces trois industries ont été retenues par les auteurs sur la base de l'importance des fonctions de recherche et de conception associées à ces activités. Il est à noter que, selon les mêmes critères, ce sont les industries de machines de bureaux, d'équipement de télécommunication, de pharmaceutique et d'équipement médical qui ont été retenues comme étant les industries manufacturières 'High-Tech'.

[32] Les définitions de Pollard et Storper (1996) reposent sur la classification industrielle américaine de 1977. Tout en reconnaissant qu'aucune comparaison directe entre notre classification et la leur n'est possible, il n'en demeure pas moins qu'il y a une correspondance très proche entre leur définition des secteurs 'High-Tech' basée sur l'innovation dans les produits et notre sélection de secteurs 'High-Tech' manufacturiers.
[33] Les problèmes de définition et d'agrégation de données rendent impossible une comparaison précise.
[34] Même remarque que la note 4.

Notre sélection d'industries 'High-Tech' s'est légèrement éloignée des définitions basées sur les produits finaux car, selon nous, il est important d'élargir le concept de secteur 'High-Tech' au delà des activités manufacturières. Il y a pour ceci deux raisons principales: d'une part, ces industries participent de manière importante à la création de nouvelles technologies, et en sont souvent inséparables (par exemple, dans le contexte de l'informatique, il n'est plus possible de séparer le logiciel (service/produit), l'ordinateur (produit) et le service de support (service)). D'autre part, même s'ils ne sont pas directement créateurs de nouvelles technologies, ces services - et surtout les services de conseils en gestion - sont des vecteurs très importants de diffusion de nouvelles technologies et d'introduction de nouveaux procédés de gestion et de production.

Tout en reconnaissant les limites de notre définition du secteur 'High-Tech', et le fait qu'elle est issue d'une approche axée principalement sur la nature des produits finaux des industries, nous pensons néanmoins qu'elle est représentative de ce qui est souvent désigné par l'expression. Pour reprendre la discussion de Bataïni et Coffey (1996), notre analyse porte sur un secteur 'High-Tech' défini de manière 'classique', alors que leur analyse, qui porte sur la distribution d'emplois de type administratif et scientifique, analyse la distribution spatiale 'd'activités à haut contenu intellectuel'.

3.0 Localisation des Secteurs 'High-Tech'

Aydalot et Keeble (1988) distinguent trois types d'études du secteur 'High-Tech': celles qui portent sur l'entreprise, en essayant de cerner les processus de choix de localisation, mais qui n'envisagent la région que 'de l'extérieur' sans prendre en considération la dynamique locale; celles qui prennent pour acquis le 'High-Tech' et qui analysent son impact sur l'équilibre territorial (notre approche), mais qui sont trop générales; et celles qui se penchent sur les milieux locaux (approche la plus prometteuse selon les auteurs). C'est peut-être parce que beaucoup d'autres auteurs sont en accord avec Aydalot et Keeble (1988) que nous trouvons peu d'analyses générales de la localisation d'activités 'High-Tech' à un niveau national, mais beaucoup plus d'analyses portant sur les restructurations sociales (Massey, 1992), sur les réseaux innovateurs (Garofoli, 1992), sur les nouveaux procédés industriels (Amirahmadi et Wallace, 1995).

Cela dit, Glasmeier (1985) a entrepris une analyse de la localisation des emplois 'High-Tech' aux USA, analyse assez semblable - en ce qui concerne la méthodologie et les sources de données - à celle que nous entreprenons pour le Canada. Selon Glasmeier (1985), les emplois 'High-Tech' sont pour la plupart situés dans les états du Nord Est et du MidWest, avec 71% de ces emplois dans 13 états. Cependant, cette situation semble évoluer car la concentration[35] d'emplois 'High-Tech' est plus grande dans les états en dehors de Nord Est et du MidWest, et la croissance d'emplois est plus rapide dans les états du Sud et de l'Ouest. Au niveau métropolitain, les emplois 'High-Tech' sont concentrés dans quelques zones métropolitaines (SMSA). De plus, dans la plupart des SMSA où l'on retrouve des emplois 'High-Tech', ces emplois sont concentrés dans un petit nombre d'industries: selon l'auteur il y a donc très peu de SMSA que l'on pourrait appeler 'centres d'innovation', c'est à dire des centres avec un secteur 'High-Tech' diversifié. Finalement, plus du tiers des 264 SMSA ont perdu des emplois 'High-Tech' au cours des années 1970, malgré la progression générale du secteur, laissant entrevoir une augmentation de la concentration du secteur.

Cette tendance à la concentration spatiale est analysée d'un tout autre point de vue par Camagni (1988). Cet auteur analyse la localisation de secteurs 'High-Tech' en Europe. Au cours des années 1970, "les régions intermédiaires et périphériques, ainsi que les zones rurales au sein de régions avancées, ont eu une croissance soutenue [d'emplois 'High-Tech'] qui contrastait vivement avec le ralentissement, et même la crise, qu'ont connu les zones métropolitaines jadis si 'fortes' ". C'est durant cette décennie qu'ont été formulées les hypothèses de complexes industriels (Garofoli, 1992), de la crise des grandes entreprises et de la résurgence des PME (Birch, 1979), et de la possibilité de développement régional axé sur les PME et la haute technologie. Cependant, selon Camagni (1988), la situation au cours des années 1980 s'est à nouveau renversée. Les nouvelles technologies, loin d'engendrer une diffusion des activités économiques, ont commencé à encourager leur concentration, et ce pour plusieurs raisons. Les nouvelles technologies "engendrent de plus en plus une intégration des différentes activités au sein du système manufacturier, de la conception au marketing" (Camagni, 1988). Les possibilités d'intégration ouvertes par les nouvelles technologies sont aussi notées par Amirahmadi et Wallace (1995), qui soulignent qu'aujourd'hui la recherche, le développement, l'analyse continue de la fabrication et la fabrication elle-même peuvent

[35] Pourcentage d'emplois 'High-Tech' par rapport au pourcentage d'emplois manufacturiers.

tous se faire à partir du même système CAD/CAM - intégrant ainsi des activités de production, de recherche et de gestion. De plus, le cycle de vie moyen d'un nouveau produit s'est réduit de 20 à environ 5 ans entre les années 1960 et 1980: de ce fait, la possibilité d'implanter des usines de montage en périphérie s'est réduite, car le cycle de vie du produit ne justifie pas de tels investissement.

Ces deux facteurs mènent donc les entreprises à rechercher une seule localisation optimale où peuvent être intégrées toutes les phases de conception, production, gestion et vente - et cette intégration mène souvent à un choix de localisation centralisé, proche d'une grande zone urbaine.

Un autre facteur cité par Camagni (1988) qui a tendance à favoriser les grandes entreprises et la localisation centrale est la réduction des marchés de masse, et la croissance des marchés spécialisés. De prime abord, et selon la thèse des post-fordistes, ce facteur devrait encourager le développement de petites entreprises, et ceci a peut-être été le cas durant les années 1970. Cependant, une fois que les grandes entreprises ont pu résoudre leurs problèmes de gestion, ce sont ces dernières qui ont pu trouver les moyens d'investir massivement dans des technologies de production flexibles. Les grandes entreprises deviennent alors capables d'exploiter des niches de marché car elles ont la possibilité de manufacturer plusieurs produits sur les mêmes machines: elles exploitent donc les économies d'étendue (taille de marché total sur une gamme de produits différents) plutôt que les économies d'échelle (taille de marché global sur un seul produit). Les effets au niveau régional de ces nouveaux procédés dépendent donc des décisions de localisation de ces grandes entreprises, et, selon Camagni (1988), ces entreprises auront tendance à se localiser à proximité de grandes agglomérations (marché du travail, sous-traitants, communications, raisons historiques).

A un niveau plus général, Malmberg (1996) fait un tour d'horizon de la littérature récente portant sur l'agglomération et les milieux locaux. Il cite le journal 'The Economist' qui, en 1994 déclarait que 'même les industries les plus récentes obéissent à l'ancien principe de la concentration géographique. Dès les débuts de l'ère industrielle les entreprises des nouvelles filières en expansion rapide ont eu tendance à se regrouper dans une petite région'. Malmberg (1996) recense les diverses théories portant sur les mécanismes de ce regroupement dans l'espace, et cite plusieurs exemples d'auteurs qui remettent en question les thèses post-fordistes: les bienfaits de l'agglomération spatiale, aussi bien en

ce qui concerne les échanges commerciaux que la proximité de marchés, de main d'oeuvre, de réseaux formels et informels, de services aux entreprises et 'd'infrastructure technologique', militent tous en faveur d'une concentration spatiale des nouvelles industries.

Finalement, l'étude récente de Baïtani et Coffey (1996), portant sur la distribution spatiale des industries à haut contenu intellectuel (high knowledge content) au sein du système urbain canadien, démontre une très forte concentration de ce type d'emploi au sommet de la hiérarchie urbaine. En effet, 55% des villes sont peu spécialisées dans ce type d'emploi tandis que seules 4.6% ont une concentration élevée d'emplois de ce type.

Que ce soit à un niveau empirique ou à un niveau théorique, et que cette théorie porte sur les décisions de localisation ou les effets des nouveaux procédés de production, il y a raison de penser que les industries 'High-Tech' auront des tendances de localisation centripètes, et ce malgré la légère déconcentration des années 1970 et les hypothèses post-fordistes portant sur les milieux innovateurs peu urbanisés . La suite de notre article tentera, au niveau du système urbain canadien, d'analyser les tendances de localisation des industries 'High-Tech'.

4.0 Données et Méthodologie

4.1 Données

Notre source principale de données est une base préparée à partir des données de recensement 1971, 1981 et 1991. Cette base comprend le nombre d'emplois par secteur économique (162 secteurs à un niveau de précision de 2 et 3 chiffres - code CAE) et par profession (7 professions). La définition des secteurs correspond à la classification CAE de 1970, et les divisions géographiques ont été standardisées pour correspondre aux divisions courantes en 1991. Il est à noter que cette base n'a pas été conçue spécifiquement pour une analyse des industries 'High-Tech': de ce fait, la désagrégation des industries n'est peut-être pas aussi grande que souhaitable, et notre définition du secteur 'High-Tech' est un peu moins précise que voulue. De plus, l'utilisation de la classification CAE de 1970, nécessaire afin de pouvoir couvrir l'ensemble de la période 1971 à 1991, impose aussi certaines limites, bien que celles-ci soient mineures à un niveau de précision de 3 chiffres.

Ces chiffres d'emploi recouvrent le système urbain canadien, défini comme étant constitué des 152 agglomérations et villes de plus de 10 000 habitants au Canada. Comprises dans ces 152 villes se trouvent les 25 régions métropolitaines de recensement (RMR), 115 agglomérations de recensement (AR) et les 12 subdivisions de recensement (SDR) ayant plus de 10 000 habitants en 1991. Les données socio-économiques utilisées proviennent des bases 2A et 2B des recensements de 1981 et de 1991.

Finalement, nous possédons aussi les chiffres couvrant la taille des établissements dans 149 des 152 agglomérations étudiées pour l'année 1991: ces données proviennent du 'Canadian Business Register' de Statistiques Canada. Il faut bien noter que ces chiffres donnent la taille des établissements et non des entreprises: un établissement est défini comme une entité qui soumet des déclarations de masse salariale au Ministère du Revenu fédéral. Une entreprise peut comprendre un certain nombre d'établissements, mais, en général, le nombre de petits établissements (moins de 100 employés) correspond d'assez près au nombre de petites entreprises étant donné que la plupart des petites entreprises sont constituées d'un seul établissement (Picot et al, 1994).

4.2 Méthodologie

Notre analyse comprend deux étapes principales. La première étape consiste à définir une typologie des villes canadiennes selon le profil de leur secteur 'High-Tech'. Nous avons élaboré cette typologie selon les quotients de localisation de chacune des huit industries étudiées.

Le quotient de localisation d'une industrie pour une ville donnée est une mesure de la présence de cette industrie dans une ville par rapport à sa présence au niveau national[36]. Concrètement le QL se calcule de la façon suivante:

$$QL_{Vi} = 100 \times (n_{Vi} / n_{Vtot}) / (n_i / n_{tot})$$

où QL_{Vi} = quotient de localisation de l'industrie i dans la ville V

n_{Vi} = nombre d'emplois dans l'industrie i dans la ville V

[36] Plus généralement, le quotient de localisation mesure la concentration relative d'un phénomène dans un endroit par rapport à une entité de référence.

n_{Vtot} = nombre d'emplois total dans la ville V
n_i = nombre d'emplois dans l'industrie i dans le pays entier
n_{tot} = nombre d'emplois total dans le pays entier[37]

L'utilisation de cette mesure ôte le biais qui serait introduit si le nombre d'emplois brut était employé, car dans ce dernier cas la typologie serait presque entièrement fondée sur la taille de population des villes.

Une fois ces QL calculés, nous avons effectué une analyse de regroupement du type Ward avec le logiciel d'analyse statistique SAS, en standardisant les valeurs des QL. Ce type d'analyse de regroupement est intuitivement la plus simple à manier car elle crée des groupes en minimisant la variance interne aux groupes et en maximisant la variance entre les groupes[38].

Cette analyse de regroupement a été faite sur les données de 1991, créant ainsi une typologie des villes canadiennes selon la structure de leur secteur 'High-Tech'. Ensuite, les données de 1981 et de 1971 ont été classées selon les classes créées pour les données de 1991 en effectuant une analyse de discriminant. Autrement dit, les classements de 1971 et de 1981 ne correspondent pas aux classements que l'on trouverait en analysant ces données indépendamment: par contre, le fait que les groupes soient définis de manière identique en 1971, 1981 et 1991 permet de retracer beaucoup plus aisément le parcours de chaque ville. Une supposition importante est faite quand à la composition du secteur 'High-Tech' au cours des vingt années d'étude: en effet, nous supposons, dans cette analyse, que les industries définis comme étant 'High-Tech' en 1991 l'était aussi en 1971 et 1981. Autrement dit, nous supposons que la constitution du secteur n'a pas varié au cours des deux décennies. Cette supposition est acceptable dans la mesure ou les industries 'High-Tech' ne sont définis qu'à un niveau de précision de trois chiffres CAE. Malgré cela, et surtout dans la mesure où notre définition des secteurs 'High-Tech' repose sur la perception actuelle de leurs produits finaux, la supposition pourrait ôter à la précision de l'analyse.

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[37] Il est à noter qu'une autre base aurait pu être choisie: ici nous calculons les QL par rapport à l'emploi total au Canada dans tous les secteurs.
[38] Noyelle et Stanback utilisent cette méthode dans leur analyse classique du système urbain américain, 'The Economic Transformation of American Cities', 1984.

Il est à noter que le fait qu'il y ait sept classes de villes n'a rien d'inéluctable. Au contraire, ce chiffre est issu d'un choix, informé par un processus de tâtonnement: parmi les sept classes identifiées, il en existe déjà trois qui ne contiennent qu'une ou deux villes. La multiplication de telles classes a peu d'intérêt. Par contre, il existe une classe importante (autour de cent observations), et, si nous nous étions arrêtés à six classes, une 'super-classe' de presque 130 villes existerait. Etant donné que les quatre grandes classes identifiées sont interprétables et utiles aux fins de l'analyse, la solution à sept classes a été retenue.

A la suite de cette classification, nous examinons brièvement l'évolution des classes entre 1971 et 1991, et ceci nous permet de commenter des processus éventuels de concentration, de dispersion, et de changement dans la localisation du secteur 'High-Tech'.

Le second volet de l'analyse tente d'identifier les caractéristiques de croissance et la nature socio-économique des diverses classes de villes. Deux techniques ont été utilisées: d'une part une analyse des moyennes a été effectuée afin de comparer les valeurs moyennes de certains indicateurs socio-économiques entre les divers classes de ville. Une différence de moyenne est considérée comme étant significative si la probabilité de rejeter l'hypothèse nulle par erreur est inférieure à 10%. D'autre part, des analyses de corrélation explorent la possibilité de covariance transversale entre les quotients de localisation et les données socio-économiques. Il est à souligner que ces analyses sont exploratoires et qu'aucun modèle n'est proposé.

Nous avons divisé le système urbain de deux façons: d'une part en fonction de la centralité, d'autre part en fonction de régions géopolitiques. Dans notre analyse nous nous référons aux agglomérations métropolitaines (notées AM, les treize agglomérations canadiennes de plus de 300 000 habitants), aux villes centrales (à moins de 100km d'une AM) et aux villes périphériques (à plus de 100km d'une AM). Les cinq régions géopolitiques sont les provinces de l'Atlantique, le Québec, l'Ontario, les Prairies et la Colombie Britannique.

5.0 Analyse des Quotients de Localisation de secteur 'High-Tech'

5.1. Typologie des agglomérations selon leur secteur 'High-Tech'

Notre analyse des agglomérations selon leur secteur 'High-Tech' a abouti à une classification selon sept classes (annexe 1). Cette classification n'est pas équilibrée dans la mesure où nous avons une classe (la classe 1) qui domine avec quatre-vingt-dix-neuf observations, trois classes qui suivent avec un nombre plus petit de villes (classes 2, 3, et 4 avec vingt-huit, treize et huit villes) et trois classes très petites (classes 5, 6 et 7 avec deux, une et une villes). Ce déséquilibre reflète la concentration des activités 'High-Tech' dans un petit nombre d'agglomérations. Au cours de la description de ces sept classes, la typologie prendra sens et nous pourrons commencer à nous référer aux classes par une nomenclature descriptive. Pour l'instant nous nous servons des numéros, et nous présentons ci-dessous l'arbre de similarité des classes. Cet arbre sert à visualiser quelles sont les classes qui se ressemblent le plus: il indique quelles classes se combineraient si on réduisait le nombre de classes une à la fois, allant de sept à une classe.

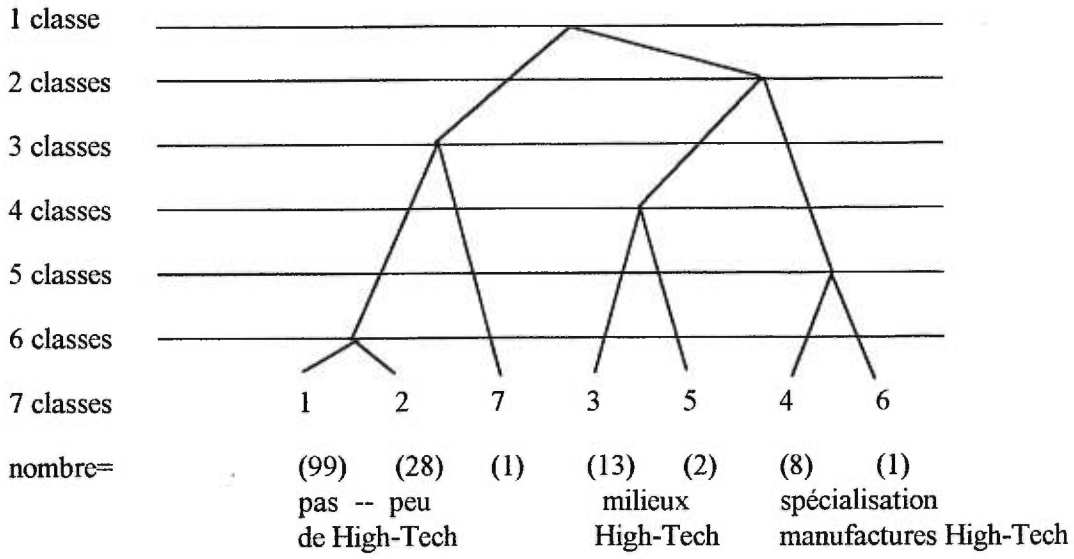

figure 1: arbre de similarités

5.1.1 Classe 1: Villes sans secteur 'High-Tech'

Cette classe de villes, regroupant quatre-vingt-dix-neuf d'entre elles, comprend celles qui n'ont pratiquement pas de présence 'High-Tech'. Toutes sauf onze ont au moins deux des huit secteurs entièrement absents (QL=0), et seul vingt-trois ont une concentration d'emplois supérieure à la concentration nationale dans un des secteurs (QL>100). Ce petit groupe est cependant significatif car il montre une certaine dispersion très ponctuelle des activités 'High-Tech'.

Ces quatre-vingt-dix-neuf villes sont pour la plupart situées en périphérie par rapport aux agglomérations majeures (soixante-et-onze sur quatre-vingt-dix-neuf), soixante-dix-huit ont une population inférieure à 50 000, et elles sont distribuées numériquement de manière homogène sur les cinq grandes régions canadiennes. Mais cette distribution numérique cache le fait que, tandis que 45% des villes ontarienne sont dans la classe 'Sans High-Tech', plus de 83% des villes de l'atlantique et de C-B le sont.

5.1.2 Classe 2: Villes à faible présence 'High-Tech'

La deuxième classe de villes comprend vingt-huit observations. La caractéristique principale de ces villes est d'avoir une certaine présence d'au moins deux des secteurs 'High-Tech' (QL>100 pour l'un d'entre eux, QL>75 pour le deuxième). Douze d'entre elles ont un QL supérieur à 110 pour au moins un secteur de service, quatorze pour au moins un secteur manufacturier.

La distribution centre/périphérie de ces villes correspond plus ou moins à celle observée pour le système urbain en totalité, mais il est important de noter que cinq de ces vingt-huit villes sont des AM: les AM sont donc sur-représentées dans ce groupe. Par contre, la distribution des villes selon les régions est très fortement biaisée: nous retrouvons une prépondérance de villes ontariennes (15), une légère sur-représentation des Prairies, et une sous-représentation des trois autres régions.

5.1.3 Classe 3: 'Milieux High-Tech'

Cette classe de villes, qui en comporte treize, se distingue par le fait qu'elle est composée d'un ensemble de villes à spécialisation 'High-Tech' multiple. Toutes sauf quatre ont au moins trois secteurs 'High-Tech' avec un QL supérieur à 100, et toutes sauf une ont au moins un de ces secteurs 'High-Tech' avec un QL supérieur à 150. Il est à noter que toutes les villes sauf une (Pembroke) bénéficient de la présence assez importante (QL autour de 100 ou plus) d'au moins deux secteurs de service 'High-Tech', et toutes ont une présence des trois secteurs. Par contre, certaines de ces villes ont une présence peu marquée des secteurs manufacturiers 'High-Tech' (notamment Victoria.BC, Regina.Man, Pembroke.Ont et Fredericton.NB qui ont un QL inférieur à 70 dans tous les secteurs manufacturiers).

Cette classe comprend six des treize AM, trois villes centrales et quatre périphériques. A part Pembroke (population de 22.830), toutes les villes ont une population supérieure à 70 000, et huit ont une population supérieure à 200 000. Seule une ville québécoise figure dans cette classe contre sept villes ontariennes. Les autres régions ont une présence plus ou moins compatible avec la distribution régionale des agglomérations.

5.1.4 Classe 4: Spécialisation manufacturière

Toutes les villes de cette classe (qui en comporte huit) ont au moins un secteur 'High-Tech' manufacturier possédant un QL supérieur à 250, cinq des villes ont deux secteurs manufacturiers avec un QL supérieur à 130, et deux villes (Montréal et Cowansville) ont quatre secteurs manufacturiers sur cinq avec un QL supérieur à 100. Par contre, seule Montréal possède un secteur de service 'High-Tech' développé, toutes les autres villes étant moins spécialisées dans les services 'High-Tech' que le système urbain canadien pris en totalité.

Tandis que les villes 'Milieux High-Tech' étaient situées de manière prépondérante en Ontario, les villes à spécialisation manufacturière sont pour la plupart (cinq sur huit) au Québec, avec deux en Ontario et une dans les Prairies. Deux de ces villes sont des AM

(Montréal et Winnipeg), et toutes les autres sont des villes centrales. On retrouve dans ce groupe un éventail complet de tailles urbaines, allant d'une population de 11 070 pour Hawkesbury.Ont à 3 100 000 pour Montréal. Ceci dit, si l'on fait exception des deux AM, toutes les autres villes de cette classe ont une population inférieure à 70 000.

5.1.5 Les trois dernières classes: hyper-spécialisation manufacturière

Les trois dernières classes peuvent être traitées ensemble dans la mesure où la plus grande d'entre elles comporte deux villes, et où toutes sont hyper-spécialisées dans un ou deux secteurs manufacturiers.

La classe 5 est composée de Brockville.Ont, hyper-spécialisée en pharmaceutique (QL=852) mais aussi en équipement de télécommunication (QL=440) et en machines de bureau (QL=392), et de Sarnia-Clearwater.Ont, hyper-spécialisée en pharmaceutique (QL=1103). Ces deux villes ont aussi au moins un secteur manufacturier pour lequel QL=0, et des secteurs de service 'High-Tech' relativement développés, se rapprochant ainsi du profil identifié pour la classe 3, qu'elles rejoignent d'ailleurs dans l'arbre des classes. Il est à noter que ces deux villes ontariennes rejoignent la classe à prépondérance ontarienne.

La classe 6, la ville de Granby, est hyper-spécialisée en équipement de télécommunication (QL=1732) ainsi qu'en aéronautique (QL=364). Elle possède aussi un secteur développé en machinerie de bureau (QL=242) et en services informatiques (QL=138). Le profil de Granby se rapproche du profil de la classe 4 - 'spécialisation manufacturière'. Cette ville québécoise rejoint la classe à prépondérance québécoise.

Finalement, la classe 7 (Woodstock.Ont) n'a pratiquement aucune industrie ou service 'High-Tech' mise à part une hyper-spécialisation dans le domaine du matériel scientifique et professionnel. Malgré son hyper-spécialisation dans ce domaine, son manque de toute autre présence 'High-Tech' la fait rejoindre les classes 1 et 2, classes à faible ou très faible présence 'High-Tech'.

5.2 Commentaires sur la typologie

Cette typologie relativement détaillée peut-être résumée assez simplement. La grande majorité des villes Canadiennes ont une très faible présence d'industries 'High-Tech'. Les classes 1, 2 et 7, qui constituent l'ensemble des villes de ce type, regroupent cent-vingt-huit des cent-cinquante-deux agglomérations de plus de 10 000 habitants. Seules cinq de ces villes ont une population de plus de 200 000 habitants, et dix-neuf ont une population de plus de 100 000. La plupart des villes périphériques (quatre-vingt-six sur quatre-vingt-dix) s'y trouvent. Bien que plusieurs villes centrales (trente-sept sur quarante-neuf) et des AM (cinq sur treize) s'y trouvent aussi, les villes centrales et les AM sont sous-représentées dans cette classe.

Une minorité de villes bénéficient de secteurs 'High-Tech' relativement développés. En gros, ces villes ce divisent en deux groupes: les villes ontariennes[39] (classe 3 et 5) qui ont une spécialisation en services 'High-Tech' ainsi qu'une certaine spécialisation manufacturière, et les villes québécoises[40] qui sont spécialisées dans un ou plusieurs secteurs manufacturiers mais qui ont une présence assez limitée (à part pour Montréal) de services 'High-Tech'. Les villes 'High-Tech' sont en général plus grandes: dans cet ensemble de vingt quatre villes se trouvent dix villes de plus de 200 000 habitants, et dix-huit de plus de 50 000 habitants. De plus, ce groupe ne comprend que quatre agglomérations périphériques, dont trois de taille supérieure à 70 000 qui peuvent être considérées comme des centres régionaux (l'exception étant Pembroke, ville périphérique de 22 830 habitants).

6.0 L'évolution des classes de 1971 à 1991

La section 5 décrit la composition et les spécificités des classes de ville pour l'année 1991. Cependant, sur les 20 années préalables, la composition de ces classes a évolué, et il est intéressant de retracer leur évolution. Afin de simplifier l'analyse, nous avons fait

[39] Ce groupe de 15 villes comprend aussi deux villes de C-B (Vancouver et Victoria), deux villes des Prairies (Calgary et Regina), la ville de Québec et la ville de Fredericton.
[40] Ce groupe de neuf villes comportes deux villes Ontariennes, Hawkesbury et Stratford, ainsi qu'une ville des Praires, Winnipeg.

subir aux quotients de localisation de 1981 et de 1971 une analyse de discriminant selon la définition des classes de 1991. Autrement dit, les classes décrites en 1971 et en 1981 ont les mêmes caractéristiques que les classes définies ci-dessus pour l'année 1991. L'intérêt de procéder par cette méthode est la possibilité de suivre l'évolution de villes particulières passant d'une classe à l'autre au fil des ans. Le désavantage est que nous ne pouvons pas savoir si la classification de 1991 est la plus appropriée pour définir la distribution des secteurs 'High-Tech' en 1981 et en 1971.

Afin de simplifier l'analyse nous n'allons que considérer les classes 1,2,3 et 4. Comme nous l'avons vu, la classe 5 s'apparente à la classe 3, la classe 6 à la classe 4, et la classe 7 aux classes 1 et 2. Sur les trois années analysées les classes 5, 6 et 7 ne comprennent jamais plus de 4 villes, et nous considérerons, dans la discussion qui suit, que, si une ville passe d'une classe vers celle à laquelle elle s'apparente, il n'y a pas eu changement de classe.

6.1 Structure de chaque classe de 1971 à 1991

D'après l'analyse de l'évolution des villes de classe en classe, nous voyons qu'il y a eu une certaine diffusion des secteurs 'High-Tech' de 1971 à 1991, mais que cette diffusion est très lente. En vingt ans, le nombre de villes à vocation 'High-Tech' n'a augmenté que de dix. De plus cette diffusion suit de près la hiérarchie urbaine. En 1971, huit des quatorze villes 'High-Tech' avaient plus de 100 000 habitants, en 1981 treize des dix-huit villes et en 1991, onze des vingt-quatre villes. Malgré le fait qu'entre 1981 et 1991 de plus en plus de petites villes soient concernées, il n'en demeure pas moins qu'en 1971, six sur quatorze villes 'High-Tech' étaient périphériques, en 1981 trois sur dix-huit et en 1991 quatre sur vingt-quatre. Donc, même si des villes plus petites semblent être concernées par le phénomène 'High-Tech' en 1991, ces petites villes sont à proximité d'un centre métropolitain d'envergure et, de 1971 à 1991, il y a une nette diminution (en termes absolus et en pourcentage) du nombre de villes périphériques 'High-Tech'.

En ce qui concerne la distribution régionale, nous remarquons que le nombre de villes 'High-Tech' dans les provinces Atlantiques, la C-B et les Prairies n'a pas évolué entre

1971 et 1991[41]. La *totalité* des villes qui ont rejoint les rangs des villes 'High-Tech' se trouvent en Ontario et au Québec. En Ontario, entre 1971 et 1991, six villes supplémentaires ont rejoint la classe 'milieux High-Tech', et une la classe 'spécialisation manufacturière'. Au Québec, cinq villes ont rejoint la classe 'spécialisation manufacturière'.

Une évolution semblable peut-être notée en ce qui concerne l'évolution de la classe 'faible présence High-Tech': ici aussi, entre 1971 et 1991 ce sont le Québec et l'Ontario qui ont augmenté leur présence (passant de quatre à six et de treize à quinze respectivement) alors que l'Atlantique s'est maintenue (deux villes) et la C-B ainsi que les Prairies ont diminué leur présence (passant de trois villes à une seule et de sept villes à quatre respectivement). En contrepartie, l'Atlantique a maintenu sa présence dans la classe 'sans High-Tech' à quinze villes tandis que la C-B et les Prairies y ont augmenté leur présence passant de dix-neuf à vingt et un et de quinze à dix-neuf respectivement. Le Québec y réduit sa présence de sept villes et l'Ontario de huit villes.

Il y a donc eu un processus de concentration relatif des industries 'High-Tech' dans les villes ontariennes et québécoises aux dépens des villes des Prairies et de la C-B. Vu la distribution du 'High-Tech' en 1971, cette concentration géographique n'avait rien d'inéluctable: en 1971 ni l'Ontario ni le Québec étaient sur-représentées dans les classes 'High-Tech', la seule région véritablement sur-représentée étant celle des Prairies. C'est entre 1971 et 1991 que la prédominance de ces deux régions dans les secteurs 'High-Tech' s'est véritablement assise. Par contre, cette prédominance est peut-être due à un phénomène de diffusion des ces industries à partir des agglomérations les plus grandes et les plus anciennes - qui se trouvent en Ontario et au Québec: si l'on considère les grandes zones métropolitaines (100km autour de chaque AM), la distribution des industries High-Tech a peu évolué entre les régions.

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[41] En Atlantique nous retrouvons une ville 'Milieux High-Tech', en C-B deux villes de ce type, et dans les Prairies trois villes de ce type et une ville 'Spécialisation Manufacturière', sauf en 1991 où nous n'y retrouvons que deux villes 'Milieux High-Tech'.

De la même façon, le déséquilibre centre-périphérie est allé en augmentant de 1971 à 1991, et seul le déséquilibre concernant la taille des villes s'est un peu résorbé - mais au profit de villes proches de grandes métropoles.

6.2 Remarques sur l'évolution de villes de classe en classe

Nous pouvons résumer de manière assez simple la discussion ci-dessus. D'abord, la grande majorité des villes qui en 1971 avaient une présence 'High-Tech' très faible ou nulle ont encore cette caractéristique aujourd'hui. Il y a cependant certains échanges entre les classes 1 et 2, certaines villes à 'faible présence High-Tech' allant vers la classe 'sans High-Tech' et *vice-versa*.

La classe 3, 'milieux High-Tech', émane de deux sources principales: la classe 3 elle-même et la classe 2 'faible présence High-Tech'. Toutes les villes ayant accédé à cette classe sont de taille assez importante (plus de 70 000).

La classe 'spécialisation manufacturière' provient principalement des classes à faible 'High-Tech', les classes 1 et 2. Toutes les villes ayant accédé à cette classe sont de taille assez faible (moins de 70 000) à part Montréal, et toutes les villes de cette classe sont, sans exception, soit centrales soit des AM.

Nous pouvons donc dire que les changements de classification sont assez rares: les changements qui ont eu lieu entre 1971 et 1991 ont tendance à être de la classe 1, 'sans High-Tech', à la classe 2 , 'faible présence High-Tech', (et *vice-versa*), de la classe 2 à la classe 3(+5), 'milieux High-Tech' et de la classe 1 à la classe 4(+6), 'spécialisation manufacturière'. Il existe aussi une certaine tendance à suivre un parcours inverse, de la classe 3(+5) à la classe 1 ou 2. Il est intéressant de noter qu'il y a très peu d'échanges entre la classe 3(+5) et la classe 4(+6), seul Montréal ayant fait ce parcours, et Brockville le parcours inverse.

7.0 Les caractéristiques socio-économiques des diverses classes[42]

Ayant défini ces sept classes de villes, sept classes que nous avons réduites à quatre, nous en explorons maintenant certaines caractéristiques. Il est important de noter la nature purement exploratoire de cette analyse: nous ne prétendons ni découvrir les 'causes' de la concentration 'High-Tech', ni conclure que sa présence ou son absence soit la 'cause' des caractéristiques dévoilées. Cependant, ces résultats pourront servir comme point de départ à une analyse plus poussée des facteurs de localisation des industries High-Tech.

Deux approches ont étés prises pour mesurer les liens entre secteur 'High-Tech' et certaines caractéristiques socio-économiques. D'une part, nous avons effectué une comparaison de la moyenne de divers indicateurs pour chacune des quatre grandes classes de notre typologie. Ces comparaisons sont indicatives, mais, surtout pour les classes qui englobent des villes à caractéristiques très différentes (en particulier la classe 4, 'spécialisation manufacturière') les moyennes doivent être utilisées avec précaution. L'autre approche a été de calculer les QL pour deux secteurs 'High-Tech' agrégés ('Manufactures', regroupant les cinq secteurs manufacturiers, et 'Services', regroupant les trois secteurs de services), et de faire une analyse de corrélation entre ces deux QL et les indicateurs socio-économiques, sans faire référence à la typologie élaborée ci-dessus. Nous pouvons d'ores et déjà dire que l'analyse de corrélation conforte les conclusions tirées de l'étude des moyennes.

En gros, un fort clivage existe entre les villes 'milieux High-Tech' et les villes 'spécialisation manufacturière'. En effet, ce sont les villes 'milieux High-Tech' qui ont les populations les mieux éduquées, les salaires moyens les plus élevés, les taux de chômage les plus bas, et ce en 1981 ainsi qu'en 1991. Par contre, les villes 'spécialisation manufacturière' ont les indicateurs soit les moins bons, soit très légèrement meilleurs que celles des villes 'sans High-Tech' - mais toujours éloignés des indicateurs pour les villes 'milieux High-Tech'. Ce sont en fait les villes de la classe 2

[42] Les résultats détaillés sont disponibles sur demande

'faible présence High-Tech' qui se rapprochent le plus, en termes de caractéristiques socio-économiques, des villes 'Milieux High-Tech'.

Il est à noter qu'un clivage semblable existe en ce qui concerne la migration: ce sont les villes 'milieux High-Tech' et, dans une moindre mesure, celles à 'faible présence High-Tech' qui possèdent la population la plus mobile (% de personnes venant de l'extérieur de la province), et les villes à 'spécialisation manufacturière' qui ont la population la moins mobile.

Comme il a été mentionné plus haut, notre analyse de corrélation conforte ces conclusions dans la mesure où des liens significatifs (sig.R > 95%) existent entre tous les indicateurs retenus et la concentration de services 'High-Tech', mais aucun lien significatif existe (sig.R < 90%) entre la concentration de manufactures 'High-Tech' et ces mêmes indicateurs. Ces conclusions confirment notre analyse des moyennes dans la mesure où les 'milieux High-Tech' se distinguent par leur forte concentration de services 'High-Tech', et les villes à 'spécialisation manufacturière' se distinguent par la forte présence de manufactures 'High-Tech'.

En ce qui concerne la taille des entreprises, les villes 'sans High-Tech' se distinguent comme ayant le plus grand pourcentage d'établissements de moins de 20 employés, que ce soient des établissement de tous secteurs confondus, du secteur manufacturier ou du secteur des services supérieurs. Par contre, ce sont les villes 'milieux High-Tech' qui ont le plus de grands établissements (plus de 20 employés), que ce soient des établissements de tous secteurs confondus ou des établissements de service supérieur. Ce sont cependant les villes à 'spécialisation manufacturière' qui ont de très loin le pourcentage le plus élevé de grands établissements manufacturiers. Nous trouvons donc qu'il y a une tendance à ce que les villes 'High-Tech' aient un plus grand pourcentage de grandes entreprises et qu'aucun lien n'est apparent entre les petites entreprises et le 'High-Tech'.

8.0 Croissance d'emplois

Il n'est pas possible de présenter ici tous les résultats portant sur la croissance d'emplois, et nous en ferons une étude plus détaillée dans un prochain article. Il est cependant intéressant de consulter certains résultats agrégés qui sont présentés dans l'annexe 2. Pour les trois périodes présentées (1971 à 1981, 1981 à 1991 et 1971 à 1991) nous voyons que ce sont les villes de la classe 4 ('spécialisation manufacturière') qui ont eu la croissance d'emplois 'High-Tech' la plus faible. De plus pour les périodes 1971 à 1981 et 1971 à 1991 cette classe a aussi la croissance d'emplois totale la plus faible. Pour la période 1981 à 1991, la classe 4 et la classe 1 ('sans High-Tech') se rejoignent avec des taux de croissance totaux (12%) nettement plus faibles que ceux enregistrés pour les classes 2 ('faible présence High-Tech', 16%) et 3 ('milieux High-Tech', 23%).

En désagrégeant les résultats, nous voyons que c'est surtout dans le domaine des services 'High-Tech' que la classe 4 croît le plus faiblement. En ce qui concerne les manufactures 'High-Tech', la croissance de la classe 4 sur l'ensemble de la période 1971 à 1991 est inférieure à celle observée pour les classes 3 ('milieux High-Tech', 37%) et 2 ('faible présence High-Tech', 39%), mais elle s'en rapproche (33%) et se distingue nettement de la croissance de la classe 1 ('sans High-Tech', 5%).

Il est important de souligner que, pour les trois périodes en considération, la croissance d'emplois dans les secteurs manufacturiers 'High-Tech' a été bien en dessous de la croissance moyenne d'emplois pour le système urbain canadien (annexe 3). Ce sont les *services* 'High-Tech' qui ont cru de manière très rapide tout au long de la période d'étude avec des taux de croissance plus de trois fois supérieurs à la moyenne nationale. Il n'est donc pas très surprenant de constater que la classe de villes spécialisées en manufactures 'High-Tech' n'a pas connu des taux de croissance très élevés.

En ce qui concerne les taux de croissance du secteur 'High-Tech' au sein des systèmes urbains régionaux, des villes de taille différentes et des villes centrales et périphériques, la figure ci-dessous résume l'évolution entre 1971 et 1991.

figure 2: Croissance d'emplois 'High-Tech' dans diverses catégories de villes canadiennes

REGIONS (systèmes urb.)	croissance 1971 à 1991	CENTRE/ PERIPHERIE	croissance 1971 à 1991	VILLES DE TAILLE DIFF.	croissance 1971 à 1991
Prairies	283%	villes centrales	222%	50 à 100 000	194%
C-B	253%	A.M.	132%	100 à 300 000	186%
Atlantique	141%	villes périph.	116%	300 000 et +	132%
Ontario	121%			25 à 50 000	62%
Québec	93%			10 à 25 000	101%

Cette figure résume en quelque sorte la discussion sur l'évolution de la répartition du secteur 'High-Tech'. Nous y voyons qu'entre 1971 et 1991, ce sont les villes centrales qui ont bénéficié d'une croissance très soutenue d'emplois 'High-Tech', ainsi que les villes d'entre 50 et 300 000 habitants. Les plus petites villes ainsi que les villes périphériques ont eu une croissance, certes, mais la plus faible. Au niveau régional, nous voyons que ce sont les régions de l'ouest qui ont crû le plus rapidement, et que les anciennes régions industrielles ont eu une croissance beaucoup plus faible. Cela dit, les systèmes urbains ontarien et québécois regroupent encore, en 1991, 74% de tous les emplois 'High-Tech' (50% et 24% respectivement) contre 66% de tous les emplois (43% et 23% respectivement). Bien que cette domination se desserre petit à petit, elle est encore bien ancrée, en particulier en ce qui concerne le système urbain ontarien.

9.0 Autres indicateurs de répartition

Il n'est pas possible de couvrir ici l'ensemble des indicateurs de répartition spatiale du secteur 'High-Tech' (ex: indice de concentration), mais une analyse sommaire de la répartition du secteur permet de constater à quel point il est concentré vers le haut de la hiérarchie urbaine. La figure 2 indique pour 1971, 1981 et 1991 le pourcentage de tous les emplois 'High-Tech' dans les trois villes et les dix villes avec le plus d'emplois de ce type.

figure 3: Proportion des emplois du système urbain au sommet de la hiérarchie urbaine

	1971		1981		1991	
	% des emplois High-Tech	% de tous les emplois	% des emplois High-Tech	% de tous les emploi	% des emplois High-Tech	% de tous les emplois
3 villes	**65%**	45%	**59%**	41%	**56%**	41%
10 villes	**82%**	63%	**82%**	64%	**81%**	65%

figure 3: pour chaque année, les trois villes et les dix villes ayant le plus d'emplois 'High-Tech' ont été retenues. Le pourcentage des emplois High-Tech du système urbain, ainsi que le pourcentage d'emplois tous secteurs du système urbain, sont indiqués.

Deux remarques s'imposent. Premièrement, il y a une très grande concentration d'emplois 'High-Tech' dans un petit nombre de villes, et ces villes sont au sommet de la hiérarchie urbaine: Toronto, Montréal et Vancouver sont, pour chacune des trois années, les trois villes ayant le plus d'emplois 'High-Tech'. Parmi les sept suivantes nous retrouvons, à peu de chose près, les sept prochaines villes par taille de population. En 1991, seule Kitchener figure parmi les dix villes ayant le plus d'emplois 'High-Tech' sans être dans les dix premières en termes de taille (elle est douzième). Deuxièmement, nous remarquons un léger desserrement au niveau des trois villes les plus importantes, desserrement qui est presque entièrement absorbé par les sept prochaines villes.

Une autre approche à la mesure de la concentration spatiale du secteur est de se référer aux quotients de localisation pour le secteur en entier. Là nous ne trouvons, en 1991, que seize villes ayant un QL 'High-Tech' supérieur à 100, dont neuf ont un QL supérieur à 120. Ces neuf villes ont d'ailleurs toutes un QL supérieur à 146. Il est intéressant de recouper cette analyse avec notre analyse de regroupement. En effet, parmi les seize villes avec un QL 'High-Tech' supérieur à 100, nous retrouvons onze des quinze villes de la classe 'Milieux High-Tech', trois[43] de la classe 'spécialisation manufacturière' et deux[44] de la classe 'Faible Présence High-Tech'. Comme nous le laisse entrevoir l'annexe 3, une spécialisation dans une ou plusieurs manufactures 'High -

[43] Granby, Montréal et Cowansville.
[44] Midland et Belleville. Ces deux villes ontariennes sont très spécialisées dans deux industries manufacturiers 'High-Tech' (QL>200) mais n'ont pratiquement aucune autre présence 'High-Tech'.

Tech' n'entraîne pas nécessairement une spécialisation au niveau du secteur en entier car, en 1991, il y a presque 50% de plus d'emplois dans les industries de service 'High-Tech' que dans les industries manufacturières 'High-Tech'. Ce sont donc les secteurs de services qui portent le plus de poids dans le calcul du quotient de localisation du secteur 'High-Tech' en entier. En 1981 et en 1971 ceci n'était pas les cas, et c'est durant la dernière décennie que les services 'High-Tech' ont dépassé les manufactures en termes d'emplois.

Il est important de remarquer que ce ne sont pas nécessairement les plus grandes villes qui sont hautement spécialisées en matière d'emploi 'High-Tech': nous avons vu que des petites villes centrales peuvent aussi être spécialisées. Par contre, les grandes villes dominent très nettement en termes de nombre d'emplois 'High-Tech', et cette domination n'a que très peu évolué au cours des vingt années étudiées.

10.0 Conclusions

10.1 Conclusions de l'analyse

La distribution des activités 'High-Tech' est très inégale dans le système urbain canadien. Nous avons observé une très forte concentration de ces activités dans un nombre restreint de villes. De plus, il y a une forte tendance à l'agglomération soit autour, soit au sein même, des plus grandes villes canadiennes. Bien que le nombre de villes ayant un secteur 'High-Tech' bien développé ait crû de quatorze à vingt quatre entre 1971 et 1991, le nombre de villes périphériques ayant cette caractéristique a baissé: il y a donc eu, au cours de ces vingt années, un accroissement de la centralité des villes de plus de 300 000 habitants en termes d'activités 'High-Tech'.

Il ne faut pas oublier, cependant, que ce groupe de vingt-quatre villes n'a pas la monopole absolu des industries 'High-Tech': même dans la classe nommé 'sans High-Tech' nous retrouvons vingt-trois villes avec une concentration d'une des huit industries supérieure à la moyenne nationale. Les vingt-huit villes de la classe 2, 'faible présence High-Tech', ont aussi des concentrations élevées d'emplois dans certaines industries,

mais ces concentrations élevées sont contrebalancées par une absence totale d'autres industries.

En ce qui concerne les vingt-quatre villes dites 'High-Tech', un clivage important existe entre celles que l'on a nommé 'milieux High-Tech' et celles qui sont à 'spécialisation manufacturière'. Les caractéristiques de ces deux types de villes sont très polarisées: les 'milieux High-Tech', villes avec une présence assez importante de la plupart des secteurs 'High-Tech', sont grandes (population élevée), et bénéficient des taux de chômage les plus bas, de salaires les plus élevés, de populations les plus instruites etc... Le contraire est vrai pour les villes 'spécialisation manufacturières'. De plus, les études de corrélation montrent que les villes avec une plus forte concentration de *services* 'High-Tech' ont tendance à avoir des indicateurs socio-économiques 'meilleurs', tandis qu'aucune relation ne semble exister entre la concentration de *manufactures* 'High-Tech' et ces mêmes indicateurs.

Il est important de rappeler que nous ne pouvons conclure à une relation de cause à effet entre 'services High-Tech' ou 'milieux High-Tech' et ces indicateurs. Il est probable que les secteurs de services 'High-Tech' ont tendance à rechercher des situations centrales dans des villes importantes afin de trouver la main d'oeuvre, les marchés et les réseaux de communications dont ils ont besoin. De ce fait, certains des facteurs qui caractérisent ce que nous avons appelé les 'milieux High-Tech' sont sans doute caractéristiques des grandes villes canadiennes et n'ont pas de rapport direct avec le phénomène étudié. C'est l'hypothèse que nous favorisons compte tenu de la petite taille (en termes d'emplois), du secteur 'High-Tech'. De la même façon, ce ne sont sans doute pas les manufactures 'High-Tech' qui sont la cause des taux de chômage plus élevés et des bas salaires qui caractérisent les villes à 'spécialisation manufacturière': par contre, les modèles de désintégration verticale (Scott, 1988) suggèrent que les centres de montage 'High-Tech' auront tendance à rechercher une main d'oeuvre bon marché sans toutefois se couper entièrement des réseaux de communications et des avantages liées à la centralité, modèle qui est vérifié par notre analyse.

Ceci nous renvoie directement aux problèmes de définition du secteur 'High-Tech': comme nous venons de le voir, une définition reposant sur la nature des produits finaux regroupe un bon nombre d'industries manufacturières qui n'ont pas une croissance d'emplois très élevée et qui ne semblent pas attirées par des niveaux d'instruction très élevés. Si le but d'analyser ce secteur est de cerner les caractéristiques des activités d'avenir, il serait sans doute nécessaire de redéfinir ce que l'on entend par 'High-Tech': et il semblerait que des définitions basées sur les procédés de fabrication et/ou sur le capital intellectuel soient mieux à même de cerner le secteur que des définitions 'classiques' reposant sur une classification du type employé par Statistiques Canada.

L'analyse des taux de croissance des divers secteurs 'High-Tech' définis de manière classique révèle que ces secteurs n'ont pas nécessairement crû plus rapidement que les autres au cours des vingt années étudiées. En effet, les secteurs de manufactures 'High-Tech' ont connu une croissance largement inférieure à la croissance d'emploi totale pour l'ensemble du système urbain Canadien. Entre 1971 et 1991, aucune industrie manufacturière 'High-Tech' n'a crû plus rapidement que l'emploi total au Canada. En contrepartie, ce sont les services 'High-Tech' qui ont connu une croissance fulgurante: ces secteurs ont cru de 368% au cours des vingt années, les services informatiques ayant crû de plus de 2000%, contre une croissance d'emploi nationale de 73%.

10.2 Commentaire méthodologique

Cette analyse statistique nous a permis d'appréhender la distribution du secteur 'High-Tech' dans le système urbain canadien. Elle met en avant une typologie des villes canadiennes et identifie certaines caractéristiques propres aux classes qui en ressortent. Il est clair cependant que ces résultats ne peuvent être qu'un début, et seules des analyses plus poussées pourront fournir des réponses à certaines questions qui ressortent de notre analyse. Par exemple, Montréal, malgré un secteur de service semblable à celles des villes 'Milieux High-Tech', se retrouve dans une classe de petites villes manufacturières, et ceci en vertu de sa concentration élevée en emplois 'High-Tech' manufacturiers. Il est évident que la structure de son secteur 'High-Tech' diffère grandement de celle de St-Jérome. En effet, Montréal possède une multitude

d'entreprises dans l'ensemble du secteur, tandis que St-Jérome ne bénéficie que d'un petit nombre de gros employeurs manufacturiers. La structure interne du secteur est d'un grand intérêt, ainsi que les relations qui peuvent exister entre les diverses entreprises et industries 'High-Tech', et ceci ne peut pas ressortir d'une analyse du type employé dans cet article.

Un autre exemple de question qui ressort de notre analyse est celle de la présence, dans certaines villes périphériques des classes à faible 'High-Tech', de hautes concentrations d'emplois dans une ou deux industries 'High-Tech'. Ces villes mériteraient une analyse plus détaillée afin d'identifier la nature de ces emplois, et les conditions qui ont fait que ces emplois ont pu s'installer dans ce type de ville. Là encore, il faudra quitter le domaine de l'étude statistique et se tourner vers des études de terrain.

Tout l'intérêt d'une analyse statistique est de fournir un cadre général, de décrire en gros les tendances de localisation des industries. Elle ne peut remplacer des études de terrain et des études de cas, mais elle peut permettre l'identification de questions à poser et elle peut indiquer la limite de généralisations qui sont souvent faites à partir d'études de cas particuliers .

10.3 Politiques d'emploi et politiques régionales

Les résultats de l'analyse soulèvent des questions importantes en ce qui concerne les politiques d'emploi et les politiques régionales axées sur le 'High-Tech'. D'abord, il faut reconnaître que le secteur 'High-Tech' tel que défini dans cet article ne représente que 3,63% de tous les emplois au Canada. Ce pourcentage est du même ordre de grandeur que celui mis en avant par Glasmeier (1985) pour les USA (environ 5%). Donc, même si ce secteur croissait rapidement, il faudrait qu'il engendre d'importants effets multiplicateurs afin d'avoir un impact réel sur l'emploi. Or, nous avons vu que les secteurs manufacturiers 'High-Tech', à part le fait qu'ils ont plus tendance à se localiser dans des villes avec des niveaux d'éducation et des salaires assez bas, n'ont pas crû de manière particulièrement rapide au cours de la période d'étude. Les politiques provinciales et fédérales citées en début d'article, qui visent les industries de manufacture 'High-Tech'

classiques, ne se concentrent pas à priori sur des filières très porteuses. Evidemment, le marché de ces industries est peut-être en expansion, et les investissements sont sans doute nécessaires, mais l'impact global *en termes d'emplois et de conditions de travail* risque d'être au mieux négligeable, au pire néfaste.

Par contre ce sont les services 'High-Tech' qui connaissent une croissance rapide et qui fleurissent dans des localisations à hauts salaires et à hautes qualifications. Cependant, les industries de service - peut-être pour des raisons de perception historique, ou peut-être à cause des problèmes de définition - sont rarement visées par des politiques d'emplois, et sont rarement perçus comme étant le moteur de la croissance de la 'nouvelle économie' technologique.

En ce qui concerne les politiques régionales (et locales), tout semble démontrer que des politiques axées sur le 'High-Tech' défini de manière classique, que ce soit les manufactures ou les services, sont vouées à l'échec. Les services se concentrent plus que les manufactures dans les grandes villes, et les manufactures ne croissent pas très vite, tout en recherchant des localisations centrales. Certaines démarches ponctuelles pourront évidemment réussir, et le fait que certaines villes périphériques ont une spécialisation dans un secteur 'High-Tech' montre que chaque projet devrait être étudié au cas par cas. Mais tenter d'axer une politique nationale de revitalisation des milieux périphériques (que ce soit par le biais de politiques régionales traditionnelles ou par l'encouragement d'initiatives locales) par les industries 'High-Tech' ne paraît pas être une possibilité réaliste: en effet, tout montre qu'au cours des vingt années étudiées les industries 'High-Tech' ont convergé, non seulement vers les grandes villes (les AM, agglomérations de plus de 300 000 habitants), mais aussi vers l'Ontario et le Québec. Effectivement, les seules petites villes qui ont rejoint les villes 'High-Tech' durant cette période sont dans ces deux provinces. Les trois autres régions ont peut-être connu une croissance d'emplois 'High-Tech' plus importante que l'Ontario et le Québec, mais cette croissance a été concentrée dans une poignée de grandes villes. Seules ces deux régions ont vu une certaine diffusion de ces emplois vers les villes proches des grands centres, mais il n'y a eu aucune diffusion vers les villes périphériques.

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Classification des 152 agglomérations canadiennes pour 1991

note: le code M signifie Agglomération Métropolitaine, C signifie ville centrale, P signifie ville périphérique

Agglom.	Cl.	pop. 1991	Rég.	
Alma	1	30195	Qc	P
Amos	1	13785	Qc	P
BaieComeau	1	32820	Qc	P
Bathurst	1	36165	Atl	P
Brandon	1	38565	Pra	P
CampbellRv	1	30860	BC	P
Campbelton	1	17185	Atl	P
Camrose	1	13420	Pra	C
Charlottwn	1	57475	Atl	P
Chatham	1	43555	Ont	C
Chicoutimi	1	160930	Qc	P
Chilliwack	1	60255	BC	C
Cobourg	1	15080	Ont	C
Corner Brk	1	11055	Atl	P
Courtenay	1	44525	BC	P
Cranbrook	1	16450	BC	P
DawsonCree	1	10980	BC	P
Dolbeau	1	15025	Qc	P
Duncan	1	27385	BC	C
Dunnville	1	12130	Ont	C
Edmundston	1	22480	Atl	P
ElliotLake	1	15040	Ont	P
Estevan	1	11375	Pra	P
FtMcMurray	1	49205	Pra	P
FtStJohn	1	14160	BC	P
Gander	1	33795	Atl	P
Gaspe	1	16400	Qc	P
GF Windsor	1	25290	Atl	P
GrndCentre	1	24265	Pra	P
GrndPrairi	1	28265	Pra	P
Haileybury	1	14995	Ont	P
Haldimand	1	20570	Ont	C
Huntsville	1	15000	Ont	P
Joliette	1	37525	Qc	C
Kamloops	1	67855	BC	P
Kapuskasng	1	10340	Ont	P
Kelowna	1	111850	BC	P
Kenora	1	15910	Ont	P
Kentville	1	24085	Atl	C
Kitimat	1	11305	BC	P
La Tuque	1	13050	Qc	P
Labrad Cty	1	11390	Atl	P
Leamington	1	35790	Ont	P
Lindsay	1	20720	Ont	C
Lloydminst	1	17280	Pra	P
Matane	1	14855	Qc	P
Matsqui	1	113560	BC	C
MedicineHt	1	52685	Pra	P
Moncton	1	106505	Atl	P
Montmagny	1	11860	Qc	C
Moose Jaw	1	35555	Pra	P
Nanaimo	1	73550	BC	C
Nanticoke	1	22725	Ont	C
NewGlasgow	1	38675	Atl	P
North Bay	1	63280	Ont	P
NthBattlef	1	18455	Pra	P
Penticton	1	45080	BC	P
Port Hope	1	11505	Ont	C
PortagelaP	1	13180	Pra	C
Powell Riv	1	18480	BC	P
PrinceAlbt	1	41255	Pra	P
PrinceGeor	1	69650	BC	P
PrinceRupt	1	18450	BC	P
PrtAlberni	1	26595	BC	P
Quesnel	1	23305	BC	P
Red Deer	1	58135	Pra	P
Rimouski	1	47815	Qc	P
Riv.duLoup	1	23455	Qc	P
Roberval	1	11630	Qc	P
SalaberryV	1	40060	Qc	C
SaultSteMa	1	85010	Ont	P
Selkirk	1	9815	Pra	C
Sept Iles	1	27275	Qc	P
Shawinigan	1	61670	Qc	P
Simcoe	1	15540	Ont	C
Sorel	1	46365	Qc	C
St John	1	124980	Atl	P
Ste Marie	1	10540	Qc	C
SteHyacint	1	50195	Qc	C
Strathroy	1	10565	Ont	C
Sudbury	1	157615	Ont	P
Summerside	1	15240	Atl	P
SwiftCurrt	1	14815	Pra	P
Sydney	1	116095	Atl	P
Terrace	1	18905	BC	P
Thetford M	1	30275	Qc	C
Thompson	1	15045	Pra	P
ThunderBay	1	124425	Ont	P
Timmins	1	47465	Ont	P
Trois Riv.	1	136305	Qc	P
Truro	1	44010	Atl	C
Vernon	1	48135	BC	P
Victoriavl	1	39830	Qc	C
Wallacebrg	1	11845	Ont	C
Wetaskiwin	1	10640	Pra	C
Weyburn	1	9675	Pra	P
WilliamsLk	1	34685	BC	P
Windsor	1	262075	Ont	P
Yorkton	1	18025	Pra	P
Barrie	2	92165	Ont	C
Belleville	2	94995	Ont	P
Bracebridg	2	12310	Ont	P
Brantford	2	97105	Ont	C
Collingwd	2	13510	Ont	C
Cornwall	2	53540	Ont	C
Edmonton	2	839925	Pra	A
Halifax	2	320505	Atl	A
Hamilton	2	599760	Ont	A
Kingston	2	136405	Ont	P
Kirkland L	2	10440	Ont	P
Lachute	2	11725	Qc	C
Lethbridge	2	60975	Pra	P
London	2	381520	Ont	A
Magog	2	20425	Qc	P
Midland	2	40375	Ont	P
Orillia	2	34070	Ont	C
Owen Sound	2	30290	Ont	P
RouynNoran	2	38740	Qc	P
Saskatoon	2	210025	Pra	P
Sherbrooke	2	139195	Qc	P
St Georges	2	23095	Qc	C
St John_s	2	171860	Atl	P
StCatherin	2	364545	Ont	A
Tillsonbrg	2	12020	Ont	C
Val d_Or	2	30045	Qc	P
Whitehorse	2	17925	BC	P
Yellowknif	2	15175	Pra	P
Calgary	3	754030	Pra	A
Frederictn	3	71865	Atl	P
Guelph	3	97210	Ont	C
Kitchener	3	356420	Ont	A
Oshawa	3	240110	Ont	C
Ottawa	3	920855	Ont	A
Pembroke	3	22830	Ont	P
Peterbrgh	3	98060	Ont	P
Quebec	3	645545	Qc	A
Regina	3	191695	Pra	P
Toronto	3	3893045	Ont	A
Vancouver	3	1602505	BC	A
Victoria	3	287900	BC	C
Cowansvill	4	12510	Qc	C
Drummondvl	4	60090	Qc	C
Hawkesbury	4	11070	Ont	C
Montreal	4	3127240	Qc	A
StJeanRich	4	68380	Qc	C
StJerome	4	51990	Qc	C
Stratford	4	27665	Ont	C
Winnipeg	4	652355	Pra	A
Brockville	5	38555	Ont	C
SarniaClwt	5	87870	Ont	C
Granby	6	59410	Qc	C
Woodstock	7	30080	Ont	C

Appendix 2

Emplois et Croissance d'Emplois dans les quatre classes de villes

Nombre d'Emplois HiTech dans selon la classification établie pour 1991, Système Urbain

classe 1991	1	1	1	2	2	2	3(+5)	3(+5)	3(+5)	4(+6)	4(+6)	4(+6)
	'sans Hi-Tech'			'faible présence Hi-Tech'			'Milieux Hi-Tech'			'Spécialisation manuf.'		
année	1971	1981	1991	1971	1981	1991	1971	1981	1991	1971	1981	1991
manuf hitec	4350	3595	4555	11910	16495	16575	55235	75045	75905	36145	45715	48165
serv hitec	3495	8410	15030	6735	18855	28990	25940	71620	136910	10210	20380	36365
total hitec	7845	12005	19585	18645	35350	45565	81175	146665	212815	46355	66095	84530
total emplois	1034375	1498345	1670435	1060515	1574220	1831110	2473350	3753440	4624580	1207880	1645360	1851350
Hi-Tech en % du total	0.76%	0.80%	1.17%	1.76%	2.25%	2.49%	3.28%	3.91%	4.60%	3.84%	4.02%	4.57%

Croissance d'emplois Hi-Tech selon la classification établie pour 1991, Système Urbain

	croissance (%) de 1971 à 1981				croissance (%) de 1981 à 1991				croissance (%) de 1971 à 1991			
classes 1991	1	2	3 (et 5)	4 (et 6)	1	2	3 (et 5)	4 (et 6)	1	2	3 (et 5)	4 (et 6)
	sans HT n=99	peu HT n=28	milieux n=15	manuf. n=9	sans HT n=99	peu HT n=28	milieux n=15	manuf. n=9	sans HT n=99	peu HT n=28	milieux n=15	manuf. n=9
manuf hitec	-17.36	38.50	35.86	26.48	26.70	0.48	1.15	5.36	4.71	39.17	37.42	33.25
serv hitec	140.63	179.96	176.10	99.61	78.72	53.75	91.16	78.43	330.04	330.44	427.79	256.17
total hi-tech	53.03	89.60	80.68	42.58	63.14	28.90	45.10	27.89	149.65	144.38	162.17	82.35
total emplois	44.86	48.44	51.76	36.22	11.49	16.32	23.21	12.52	61.49	72.66	86.98	53.27

Appendix 3

Croissance et nombre d'emplois 'Hi-Tech' dans le système urbain canadien

	Nombre d'emplois			Croissance (en %)		
Industries	1971	1981	1991	71 à 81	81 à 91	71 à 91
machines bureau	13615	19055	20200	39.96	6.01	48.37
aéronefs	22900	35520	39310	55.11	10.67	71.66
télécommunic.	40290	46255	40970	14.81	-11.43	1.69
pharmaceutique	12695	15025	20380	18.35	35.64	60.54
mat. scientifique et professionel	18355	25425	24665	38.52	-2.99	34.38
sous-total Manufactures Hi Tech	107855	141280	145525	30.99	3.00	34.93
services informatiques	4315	29350	93530	580.19	218.67	2067.56
études scient.	42095	90005	123835	113.81	37.59	194.18
conseil gestion	4715	23885	38830	406.57	62.57	723.54
sous-total Services Hi Tech	46410	119355	217365	157.18	82.12	368.36
Hi-Tech dans le système urbain	154265	260635	362890	68.95	39.23	135.24
Emplois dans Système Urbain	5786810	8483830	9991150	46.61	17.77	72.65
Hi-Tech en % emplois du S.U	2.67%	3.07%	3.63%			

Chapter 8

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

article by: Richard Shearmur and William Coffey (1996)

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Abstract

Since the late 1970's there has been a growing body of evidence suggesting that small establishments create proportionally more new jobs than large ones. For reasons which are perhaps as political as they are objective, these results have had a major influence on the development and implementation of regional development policy initiatives. A review of the literature reveals that not only is the evidence linking small establishments with employment growth being called into question upon its own terms, there has also been no attempt to study the spatial dispersion of this purported relationship. The empirical analysis presented in this paper introduces the spatial dimension by asking whether a link can be established between the presence of small establishments in Canadian CMA/CAs and employment growth in these cities. The analysis provides no evidence to suggest that there is a simple link between the size of establishments and employment growth. Furthermore, the results suggest that, if a relationship exists, it differs according to the size of the CMA/CAs considered.

1. Introduction

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 & 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, and 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, whilst 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[45] concentrated on a variety of top down approaches such as infrastructure provision, capital investment grants, location incentive packages

[45] The reappraisal is more general: there has been a shift away from the top-down approach in Britain and France, to name but two other countries with strong regional policy traditions.

(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).

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, whilst 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 will first of all review the evidence that small companies do indeed create more jobs than larger ones, and examine the reasons why this may be so. Whilst the evidence does appear to point this way, the policy implications are unclear for a number of reasons which will be set out below. After reviewing this evidence, the results of our analysis of 59 Canadian cities will be 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, whilst this dimension is stressed by geographers (Openshaw, 1981; Bourne, 1991 etc...) economists have only recently began to seriously take into account the spatial dimension of the phenomena that they study[46] (Krugman, 1991; Martin and Sunley, 1994; Vedder and Gallaway, 1996). 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

[46] Although Nicholas Kaldor is a notable exception to this generalisation (Targetti & Thirlwall, 1989: see articles on cumulative causation and regional policies in Parts III and IV).

employment the most, then 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 a 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. To begin with we will review the evidence linking SMEs to employment growth and review some criticisms thereof: this will serve to place our geographical analysis in a broader context.

2. Small and medium enterprises (SMEs)

2.1 Definition

It is worth stopping for a moment in order to consider what exactly 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 to standardise what is meant by the term. 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 the definitions arrived at using each data set. 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 shareholding 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 looked at, 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, in practical terms a fairly pragmatic approach is usually adopted, and whilst some additional criteria may be used in certain industries, SMEs are primarily defined in terms of employment. This leads on 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 (e.g. all establishments of less than 100 employees) but also at

discrete size classes (e.g. all establishments of between 50 and 99 employees). Failure to do so can lead to erroneous conclusions and ineffective policies[47].

2.2 Review of Recent Evidence Concerning the Job Creation Role of SMEs

As has been 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 it is manufacturing firms of below 100 employees which 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

[47]Although this point will not be elaborated upon, it is worth referring to tables 4 and 5 for an example of how errors can occur (for more details about these tables see section 3.3). If table 5 (stage 1) were consulted alone one would conclude that cities in which the proportions of establishments of less than 5, 10 and 20 employees increase witness slower employment growth. However, if discrete size classes are analysed (table 4, stage 1), it can be seen that only cities in which the proportion of establishments of 1-4 employees grows faster experience slower employment growth. For establishments in the 10-19 size class a significant inverse relationship is observed. Hence, studies which limit their analysis to cumulative size classes apparently gloss over some important distinctions and this example shows how policies implemented on the basis of such studies may have the opposite effect of that intended.

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. Whilst the difficulty of international comparisons is acknowledged the evidence does appear to indicate the rising importance of small companies in terms of employment over the 1970's and early '80's, in the manufacturing sector at least.

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 (alluded to above) is the fact the data used by Birch (the Dun & 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)[48]. 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 (this point is made by Baldwin & 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.

[48] This phenomenon is referred to as 'regression-to-the-mean'

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, 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, whilst 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) not clearly showing either small or large plants to be 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): whilst 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, whilst sectorial shifts have contributed to the phenomenon, on the basis of the evidence 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, whilst recognising the possible effects of economic cycles, has not arrived at either empirical observations or theoretical arguments convincingly describing its effects. Neither has it dealt with the time-scale over which the effect of small establishments on employment growth is meant to take effect: Baldwin & 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 & Odle, 1982; Leonard 1986; Storey & Johnson, 1987; Davis, Haltiwanger &

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[49], a number of other considerations can lead to a questioning of policy stances based upon the belief that small businesses can be focused on to the exclusion of others in order to stimulate employment.

2.3 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...)"[50] (Schumpeter, 1951). Entrepreneurs are the dynamic element which realise new combinations of factors and are a source of innovation. Particularly in a period of rapid technological change such as the current one (1980's and 1990's), during which information technology has transformed work practices in almost all economic sectors, small businesses and entrepreneurs can theoretically not only develop the new technology but also 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).

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[49] Of course, this is a conservative statement, valid for Canada on the basis of Baldwin et al (1994) and Picot et al (1994). Davis Haltiwanger and Schuh (1996) go substantially further as far as the US is concerned.
[50] Translated back from French.

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, although 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 on 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 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, whilst 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[51], although no connection has been investigated between the two.

2.4 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 for small businesses. 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 as their share of employment has decreased, thus

[51] P.A.Julien (1995) in a study of 242 small firms in Québec, selected because their product is exposed to international competition under NAFTA, reports that only 70 have taken measures to meet the threat of competition. Of course these measures are not only technological, but once again one finds only a small proportion of small firms which are 'dynamic' or 'innovative'. The most dynamic firms are in the 20-49, 50-99 and 100-249 size classes. Julien then goes on to report that a large proportion of the firms which are not reacting are in fact operating in protected environments (because a low percentage of their production is in fact affected by NAFTA). Nevertheless, it can be surmised that small firms operating in a protected provincial environment are not the most dynamic ones.

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 & Smith, 1991; Polese, 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 & 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 spatial areas. 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.

3: Establishment size and employment growth in the Canadian urban system

3.1 The Geographic Dimension and the Canadian Urban System

Some of the problems associated with levels of spatial aggregation, and spatial analysis in general, have been clearly set out by Openshaw (1981). He stresses, amongst other things, that the results of any spatial analysis can be profoundly modified according to the data's level of aggregation and to the geographic divisions which are chosen for analysis. Most of the results described above suffer from one major drawback if they are to be used as a rationale behind local or regional development policies which emphasize SMEs: they have been performed at the level of the nation or of large regions. Furthermore, 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 indisputable 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 an real link between SMEs and employment growth in Toronto may entirely overwhelm a lack of relationship across the rest of the territory. Furthermore, whilst the results of individual case studies describing the process of job creation through the support of SMEs 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 this 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), see annexe 1) was prompted by a number of considerations. First of all, the CMA/CA concept is one which 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. Whilst 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 (i.e. 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 below about 25,000. However, if local development policies - and in particular support for SMEs - is 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 within which most employment is concentrated.

3.2 Data

In order to perform the geographic analysis we have obtained data from the Statistics Canada labour force survey covering the 59 Census Metropolitan Areas (CMAs) and Census Agglomerations (CAs). This data provides 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 is derived from Revenue Canada Taxation's payroll deduction account file. The data is 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. Whilst 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 & 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 has been 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.

3.3 Methodology

For the purposes of analysis the data described above have been transformed. 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: in other words, 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[52]. 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

[52] 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.

IL, indicates the change in the proportion of establishments below the previously indicated cut-off sizes[53].

The analysis presented below has been 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)[54]. 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[55] (for a more detailed discussion of the rationale behind using these indicators, see Coffey and Shearmur, 1996 and Coffey et al, 1989). The analysis of covariance (ANCOVA) technique is used[56], with the geographic indicator as the main effect and the establishment size indicator as covariate. Employment growth is always the dependent variable. These geographic indicators are 1) region (Atlantic, Quebec, Ontario, Prairies and BC), 2) city size (over 300,000 people; 100-300,000; 50,000 to 100,000; and below 50,000) and 3) 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

[53] For mnemonic purposes, 'C' stands for 'Class', 'CL' for 'Class Less than...', 'I' for 'Increase in C' and 'IL' for 'Increase in CL'. Of course, the 'Increase' variables would be more correctly referred to as change variables, but change begins with the letter 'C'!

[54] The employment growth variable is the dependent variable in all of the subsequent analyses.

[55] The importance of these different geographic indicators is discussed in the works referred to. However, as a rule of thumb it can be said that 'Region' controls for regional differences such as resource endowment, location, regional specialisation etc..., 'Size' controls for the effects of agglomeration and urbanisation economies and 'MCP' (proximity to a major metropolitan centre) controls for the possible positive or negative effects of being located in a central or a peripheral area.

[56] see technical note

this exploratory analysis - which is that the relationship between establishment size and employment growth is tenuous - does not require the parameters to be explicited. 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[57] 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 and Kelowna.

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, at the very

[57] The studentised residual is the residual divided by its standard error.

least, 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 possible from the results of this geographic analysis to verify whether this is the case across the urban system.

3.4 Employment Growth and Establishment Size in the Canadian Urban System, 91-94

3.4.1 Employment growth and initial proportions of establishments in each size class

Table 1 details the results of the analyses relating the initial proportion of establishments in each size class to employment growth, and table 2 the results relating the initial proportion of establishments below particular cut-off points to employment growth. For each table, the stage 1 (regression) results are in the left column, the stage 2 (ANCOVA) results for each of the three geographic variables are in the three following columns, and 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 - is presented below the results of the relevant stage 2 analysis.

From the first column of table 1 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 and employment decline. If the cumulative percentages are examined (table 2) a similar conclusion can be drawn: there is a weak link between the proportion of establishments of below 200 employees and job growth (90%), as there is for the less than 500 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 it can be seen that 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 1 and 2). 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 - i.e. non existent - within each of the five regions analysed.

Controlling for CMA/CA population size reveals that, once city size is taken into account, 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%) - although the effect of establishment size on employment growth is most strongly felt when the proportion of establishments of below 500 employees (99%) and below 200 (95%) is analysed whilst 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 will be noted, however, that whilst 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 3), 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 centrality has very little effect on the significance levels associated with the initial establishment size variables. A weak negative relationship emerges between 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 it can be said that, 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 one between the percentage of establishments of below 200 (and 500) employees and faster growth, but this relationship is entirely wiped out when controlled 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, depending on city size, establishment size may relate in entirely different ways to employment growth. Any simple model suggesting that cities with more small establishments will benefit from faster employment growth must therefore be seriously questioned.

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

Whilst 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 reviewed 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 4 and 5 - 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 whilst some tentative conclusions can be drawn many questions are also raised.

The first remark that can be made is that 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, faster growing CMA/CAs have higher values of I3 (90%), I4 (99%) and I5 (99%). 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 the expansion of that size class in a CMA/CA the faster that CMA/CAs employment growth. This observation is opposite to that which could be expected from the reviewed 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 wipes out 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. If the correlation coefficients are looked at (table 3), it can be noted that within cities of 50-100K and those 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.

4. Discussion and conclusion

A review of the current literature surrounding the employment effects of small establishments 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 having been based on the analysis of cohorts of establishments across particular time periods, with all the statistical and methodological problems that such an approach implies.

However, the geographical perspective is of particular importance bearing in mind that an increasing number of local and regional development policies have jumped on to the small establishment band-wagon. 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 in at regional or local scale.

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. Whilst 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 the various city sizes. This result, a by product of the paper's main thrust, merits further investigation.

These results are limited by two factors. First of all, 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.

5. 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 case applications 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: indeed, 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[58] regression analyses in this paper test a model of the following type:

observed value of employment growth	=	constant	+	effect of[59] establishment size	+	error

The stage 2 ANCOVA analyses extend the model as follows:

observed value of employment growth	=	constant	+	effect of establishment size (covariate)	+	effect of + size, region or centrality (categorical)		error

[58] Stages 1, 2 and 3 are described in section 3.3 of the paper.
[59] The actual variables analysed are the percentage of establishments in each size class, and the 1991 to 1994 change in this percentage. For the sake of covenience these variables have been referred to as 'establishment size' variables in this note.

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[60]: 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 is, however, 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 idependently 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

[60] The total sum of squares may therefore differ from the sum of covariate, categorical and error sums of squares. The type III partial sums of squares method, GLM procedure SAS 6.11, has been used.

effects are added reduces the reliability of the results. Were the three categories introduced concurrently, eleven[61] 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.

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[61] One size category and one centrality category are identical.

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Système Urbain Canadien 1991-1994

Atlantique n=13	pop.('000)	métro.
Halifax	300+	Metro
Sydney	100-300	+100km
St John's	100-300	+100km
Moncton	100-300	+100km
St John	100-300	+100km
Fredericton	50-100	+100km
Charlottetown	50-100	+100km
Truro	25-50	-100km
Bathurst	25-50	+100km
New Glasgow	25-50	+100km
Summerside	10-25	+100km
Edmundston	10-25	+100km
Corner Brook	10-25	+100km

Colombie Britannique n=9		
Vancouver	300+	Metro
Matsqui	100-300	-100km
Kelowna	100-300	+100km
Victoria	100-300	+100km
Chilliwack	50-100	-100km
Kamloops	50-100	+100km
Nanaimo	50-100	+100km
Prince George	50-100	+100km
Dawson Creek	10-25	+100km

Quebec n=9		
Quebec	300+	Metro
Montreal	300+	Metro
Sherbrooke	100-300	+100km
Trois Rivieres	100-300	+100km
Chicoutimi	100-300	+100km
Sept Iles	25-50	+100km
Rimouski	25-50	+100km
Baie Comeau	25-50	+100km
Rouyn Noranda/Val d'Or	25-50	+100km

Ontario n=17	pop.('000)	métro.
Hamilton	300+	Metro
Kitchener	300+	Metro
St.Cath/Niagara	300+	Metro
London	300+	Metro
Toronto	300+	Metro
Ottawa	300+	Metro
Oshawa	100-300	-100km
Sudbury	100-300	+100km
Kingston	100-300	+100km
Windsor	100-300	+100km
Thunder Bay	100-300	+100km
Cornwall	50-100	-100km
Guelph	50-100	-100km
Peterborough	50-100	-100km
Brantford	50-100	-100km
Sarnia Clearwater	50-100	-100km
Sault Ste Marie	50-100	+100km

Prairies n=11		
Calgary	300+	Metro
Edmonton	300+	Metro
Winnipeg	300+	Metro
Saskatoon	100-300	+100km
Regina	100-300	+100km
Medicine Hat	50-100	+100km
Red Deer	50-100	+100km
Lethbridge	50-100	+100km
Prince Albert	25-50	+100km
Brandon	25-50	+100km
Moose Jaw	25-50	+100km

Observations par classe de taille:

plus de 300,000 habitants	n=13
100,000 à 300,000	n=17
50,000 à 100,000	n=15
moins de 50,000	n=14

Observation par proximité à une métropole

Métropole	n=13
Moins de 100km	n=9
Plus de 100 km	n=37

Initial Percentage of Establishments in Each Size Class
Total Employment Growth in 59 Canadian Metropolitan Areas

STAGE 1

GLM model **G = C**

		+/-	Sig
Geo effect			
R2			
Class	C1	+	
Geo effect			
R2	0.01		
Class	C2	+	
Geo effect			
R2	0.01		
Class	C3	-	
Geo effect			
R2	0.04		
Class	C4	-	
Geo effect			
R2	0.04		
Class	C5	-	
Geo effect			
R2	0.04		
Class	C6	-	
Geo effect			
R2	0.00		
Class	C7	-	
Geo effect			
R2	0.04		
Class	**C8**	-	**
Geo effect			
R2	0.08		**

STAGE 2
REGION

G = Region C

	+/-	Sig
Region		***
0.27		***
C1	+	
Region		***
0.27		***
C2	+	
Region		***
0.27		***
C3	-	
Region		***
0.30		***
C4	-	
Region		***
0.27		***
C5	-	
Region		***
0.29		***
C6	-	
Region		***
0.29		***
C7	-	
Region		***
0.27		***
C8	-	
Region		**
0.27		**

STAGE 2
METROPOLITAN SIZE

G = Size C

	+/-	Sig
Size		
0.03		
C1	+	
Size		
0.06		
C2	+	
Size		
0.03		
C3	-	*
Size		
0.09		
C4	-	*
Size		
0.08		
C5	-	**
Size		
0.11		
C6	-	
Size		
0.03		
C7	-	
Size		
0.06		
C8	-	**
Size		
0.15		*

STAGE 2
DISTANCE FROM MAJOR METRO AREA

G = MCP C

	+/-	Sig
MCP		
0.06		
C1	+	
MCP		
0.07		
C2	+	
MCP		
0.07		
C3	-	
MCP		
0.11		
C4	-	
MCP		
0.07		
C5	-	*
MCP		
0.07		
C6	-	
MCP		
0.07		
C7	-	
MCP		
0.08		
C8	-	
MCP		
0.10		

STAGE 3
Interaction effects
G = Region C Region*C

	R2 Inc.	Sig
Region*C1	0.04	
Region*C2	0.04	
Region*C3	0.04	
Region*C4	0.07	
Region*C5	0.04	
Region*C6	0.03	
Region*C7	0.06	
Region*C8	0.04	

STAGE 3
Interaction effects
G = Size C Size*C

	R2 Inc.	Sig
Size*C1	0.02	
Size*C2	0.05	
Size*C3	0.01	
Size*C4	0.00	
Size*C5	0.05	
Size*C6	0.22	***
Size*C7	0.12	*
Size*C8	0.05	

STAGE 3
Interaction effects
G = MCP C MCP*C

	R2 Inc.	Sig
MCP*C1	0.04	
MCP*C2	0.01	
MCP*C3	0.02	
MCP*C4	0.07	
MCP*C5	0.01	
MCP*C6	0.08	
MCP*C7	0.09	*
MCP*C8	0.01	

NOTES

SIGNIFICANCE LEVELS (sig.)

*** = 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.

R2 is the model's overall coefficient of determination (r-square).

GLM models

G = % employment growth
C = % of establishments in size class
Region = 5 canadian regions
Size = 4 size categories
MCP = 3 proximity categories

All tests have been carried out using 59 observations. Outliers have been excluded, the maximum number of outliers being 2 (except for model G=C1, where 3 were identified). The models with more than one indepen--dent variable must be interpreted with caution since the ratio of obser--vations to IV's is low.

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

The +/- column indicates the direction of the covariation between % of establishments and employment growth.

Initial Percentage of Establishments Below a Certain Size
Total Employment Growth in 59 Canadian Metropolitan Areas

STAGE 1

GLM model **G = CL**

		+/-	Sig
Geo effect			
R2			
Class Geo effect	CL1	+	
R2	0.01		
Class Geo effect	CL2	+	
R2	0.05		
Class Geo effect	CL3	+	
R2	0.04		
Class Geo effect	CL4	+	
R2	0.03		
Class Geo effect	CL5	+	
R2	0.02		
Class Geo effect	**CL6**	+	*
R2	0.07		*
Class Geo effect	**CL7**	+	**
R2	0.09		**

STAGE 2
REGION

G = Region CL

	+/-	Sig
Region		***
0.27		***
CL1	+	
Region		***
0.27		
CL2	+	
Region		***
0.27		
CL3	-	
Region		***
0.27		
CL4	-	
Region		***
0.29		
CL5	-	
Region		***
0.28		
CL6	-	
Region		***
0.27		
CL7	-	
Region		***
0.28		

STAGE 2
METROPOLITAN SIZE

G = Size CL

	+/-	Sig
Size		
0.03		
CL1	+	
Size		
0.06		
CL2	+	**
Size		
0.11		
CL3	+	*
Size		
0.09		
CL4	+	*
Size		
0.08		
CL5	+	
Size		
0.05		
CL6	+	**
Size		
0.13		
CL7	+	***
Size		
0.18		

STAGE 2
DISTANCE FROM MAJOR METRO AREA

G = MCP CL

	+/-	Sig
MCP		
0.06		
CL1	+	
MCP		
0.07		
CL2	+	
MCP		
0.10		
CL3	+	
MCP		
0.08		
CL4	+	
MCP		
0.08		
CL5	+	
MCP		
0.08		
CL6	+	
MCP		
0.09		
CL7	+	**
MCP		
0.11		*

STAGE 3
Interaction effects
G = Region CL Region*CL

	R2 Inc.	Sig
Region*CL1	0.04	
Region*CL2	0.03	
Region*CL3	0.07	
Region*CL4	0.04	
Region*CL5	0.05	
Region*CL6	0.07	
Region*CL7	0.04	

STAGE 3
Interaction effects
G = Size CL Size*CL

	R2 Inc.	Sig
Size*CL1	0.03	
Size*CL2	0.00	
Size*CL3	0.03	
Size*CL4	0.11	*
Size*CL5	0.21	***
Size*CL6	0.04	
Size*CL7	0.02	

STAGE 3
Interaction effects
G = MCP CL MCP*CL

	R2 Inc.	Sig
MCP*CL1	0.04	
MCP*CL2	0.03	
MCP*CL3	0.06	
MCP*CL4	0.05	
MCP*CL5	0.06	
MCP*CL6	0.07	
MCP*CL7	0.01	

NOTES
SIGNIFICANCE LEVELS (sig.)

*** = 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.

R2 is the model's overall coefficient of determination (r-square).

GLM models

G = % employment growth
C = % of establishments below a certain size
Region = 5 canadian regions
Size = 4 size categories
MCP = 3 proximity categories

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 indepen--dent variable must be interpreted with caution since the ratio of obser--vations to IV's is low.

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

The +/- column indicates the direction of the covariation between % of establishments and employment growth.

Pearson Correlation Coefficients Between Establishment Size Variables and Employment Growth

within each of four CMACA size categories

Discrete size classes
Initial %

		Over 300 K	100-300K	50-100K	less than 50
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 *	
		n=13	n=17	n=15	n=14

Cumulative size classes
Initial %

		Over 300 K	100-300K	50-100K	less than 50
CL1	ess than 5	0.48 *			
CL2	than 10				
CL3	than 20		0.41 *		
CL4	than 50		0.54 **	0.47 *	
CL5	than 100		0.44 *	0.50 *	-0.52 *
CL6	than 200		0.53 *	0.48 *	
CL7	than 500		0.43 *	0.47 *	
		n=13	n=17	n=15	n=14

Discrete size classes
Change in %

		Over 300 K	100-300K	50-100K	less than 50
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				
		n=13	n=17	n=15	n=14

Cumulative size classes
Change in %

		Over 300 K	100-300K	50-100K	less than 50
IL1	less than 5	-0.69 ***	-0.41 *		
IL2	than 10	-0.64 **	-0.57 **		
IL3	than 20	-0.54 *	-0.56 **		-0.58 **
IL4	than 50				
IL5	than 100			0.57 **	0.67 ***
IL6	than 200			0.51 *	0.52 *
IL7	than 500				
		n=13	n=17	n=15	n=14

'***' indicates 99% significance level
' **' indicates 95% significance level
' *' indicates 90% significance level

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

STAGE 1

GLM model **G = I**

		+/-	Sig
Geo effect			
R2			
Class	**I1**	-	***
Geo effect			
R2	0.14		***
Class	I2	-	
Geo effect			
R2	0.00		
Class	**I3**	+	*
Geo effect			
R2	0.11		*
Class	**I4**	+	***
Geo effect			
R2	0.23		
Class	**I5**	+	***
Geo effect			
R2	0.25		***
Class	I6	-	
Geo effect			
R2	0.01		
Class	I7	-	
Geo effect			
R2	0.02		
Class	I8	-	
Geo effect			
R2	0.01		

STAGE 2
REGION

G = Region I

	+/-	Sig
Region		***
0.27		***
I1	-	
Region		***
0.27		***
I2	-	
Region		***
0.3		***
I3	+	
Region		***
0.31		***
I4	+	**
Region		***
0.34		
I5	+	***
Region		
0.33		***
I6	-	
Region		***
0.28		***
I7	-	
Region		***
0.27		***
I8	-	**
Region		***
0.32		***

STAGE 2
METROPOLITAN SIZE

G = Size I

	+/-	Sig
Size		
0.03		
I1	-	*
Size		
0.08		
I2	-	
Size		
0.03		
I3	+	***
Size		
0.22		***
I4	+	***
Size		
0.22		***
I5	+	***
Size		
0.27		***
I6	-	*
Size		
0.07		
I7	-	
Size		
0.07		
I8	-	
Size		
0.05		

STAGE 2
DISTANCE FROM MAJOR METRO AREA

G = MCP I

	+/-	Sig
MCP		
0.06		
I1	-	***
MCP		
0.17		**
I2	-	
MCP		
0.07		
I3	+	**
MCP		
0.17		**
I4	+	***
MCP		
0.25		***
I5	+	***
MCP		
0.28		***
I6	-	
MCP		
0.07		
I7	-	
MCP		
0.07		
I8	-	
MCP		
0.08		

STAGE 3
Interaction effects
G = Region I Region*I

	R2 Inc.	Sig
Region*I1	0.10	
Region*I2	0.09	
Region*I3	0.02	
Region*I4	0.05	
Region*I5	0.05	
Region*I6	0.07	
Region*I7	0.06	
Region*I8	0.05	

STAGE 3
Interaction effects
G = Size I Size*I

	R2 Inc.	Sig
Size*I1	0.07	
Size*I2	0.06	
Size*I3	0.02	
Size*I4	0.01	
Size*I5	0.01	
Size*I6	0.13	*
Size*I7	0.13	*
Size*I8	0.12	*

STAGE 3
Interaction effects
G = MCP I MCP*I

	R2 Inc.	Sig
MCP*I1	0.02	
MCP*I2	0.04	
MCP*I3	0.01	
MCP*I4	0.01	
MCP*I5	0.00	
MCP*I6	0.09	*
MCP*I7	0.00	
MCP*I8	0.01	

NOTES

SIGNIFICANCE LEVELS (sig.)

*** = 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.

R2 is the model's overall coefficient of determination (r-square).

GLM models

G = % employment growth
I = change in % of establishments in size class
Region = 5 canadian regions
Size = 4 size categories
MCP = 3 proximity categories

All tests have been carried out using 59 observations. Outliers have been excluded, the maximum number of outliers being 2 (except for model G=C1, where 3 were identified). The models with more than one indepen--dent variable must be interpreted with caution since the ratio of obser--vations to IV's is low.

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

The +/- column indicates the direction of the covariation between the change in the % establishments of each size and employment growth.

Table 5
Proportional Change in Percentage of Establishments Below a Certain Size
Total Employment Growth in 59 Canadian Metropolitan Areas

STAGE 1

GLM model **G = IL**

		+/-	Sig
Geo effect			
R2			
Class Geo effect	**IL1**	-	***
R2	0.14		***
Class Geo effect	**IL2**	-	***
R2	0.20		***
Class Geo effect	**IL3**	-	***
R2	0.19		***
Class Geo effect	**IL4**	-	*
R2	0.05		*
Class Geo effect	**IL5**	+	**
R2	0.14		**
Class Geo effect	**IL6**	+	*
R2	0.10		*
Class Geo effect	IL7	+	
R2	0.04		

STAGE 2
REGION

G = Region IL

	+/-	Sig
Region		***
0.27		***
IL1	-	
Region		**
0.27		***
IL2	-	*
Region		*
0.32		***
IL3	-	*
Region		*
0.32		***
IL4	-	
Region		***
0.27		***
IL5	+	***
Region		***
0.32		***
IL6	+	***
Region		***
0.37		***
IL7	+	*
Region		***
0.32		***

STAGE 3
Interaction effects
G = Region IL Region*IL

	R2 Inc.	Sig
Region*IL1	0.10	
Region*IL2	0.05	
Region*IL3	0.07	
Region*IL4	0.00	
Region*IL5	0.02	
Region*IL6	0.05	
Region*IL7	0.04	

STAGE 2
METROPOLITAN SIZE

G = Size IL

	+/-	Sig
Size		
0.03		
IL1	-	*
Size		
0.08		
IL2	-	***
Size		
0.25		***
IL3	-	***
Size		
0.21		*
IL4	-	
Size		
0.07		
IL5	+	***
Size		
0.2		**
IL6	+	**
Size		
0.14		*
IL7	+	
Size		
0.05		

STAGE 3
Interaction effects
G = Size IL Size*IL

	R2 Inc.	Sig
Size*IL1	0.07	
Size*IL2	0.01	
Size*IL3	0.04	
Size*IL4	0.06	
Size*IL5	0.13	**
Size*IL6	0.08	
Size*IL7	0.06	

STAGE 2
DISTANCE FROM MAJOR METRO AREA

G = MCP IL

	+/-	Sig
MCP		
0.06		
IL1	-	***
MCP		
0.17		*
IL2	-	***
MCP		
0.23		***
IL3	-	***
MCP		
0.2		***
IL4	-	
MCP		
0.06		
IL5	+	***
MCP		
0.19		**
IL6	+	**
MCP		
0.14		**
IL7	+	
MCP		
0.11		

STAGE 3
Interaction effects
G = MCP IL MCP*IL

	R2 Inc.	Sig
MCP*IL1	0.02	
MCP*IL2	0.00	
MCP*IL3	0.02	
MCP*IL4	0.07	
MCP*IL5	0.03	
MCP*IL6	0.00	
MCP*IL7	0.00	

NOTES
SIGNIFICANCE LEVELS (sig.)

*** = 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.

R2 is the model's overall coefficient of determination (r-square).

GLM models

G = % employment growth
IL= change in % of establishments below a certain size
Region = 5 canadian regions
Size = 4 size categories
MCP = 3 proximity categories

All tests have been carried out using 59 observations. Outliers have been excluded, the maximum number of outliers being 2 (except for model G=C1, where 3 were identified). The models with more than one indepen--dent variable must be interpreted with caution since the ratio of obser--vations to IV's is low.

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

The +/- column indicates the direction of the covariation between the change in the % establishments of each size and employment growth.

Chapter 9

A Geographical Perspective on Education and Jobs: Employment Growth and Education in the Canadian Urban System, 1981-1994[62]

article by: Richard Shearmur (1998)

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Abstract

There is a widespread acceptance today that one of the key determinants of employment growth and/or retention is education. This holds true, it is said, for nations, regions, and localities. However, most of the evidence put forward for this contention is of a non-geographic nature: the evidence tends to come from studies of the effect of education on employment prospects for individuals. To a lesser extent, some studies have been made which compare differences in national education levels with differences in employment rates, but such comparisons suffer not only from the inherent difficulty of comparing education across nations, but also from the small number of observations involved. In this article, an attempt is made to determine whether a relationship exists between the education levels of the workforce in Canadian urban areas and employment growth in these urban areas. It is found that such a relationship does exist, but that it weakens considerably once geographic factors such as size, region and proximity to a major metropolitan area are controlled for. Thus the relevance of education as a tool for local development is not as clear cut as the literature would suggest.

[62]The distinction between training and education, a crucial one raised by Betchermann (1993), Chapman (1994), Ekos (1995) and many others, is not dealt with in this paper. As far as possible only studies relating to education are referred to, and the empirical study itself clearly only uses education variables.

1. Introduction

It is widely accepted today that, for individuals and for countries, education is of paramount importance in terms of obtaining good employment and of competing in the global market. Reich (1992) and Chapman (1994), for instance, set out the basic arguments for the increasing importance of education for national economies. Lowe & Krahn (1995), the Economic Council of Canada (1992) and Constantinos & West (1991) show how relevant education levels are for individuals who seek employment.

Furthermore, there has been a shift in emphasis on the provision of education over the past two decades. Whereas traditionally this has been an area of national concern, budget cuts have tended to hit education hard, and local areas are now becoming aware of the importance of an educated workforce in terms of attracting and retaining employment (e.g. Quorum, Feb. 1996). A substantial literature has emerged on the subject of local development, and almost invariably education and training feature quite prominently among the policy options available to local areas in order to promote development (ECC, 1990a; Meyer, 1991; Galaway & Hudson, 1994). It is also interesting to note that education features quite prominently in the list of location factors given by contributors to real estate magazines (Coffee, 1994; Hamer, 1993).

The arguments which link the benefits of education to national and to personal development are well rehearsed, and are backed by a certain amount of empirical evidence (there is little doubt about the benefits which individuals derive from education, the evidence concerning countries is more open to interpretation). However, very little work has been done exploring whether or not these relationships hold at a smaller geographic scale.

It may appear obvious to many observers that education, which benefits nations and which benefits individuals will necessarily also benefit localities. However, Openshaw (1981) has pointed out the dangers of making inferences from one geographic scale to another, and Constantinos & West (1991) and Cousineau & Vaillancourt (1987) have already pointed out the problems inherent in assuming that what is good for individuals is necessarily good for the country.

In this paper, I will first briefly review the arguments concerning the benefit of higher education levels to nations and individuals. Although there is some question as to the extent to which each type of entity benefits, there is general agreement that the benefits outweigh the costs in most cases.

I will then turn to the issue of whether these arguments can be extended to regions and localities. The fact that localities are situated within a very fluid labour market (Maillat, 1989; Courchene, 1986), the fact that education increases personal mobility (Marr et al, 1981), and the related question of whether employment will move towards people or vice-versa will be considered.

Then, after presenting the data and the analytical approach, the results of an empirical study examining the links between education levels within 152 Canadian urban agglomerations and employment growth will be set out. This study goes beyond the analysis of employment totals, and attempts to identify which economic sectors are the most influenced by local education characteristics. In order to ensure that *local* characteristics are being considered the effect of population size, proximity to a major metropolitan area[63] and of geographic region within Canada are controlled.

Finally, the conclusion will discuss the results' limitations, further avenues of study, and the policy implications of these preliminary findings.

2. Education and Economic Growth

2.1 National Competitiveness and Education

The link between education and economic growth is one which has nearly become self-evident over time, to the extent that there is rarely much lengthy discussion surrounding the nature of the link and its mechanisms. It is important, however, to clearly distinguish two dimensions of the link, and to examine the evidence for each in a little more detail. The first dimension is the geographic one: traditionally, education levels have been compared across international boundaries (e.g. Buxton, 1994), and some connection has been found between education levels and growth. To a lesser extent, differences in the national distribution of education levels have also been considered (Cousineau &

[63] Defined as an urban agglomeration of over 300,000 people

Vaillancourt, 1987; Lehnen & McGregor, 1994), but rarely at a very disaggregated level. The second dimension is that of the individual: to most people, and to many policy-makers, it is this dimension which carries the most importance. Questions as to whether education is a good financial investment (Constantinos & West, 1991), whether it perpetuates class boundaries, whether it enables young people to obtain jobs (Marquardt, 1995) ... all of these relate to the consequences on the individual of receiving certain types of education.

There are obvious problems associated with the comparison of education levels across borders (Buxton, 1994). First of all, the education systems are often very different from country to country, and they embody not only different education techniques but entirely different views of society. Thus, in comparing education levels internationally one is necessarily comparing societies and cultures - and although standardised examination results may provide some clues as to the different levels of attainment, it is doubtful that these can detect anything but the broadest of trends. Second, even if one assumes that the differences between societies are of decreasing relevance in this era of globalisation, the mere fact that syllabuses differ, that different items are taught at different levels, and that different approaches are used to teach the same material renders age-group or school-level comparisons of limited use.

The Economic Council of Canada (1992) writes that Canadians must collectively and individually face the challenge of becoming more qualified or of accepting lower salaries and the World Bank has said that the future viability of any nation depends on the health of its human resources (reported in Gazette, 25/3/97). The rationales behind these statements are numerous - and sometimes nebulous - but two themes tend to recur in the arguments emphasising the importance of education to nations. First, there are a set of reasons which are based on the increasing globalisation of the economy. Barnet & Cavanagh (1994), from a series of case studies of major transnational corporations, show how location decisions are increasingly being taken on an international level, with labour-force characteristics (education, wage, labour organisation...) often playing an important role. In such an environment, each country's labour-force is pitted against the other's: the argument goes that it is the countries with the most highly educated workforce that will attract (or retain) the 'best' jobs. Thus, in Reich's (1992) analysis, it is only if countries can provide a workforce which includes a high proportion of 'symbolic analysts' (well educated individuals who can perform complex tasks autonomously - and who occupy the 'good'

jobs[64]) that they will be able to fully benefit from the globalised economy. At the other end of the scale, countries with low levels of education will tend to attract low-paid production jobs.

The second set of reasons developed to explain why countries need an educated workforce is based on the impact of new technology. Here, there is somewhat less unanimity. One argument is that the introduction of new technology into the workplace has put more emphasis on 'mental' tasks - so that even workers on the shop floor are now required to understand and perform complex tasks such as programming CAD/CAM machines. Furthermore, as workers are freed from the drudgery of routine factory work, they will be required to perform a greater variety of tasks. An argument to the contrary is that, far from acceding to a higher plane of work, production workers (and increasingly professionals) will be displaced by technology (Rifkin, 1996) and those that remain will see their tasks reduced to the overseeing of robots and computers. Most authors tend to present both arguments (Amirahmadi & Wallace, 1995; Muszynski & Wolfe, 1989; McMullen, 1997) but McMullen (1997), in a recent review of the empirical evidence surrounding the issue, tentatively suggests that the upskilling scenario is beginning to prevail.

2.2 The Benefits of Education to the Individual

Although the lines of reasoning described above are invoked when putting forward the argument that nations ought to invest in the education and training of their workforce, they obviously have a consequence on individuals who often make the ultimate education decisions. Individual education decisions, and education investment taken by a single nation, can be analysed in a more quantifiable way[65]. Constantinos & West (1991) make a detailed analysis of the financial returns on education from the point of view of both individuals and society. They point out that in Canada, bearing in mind the heavy subsidisation of education, there is a divergence between the returns to individuals and those to society: indeed, whereas individuals, for a fairly moderate financial investment (forgone earnings and low fees) obtain high returns (higher income for the rest of their

[64] The 'good jobs' - 'bad jobs' debate will only be alluded to in this paper. For a more complete discussion see ECC, 1990; Reich, 1992; Houseman, 1995; Gunderson & Riddell, 1995. In this paper the simplified dichotomy will be used - but Houseman (1995), for instance, takes a far closer look at what these concepts entail.

[65] No implication is being made here that dimensions such as the socialisation of young people, personal fullfillment, perpetuation of cultural and artistic values and traditions are not crucial aspects of education.

life), society invests heavily (forgone taxes and cost of education) for smaller returns (increased taxes paid over life-time). They conclude that - taking a benchmark return of 10% (the same as used by Cousineau & Vaillancourt (1987), who performed a similar study) - society gains financial benefits from elementary and high-school education, but not from university education, particularly if the differences due to inherent ability of each individual are taken into account. This approach takes a rather narrow financial view of education: investing in education may have considerable positive externalities, and the returns both to the individual and to society may not be measurable in terms of income and tax revenue alone. However, this type of analysis does raise two important points. First of all, it underlines the fact that each level of education may not provide the same returns. Second, it clearly points out a mechanism whereby the investment by individuals in education may not actually benefit the nation as a whole.

The Economic Council of Canada (1992) also looks at education from the point of view of the individual and notes that education is a good investment, providing high returns for individuals not only in financial terms but also in terms of job satisfaction and security. The incidence of unemployment is considerably higher amongst people with fewer than nine years of formal education (ECC, 1991), and there is a definite relationship between participation rate and level of schooling. Thus, there is little debate about whether education is beneficial for individuals: a question remains, though, over the precise nature and extent of its benefits to nations.

2.3 Outline of a Counter Argument

Having briefly outlined the case for the importance of education in terms of national and personal economic development, it is worth considering the matter from a different perspective. Indeed, whereas it appears to be generally accepted that the future wealth of nations is dependent on an educated workforce, it is striking that the literature on corporate location decisions, Barnet and Cavanagh (1994) notwithstanding[66], attaches relatively minor importance to workforce education levels. Eaton et al (1994a and b), Gunderson (1994) and Malmberg (1996) in their discussions on business location factors, do not mention education as an important independent factor. Labour force skills form part of a multitude of factors which contribute to agglomeration economies within certain

[66] Barnett and Cavanagh (1994) do not focus exclusively on education: but labour force characteristics (of which education is an important one) do play a dominant role in their analysis of location descisions.

areas (Eaton et al, 1994b; Malmberg, 1996) and which may provide 'industrialised' countries like Canada with some advantage in attracting high-wage jobs (Gunderson, 1994). However, Gunderson points out that low wage countries are increasingly able to provide pools of highly skilled labour. For nations, education would appear to be a *sine qua non* condition for competition in the global market, particularly for 'good' jobs, but not sufficient in itself to promote growth.

It can be argued that a similar phenomenon is taking place for individuals: there is evidence that there is no shortage of literate people in Canada. Boothby (1993) shows that many qualified people with high levels of numeracy and literacy are employed in jobs which do not require these qualifications and skills[67]. Furthermore, Lowe and Krahn (1995) find in their study that amongst young workers there is a pervasive feeling of overqualification for the jobs being undertaken: it is thus possible that jobs which required lower qualifications a few years ago now require higher qualifications, merely because the overall education levels have risen. If this is the case, it is not the absolute level of education which is relevant but the level relative to the rest of the population, irrespective of the requirements of the job. If the jobs do not really require such high levels of education, it can be concluded that Canada's education system is inefficient in that it is fuelling an 'educational inflation' which ultimately benefits no-one. Higher educational achievement may have become, for the individual, a necessary condition for *obtaining* a job - but one which is unnecessary for the successful *performance* thereof.

Finally, Myles (1996) introduces an interesting political twist to the arguments concerning education and training. He argues that the current emphasis on education as a tool for economic development in industrialised countries can at least partly be explained on ideological grounds: by shifting attention away from two decades of macroeconomic policy aimed at limiting labour demand and onto individuals who are said to lack the necessary qualifications, governments are performing a useful political exercise. He underlines the fact that there is a tendency for the few most highly qualified individuals to obtain all the rewards from high academic achievement (Reich's (1992) symbolic

[67] The Economic Council of Canada (1991) suggests otherwise. It notes that there are an increasing number of jobs requiring secondary education - but it is not clear whether the requirement is set by the employers or by the nature of the job itself. In ECC (1992), the inefficiency of the education system is noted (there are high levels of illiteracy amongst Canada's adult population): this is clearly a great economic handicap for the individuals involved, but its effect on the overall performance of Canadian industry is not analysed.

analysts?), and also highlights the possibility that a substantial segment of any population may simply be unable to achieve 'adequate' levels of literacy and numeracy.

2.4 Education at a Sub-National Level

On the whole far less attention has been paid to the effects of differing education levels within countries. That is not to say that education is not regarded as a key determinant of economic growth: the literature on local economic development clearly establishes that this is the case. Education and training is nearly systematically put forward as one of a small set of policy options available at a local level (Coffey & Polese, 1984; ECC, 1990; Meyer, 1991; OECD, 1993; Galaway & Hudson, 1994). The large education gaps observed between the various regions of Canada were noted by the ECC (1992), and Cousineau and Vaillancourt (1987) have applied the financial approach described in section 2.2 to assess the efficiency of provincial investments in education. However, there are relatively few studies which go beyond describing the disparities in education levels and which actually determine what economic effect education levels have on regions and localities. Lehnen and McGregor (1994), in their study of education levels across the fifty American states, come to very interesting conclusions in terms of the dimensions of educational achievement which can be used to characterise a state's education level, but conclude that further work is necessary, first of all at a higher level of spatial disaggregation and, second, on the demand side of the equation. In other words, it is necessary, according to them, to look for the relationship between education and employment from a geographical perspective.

Vedder and Gallaway's (1996) study of the spatial variations in U.S. unemployment points to an approach which may usefully be used for education. After establishing that large and persistent[68] unemployment differentials exist amongst the fifty American states they seek to uncover some of the determinants of unemployment levels. To do this they perform a series of exploratory regression analyses using variables such as union membership, tax rates and economic structure as explanatory variables. Although education levels are not used in their study, the relationship between education and unemployment could easily have been analysed in this way.

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[68] These differentials are found to persist for the 30 year study period, 1960 to 1991: over this period there is very little evidence of a tendency for the unemployment gap to narrow with time.

Coffey and Shearmur (1996, 1998), in their studies of employment across the Canadian urban system[69], attempt to identify some of the correlates of employment growth across these cities: education levels are found to be significantly correlated with employment growth but the correlations are relatively small and only one education variable is analysed. In the context of these wider studies the matter is not examined further.

Cousineau and Vaillancourt (1987) are amongst the few to have studied the effects of an uneven distribution of education levels within a country: they look at the relationship, across Canadian provinces, between incomes and the incidence of university education. They observe that, except for Nova Scotia, "a province's average annual labour income varies directly with the education level of its labour force". The education levels used are the highest achieved by the worker: they find that the relationship exists whether the level used is primary education (negative relationship) or secondary and post-secondary education (both of which show positive relationships), and these relationships persist even after controlling for worker experience and different composition of each province's labour force. Thus, although they limit their study to university levels, they note that other education levels could also display similar patterns. However, after examining the financial investment which each province makes in education, Vaillancourt and Cousineau (1987, p369, p371) conclude that

> "the efficiency of investment in university as a tool for reducing regional income disparities is ... not clearly established... While the belief of certain low-income provinces that they can promote economic development through investment in university education is false, due to non-profitable private rate of return and/or unfavourable net migration flows, this does not mean that the benefits from these investments are not large for the rest of Canada"

Thus, the evidence and arguments presented at the sub-national level show the same tendency as that presented both at a national and at an individual level: there is a widespread acceptance of the idea that higher education levels lead to economic development, but the evidence - which is not very voluminous - is less clear cut. The inclusion of education provisions in local development schemes, whilst an attractive and non-controversial policy measure, is not necessarily beneficial for development.

[69] This study was conducted using the same data as presented in this article

3.0 Data, Methodology, and Comments

3.1 Data

The data used in this study come from three distinct databases. The data on employment and employment growth for the 1981 to 1991 period has been obtained by special order from the Statistics Canada census division. The data cover the 152 Canadian urban agglomerations of over 10,000 people, including the 25 Census Metropolitan Areas, the 115 Census Agglomerations and the 12 Census Sub-Divisions which, in 1991, had over 10,000 inhabitants. The data cover employment in 160 economic sectors at the two and three digit SIC level. These sectors have been aggregated into fifteen sectors, corresponding to those used in Coffey & Shearmur (1996): aggregated total, service and goods producing employment have also been analysed (see appendix 1). Each urban agglomeration has been classified according to region (Atlantic Canada, Quebec, Ontario, the Prairies and British Columbia), to size (over 300,000; 100 to 300,000; 50 to 100,000; 25, to 50,000 and below 25,000) and by proximity to a major metropolitan area (Major metropolitan area (MA): over 300,000 people; central city: within 100km of an MA; peripheral city: over 100km from an MA). This or similar classifications have been used by Coffey & Polese (1988a, 1988b), Coffey et al (1989), Coffey & Shearmur (1996, 1998) and Shearmur (1997). In this study the classification will serve as a means of controlling the effect of education levels on employment growth for region, city size and centrality (RSC).

The data on employment growth between 1991 and 1994 has been obtained by special order from the Statistics Canada labour force survey. The data cover 59 Canadian urban agglomerations, and these tend to be the larger cities. 52 economic sectors are covered at the two digit SIC level, and these have been aggregated into fourteen sectors. Thirteen of these sectors replicate those of the 1981 to 1991 period; one, the "business services" sector, merges the "business services" and "other producer services" of the 1981 to 1991 data (see appendix 1).

The data on initial education levels and growth thereof have been obtained by special order from the Statistics Canada 2A and 2B census information for 1981 and 1991. These data consist of the percentage of the working age population which has achieved

certain education levels. The data cover eight education levels (see appendix 2), and two aggregated levels have been added.

All geographic boundaries have been adjusted to correspond with the 1991 census definitions.

3.2 Methodology

In this section, some general methodological considerations will be described, following which a more detailed discussion of the various approaches is given. The analysis which has been conducted is necessarily exploratory in nature, and a variety of approaches to analysing the link between education and employment growth have been used. Broadly speaking, these can be divided in two ways.

A first distinction can be made between an approach driven by theoretical considerations and one which is purely exploratory. There are reasons for suggesting that a particular combination of education variables is more closely related to employment growth than others - the reasons will be summarised below - and the first approach therefore tests a model which has been constructed to explore this theory. The purely exploratory approaches make no assumptions as to which education indicators are linked to employment growth. The second approach therefore relies upon statistical criteria to assess which variables are most strongly related to employment growth.

A second distinction can be made between the analyses which explore the education/employment growth relationship over one period of time, and those which explore the changing nature of this relationship over time. Due to data limitations the comparison over different time periods (1981-1991 and 1991-1994) cannot be directly related to the detailed analysis of the 1981 to 1991 period, but some important general points can be made.

These various approaches will be described below, but they all have in common the reliance on regression analysis. The detailed analyses covering the 1981 to 1991 period systematically control for the effect of city size, proximity to a metropolitan centre and region. Indeed, previous studies (Coffey & Shearmur, 1998) have highlighted the strong connection which exists between employment growth and the size and location of urban

areas. The differences in employment growth across these dimensions, and the differences in education levels, are more readily explained by theories such as those relating to agglomeration economies, national and international trade, shifts affecting regional and/or peripheral economies, and, more generally, business location theories which include labour skills *as one of a number of factors*, than they are by education alone[70]. If the education variables are statistically significant after controlling for the region, size and centrality variables (RSC), then it can be concluded with somewhat more confidence[71] that education levels have a unique effect on employment growth at the level of urban areas.

In practical terms, it will be seen that analysis of covariance is used, and the results presented are those obtained from using ANCOVA models. These models are identical to regression models except that instead of entering each control effect by inserting dummy variables into the regression equation, the controls can be entered as single variables (or effects). This enables the strength of each control effect to be assessed as whole and eases the presentation and interpretation of results.

All models have been tested across fifteen different economic sectors, as well as employment aggregates (goods producing, service and total employment)[72]. Indeed, it is quite feasible that education levels bear a different relationship to employment growth depending on the economic sector considered. Thus, an important question which underpins the following analysis is that relating to whether or not there exists a common model relating education to employment growth across all economic sectors.

The models been corrected for two sources of possible error. First of all, due to data suppression by Statistics Canada, employment figures are rounded off in a probabilistic fashion to the higher or lower multiple of five. Thus, in cities where there are few employees, large errors can occur when growth rates are calculated. In order to minimise this problem, all cells with less than 100 jobs in the initial year (1981 for the 1981-1991 period, 1991 for 1991-1994) have been set to missing value. Thus the number of observations used for each model varies somewhat according to the sector. Second, all

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[70] For a more detailed discussion on the inclusion of these control variables see Coffey & Shearmur, 1996, 1998.
[71] But clearly not with absolute confidence.
[72] see annexe 1 for a list of sectors analysed.

outliers with a studentised residual[73] greater than three have been identified and removed. Note that the analysis has been performed using the REG and GLM procedures of SAS statistical software, version 6.11. The REG procedure has been used for identifying outliers, but the GLM procedure has been used for the final presentation of results.

3.2.1 Methodological considerations

It must be made clear at the outset that causality cannot be established by the type of analysis just described. However, there is a large body of literature, some of which is referred to above, which posits that there does exist a causal link running from high education levels to faster subsequent employment growth. Thus, if a correlation is found between initial education levels and subsequent employment growth, then the arguments for the causal link will be reinforced. If, however, no link is found, then this will suggest either that other factors have an effect upon the education/employment link (over and above the RSC controls), or that the causal link does not exist at the urban level.

Another point to bear in mind is the possible mediating effect of other factors. For instance, an urban area with a high quality of life may, prior to 1981, have attracted many educated people. Over 1981 to 1991 these same quality of life factors[74] may attract even more people and jobs: in addition, the presence of jobs in 'footloose' sectors - ones which can move around to locate in pleasant areas - will have multiplier effects across the rest of the economy. If this is replicated in enough urban areas then an association between higher initial education levels and employment growth in most sectors will be identified, but this will not be a causal relationship - in this example the underlying cause is 'quality of life'. It is useful to interpret the results for each sector with this eventuality in mind, paying attention to the distinction which can be made between 'basic' and 'non basic' industries. 'Basic'[75] industries are those most likely to produce tradable goods which can

[73] The residual divided by its standard error.

[74] Quality of life is used as an example. Any enduring feature of a city could have this effect, and it is for this reason that the RSC control variables are included - to control for some of the most widely recognised enduring features.

[75] Of the fifteen sectors analysed, four can be considered 'basic': the primary, manufacturing, business service and FIRE sectors. Some others, such as transport & communications, health & social services and education are are more difficult to classify, whereas sectors such as construction, retail, consumer services and accommodation & restaurants can be classfied as 'non basic'. Given the level of aggregation of these sectors, this distinction cannot be water-tight, and each sector comprises export-oriented and local market-oriented producers.

contribute to an urban area's export earnings: by virtue of their reliance on exports, such industries tend to be more mobile, or 'footloose', than the non-basic industries which rely solely on local demand to thrive. Education (or other *local* characteristics) is more likely to have a supply effect for the 'footloose' industries, and an indirect multiplier (or a direct demand) effect on the others.

3.2.2 Model testing approach

The first results to be presented are derived from applying an identical model to all sectors of the economy. The model includes the three RSC effects and two education variables. The RSC effects are entered in order to control for some general urban growth theories, and the education variables to test on the one hand the extent to which the effect of education can be distinguished from that of RSC, and on the other hand to test the extent to which the inclusion of education improves the overall explanatory power of the model.

Lehnen and McGregor (1994) have shown that, in the USA, states can be successfully classified according to human capital along two dimensions, "basic skills and abilities" and "complex skills and abilities". In their study they include twelve education variables, including the percentage of the population with various education levels and the scores on standardised exams (such as the SAT) for the beginning and end periods of the study. The Cousineau and Vaillancourt (1987) study, although not as specific on the human capital dimensions, suggests that more than one education level should be included if the effect of education on employment growth is to be understood.

These considerations suggest that a model incorporating two education variables - each representing a distinctive educational dimension - may serve to explain employment growth across the urban system in Canada. To begin with, therefore, the educational dimensions inherent within the Canadian urban system are explored. Due to the nature of the variables - a series of percentage levels summing to 1 for each urban area - factor analysis of the sort used by Lehnen & McGregor (1994) is inappropriate since any one education variable can be fully predicted by the ones remaining. A useful technique for circumventing this problem is correspondence analysis[76], which relies on chi-square type

[76] The standard reference on correspondence analysis is Benzécri, 1973. For an example of its application and a concise technical appendix see Langlois & Razin, 1995.

techniques to perform a weighted principal component analysis of a contingency table. Since the percentages in the education data set are drawn from a contingency table (by dividing each row by total population) then correspondence analysis can be used to extract the principal components from the education data.

This correspondence analysis serves to confirm whether or not there is reason to assume that the two dimensions identified by Lehnen & McGregor (1994) across the US states also exist across the Canadian urban system. On the basis of the analysis of dimensions in the Canadian 'educational space', a model is then constructed which incorporates one indicator of 'basic skills' - the percentage of the population having obtained a grade 13 certificate - and one indicator of 'complex skills' - the percentage of university degree holders. This model is then tested across all economic sectors for the 1981 to 1991 period.

3.2.3 Exploratory approaches

The basic question which the exploratory approaches seek to address is *which* education variable(s) are most closely connected with employment growth across the urban system. As has been made clear above, there is no consensus on this matter. Although there are good reasons to test whether a 'basic skills' / 'complex skills' model possesses explanatory power it is necessary to bear in mind that Lehnen & McGregor (1994) do not themselves suggest that these two dimensions are those which affect employment growth.

Thus, over the 1981 to 1991 period, each education variable is entered alone into a regression model which includes, by default, the RSC control variables. For each education variable and each economic sector, the F value, significance level, and direction of the relationship is noted. In this way, education variables which have a similar relationship with employment growth can be identified. Economic sectors which display similar associations between growth and education levels can also be identified, and it is possible to identify whether trends observable at an aggregate level are also observable for individual sectors.

3.2.4 Time periods

The analyses described above have been performed for the 1981 to 1991 period, but another question which can partially be addressed by the database at hand is the extent to which the link between education and employment growth remains constant over time. However, the employment growth information for the 1991 to 1994 period only covers fifty nine of the larger cities in the Canadian urban system (mostly those of above 25,000 people).

Due to the small number of observations it has not been possible to introduce the control variables since doing so increases the ratio of independent variables to observations beyond acceptable limits (Tabachnik & Fidel, 1996). Thus, a separate analysis has been performed of the 1981 to 1991 data which only covers the 59 observations available for the 1991 to 1994 period, and which does not include control variables. The results presented here are those obtained from an exploratory approach in which each education variable is tested across each economic sector for both 1981 to 1991 and 1991 to 1994. These results provide some interesting insights into the changing nature of the education / employment growth relationship, but the conclusions drawn from this analysis are more speculative than those for the 1981 to 1991 period which cover the entire urban system.

4.0 Results

The results will be presented in four parts. The first part will provide a brief description of the variation of education levels across Canadian regions, across cities of different sizes and cities of varying proximity to metropolitan centres. The different rates of employment growth across these dimensions will also be discussed, and the importance of including - where possible - the control variables will become apparent.

The second part will present the results of the model-testing approach. As discussed above, this approach rests upon the existence of at least two educational 'dimensions' in Canadian cities, and the results of the correspondence analysis will be presented in this context. A third section will go over the results obtained from an exploratory analysis, and the final section will describe some of the ways in which the education-employment link varies over time.

4.1 Education and employment growth in the Canadian urban system

Both education levels and employment growth rates vary significantly across regions, cities of different size and cities located closer or further away from a metropolitan centre. Table 1 shows the mean employment growth rates and the mean education levels in cities across each of the three RSC dimensions. These results are presented merely as a way of contextualising the regression analyses, and as such are to be viewed as an illustration, and not an analysis, of the variation across the RSC dimensions. With this in mind, results are presented for just three different education variables, the lowest (ed1), an intermediate level (ed3) and the highest (ed8), and the three aggregate sectors.

Across different city size classes education levels vary significantly. In 1981 the largest cities have the most educated population, with a very high mean percentage of university degree holders. It can be noted that the percentage of degree-holders decreases monotonically across the city size classes. There is a tendency - though not a statistically significant one - for this advantage to be reinforced over 1981 to 1991 since it is the larger cities which have faster growth rates. Larger cities also have a lower proportion of the least educated people, and here too a monotonic progression is observed as one moves from the largest to the smallest cities. This pattern is again strengthened over time since there is a tendency for the smaller cities to reduce this proportion at a slower rate than the larger ones.

There are also significant variations in education levels across metropolitan, central and peripheral cities. It is the metropolitan cities which have, by far, the highest proportions of university degree holders and the lowest proportions of least educated people. There is little difference, however, between central and peripheral cities in this respect. Across this dimension there is also a tendency for the pattern to be reinforced over time.

Finally, education levels differ across regions as well, but the pattern does not tend to be self reinforcing. For instance, in 1981 Quebec cities had, on average, the lowest proportion of degree holders but benefited from the fastest rate of growth. Cities in the Prairies, with the highest proportion of degree holders display the slowest growth rates for this indicator. However, although Quebec cities had the highest proportion of least educated people in 1981, they also had the slowest decrease in this proportion over the

1981 to 1991 period, and it is noticeable that the rate of change in Quebec is substantially slower than in all other regions.

Total employment growth rates over 1981 to 1991 differ significantly across city size and centrality, but are surprisingly even across the five Canadian regions. This eveness disguises significant differences within certain economic sectors, most notably in what may be termed the 'basic' or 'export' sectors such as business services, FIRE, and all three goods producing sectors. Across the 'centrality' dimension there is a tendency for employment growth in the service sectors - both high order and retail - to vary significantly, as they do to a lesser extent across the city size classes.

No attempt will be made, in this section, to link the education patterns observed across these various dimensions with the employment growth patterns. However, the significant variation across these dimensions, as well as the theoretical importance of these dimensions in terms of employment distribution and growth (see Coffey & Shearmur, 1998), emphasises the necessity of controlling for their effect to the extent that this is possible. Thus, in all the regression analyses except those constructed to explore the changing relationship of education and employment growth across time, the RSC control variables will systematically be included.

4.2 1981-1991: A model testing approach

Before presenting the results obtained by testing an employment growth model across the fifteen economic sectors, it is important to verify whether our set of education variables can be reduced to two dimensions such as suggested by Lehnen & McGregor (1994). Once the choice of education variables has been justified, the regression results will be presented.

4.2.1 Educational Dimensions

Across the Canadian urban system, in 1981, the ten education variables which have been analysed can be summarised by two distinct dimensions (figure 1). The first dimension, which explains 52.2% of total chi2, opposes post-secondary education on the one hand to no post-secondary education on the other. In particular, the results of the correspondence analysis show that the ed1 variable lies along this dimension. Thus,

using ed1 as an indicator of 'basic skills' is inappropriate: this is confirmed by referring to the correlation matrix (table 2) in which the high and negative correlations between ed1 and most post-secondary education indicators can be noted. Ed2 (grade 9 to grade 13, no certificate) tends to be associated with the higher levels of education along this axis.

The second dimension. which accounts for 28.5% of total chi2, opposes ed2 to all other education levels, in particular to ed5 (non-university, post secondary, no certificate), ed3 (grade 9 to grade 13, with certificate), ed4 (trades certificate) and ed8 (university degree).

Although the results are not entirely clear cut, these dimensions correspond to some extent to those identified by Lehnen and McGregor (1994). The first axis can be interpreted as defining a 'complex skills' dimension, with ed1 at one extremity and ed7 and ed8 (both university education variables) at the other. The second axis can be interpreted as a 'basic skills' dimension with lack of skills at one extremity (ed2) and 'skills' at the other (in particular grade 13 certificate and trades diploma). One could have expected ed1 to define the 'lack of skills' extremity, but this variable is not relevant either way in defining this dimension.

The dimensions which emerge from this analysis are not as unambiguous as those defined by Lehnen & McGregor (1994), who possessed a wider array of variables - skills tests as well as formal education variables: but their basic proposition, that there are two dimensions to the measurement of human capital, is confirmed across the Canadian urban system. Despite the limited variety of data used in this analysis, not only the number but also the nature of these dimensions appears to be substantiated.

It is therefore appropriate to test a model of urban employment growth which includes *two* education variables, one representing 'complex skills', the other 'basic skills', since each of these dimensions may affect employment growth in a different way. The variables included in the model have been chosen partly on statistical grounds, partly on conceptual grounds. From a statistical perspective it is necessary to include one variable which is closely associated with each dimension[77]. These variables must not be highly correlated in order that they may be construed as 'independent' variables. From a

[77] Composite indicators have been avoided due to the interdependence of the education variables and to the ambiguous interpretation of such indicators.

conceptual perspective, the variables must be easily interpretable, and if possible they must correspond to clearly defined education levels.

The variables retained for the model are therefore ed8, the percentage of population with a university degree, and ed3, the percentage of population with a grade13 certificate. Ed8 (university degree) represents the 'complex' skills dimension, and ed3 (grade 13 certificate) 'basic' skills. These variables are not very highly correlated (r = - 0.23) and can be interpreted unambiguously. From a purely statistical perspective, the choice would have been ed7 (university, no degree) - a variable associated almost exclusively with the first dimension - and ed5 (some non university post secondary, no certificate) - almost exclusively associated with the second dimension. These variables are uncorrelated (r = 0.02), but the resulting model would not be testing well defined levels of educational achievement.

4.2.2 The model

The basic model tested across all economic sectors for the 1981 to 1991 period is the following:

g_i = region + size + centrality + %grade13 + %degree + e

where	g_i =	% employment growth in sector i over 1981 to 1991
	region =	regional effect (5 regions)
	size =	size effect (5 sizes)
	centrality =	centrality effect (2 classes)
	%grade13 =	proportion of the population aged 15 and over with grade 13 certificate as maximum educational achievement
	%degree =	% of degree holders in the population aged 15 and over
	e =	error term

It is immediately apparent from observing the results in table 3 that the RSC effects are systematically significant. For each of the eighteen models tested at least one of the three effects is highly significant in explaining employment growth. Over 1981 to 1991, there is a tendency for the centrality effect to be most closely associated with employment growth - this is the case for nine of the fifteen sectors, and for total and service employment.

The education variables are also statistically significant for a number of sectors, but 'basic skills' are far less relevant than 'complex skills'. For total employment growth and goods producing growth, the proportion of degree holders in 1981 is very closely associated with employment growth over the 1981 to 1991 period, the strength of this association being greater than that of any of the RSC variables. For service sector growth, however, neither education variable is statistically significant.

This pattern is replicated, for the education variables, in five individual sectors. In particular, employment growth in the manufacturing sector is closely associated with high initial percentages of degree holders. Surprisingly, though, the initial proportion of degree holders is not significant in the models pertaining to growth in the financial and high order business services. On the other hand, the RSC variables are all very highly significant, particularly for employment growth in business services. It is worth noting that this sector is the only one for which growth rates vary significantly across all three RSC dimensions, and the overriding importance of these control effects is in keeping with the study by Coffey & Shearmur (1997) which emphasises the strong tendency that business services have to locate towards the top of the urban hierarchy.

The only economic sector for which the basic skills dimension plays a significant role is the education sector. For this sector, the initial proportion of the population having a grade 13 certificate is the strongest predictor of subsequent employment growth. All variables except for the percentage of degree holders are significant in this model.

Overall, the hypothesis that each educational dimension has a distinct effect on employment growth is not verified. Only one of the two educational dimension appears to play a role, and neither are of any value in explaining employment growth in the aggregate service sector. Furthermore employment growth in nine out of the fifteen sectors analysed would appear, on the basis of this model, to be entirely unrelated to the initial education levels in urban areas. Thus not only does just one dimension appear relevant, this relevance is almost entirely confined to the manufacturing sector. The pattern which emerges is one in which the manufacturing sector is the only sector for which initial education levels play a role in determining future employment growth. The faster growth in retail and health & social security employment which is also associated with higher initial education levels probably occurs either as a consequence of the faster

manufacturing growth, by way of consumption multiplier effects, or as a result of the higher demand which a more educated population may have for these services.

In order to verify whether these tentative conclusions are justified, the results obtained by an exploratory approach will now be presented.

4.3 An exploratory approach

The database used for conducting the above analysis contains eight distinct education variables, and two further ones have been constructed (see annex 2). The proposed model only highlights the relevance of education levels for a small number of sectors, and it may be that other education variables possess better explanatory power for specific sectors. In other words, there may not be one model which is valid across all sectors.

In order to keep the analysis straightforward, and bearing in mind the apparent irrelevance of the second educational dimension, the exploratory analysis will be restricted to analysing each education variable individually, not in combination with other education variables.

Table 4 presents the results for each education variable and each economic sector. The F values for the RSC effects have been shown only for the models in which the 'best' (highest F value) education variable is included. For each sector two r^2 values are shown, the value for the RSC effects alone and the value after the 'best' education variable has been added.

It can first of all be noted that, if the model is allowed to differ across economic sectors then education becomes a significant factor for fourteen of the eighteen sectors (as opposed to eight of the eighteen sectors for the fixed model). This suggests that the link between education and employment growth differs across economic sectors, and one model is not appropriate for all sectors.

Interestingly, although it is the proportion of degree holders which is the most strongly connected to employment growth both overall and in the goods producing sectors, this variable does not emerge as the most significant for *any* of the individual sectors. In six of the fifteen sectors, rather than high proportions of degree holders being positively

correlated with growth, it is high proportions of people with little or no formal education (ed1) which are strongly associated with employment decline.

The 'intermediate' education levels are not very significant in terms of employment growth. Higher initial levels of ed1 have a significant depressing effect on employment growth in many sectors (including the three aggregate employment growth indicators), and higher initial levels of ed6 and ed8 have significant positive effects on employment growth in many sectors. This tends to underline not only the deleterious effect of very low levels of education, but also the relevance of formal qualifications - both ed6 (non university certificates) and ed8 (university degrees) are indicators of the proportion of the population which has *completed* a post secondary education course.

Higher proportions of ed6 and ed8 do not have the same significance over all economic sectors. For the aggregate service sector, and for business services in particular, it is specifically the proportion of ed6 which enters the model significantly, the proportion of ed8 having no effect. Such a result does not necessarily suggest that the proportion of degree holders is unrelated to business service employment growth; indeed, if the RSC control variables are left out then growth in this sector is closely associated with the proportion of degree holders. Rather, the result shows that the ed6 variable - the proportion of the population with non-university post secondary certificates - has an effect on employment growth in the service sectors over and above the effect of the RSC controls.

More specific remarks can be made about the results obtained in some sectors. Employment growth in the education sector, for instance, is faster in cities with higher initial levels of ed3 (grade 13 certificate) and lower initial levels of ed13 (below grade 13). It can also be noted that analysis of the type presented in table 1 shows that there is a tendency for employment in the education sector to grow faster in larger cities, in metropolitan areas, and in Ontario, the Prairies and BC - the three regions with the lowest percentages of population not having achieved grade 9.

This pattern reinforces the remarks made above regarding the cumulative processes which may be at work with regards to education levels. If education employment tends to grow fastest in urban areas which already have relatively high levels of educational attainment then it can be hypothesised that there will be more opportunities for

educational improvement in cities which already have an educated population. Conversely, cities which appear in most need of education employment, i.e. those which have the lowest levels of education amongst the population - also have the lowest employment growth in the sector. Of course, the faster growth in the education sector may be due to the higher demand for educational services which emanates from a more educated population - but this demand process will feed into the cumulative tendencies which have been observed above.

Overall, three principal conclusions can be drawn from this exploratory analysis. First, there is a general tendency across all sectors for employment to grow more slowly in cities where educational attainment is the lowest (highest proportions of ed1) and to grow in cities where educational attainment is the highest (highest proportions of ed6, ed8 and ed9). Second, although there is not one model which fits all sectors - the above holds true in a general way for all sectors in which education levels are found to have a significant effect. Finally, when growth in the education sector is analysed not only as a dependent variable but as one which could potentially have an effect upon education levels, further evidence of a cumulative process is found: higher initial education levels beget faster employment growth in the education sector.

A final conclusion, which echoes that made in the previous section, is the importance of the RSC control variables. Although initial education levels appear to have an independent effect on employment growth in most sectors (the education variables are statistically significant with large F values), centrality, region and, to a lesser extent, city size, are consistently related to employment growth in all but one sector. The addition of an education variable to the 'control' RSC model generally improves the explanatory power of the model, but not to a very great degree. The increase in r^2 is small, and this shows that education levels do not add much to the explanatory power of the RSC effects. Rather, the explanatory power of the RSC effects can partly be accounted for by the variation in education levels across the RSC dimensions.

The manufacturing sector stands out in this respect. For this sector, the inclusion of an education variable leads to a very sizeable jump in the proportion of variance explained, from $r^2 = 0.17$ to $r^2 = 0.26$. In this sector, not only do education levels (specifically ed1 and ed6) play a significant role when the RSC dimensions are controlled for, but the role of education levels is to a large extent distinct from the role of RSC. Initial education levels,

as growth factors, can be distinguished from factors such as region, centrality and city size, whereas for most other sectors there is a large degree of overlap.

The retail sector behaves in a similar fashion to the manufacturing sector, with education playing a significant and independent role. After including an education variable, the coefficient of variation, r^2, jumps from 0.14 to 0.22. Whereas it can be hypothesised that, for the manufacturing sector, higher education levels have a supply effect, in the case of education it is more likely to be the effect on local demand which is most relevant. It is interesting to note, in this respect, that the pattern of education variables which are associated with manufacturing employment growth is very similar to the pattern observed for retail employment growth.

4.4 The 1991-1994 period

It is unfortunately not possible, on the basis of the data which we have, to perform a comprehensive analysis since only 59 cities are covered for the 1991-1994 period. These cities tend to be amongst the larger ones, and the smallest size category is virtually unrepresented. In order to effect a comparison, the selection of 59 cities is analysed over 1981-1991 and 1991 -1994.

The education variables which are most strongly connected with employment growth in the 59 cities from 1981 to 1991 (see table 5) differ from those identified in the analysis of the entire urban system (see table 4). This is not surprising for two reasons: on the one hand, the set of cities analysed is different and has not been randomly selected. On the other hand, the results presented in table 4 are derived from simple univariate regression analyses with no control for the RSC variables. Bearing in mind the considerable variation of education levels across the various RSC dimensions (see table 1) the difference in results when these controls are taken out is to be expected.

Having said this, the differences are less remarkable than the similarities. Over the 59 cities, we still find that higher education (university degrees and non university certificates) is associated with employment growth in all three aggregate sectors, and that lower education levels (in particular the percentage of people not having a grade 13 certificate, ed13) are strongly associated with lower employment growth. The positive effect of higher levels of education is evident in eight of the fifteen sectors, and the

depressing effect of low levels of education is also evident in eight sectors (not the same eight). It can be noted in particular that growth in the business service sector is strongly associated with higher proportions of degree holders.

This general pattern disappears over the 1991 to 1994 period. Over these years, initial levels of both low and high educational attainment have no significant association with aggregate employment growth. From a series of results over 1981 to 1991 which suggest the association between employment growth and post secondary diplomas or degrees, we go to a series of results which suggest the opposite: it is ed5 (proportion of the population with some non-university education) and ed7 (proportion of the population with some university education) which are most closely related to employment growth, i.e. the two indicators which highlight non-certified post secondary studies (but also the two indicators most closely associated with the educational dimensions previously identified).

The positive association between ed5 and employment growth is principally evident in the goods producing, and specifically the manufacturing sector; that between employment growth and ed7 only occurs in the construction industry and in some service sectors. The business service sector is the *only* sector for which there exists a significant association between the initial proportion of degree holders and employment growth. Over the 1991 to 1994 period, employment within the education sector is unrelated to initial education levels - there is thus no evidence of a cumulative-type process over this period, but there isn't evidence, either, of increased education employment in cities with the lowest levels of attainment.

Finally, some remarks can be made relating to the total explanatory power (r^2) of the models over the different periods. Over 1981 to 1991, growth in two basic industries is quite strongly associated with initial education levels (max. $r^2 = 0.16$ for manufacturing and max. $r^2 = 0.18$ for business services[78]). Apart from growth in consumer services, growth in consumer oriented activities such as retail, accommodation & restaurants and construction are not as closely connected with initial education levels[79]. Over the 1991 to 1994 period, there is a change in pattern: employment growth in the 'basic' industries is no longer associated with initial education levels (max. $r^2 = 0.08$ for manufacturing and

[78] max. r^2 is the highest r^2 obtained by regressing an initial education variable against growth in the sector under consideration. Whatever the actual indicator which produces it, max. r^2 is taken to be an indicator of the strength of association between initial education levels in general and employment growth in that sector.
[79] max. $r^2 = 0.08$ in construction; 0.08 in retail; 0.09 in accommodation and restaurants

max. r^2 = 0.08 for business services), whereas the association has strengthened in the consumer oriented sectors[80]. It is not possible to emit any conclusions on the basis of this pattern, but an interesting hypothesis is that over 1981 to 1991 initial education levels acted as labour supply factors, and therefore had a stronger effect on employment growth in potentially 'footloose' industries, and that over the 1991 to 1994 period they acted as output demand factors, and therefore had a stronger effect on industries which produce and sell locally.

The comparison made between the 1981 - 1991 and 1991 - 1994 periods is instructive because it clearly illustrates that the general pattern identified over the first period is not reproduced over each time period. The reasons for this change are far more difficult to identify. There may be some intrinsic differences between the 1980's and the 1990's. The effect of initial education levels over a ten year period may differ from its effect over a three year period. The 1981 -1991 period, which approximately covers a complete economic cycle, is different from the 1991-1994 period which covers a recession and slow recovery. The comparison thus raises more questions than it answers, but it does serve to highlight the fact that the widely held view that higher levels of education are associated with faster employment growth - a view supported by the findings over 1981 to 1991 - must be tempered by other, as yet undetermined, considerations.

5.0 Conclusion

5.1 Results

The conclusions will deal principally with the 1981 to 1991 period since the data covers the entire urban system and a complete analysis has been performed for the period. There is no doubt that initial education levels in Canadian urban agglomerations are associated with employment growth, and current theory suggests - to the extent that it deals with causality - that the employment growth is at least partly a consequence of the more educated workforce. However, in all sectors except for manufacturing and retail, the inclusion of an education variable does not greatly improve the explanatory power of the basic RSC model.

[80] max. r^2 = 0.24 in construction, 0.18 in retail, 0.11 in accommodation and services

This suggests that, given a city's basic geographic characteristics (size, region and distance from a major metropolitan area), employment growth in most economic sectors is influenced by education levels only to the extent that these co-vary with the RSC dimensions. Variations in employment growth in most sectors would appear to be adequately accounted for by position in the urban hierarchy, region and centrality. The inclusion of education variables clarifies the situation, by partitioning out the 'education' element from the other dimensions but does not add much to the overall power of the models.

However, two important exceptions are identified. Manufacturing and retail employment growth do seem to occur in cities with higher initial education levels independently from the RSC dimensions. Since manufacturing is one of the basic sectors identified earlier in the paper, this propensity for the sector to grow in cities with a more educated workforce is very significant, particularly in the light of the fact that although very few *individual* sectors behave similarly, *total* employment growth and growth in the aggregate *goods* producing sector are also explained considerably better after the inclusion of an education variable. It can be hypothesised that the growth of the manufacturing sector generates diffuse multiplier effects throughout the economy which become apparent at the aggregate level. These multiplier effects would appear to be particularly significant in the retail industry.

The other basic sectors identified behave in very different, though not unexpected, ways. Primary sector growth is not very strongly related to initial education levels, but the RSC factors are strongly associated with it. Business services, the distribution and growth of which are strongly connected with the urban hierarchy (Coffey & Shearmur, 1997), are likewise shown to be only weakly associated with initial education variables once the RSC dimensions are accounted for. A similar pattern is observed for the FIRE sector. For all three of these basic sectors, initial education levels explain very little of the inter-city variation in growth rates once the RSC variables are accounted for.

The comparative analysis of the 1981-1991 and 1991-1994 periods shows that the relationship between initial education levels and employment growth is not fixed over time. During the latter period, which covers a recession and the beginning of a 'jobless recovery', the overall association between initial education levels and employment growth remained quite strong, but fewer individual sectors stand out as displaying significant

relationships. In particular, the strong association between manufacturing employment growth and education has disappeared, and has been replaced by stronger associations in consumer oriented sectors such as construction, retail and hotel & accommodation. If this trend is verified, it may signal that an educated population is increasingly becoming related to employment growth through its capacity to spend rather than through its capacity to create and/or undertake employment which requires skills. Another possibility is that this trend is due to the recession: only cities with a more highly educate population retained the spending power to maintain these consumer oriented jobs, and, when a recovery occurs, these high education levels will once again be conducive to growth in the basic manufacturing sector.

5.2 Policy Recommendations and Further Questions

This analysis has concentrated on attempting to identify associations between education levels and employment growth in individual urban areas. Just as it is not possible to generalise from the national to the local level, it is also not possible to extend the conclusions of this analysis to the aggregate national level. Thus only local and municipal policies can be commented upon, and, bearing in mind the current trend towards local development, it is principally this type of policy which will be addressed. Having said that, it is worth bearing in mind the increasing relevance of local and regional economies to the global economy (Scott, 1996): this analysis, which looks at the effect of education levels on small geographic sub-divisions in the fluid national environment, may provide useful pointers for the study of workforce qualifications and employment at an international scale.

Many local development policies place heavy emphasis on the development of human capital - and whilst it is recognised that formal education is not the only means of doing this, it is also clear that an increase in formal education levels will not detract from the aim. It has been pointed out that the danger of increasing human capital locally is that this type of capital is highly mobile, and local investment therein may not actually benefit the locality (Cousineau & Vaillancourt, 1987; Maillat, 1989). This study shows that, at a local level, higher initial levels of education may indeed play a role in attracting and/or promoting employment growth, but that its role must not be overstated. Once total employment growth is controlled for region, size and centrality, education variables add a modest but significant element of explanation. In particular they add to the explanation of

manufacturing employment growth. Thus policies which seek to attract or promote manufacturing employment on the basis of providing a more qualified and skilled workforce appear to be concentrating on a relevant factor. However, it must not be forgotten that manufacturing employment is declining nation-wide, and localities competing for manufacturing jobs are competing for a shrinking pie. Even in high-tech manufacturing sectors, employment growth between 1971 and 1991 has been below the Canadian national average (Shearmur, 1997). Another point worth noting is that the effect of initial education levels on manufacturing employment growth appears to have greatly diminished between the 1980's and the early 1990's, and that the specific education levels which associate with employment growth differ according to the time period analysed.

The high-growth basic industries are principally business services (within which are included computer programming, research & development, management constancy...). Whereas development at the urban level could be far more effective in terms of job creation if such sectors could be promoted, there is no evidence that high initial education levels are sufficient to do so. Indeed, it is striking how little effect education levels have upon growth in these sectors once region, size and centrality are controlled for. Thus competition for these high-growth jobs cannot be waged between urban areas on the basis of workforce skills: this does not mean that education levels are not relevant to these industries, only that high education levels must be combined with the geographic and agglomeration advantages that only certain cities possess. Since localities cannot easily overcome handicaps linked to the absence of these advantages, it appears from this analysis that unless they already possess them they will have some difficulty in attracting or promoting employment in high-growth sectors.

Finally, it is important for policy makers to realise that the target may be moving, and may be dependent on phases of the economic cycle. The 1980's figures cover a fairly long period, and record the possible long term effects of education on employment growth. The figures for the 1990's only cover a fairly short period, one in which very few jobs were created anywhere - over this period what has been termed higher job growth could in many cases be called lower job loss. This distinction may be important, and higher education levels may have a heightened demand effect during recessionary periods and a heightened supply effect during periods of growth. Alternatively, the effects of education on employment growth may evolve over time.

Far more questions have been raised in this paper than have been answered: these questions are of crucial importance to local policy makers, because the fundamental issue at stake is the extent to which local policies can be based on arguments and rationales developed at a macro level for countries and for individuals. On a theoretical level such extrapolations cannot be justified. Only a fuller development of the theory surrounding the local effects of education on employment will be able to provide underpinnings for local policies, and it is hoped that this paper has provided some insight into the nature of the problems and into possible avenues of investigation.

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Education Variables

Variables from the Statistics Canada 2B census profile

These variables indicate the percentage of the working age (15 years and over) population in each city whose maximum academic qualification is the following:

ED1: less than grade 9
ED2: grade 9 to 13, no certificate
ED3: grade 9 to 13, with certificate
ED4: trades certificate or diploma
ED5: non university post-secondary, no certificate
ED6: non-university post-secondary, with certificate
ED7: university, no degree
ED8: university, with degree

Aggregated variables:

ED13: less than grade 13, no certificate (ED1+ED2)
ED9: some post-secondary (ED4+ED5+ED6+ED7+ED8)

Note that in tables 1, 2 and 3, **EDx** signifies initial education levels and **iEDx** signfies the percentage increase in EDx

Economic Sectors

note: the exact composition of each sector is available upon request.

Aggregates

a	Total employment	= b + c
b	Goods producing employment	= sum of 1 to 3
c	Service sector employment	= sum of 4 to 15

Individual sectors

1 Primary
2 Manufacturing
3 Construction

4 Transport & communications
5 Public utilities
6 Wholesale & storage
7 Retail trade
8 Consumer services
9 Accommodation & food services
10 Finance, insurance & real estate (FIRE)
11 Business services *
12 Other producer services *
13 Education
14 Health & social services
15 Public administration

for the 1991 to 1994 analysis, 11=11+12

* Note that for the 1991 to 1994 sectors, there is no 'other producer service' sector. This sector has been aggregated with business services.

The 1981 to 1991 figures come from Statistics Canada census information, and the sectors have been constructed by aggregating 160 sectors at the 2 and 3 digit SIC level.
The 1991 to 1994 figures are from the labour force survey, and the sectors have been constructed by aggregating 52 sectors at the 2 digit SIC level.

Table 1 - Variation of education and employment growth indicators across RSC dimensions

Region	initial 1981 values			% increase 81 to 91			% increase in employment 81 to 91						
	ED1	ED3	ED8	INCED1	INCED3	INCED8	Primary	Manuf.	FIRE	B.serv.	GOODS	SERV	TOTAL
Atl	20.7	10.7	6.7	-34.7	20.4	39.1	8.2	-8.3	8.7	42.1	-4.2	17.1	10.8
Qc	27.2	17.5	5.1	-20.5	0.7	41.6	10.1	-3.6	31.2	65.1	-1.5	21.4	13.0
Ont	18.8	13.4	6.3	-33.2	18.6	37.9	-3.0	-20.0	27.5	87.3	-10.8	28.8	13.1
Pra	16.6	10.1	7.2	-31.3	22.0	25.7	38.6	-10.0	12.0	30.8	-2.3	18.3	13.1
BC	14.0	12.0	5.8	-34.4	17.5	28.0	12.5	-1.0	7.9	47.1	-2.6	22.2	13.0
Chi2	78.9	106.4	21.7	51.7	52.1	21.7	19.9	17.3	22.1	25.8	7.6	10.8	0.4
p(chi2=0)	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.03	0.98
City Size													
300k+	15.6	13.0	10.3	-32.4	14.8	37.1	17.9	-7.5	26.9	70.4	-0.7	28.3	19.0
100-300	18.1	12.3	7.5	-33.6	18.8	39.0	8.2	-8.4	24.4	81.1	-2.8	29.9	20.2
50-100	18.7	13.8	6.4	-31.7	15.2	33.7	27.2	-12.6	25.9	80.4	-4.4	27.7	16.7
25-50	20.7	13.1	5.3	-28.2	15.8	34.1	13.1	-10.8	17.7	45.9	-6.1	21.2	11.1
10-25	21.2	13.5	5.3	-28.5	13.7	35.1	1.8	-9.7	17.2	45.7	-6.4	18.8	8.9
Chi2	12.0	3.6	46.6	8.9	2.4	2.7	8.9	3.8	4.1	15.3	1.9	19.4	18.4
p(chi2=0)	0.02	0.46	0.00	0.06	0.66	0.60	0.06	0.44	0.39	0.00	0.76	0.00	0.00
Centrality													
pop. 300K+	15.6	13.0	10.3	-32.4	14.8	37.1	17.9	-7.5	26.9	70.4	-0.7	28.3	19.0
less 100km	21.6	14.0	5.4	-29.8	18.4	35.8	13.0	-11.9	29.0	82.5	-5.1	30.1	16.1
more 100km	19.5	12.9	5.9	-29.5	13.4	34.7	9.4	-9.5	14.8	47.9	-5.7	18.2	10.1
Chi2	9.9	4.9	28.7	1.6	3.1	0.7	2.6	1.6	10.2	13.5	0.8	19.8	9.2
p(chi2=0)	0.01	0.09	0.00	0.45	0.21	0.71	0.27	0.46	0.01	0.00	0.67	0.00	0.01

Notes:

- the values in this table are mean percentages (value between 0 and 100), except for the chi^2 and $p(chi^2)$ rows.
- the chi^2 values are derived from Kruskal Wallis tests
- the $p(chi^2)$ row indicates the probability that the education or growth variables do not vary across the dimension (value between 0 and 1)
- the INCED columns indicate the mean percentage change in the ED variables from 1981 to 1991

Figure 1: Correspondence analysis of 1981 education levels across 152 urban areas

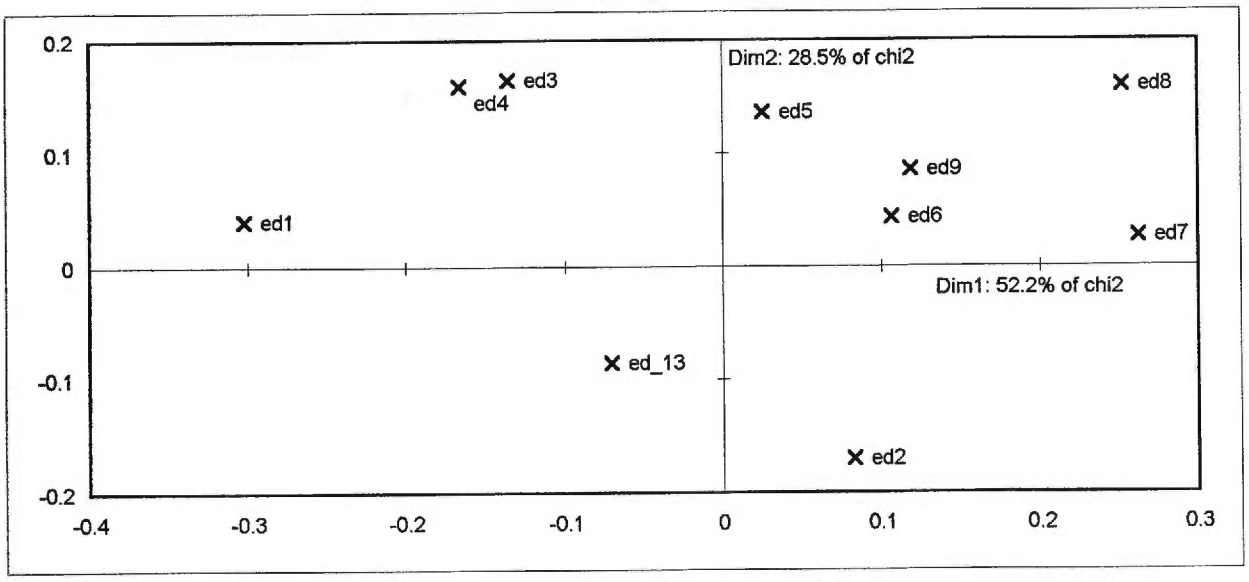

Table 2: Correlation matrix of 1981 education variables

		ED1	ED2	ED3	ED4	ED5	ED6	ED7	ED8	ED9	ED13
mean		19.85	29.79	13.25	3.91	5.61	14.44	7.00	6.15	37.11	49.64
standard deviation		6.16	6.13	3.13	1.25	1.21	2.41	2.23	2.29	5.62	5.80
number of observations		152	152	152	152	152	152	152	152	152	152
less than grade 9	ED1	1	-0.55	0.41	0.36	-0.17	-0.66	-0.68	-0.52	-0.72	0.48
9 to 13, no certif.	ED2		1	-0.73	-0.54	-0.38	0.12	0.26	-0.08	-0.08	0.47
9 to 13, certif.	ED3			1	0.65	0.32	-0.28	-0.55	-0.23	-0.22	-0.33
trades diploma	ED4				1	0.21	-0.15	-0.57	-0.36	-0.17	-0.18
non univ. post sec., no certif.	ED5					1	0.17	0.02	0.22	0.43	-0.59
non univ. post sec., certif.	ED6						1	0.50	0.30	0.75	-0.57
univ., no degree	ED7							1	0.69	0.77	-0.45
univ., degree	ED8								1	0.78	-0.63
some post sec. (ED4 to ED8)	ED9									1	-0.85
no grade 13 certif. (ED1+ED2)	ED13										1

Table 3 - 152 cities, 1981-1991 model testing approach

	Region	Size	MCP	ED3	ED8
Total	0.46	1.54	9.46***	(+)0.39	(+)14.98***
Goods	3.19**	0.31	1.2	(+)0.59	(+)16.11
Service	2.49**	3.94***	22.25***	(+)1.48	(+)1.40
Primary	8.40***	4.87***	5.66**	(+)1.25	(-)1.34
Manufacturing	4.08***	0.99	1.54	(+)2.24	(+)8.58***
Construction	11.83***	1.43	13.98***	(+)0.07	(+)2.97+
Transport & Communication	1.41	1.63	5.37**	(-)1.53	(+)1.22
Utilities	1.53	0.07	0.18	(-)0.40	(+)3.04*
Wholesale & Storage	0.73	1.2	20.78***	(+)0.03	(+)1.38
Retail	0.73	1.74	6.63**	(+)0.91	(+)7.94***
Consumer services	4.98***	5.63***	10.78***	(+)0.95	(-)0.03
Accommodation & restaurants	0.44	0.88	10.81***	(+)1.96	(+)1.07
FIRE	2.70**	0.99	5.51**	(-)0.41	(+)0.40
Business services	6.75***	5.62***	9.23***	(-)0.48	(+)2.31
Other producer services	0.78	4.67**	3.39*	(-)0.53	(+)0.59
Education	10.66***	3.98***	8.77***	(+)13.82***	(+)2.25
Health & Social serv.	2.81**	1.61	0.76	(+)2.22	(+)4.58**
Public admin.	9.12***	3.15**	16.46***	(-)0.20	(+)0.36

Notes:

- columns ed1 to ed13 contain the F value associated with the education variable in the multivariate regression of sectorial employment growth against the RSC and two education variables.
- the sign of the regression coefficient associated with the education variable is indicated in parenthesis
- the significance levels are indicated as follows: *** = 99%; ** = 95%; * = 90%
- the F value associated with the RSC effects is indicated in the appropriate column

Table 4 - 152 cities, 1981 to 1991 exploratory analysis

	F values for RSC variables 'best' education included.						F value for each education variable when added to the RSC model									
	Region	Size	MCP	best	r^2 with best	r^2 only RSC	ED1	ED2	ED3	ED4	ED5	ED6	ED7	ED8	ED9	ED13
Total			9.23***	ed8	0.25***	0.20***	(-)14.17***					(+)5.69**		(+)15.37***	(+)9.60***	(-)9.14***
Goods	4.03***			ed8	0.18***	0.07	(-)12.22***				(+)7.21***	(+)5.34**	(+)4.39**	(+)16.54***	(+)14.87***	(-)13.77***
Service	2.55***	3.95***	22.98***	ed1	0.32***	0.30***	(-)5.69**					(+)5.31**				(-)3.59*
Primary	7.97***		4.09**	ed5	0.29***	0.28***					(+)4.29**					
Manufacturing	9.50***			ed1	0.26***	0.17***	(-)12.72***	(-)3.40*	(+)2.83*			(+)10.93***	(+)7.47***	(+)8.99***	(+)8.84***	(-)11.96***
Construction	19.00***		14.80***	ed1	0.48***	0.41***	(-)5.56**					(+)5.10**		(+)3.04*	(+)3.31*	(-)3.00*
Transport & Communication		2.54*	6.04**		0.14**	0.13**										
Utilities				ed4	0.20**	0.14		(-)3.38*		(+)7.69***		(+)6.06**		(+)2.89*	(+)7.19***	(-)5.22**
Wholesale & Storage			19.69***	ed1	0.24***	0.24***	(-)4.97**				(-)3.31*					
Retail	3.27**	2.19*	7.01***	ed6	0.22***	0.14**	(-)12.38***				(+)4.48**	(+)14.95***		(+)8.30***	(+)14.19***	(-)14.08***
Consumer services		4.65**	10.97***		0.28**	0.29***										
Accommodation & restaurants			10.82***	ed1	0.14**	0.11**	(-)4.96**					(+)3.15*				
FIRE	2.50**		5.61***		0.22***	0.22***										
Business services	10.68***	5.08**	6.35**	ed1	0.48***	0.45***	(-)5.14**					(+)4.45**				
Other producer services		5.71***			0.30***	0.27**										
Education	8.98***	4.49***	5.94**	ed3	0.31***	0.28***		(-)6.91***	(+)8.97***							(-)5.86**
Health & Social serv.	2.79**			ed13	0.18***	0.12**	(-)6.96***				(+)7.48***	(+)6.39**		(+)4.95**	(+)7.70***	(-)9.22***
Public admin.	9.35***	3.48**	18.31***	ed1	0.38***	0.36***	(-)3.02*									

Notes:

- columns ed1 to ed13 contain the F value associated with the education variable in the multivariate regression of sectorial employment growth against the RSC and education variables.
- the sign of the regression coefficient associated with the education variable is indicated in parenthesis
- the significance levels are indicated as follows: *** = 99%; ** = 95%; * = 90%
- the r^2 associated with the model including the 'best' education variable (that which displays the highest F value) is in the 'r^2 with best' column
- the 'best' education variable is indicated in the 'best' column.
- the r^2 associated with the RSC model alone is in the 'r^2 only RSC' column

Table 5 - 59 cities, comparison of 1981-1991 and 1991-1994

1981-1991	max.r^2	best	ED1	ED2	ED3	ED4	ED5	ED6	ED7	ED8	ED9	ED13
Total	0.30***	ed8	(-) 3.58*						(+)5.22**	(+)23.21***	(+)11.74***	(-)11.27***
Goods	0.16***	ed13		(-)7.24***				(+)3.09*			(+)6.96**	(-)10.16***
Service	0.27***	ed8								(+)19.90***	(+)3.64*	(-)3.59*
Primary	0.08**	ed1	(-) 4.60**									
Manufacturing	0.16**	ed6		(-)8.47***			(+)6.01**	(+)9.94***			(+)6.34**	(-)9.01***
Construction	0.08**	ed3	(+)3.87*	(-)3.24*	(+)4.96**			(-)3.89*	(-)3.61*			
Transport & Communication	0.32***	ed8	(-)6.41**			(-)5.27**				(+)24.41***	(+)4.34**	(-)2.84*
Utilities	0.26***	ed4		(-)14.03***	(+)6.21**	(+)17.32***						(-)3.66*
Wholesale & Storage	0.10**	ed8								(+)6.34**		(-)4.10**
Retail	0.08**	ed13		(-)4.81**	(+)4.71++		(+)3.22*					(-)4.88**
Consumer services	0.20***	ed4	(-)8.28***	(+)4.94**	(-)10.77***	(-)13.07***		(+)3.24**	(+)8.51***	(+)3.17*	(+)5.51**	
Accommodation & restaurants	0.09**	ed6	(-)4.45**					(+)5.56**			(+)5.55**	(-)3.13*
FIRE	0.06*	ed6						(-)3.46*		(+)2.96*		
Business services	0.18***	ed8								(+)11.63***		
Other producer services	0.10**	ed5					(-)5.21**					
Education	0.27***	ed4	(-)8.42***	(+)3.84*		(-)20.14***			(+)11.99***			
Health & Social serv.	0.15***	ed8				(-)6.04**				(+)9.51***		
Public admin.	0.07**	ed6						(-)4.29**				

1991-1994	max.r^2	best	ED1	ED2	ED3	ED4	ED5	ED6	ED7	ED8	ED9	ED13
Total	0.20***	ed5				(-)4.21**	(+)13.39***					
Goods	0.18***	ed5					(+)11.80***					
Service	0.08**	ed4				(-)5.05**			(+)3.26*			
Primary	0.09**	ed6						(+)5.06**				
Manufacturing	0.08**	ed5				(+)3.53*	(+)4.81**					
Construction	0.24***	ed1	(-)16.97***		(-)3.47*	(-)7.61***	(+)3.24*	(+)8.36***	(+)9.76***		(+)10.00***	(-)4.90**
Transport & Communication	0.15***	ed1	(-)9.63***				(+)3.45*				(+)2.85*	
Utilities												
Wholesale & Storage	0.06*	ed9		(+)3.12*							(-)3.53*	
Retail	0.18***	ed3		(+)3.21*	(-)12.14***							
Consumer services												
Accommodation & restaurants	0.11**	ed4			(-)4.19**	(-)6.94**			(+)5.07**			
FIRE	0.07*	ed4				(+)3.83*						
Business + prod. services	0.08*	ed1	(-)5.22**			(-)4.54**			(+)2.86*	(+)4.33**	(+)3.04*	
Education												
Health & Social serv.	0.05*	ed3			(+)2.85*							
Public admin.	0.09*	ed13	(-)3.06*								(+)3.13*	(-)5.42**

Notes:

- columns ed1 to ed13 contain the F value associated with the univariate regression of the education variable against sectorial employment growth.
- the direction of the relationship is indicated in parenthesis
- the significance levels are indicated as follows: *** = 99%; ** = 95%; * = 90%
- the r^2 associated with the 'best' education variable (that which displays the highest F value) is in the max. r^2 column
- the 'best' education variable is indicated in the 'best' column.

Chapter 10

Conclusion

The conclusion to this thesis will be brief. Each of the empirical analyses is self contained, and the principal lessons to be drawn from each one have already been set out. It is, however, useful to emphasise two main themes from the foregoing work. One is an important methodological issue, the other a policy one. These will be elaborated below, and the final section of the conclusion will indicate a few avenues of research opened up by the work contained herein.

10.1 Methodology: the limits to statistics

It has not been claimed in the foregoing empirical analyses that statistics can provide any definitive answer regarding the causes of spatial variation in employment growth across Canadian cities. The limits of the approach are now apparent. Clearly, economic and employment growth rely on a very wide variety of factors, and many of these factors can only be measured with difficulty. The institutional and cultural framework, to name but two of the factors which theorists accept as being central to understanding growth, can only be measured, if at all, in a very approximate fashion. Even so, if growth were *solely* a factor of these two variables, there is little doubt that good proxy measurements would by now have been developed.

However, employment growth and distribution is not *solely* a result of any number of variables. It is a social process, largely determined by social evolution, and even if there exist some factors which are more closely related to growth than others, it is impossible to isolate their effect. Indeed, all of the factors identified - and no doubt others which have not been - combine to produce certain growth and distributional outcomes, and it is a study of their combination which may lead to a deeper understanding of the processes involved.

For all the methodological refinement which can be introduced in statistics, the basic problem remains that it is a study of averages. And even if some authors feel able to make heroic statements such as "the average of the democracy indicator from 1975 to 1994 is 0.85 for Jewish countries (1 country)" (Barro, 1997, p76), the fact remains that to

be of any value at all a large number of observations is required for statistical techniques to be of relevance. This is particularly so if variables are to be studied in combination. In the preceding analyses we have been fortunate to possess a reliable database covering 152 urban areas. The variables are comparable, the scope for error is known, and the definitions over time have been verified. Even in such a context, only a small number of variables can be tested simultaneously: so, even with (near) perfect measures of every conceivable growth factor, statistical techniques would only permit one to explore the combination of a very few at a time.

Kuznets addressed the problem by relying on simple techniques - often frequency analysis - and there is much to be said for this approach which preserves the individuality of each observation. Another technique has been suggested in the preceding pages: that of combining statistical analysis with case studies. In each of the four analyses, outliers have been identified and discarded: this has enabled rough models to be suggested: but in order to begin to understand the relationship between these models and real life, studies should be made of the cities in which the model does not hold. Understanding why an observation does *not* conform to a statistical model is maybe the best way of achieving some understanding of why the others do.

Even this approach will not suffice: ultimately there is no one recipe for employment growth. Each location, each culture will have different goals and different ways of achieving those goals. The statistical approach can help in identifying regularities so that informed decisions can be made, it can help in divesting received wisdom and current orthodoxies of some of their power, and it can provide valuable descriptions of distributions and relationships from which more holistic theories of growth can be derived.

10.2 Policy

Towards the end of part I I argued that governments, and by extension society, are not powerless in the face of market forces and technological change. These forces can be harnessed and put to good use by and for society, and they have no value outside the outcomes which they lead to. These outcomes cannot be determined by any amount of analysis: they are political choices. The attempt made by many neo-classical economists to suppress this basic fact, to invest in 'the market' some power over and above that of a tool, can lead to outcomes which are socially undesirable. Moreover, by ignoring the

political workings of the economy, neo-classical economics enables financial and multinational interests to manipulate the market with impunity - since, in theory, markets cannot be manipulated.

In terms of regional and local development policy there are good reasons to believe that intervention is necessary. An argument has been made for renewed national level intervention, not only in the area of macro-economics, but with regards to the spatial distribution of economic activity. A return to the policy approach of the 1960's and 1970's is not suggested: it is clear that local policy makers and communities are better able than central government to identify local potential and effect the institutional and cultural changes necessary to exploit it. On the other hand, central government can provide information and knowledge to assist these local initiatives. It can also implement measures to regulate inter-jurisdictional competition and establish a framework which enables the rights and responsibilities of firms which benefit from local subsidies to be defined.

Some support for policy approaches explored in this thesis has emerged from the empirical research, in particular the suggestion that education levels may have an effect on the distribution of employment growth. But policy approaches based on targeting small establishments because of their size do not appear vindicated. Also, the lack of any apparent link between high value added manufacturing industries and high employment growth is evidence of a lack of connection between output and employment - a possibility entertained in Keynesian economics (which emphasises a policy role in correcting this - though not necessarily at the local level) but not by free marketeers.

In this context a question which intersects the 'growth coalition' arguments of Logan & Molotch (1987/1996), Cox (1995) and Leitner (1990) has arisen: why have SMEs and high tech industry been the focus of so much political interest if they do not generate the jobs which are often stressed when policy approaches targeting these factors are implemented? Only a study of the precise distribution of costs and benefits can grapple with this question, but the political power of high-tech companies (such as Bombardier and Pratt & Whitney, two high-tech firms in Quebec which have benefited from provincial (and federal) subsidies) must not be underestimated. The popularity of SMEs as a policy focus, which goes well beyond the realm of development policies, can maybe be related to desire of larger establishments to externalise the costs of flexibility: a reliance on

subsidised SMEs, just like a reliance on subsidised labour, is a means for the larger establishments to indirectly benefit from transfer payments. If this is the case, then it can be hypothesised that policy makers who focus upon these factors may be influenced either by fashion or by their class interests (business 'fashions' are developed in the ruling and managerial classes) which do not necessarily correspond to the interests of the region or locality. Such a possibility leads on necessarily to the type of analysis performed by Massey (1995) and Massey et al (1992) in which such class structures are found to be closely related to the spatial distribution of labour in general (Massey, 1995) and to the promotion and location of high-tech business parks in particular (Massey et al, 1992).

This analysis has not provided any definitive answers regarding the factors which affect the distribution of economic activity throughout the urban system. Rather, it has served to highlight the fact that some factors relied upon by conventional policy approaches are not related to employment in a manner as staightforward as often suggested. Maybe the most interesting 'positive' result is the importance which the regional factor systematically has upon urban employment growth: this indicates that individual cities only have a limited ability to influence employment creation since location within a region appears to be an important determinant of subsequent growth. Even the effect of city size and metropolitan proximity is less important than the regional factor.

The factors affecting regional (as opposed to urban) performance have only been studied indirectly in this thesis: but clearly international markets play a major role in determining the economic health of regions. In the 1970's, there was high demand for oil, so the Prairies boomed. In the late seventies and early eighties the demand for automobiles slumped and the industry was undergoing major restructuring - so Ontario, and to a lesser extent Quebec, suffered. Today, in 1998, the Asian crisis has severely undermined demand for the export of primary products from British Columbia, so it is probable that the region is experiencing decline relative to the rest of Canada. On the other hand, Quebec and Ontario may be benefiting from the low dollar and their manufacturing exports may be on the increase again. All of these regional effects will filter down to the cities within the regions - whatever the local policies put in place.

To ensure long term local economic health it is thus more important for urban units to build up institutions and a local culture which are capable of weathering these externally

inflicted ups and downs than to attract the latest fast growth industry. A diversified economy - whilst flying in the face of the theories relating to growth poles and comparative/competitive advantage - appears to be a good way of ensuring a certain stability. An educated workforce is also connected with employment growth, but it is clearly more difficult for smaller cities to retain their educated workforce: perhaps a diversified economy with diverse opportunities is a way of doing this. It is also necessary to recognised that each urban area is a distinct entity, and each needs to search for its own solutions for employment creation. The search for generalised growth factors may be of limited practical relevance in terms of identifying solutions - but the mere fact that it can guard against facile generalisations ensures its continued role in the debate surrounding local employment policies.

At a more general level, there is a role for national government in attempting to protect regions and cities from the vagaries of international markets. Whilst it is not possible to abstract from them completely, policies which smooth out aggregate demand could go a long way to providing appropriate conditions for localities to make the most of their potential. Policies which protect infant industries may provide localities with enough time to promote endogenous growth before competing directly with similar industries from across the world. Some form of control on flows of financial capital may provide a more stable environment in which trade in complementary goods can occur without traders suffering from the effects of wild currency fluctuations. The imposition of trade restrictions on imports from nations which do not share similar social and labour conditions may mitigate the effect of cost competition from less developed countries (Lipietz, 1986). Profligate and ill-thought out government spending is not being advocated: it is not being suggested that all problems can be solved by deficit financing. But the pendulum has swung so far away from government intervention on the demand side, and from government regulation of certain markets (such as the labour market or the 'market' of competing localities), that a return to some form of national government involvement *is* being advocated. The exact nature of this involvement, whilst it may run along the broad lines indicated in this thesis, is open to discussion.

Until there is some restraint put upon the unbridled play of global market forces, regions and localities will be under increasing pressure to provide a stable environment for their residents - but at the same time their power to have any effect upon this will be vastly reduced. There is a role for national governments in the management of international,

national and regional economies: this role exists because of the cultural cohesion of most nations which are, even in an age of globalisation, units with which many people can identify (Daly & Cobb, 1994; Todd, 1998). It is important for national governments to live up to their responsibilities and act as buffers and regulators of economic forces rather than as uncritical enablers. Urban governments need not be passive: a nation is made up of its constituent parts and well thought out local policies implemented in a somewhat more stable environment could be highly beneficial at both a local and a national level. But in the current climate local policies tend to converge upon cost reducing incentives which lead to a downward spiral of inter-urban competition.

10.3 Unanswered Questions

As this thesis has been developing, the extent of the unanswered questions and new avenues of research has widened considerably. From an initial position where I imagined that some answers could be found I now find myself having to choose which unanswered questions to emphasise most.

At one level, there are clearly methodological considerations to be pursued. The combination of statistics - to identify trends and outliers - and case studies - to understand the nature of outliers - is a promising avenue which may enable one to overcome some of the limits of pure statistical, and of pure case work, analysis. The statistics can be confronted with cases in which the whole context is considered, and the case studies will be able to distinguish between particular and general phenomena. Such an approach to the study of employment growth would lead to a more complete understanding of the processes involved.

It has already been indicated in the study on SMEs that the results require further investigation. The time period studied is short, and it will be interesting to see to what extent the results can be replicated over different time periods. Also, only 59 observations were used, and a more complete database would serve to investigate the link between SMEs and employment growth in the smaller cities.

Similarly, the study of education levels was limited by data availability, particularly over the 1991 to 1994 period. The study can be used as a basis for refining the understanding of the link between different measures of educational attainment and employment

growth. Once this has been done, two important aspects of the education/growth link need to be investigated. On the one hand, the results suggest that manufacturing industries are more likely to grow (or to decline more slowly) in cities with a more educated workforce - this result needs verifying and the reasons behind it need exploring. On the other hand, it is suggested that education levels - usually considered to be a supply-side indicator for labour quality - may in fact have a demand effect. Whether they have a supply or a demand effect may depend on whether the period under study is expansionary (1981-1991) or recessionary (1991-1994). This hypothesis requires further investigation.

The effects of international trade and financial markets on local growth merit further analysis: the degree to which localities can have a real effect upon their own economies is an open question, notwithstanding the literature on competitive regions and local development. Not only has some recent research suggested that urban governments may not in fact be *authorised*, under the GATT, to implement development policies at a local level (Shearmur, 1998), but even if it were entirely 'legal' the extent to which they can buck world trends and the mobility of capital is not clear. It is this question which is perhaps most central for local policy makers today.

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Appendix 1: Some Empirical Results Relating to the Analysis of Urban Systems

A.1.1 Empirical examples of specialisation in urban systems

There are many ways of approaching the definition of function within an urban system, even if the function is narrowed down to industrial structure (as opposed to social, political or other possible functional dimensions). Often researchers are faced with large matrices, composed of employment observations for each city within the system analysed (Berry, 1978, p221). Faced with such a database, there are basically two possible approaches: either the researcher prioritises certain sectors and functions, and performs a classification of urban units based on judgement informed by theory, or statistical methods can be used (such as factor analysis, Berry, 1978; cluster analysis Noyelle & Stanback, 1984; Coffey & Shearmur, 1996) which extract groups of cities with certain profiles. However, even the use of statistical approaches requires choices to be made, since the level of disaggregation of the data and the classification of borderline cases usually depends upon the theoretical framework within which the researcher is evolving.

It is worth taking note of Berry's (1978) conclusion as regards the outcome of exercises in urban classification. After reviewing the literature of the time, he concludes that:

> "The economic base of urban centres tends to act independently of other urban structural features (with the exception of hierarchical organisation of market oriented activities ...), and, to the extent that there is geographic specialisation based on locational factors other than market orientation, each broad economic function will lead to its own distinctive economic town type. Public activities - military bases, educational centres, public administration - act as any other specialised economic base.
>
> Every urban system is organised system-wide into a hierarchy of centres based on aggregate economic power. The functional size of centres in an urban hierarchy is a universal latent dimension..." (Berry, 1978, pp231-232)

We will now briefly review some more recent exercises in urban classification and it will be seen that despite the evolving economic framework of the last twenty years, Berry's basic conclusions remain valid today.

Sassen (1991/1996), in her discussion of global cites, is not faced with detailed problems of classification since she is not attempting to describe the world's entire urban system. Rather, she begins her analysis with a consideration of the world economy, and a description of how changes in this economy have

> "assumed forms specific to particular places... The geography and composition of the global economy changed so as to produce a complex duality: a spatially dispersed, yet globally integrated economy" (Sassen, 1991/1996, p61).

This duality has, according to Sassen introduced a new role for the world's major cities. Although she recognises that these changes probably have repercussions throughout the entire urban system, comprised of the various national systems, she concentrates on what she sees as the cities at the top of this hierarchy, the major financial centres of New York, London and Tokyo. "Top-level control and management of the financial industry has become concentrated in these financial centres" (Sassen, 1991/1996, p63). Other 'central' functions have also concentrated within these cities: she recognises that the international division of labour exists, but emphasises that the ultimate control of most economic activities can be traced back to the high-order service agglomerations within world cities.

Coffey's (1994) findings suggest that Sassen's view of major cities as control centres is replicated within the Canadian urban system: from 1971 to 1991 there has been a shift of high order services towards Canadian metropolitan areas, in particular towards Toronto. In Canada "complexes of corporate activity" have evolved which are characterised by the

> "spatial clustering and mutual symbiosis of 1) the head or divisional offices of primary, secondary and tertiary sector firms; 2) high-order financial establishments; and 3) the producer service firms that provide inputs to the first two types, as well as to each other" (Coffey, 1994, p67).

Rice (1996), moves further still down the 'international urban hierarchy' and focuses on headquarters location in "peripheral quaternary places" such as Calgary. He finds that during the 1970 to 1990 period, "Calgary attracted headquarters of companies from subsectors that were declining relative to other subsectors of the Canadian economy" (Rice, 1996, p78). The headquarters of rapidly growing sectors, on the other hand, are concentrated almost exclusively in Montreal and Toronto: thus, from a different perspective, that of headquarters locations, Rice confirms the functional model put forward by Sassen - there appears to exist a global urban hierarchy related to control functions within the economy, with a small group of international cities at the summit of the hierarchy, cities such as Toronto (and to a lesser extent Montreal) serving as intermediate centres, and so on down the national urban hierarchy.

Such an analysis can be supplemented by a more holistic approach to the urban system: for the purposes of Sassens's (1991/1996) and Rice's (1996) analysis, control functions are at the centre of their 'classification' approach. These also emerge from Coffey's (1994) study of Canadian metropolitan areas, but other urban functions become apparent if other economic sectors and a wider number of cities are considered.

In 1984 Noyelle & Stanback (1984) proposed a classification of the 140 largest SMSAs in the USA based upon an analysis of the industrial composition of their employment in 1976. Their study differs from previous urban classifications (such as those reviewed in Berry, 1978) by the fact that their data disaggregates service employment into sectors of similar refinement as usually accorded to manufacturing industries. They identify four principal 'types' of city (Noyelle & Stanback, 1984, p4):

1- *nodal* cities, such as New York, Chicago, Philadelphia, Boston .... are characterised by high proportions of employment in high order services and government. These cities can in turn be classified as national, regional or sub-regional nodes.
2- *specialised service centres* provide a narrower range of intermediate service activities, and fall into two categories. i) *functional nodal* which comprises cities which have a strong production orientation but have become decision making centres in certain sectors; ii) *government-education* and *education-manufacturing* cities which specialise in government or non-profit services.
3- *production centres* specialise in the production of manufactured goods, both commercial and military. This also includes cities specialising in resource extraction.
4- *consumer-oriented centres* specialise either as resort/retirement cities or as residential areas.

Overall, Noyelle & Stanback (1984) find that during the period of their study (approximately 1959 to 1976) there has been some decentralisation of manufacturing production but, in keeping with the previously mentioned studies, decision making activities and high order services have remained very centralised. Their analysis highlights the difference between 'snowbelt' urban areas - in which the slow growing cities with an important manufacturing base are located - and 'sunbelt' areas where the faster growing military and resort-retirement cities are located. Finally, they suggest that focus must not only be on overall employment growth but also on intra-sectoral employment shifts: some of their manufacturing centres have not experienced major employment loss, but within these cities there has often been major sectoral shifts in employment (from manufacturing to services).

Coffey & Shearmur (1996) performed an analysis similar to Noyelle & Stanback's but for the Canadian Urban System in 1991. 152 agglomerations of over 10,000 population were analysed, and

a statistical approach to the definition of clusters (cluster analysis) was used[1]. In keeping with Berry's (1978) conclusion, broadly similar functional categories were identified and Coffey & Shearmur's seven functional categories have been grouped below to highlight the similarity with Noyelle & Stanback's analysis.

1- a small group of *diversified* cities, characterised by the presence of services (both consumer and high-order), manufacturing and government. In general these are the larger Canadian cities (Montreal, Toronto, Vancouver ....), and correspond to Noyelle & Stanback's *nodal* centres.

2 - three groups of cities specialising in certain service sectors. i) A *health and education* group and ii) a *health and manufacturing* group. These cities tend to be relatively small and to have a marked under specialisation in high order services. iii) The third group, *public administration* comprises six urban areas highly specialised in public administration. Apart from Ottawa-Hull, all of these are small relatively remote cities, and have low concentrations of employment in most other economic sectors.

3 - production centres fall into two distinct groups. i) *primary* cities are those which have a marked specialisation in the production of primary goods. In most cases these can be characterised as 'single industry' towns. ii) *manufacturing and utilities* cities are those which specialise in the production of manufactured goods. Both these groups of cities have low concentrations of high order services.

4 - finally, a *retail and accommodation* cluster groups cities which specialise in these consumer services.

Overall, Coffey & Shearmur's (1996, p35) classification reflects two types of influences. On the one hand, there is a marked distinction between Census Metropolitan Areas (CMAs) (generally agglomerations of over 100,000 people, see chapter 5) and non-metropolitan areas. Few CMAs are found in the *retail and accommodation* , *primary*, and *public administration* clusters, and 23 out of the 25 CMAs can be found in the *health and education* and *diversified* groups. On the other hand, a regional logic becomes apparent, with the cities in *retail and accommodation*, *primary*, and *public administration* being mainly located west of Ontario, and the cities in the *health and education* and *manufacturing and utilities* groups being located east of the Prairies. Although the geography of Canada clearly differs from that of the USA (!), this finding reflects Noyelle & Stanback's to the extent that their classification also brings out a regional dimension.

[1] The data used by Coffey & Shearmur (1996) is identical to that described in chapter 5 and used in the empirical analyses in this thesis.

The functional specialisation of cities is therefore well documented, not only within national urban systems but increasingly at an international level. Both Noyelle & Stanback (1984) and Coffey & Shearmur (1996) emphasise that, for individual cities, function can evolve over time, but these changes tend to occur within smaller urban units: towards the top of the urban size hierarchy functional shifts were practically non-existent in Canada between 1971 and 1991 (Coffey & Shearmur, 1996, p37). It is not the purpose of this section to explore in detail the nature of these functional shifts. Rather, having established that at a given point in time urban areas have different industrial structures, the next section will describe some ways in which this specialisation can affect the prospects for employment growth.

A 1.2 Examples of Spatial Variations in Employment Growth due to Regional and Urban Specialisation

Given the fact that urban areas tend to have specific functions and industrial structures, it follows that as world markets, production methods and industrial organisation change some cities will benefit - if the changes rely upon the functions which they perform - and others will lose out - if their functions become obsolete.

Over the last twenty five years this has been most clearly obvious in manufacturing regions. As production processes have evolved, as production lines have been automated, as heavy industry has become obsolete, and as the less-skilled labour intensive processes have - to some extent at least - been relocated to other countries - so regions and cities which relied upon a manufacturing base have suffered major job losses. Other regions, those which specialised in 'control' functions such as finance, high order services and, to some extent, government, have tended to expand.

This processes will be illustrated below by reference to three examples: first, the case of the Canadian auto industry - concentrated in cities in southern Ontario - will be described. Second high order services, located principally in Toronto and Montreal, will be discussed. Finally, the American midwest will be referred to - not as an example of restructuring per se - but as an example of how factors other than industrial restructuring can affect an area's performance.

A 1.2.1 The Canadian Auto Industry[2]

The first point to make with regards to this industry is that there is no 'Canadian' industry as such: rather, the Canadian auto manufacturers are fully integrated in the North American industry. In the 1970's, Canada had a larger share of the low-value added labour intensive stages of the

[2] This brief discussion follows Holmes (1996)

manufacturing process whereas the USA, in which the 'big three' auto manufacturers are based (Ford, Chrysler and GM) tended to have a larger share of R&D and high-value added parts manufacturing. It is the internal decisions made within these three large auto manufacturers which have largely determined this spatial pattern of specialisation.

During the 1980's the North American auto industry was in crisis: internal markets did not grow, and an increasing number of foreign auto manufacturers began to assemble and sell cars within Canada and the USA. North American firms were unable to compete with the (principally) Japanese competition for a number of reasons. The main problem faced in Canada and the USA was that the relatively protected North American market and the industry's low reliance on exports had led to "poor productivity and the continuation of the contractually entrenched practice of granting auto workers annual real wage increases" (Holmes, 1996, p236).

Faced with intense competition, the industry's first approach was "a restructuring program aimed at technological renewal through plant modernisation" (Holmes, 1996, p237). However, the new technology was only partly able to overcome the competitive gap with the Japanese producers, who had introduced the 'lean' production methods (Harrison, 1994) to North America. These methods depend upon 'just-in-time' production lines - supplies are ordered as and when they are required from external contractors - thereby increasing the importance of co-operation with outside firms and reducing inventories. In addition to this additional external contracting, the 'lean' production methods rely upon a "streamlined flow of materials through the manufacturing process" and considerable changes in the role of labour. Flexibility and responsibility for the production line are required, as opposed to the structured division of labour which had evolved in the North American system.

The North American auto industry attempted to restructure throughout the 1980's in order to emulate the Japanese example, and by the early 1990's had been largely successful in closing the productivity and quality gap with its Japanese competitors (Holmes, 1996, p242). However, the considerable changes described above have had a number of impacts on employment within the industry.

The early eighties witnessed massive layoffs in U.S. cities, such as Detroit and Flint, which were dependent on this industry (Manzagol et al, 1998). The effects of the early eighties recession and the concurrent restructuring of the automobile sector were felt less strongly in Canada because of lower labour costs, but there was nevertheless considerable shedding of employment as demand decreased, plants automated and manufacturers attempted to contract out supplies (Holmes; 1996). On the other hand, employment amongst Canadian auto-parts manufacturers rose from the early eighties, as the conversion to just-in-time production techniques began to take effect (Holmes, 1986;

1996). In the early nineties, employment losses were again evident in the Canadian auto industry as the recession reduced demand and provided an added spur for restructuring. In general, though, the Canadian auto manufacturing industry has fared much better than its American counterpart because of the lower wages combined with the lower cost of benefits (medical insurance is state-provided in Canada, Manzagol et al, 1998).

Whilst this may have prevented major dislocation in the eighties, the cost-advantage of Canadian locations may prove to be a disadvantage now that NAFTA is in place (Holmes, 1996; Manzagol et al, 1998). Very little R&D takes place in either the Canadian auto-parts or the Canadian assembly establishments, and cost-based competition will be increasingly difficult as Mexico becomes a viable location. Already, many auto manufacturers are opening plants there (Manzagol, 1998).

Faced with changes such as these, the Ontario cities which specialise in auto-manufacturing (such as Windsor and Oshawa) are subject to a series of processes and forces which operate on their function in the urban system. The growth or decline of their employment base is determined almost exclusively by demand and production considerations which lie outside their control. Fluctuations in the auto-manufacturing employment generate wider consumption and supply multiplier effects which can have repercussions throughout the cities' entire economy.

A 1.2.2 High Order Services in Canada[3]

High order services (business and financial services) have been amongst the fastest growing sectors of the Canadian economy between 1971 and 1991, with growth of 184% for the group as a whole and of 285% for business services. Over the same period manufacturing employment only grew by 22%. By 1991, the high order service sector comprised over 11% of all employment in the Canadian urban system and thus, by its volume of employment and growth rates alone, this industry will have had a considerable impact on the different fortunes of Canadian cities in terms of employment. Indeed, as became clear when describing the functional structure of the Canadian urban system, high order services tend to concentrate towards the top of the urban hierarchy, and the fast growth of this sector will therefore tend to benefit these larger centres.

The growth of this sector can be assigned to structural factors relating to the evolving economy in industrialised nations. The vertical disintegration of firms leads to the outsourcing of previously internalised service functions (such as accounting and legal work). The implementation of new production methods often requires input from consultants of various kinds. The globalisation of markets increases the demand for information whether it be on markets, taxes or trade issues. The

[3] This discussion follows Coffey & Shearmur, 1998

volatility of exchange rates requires exporting firms to engage in currency manipulations (futures or options on exchange rates) in order to stabilise their costs and returns: financial services are required.

Business services are not only important for the smooth functioning of their 'host' economies. They are becoming major exporters: "Canadian-based consulting services alone accounted for $817 million worth of international exports in 1989, representing a real increase ... of over 400% relative to the 1969 value" (Coffey & Shearmur, 1998). Even the business services which do operate as 'enablers' for other exporting sectors can be seen as forming part of the economic base, so the importance for Canadian exports of business services is probably understated in the above estimate.

Thus, just as changes in the automobile sector have influenced certain cities with a 'manufacturing' function, so the structural changes on-going in national and international economies are affecting the relative employment growth in cities specialising in the provision of high order services. The 'high order service' function is concentrated within a small number of large urban areas. Almost half of the employment in this sector was to be found, in 1991, in Canada's three largest cities - Toronto, Montreal and Vancouver, and 70% in the ten largest cities. The service orientation of these cities has predisposed them to faster employment growth, not only in the business services and financial sectors, but also in the wider economy as local consumption multiplier effects are felt.

The structural evolution of production processes towards increased reliance on external service provision, and the new roles created for these services in a context of globalisation, will tend to have a polarising effect on employment distribution in the Canadian urban system. This effect is not only due to the fast growth rate of the services themselves. Another effect is the 'relocation' of high order service functions towards major metropolitan areas as service employment previously 'disguised' as manufacturing employment in plants in manufacturing cities is 'split off' and relocated.

Faced with these evolutions - which once again lie outside the control of individual urban areas - differential rates of employment growth (both direct, in the high-order services, and indirect, through the multiplier effect) will occur within an urban system. It is the urban units' initial functional specialisation which will dictate how the employment growth is distributed spatially across the urban system.

A 1.2.3 Exchange Rates and Midwest Manufacturing

The two examples given above show how the industrial structure of a city - its function - can determine its growth prospects due to changes in the market and production processes for the sector

in which it specialises. The globalisation of the economy, the relocation of plants, the introduction of new technology, increased demand for services - all of these wider economic considerations have differential effects on different economic sectors, and hence on cities which specialise (or don't specialise) in these sectors. In this final section, the regional impact of purely financial changes will be described.

The exchange rate, which is determined at a national level, can have important regional impacts since it bears directly upon a region's export capacity. In an increasingly global economy in which a region's 'outside' economy usually includes foreign countries, exchange rate fluctuations can have considerable differential impact upon different industries and regions.

Hervey & Strauss (1997), in a study of midwest manufacturing over the 1970 to 1996 period, investigate how exchange rates can affect regional exports. In particular, they show how the effective exchange rate faced by any region does not correspond to the national exchange rate since it is dependent upon the value of the home currency in relation to the combined exchange rates with numerous foreign currencies. Thus, at the present time, a Canadian region/industry exporting to Asia may be faced with an increase in its effective exchange rate as the Canadian dollar gains value relative to Asian currencies, but another region/industry exporting to the USA will face the opposite trend, as the Canadian dollar declines relative to the US dollar. Hervey & Strauss (1997) explore these differential regional effects by considering the export destinations of manufacturing outputs from the Midwest. Their basic contention is "that different geographical/economic regions of the United States, by virtue of their different industrial make-up and the different foreign markets in which their industries are active, face different composite exchange rates" (Hervey & Strauss, 1997).

Details of their study will not be given here, but they demonstrate empirically how exchange rates fluctuations have had different impacts of American regions owing to their different industrial structure. This argument could naturally be extended to elements of the urban system.

In the light of export-base theory, these considerations are extremely important: the local multiplier effects of export industries have been shown to related to the overall employment prospects of urban units. Exchange rate fluctuations have very different effects on urban units' export bases depending on export destinations - which are in part determined by the nature of the export bases, an element of urban units' industrial structures. Although urban units often have stronger connections with national than international markets, free trade agreements are rapidly increasing the importance of international trade for urban areas. Exchange rate fluctuations, usually analysed in the context of macro-economic policy, have differential regional impacts and may increase or decrease the

competitiveness of a region's export base depending on the export destinations of the region's industry.

Appendix 2: The Canadian Urban System

note: in the MCP column, A signifies 'Metropolitan area of over 300,000 people
C signifies within 100km of a type A city
P signifies over 100km from a type A city

note: a star in the rightmost column indicates that the city is included in the 1991-1994 analyses

Name of CMA / CA / CSD	1991 population	Region	M.C.P	59 cities in labour force survey	Name of CMA / CA / CSD	1991 population	Region	M.C.P	59 cities in labour force survey
Halifax	320505	Atl	A	*	Simcoe	15540	Ont	C	
St.John's	171860	Atl	P	*	Cobourg	15080	Ont	C	
St John	124980	Atl	P	*	Elliot Lake	15040	Ont	P	
Sydney	116095	Atl	P	*	Huntsville	15000	Ont	P	
Moncton	106505	Atl	P	*	Haileybury	14995	Ont	P	
Fredericton	71865	Atl	P	*	Collingwood	13510	Ont	C	
Charlottetown	57475	Atl	P	*	Bracebridge	12310	Ont	P	
Truro	44010	Atl	C	*	Dunnville	12130	Ont	C	
New Glasgow	38675	Atl	P	*	Tillsonburg	12020	Ont	C	
Bathurst	36165	Atl	P	*	Wallaceburg	11845	Ont	C	
Gander	33795	Atl	P		Port Hope	11505	Ont	C	
Grand Falls - Windsor	25290	Atl	P		Hawkesbury	11070	Ont	C	
Kentville	24085	Atl	C		Strathroy	10565	Ont	C	
Edmundston	22480	Atl	P	*	Kirkland Lake	10440	Ont	P	
Campbelton	17185	Atl	P		Kapuskasing	10340	Ont	P	
Summerside	15240	Atl	P	*	Edmonton	839925	Pra	A	*
Labrador City	11390	Atl	P		Calgary	754030	Pra	A	*
Corner Brook	11055	Atl	P	*	Winnipeg	652355	Pra	A	*
Vancouver	1602505	BC	A	*	Saskatoon	210025	Pra	P	*
Victoria	287900	BC	C	*	Regina	191695	Pra	P	*
Matsqui	113560	BC	C	*	Lethbridge	60975	Pra	P	*
Kelowna	111850	BC	P	*	Red Deer	58135	Pra	P	*
Nanaimo	73550	BC	C	*	Medicine Hat	52685	Pra	P	*
Prince George	69650	BC	P	*	Fort McMurray	49205	Pra	P	
Kamloops	67855	BC	P	*	Prince Albert	41255	Pra	P	*
Chilliwack	60255	BC	C	*	Brandon	38565	Pra	P	*
Vernon	48135	BC	P		Moose Jaw	35555	Pra	P	*
Penticton	45080	BC	P		Grand Prairie	28265	Pra	P	
Courtenay	44525	BC	P		Grand Centre	24265	Pra	P	
Williams Lake	34685	BC	P		Nth.Battleford	18455	Pra	P	
Campbell River	30860	BC	P		Yorkton	18025	Pra	P	
Duncan	27385	BC	C		Lloydminster	17280	Pra	P	
Port Alberni	26595	BC	P		Yellowknife	15175	Pra	P	
Quesnel	23305	BC	P		Thompson	15045	Pra	P	
Terrace	18905	BC	P		Swift Current	14815	Pra	P	
Powell River	18480	BC	P		Camrose	13420	Pra	C	
Prince Rupert	18450	BC	P		Portage la Prairie	13180	Pra	C	
Whitehorse	17925	BC	P		Estevan	11375	Pra	P	
Cranbrook	16450	BC	P		Wetaskiwin	10640	Pra	C	
Fort St.John	14160	BC	P		Selkirk	9815	Pra	C	

Kitimat	11305	BC	P		Weyburn	9675	Pra	P	
Dawson Creek	10980	BC	P	*	Montreal	3127240	Qc	A	*
Toronto	3893045	Ont	A	*	Quebec	645545	Qc	A	*
Ottawa	920855	Ont	A	*	Chicoutimi	160930	Qc	P	*
Hamilton	599760	Ont	A	*	Sherbrooke	139195	Qc	P	*
London	381520	Ont	A	*	Trois Rivieres	136305	Qc	P	*
St.Catherine	364545	Ont	A	*	St.Jean de Richelieu	68380	Qc	C	
Kitchener	356420	Ont	A	*	Shawinigan	61670	Qc	P	
Windsor	262075	Ont	P	*	Drummondvillle	60090	Qc	C	
Oshawa	240110	Ont	C	*	Granby	59410	Qc	C	
Sudbury	157615	Ont	P	*	St.Jerome	51990	Qc	C	
Kingston	136405	Ont	P	*	Ste Hyacinthe	50195	Qc	C	
Thunder Bay	124425	Ont	P	*	Rimouski	47815	Qc	P	*
Peterborough	98060	Ont	P	*	Sorel	46365	Qc	C	
Guelph	97210	Ont	C	*	Salaberry-Valleyfield	40060	Qc	C	
Brantford	97105	Ont	C	*	Victoriaville	39830	Qc	C	
Belleville	94995	Ont	P		Rouyn Noranda	38740	Qc	P	*
Barrie	92165	Ont	C		Joliette	37525	Qc	C	
Sarnia Clearwater	87870	Ont	C	*	Baie Comeau	32820	Qc	P	*
Sault Ste.Marie	85010	Ont	P	*	Thetford Mines	30275	Qc	C	
North Bay	63280	Ont	P		Alma	30195	Qc	P	
Cornwall	53540	Ont	C	*	Val d'Or	30045	Qc	P	
Timmins	47465	Ont	P		Sept Iles	27275	Qc	P	*
Chatham	43555	Ont	C		Riviere du Loup	23455	Qc	P	
Midland	40375	Ont	P		St Georges	23095	Qc	C	
Brockville	38555	Ont	C		Magog	20425	Qc	P	
Leamington	35790	Ont	P		Gaspe	16400	Qc	P	
Orillia	34070	Ont	C		Dolbeau	15025	Qc	P	
Owen Sound	30290	Ont	P		Matane	14855	Qc	P	
Woodstock	30080	Ont	C		Amos	13785	Qc	P	
Stratford	27665	Ont	C		La Tuque	13050	Qc	P	
Pembroke	22830	Ont	P		Cowansville	12510	Qc	C	
Nanticoke	22725	Ont	C		Montmagny	11860	Qc	C	
Lindsay	20720	Ont	C		Lachute	11725	Qc	C	
Haldimand	20570	Ont	C		Roberval	11630	Qc	P	
Kenora	15910	Ont	P		Ste Marie	10540	Qc	C	