2011

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Ray, D.M., Lamarche, R.H. & Biffignandi, S. "The Geography of Employment Growth in Western Canada: A Regional Typology based on Multifactor Partitioning". Canadian Assocition of Geographers Annual Meeting and Conference, University of Calgary, Calgary, Alberta, May 31 - June 4, 2011.

http://hdl.handle.net/1880/48677

The Geography of Employment Growth in Western Canada: A Regional Typology based on Multifactor Partitioning

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ABSTRACT

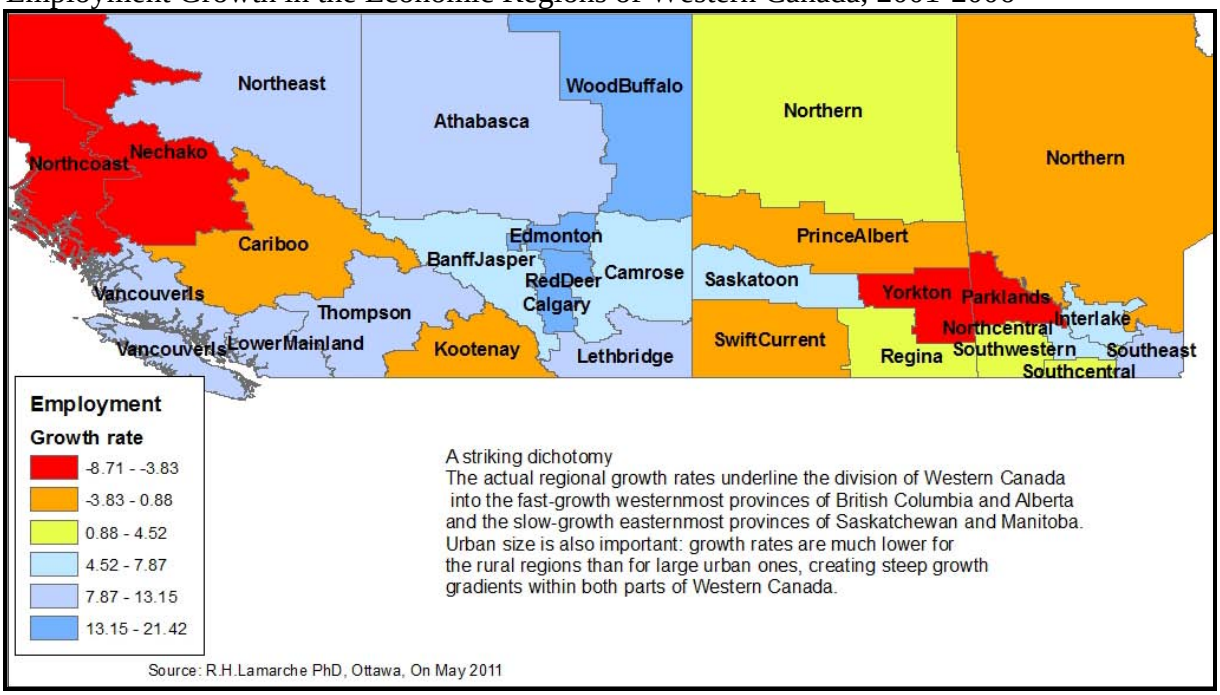
Canada's employment growth, 2001-2006, masked large regional variations. Such disparities have been a major policy concern since the (British) Royal Commission on the Distribution of the Industrial Population (Barlow Report 1940) which introduced shift-share analysis and identified industry-mix as the principle determinant of regional disparities (Jones 1940). This paper uses the Ray-Srinath multifactor partitioning (MFP) model, an advanced shift-share methodology, to extract the region, industry-mix and net interaction effects on regional employment growth in Canada 2001-2006 and presents the results for the thirty economic regions of Western Canada. All three effects are important. However, it is the region effect, not industry-mix, which has most affected employment growth in Canada 2001-2006. Indeed, no region with a low region effect exceeded the national employment growth rate. But some regions with a very good industry-mix failed to reach the national growth rate because of their poor region effect. The MFP results are mapped and used to allocate the economic regions of Western Canada to the Biffignandi regional typology. Seven main regional development types are identified. The top class is the "regions of general employment expansion". The Calgary-Edmonton corridor is in this class: Calgary scored a triple "A" rating, excelling on all three growth effects. Its employment growth rates were among the very highest in the country. At the other extreme, some peripheral areas lagged on all three components and experienced employment decline. The paper concludes with some policy implications.

Introduction

Canada experienced the fastest rate of employment growth of any of the G7 countries 2001-2006, but there were big differences between the growth rates of different economic regions. Red Deer grew by 21 per cent, the highest rate of employment growth in Canada, but employment in the North Coast of British Columbia fell by almost 9 per cent (Fig. 1). Policies to address regional disparities in employment growth must begin with a proper understanding of the

regional structure of employment growth. The first such approach was shift-share analysis which was introduced in the very influential (British) Royal Commission on the Distribution of the Industrial Population (Barlow Report 1940).

Fig. 1. Employment Growth in the Economic Regions of Western Canada, 2001-2006



Note: the economic regions are listed in Appendix I.

This article begins with a methodological section which demonstrates conclusively, both mathematically and with examples, that the shift-share technique introduced in the Barlow Report seventy years ago is deeply flawed, and its results inconsistent and misleading. The Ray-Srinath Multifactor Partitioning (MFP) model is offered as a needed replacement and the results of an MFP analysis of Canada's 2001-2006 employment data are presented for the 30 economic regions of Western Canada. The regional structure of employment growth is complex. However the region effect on employment growth is generally more important than industry-mix. Finally the Biffignandi regional typology is described and applied to the MFP analysis of Western Canada. The results of the MFP analysis and the application of the Biffignandi typology provide a framework for further detailed regional work to identify the regional policies needs.

Partitioning Regional Growth Rates: Objectives and Policy Implications

Objectives of traditional Shift-Share and Multifactor Partitioning

Regional disparities in employment growth, which first became a subject of major policy concern with the Great Depression, need to be partitioned into their various components if their causes are to be understood and effective regional policies applied. The traditional method for partitioning regional employment growth is shift-share analysis which dates back to an appendix "on the Location of Industry" in the Barlow report (Jones 1940 pp.249-280). Shift-share gained widespread acceptance through the work of Dunn (1960), though Dunn never referred to the Barlow Report, or to his first article (Dunn 1959) and the scathing critique which it received

from the French mathematician Rosenfeld (1959). **T**he first shift-share analysis for Canada was published by the Dominion Bureau of Statistics (1969) and later updated under its new name, Statistics Canada (1973). Shift-share partitions employment growth into the part that can be attributed to the region's industry-mix and the remainder which is labelled regional-share. Numerous attempts have been made to improve and extend shift-share in the seventy years since it was introduced, but none have correctly overcome or even properly recognized its fundamental mathematical flaws (Ray 1990, and Nazara and Hewings 2004). This paper explains these flaws and offers Multifactor Partitioning (MFP) (Ray 1990, and Lamarche et al. 2003) as a replacement.

Both traditional shift-share and multifactor partitioning accept that regional disparities in employment growth can be understood and addressed only if the regional growth rates are first partitioned into their components. Dunn noted that the traditional model "enables us to come to grips empirically and analytically with the fact that there are two distinct types of phenomena that generate the shifts (in employment) that we observe" (Dunn 1960, p.101). The more important of the two was thought to be industry-mix: regions with a concentration of fast-growth industries could be expected to achieve the fastest growth rates. The second factor identified by Dunn, namely the intrinsic regional differences in the location such as those between metropolitan regions and remote rural regions, was considered less important. However Dunn overlooked what may be the most important effect of all on employment growth, namely the interactions between regions and industries, which traditional shift-share fails to measure.

Policy Implications of the Traditional Shift-Share

The shift-share analysis in the Barlow Report identified a regional dichotomy according to whether regions had a favourable or an unfavourable industry-mix. This regional dichotomy led in turn to a simple one-size-fits-all policy of encouraging secondary manufacturing firms to move to slow-growth regions. The Royal Commission on Canada's Economic Prospects (the Gordon Report 1957) echoed the conclusions of the Barlow Report. In particular it argued that since the fast-growth Heartland Provinces of Ontario and Quebec had a highly developed manufacturing sector, it followed that regional disparities in Canada could be reduced by attracting manufacturing industry to the Hinterland Provinces (Beaumier 1998). A succession of three Federal agencies, the Area Development Agency and the Departments of Regional Economic Expansion and Regional Industrial Expansion, offered incentives to encourage manufacturing industry to relocate in "Special Areas" (Brewis 1975, p. 128). Not surprisingly, such policies failed in Canada as in Britain (Brewis 1975 pp131-133, Buswell et al 1987, Wallace 1998 p 263, and Polese 2009 pp 204-206).

In 1987, a broader approach to reducing regional disparities was initiated with the creation of separate development agencies in Atlantic Canada, the North and in Western Canada where a Department of Western Diversification (WD) was established. All three hinterland agencies are mandated to coordinate federal activities in their respective regions. In addition, WD encourages the creation of enterprise in the four Western Provinces with the objective of diversifying their economies.

It was right and proper to abandon the traditional shift-share thinking. The results obtained from it are inaccurate, incomplete, and misleading. However these new agencies lack a methodology to correctly analyse, identify and measure the components of regional employment growth and to define the comprehensive variety of regional types and their particular policy needs. Multifactor partitioning has been designed to fill this gap.

Policy Implications of Multifactor Partitioning

Multifactor Partitioning (MFP) begins with the recognition that growth forces differ fundamentally in character, are complexly interwoven, and produce quite different geographies. Differences in the national growth rates of individual industries change the economic structure of the national economy from first a reliance on primary industries, to next a greater dependence on manufacturing, to finally a service-oriented economy (Clark 1940). The national growth components have regional effects because industries are not distributed proportionately among the regions. Differences in the intrinsic region effects on growth produce a changing geography of the economy, with, for instance, a greater concentration of economic activity in metropolitan regions. The growth performance of individual industries is also sensitive to the specific locational advantages of each region. These specific region-industry differences in growth rates are extracted and measured separately as interaction effects. Regional differences in interactions produce an economic restructuring of the regions. It is worth examining the equations used in these two models to provide a mathematical proof of the errors in shift-share and the advantages offered by MFP.

The Traditional Shift-share Model

The Mathematics of Traditional Shift-Share

The equation used in traditional two-component shift-share analysis to partition employment growth is given below (5). It is taken from Lamarche et al. (2003, p. 127) and uses the Statistics Canada notation (1973).

$$\underbrace{E^0_{.j}(r_{.j} - r_{..})}_{\mathbf{1}} = \underbrace{\sum_{i=1}^{S} E^0_{ij}(r_{ij} - r_{i.})}_{\mathbf{2}} + \underbrace{\sum_{i=1}^{S} E^0_{ij}(r_{i.} - r_{..})}_{\mathbf{3}} \qquad (5)$$

$E^o_{.j}$ = the total employment in region *j* in the base year *o*, year 2001 in this study.

$r_{..}$ = the national growth rate; $r_{.j}$ = the growth rate of region *j* from 2001 to 2006.

r_{ij} = the growth rate of industry *i* in region *j* and $r_{i.}$ = the national growth rate of industry *i* .

Term (1) on the left-hand side of equation (5) determines if a region is performing above or below the national average. Regional-share (2), the first term on the right hand side of equation 5, measures the differences between the regional industry rates and crude national industry-rates. The last term (3) measures the contribution of the industry mix in the region to employment growth. It is defined as the difference between the national growth-rate for each industry and the total national growth rate.

Usually the shift-share results are given for only total employment, but the disaggregated results are much more revealing. Saskatoon is selected as an example to illustrate how traditional shift-share works at the disaggregated level.

A Traditional Shift-Share partitioning of Saskatoon's Employment Growth

Saskatoon, with a population of 279,000, is Saskatchewan's largest economic region but its employment growth was less than the national rate: it was only 5.92 per cent compared to Canada's 8.19 per cent. This gap in its growth performance was not due to its industry-mix. Agriculture and manufacturing, Canada's two declining sectors

in this period, accounted for 16.6 per cent of the economic region's employment - somewhat less than the national average of 17.7. Indeed Saskatoon had a slightly favourable industry-mix of 0.68 per cent according to traditional shift-share (Table 1).

There is little of interest in the individual industry-sector growth-rates themselves: the rate of growth for each industry-sector in any region is set by the national growth rate for that sector and is the same for every region. Attention then turns to the contribution of regional-share in understanding Saskatoon's poor employment growth-performance (Table 1).

Table 1: Saskatoon Employment 2001-2006: A Traditional Shift-share analysis

	Employm't	Actual growth	Actual growth	growth at				
	2001	2001-06	2001-06	national	Regional-share	Regional-share	Industry-mix	Industry-mix
		number	rate %	Rate of 8.19%	Number	rate %	number	rate %
Canada	15,600,720	1,277,820	8.19	1,277,820				
Saskatoon								
Total	152,600	9,035	5.92	12,499	-4,500	-2.95	1,036	0.68
Mining,oil,gas	4,410	985	22.34	361	-816	-18.5	1,440	32.65
Manufacturing	**11,315**	**785**	**6.94**	**927**	**1,663**	**14.7**	**-1,805**	**-15.95**
Retail trade	16,330	660	4.04	1,338	-845	-5.17	167	1.02
Finance & insurance	4,835	-55	-1.14	396	-464	-9.6	13	0.27
Science& tech.serv.	6,705	1,500	22.37	549	522	7.79	429	6.4
Arts. Entertainment	3,060	-280	-9.15	251	-706	-23.07	175	5.72

Note: The results are extracted from a shift-share analysis of the 2001-2006 Census data for employment in the 18 industry sectors in the 73 economic regions as defined by Statistics Canada for the ten Provinces of Canada using equation 5.

Regional-share is much more important than industry-mix in explaining Saskatoon's poor employment-growth record: it cost the region 4500 jobs (Table 1). But 8 of the 18 sectors had positive regional-share values, including manufacturing. Manufacturing grew in Saskatoon at a crude rate of 6.94 per cent adding 785 jobs. In fact manufacturing added only 142 jobs less (927 – 785) than if it had grown at the national rate for all employment. It would have declined by 1805 jobs had it followed the national rate of decline for manufacturing. The difference (1805-142) is assigned as a large positive regional-share of +1663 jobs. But it seems quite unreasonable to claim that Saskatoon's manufacturing enjoyed such a strong positive regional share, given the region's hinterland status, the negative effects of the National Policy, and the negative region-share effect in Saskatoon for employment as a whole (McCann 1988, Lehr 1988 and Polese 2009).

Identifying the Flaws in Traditional shift-share

In principal, the regional-share rate should apply equally to all sectors. A so-called regional share which is different for each sector is actually a region-industry effect and not what it purports to be. The problem stems from the use of crude growth-rates in the shift-share calculations. Note that the crude rate of the regional employment growth equals the weighted sum of the individual industry growth-rates and their employment distribution within the region.

The growth rates of industries that make up a larger share of the region's employment are given a heavier weight in calculating the regional rate. So the regional growth rate is affected by the employment distribution. But the employment distribution is an industry-mix effect, not a regional effect. As a consequence, the region effect incorporates some of the industry-mix effect. Similarly, the industry-mix effect incorporates some of the region effect. Each measure is confounded by the other.

The mathematical proof and the solution of the confounding of industry and region effects are provided by standardizing the data. Standardizing rates in order to achieve valid comparisons is a common procedure. In demography, for instance, death rates are standardized by using the national age composition of the population as a necessary prerequisite to computing regional death rates. The standardized national industry growth rates are defined as

$$\hat{r}_{i.} = \sum_{j=1}^{R} \frac{r_{ij} E^0_{.j}}{E^0_{..}}$$

The standardized national industry rates are freed from the bias of the individual regional distributions by using the regional distribution for the total employment. Using a common set of regional weights for every industry means that the comparison of an industry concentrated in slow growth regions is placed on an equal footing with another industry concentrated in fast growth regions. Similarly, using a common set of aggregate industry rates in computing the standardized region rates means that the growth rate of a region with a concentration of slow growth industries is not biased by its industrial composition.

The difference for the individual sectors is influenced by the degree of their regional concentration. For some sectors the standardized and crude rates are not greatly different. The smallest difference is for retailing: its distribution mirrors that of the population and total employment. The biggest differences are for the agriculture, forestry and fishing sector and for the oil and mining sector (Appendix II).

The confounding of the industry-mix and region effects is demonstrated by adding and subtracting the standardized national industry growth rate to the first term on the right-hand side of equation (5). This term is now written as

$$\sum_{i=1}^{S} E^0_{ij}(r_{ij} - \hat{r}_{i.} + \hat{r}_{i.} - r_{i.})$$

The summation over the difference of the first two growth rates and the second two rates can be written as:-

$$\sum_{i=1}^{S} E^0_{ij}(r_{ij} - \hat{r}_{i.}) + \sum_{i=1}^{S} E^0_{ij}(\hat{r}_{i.} - r_{i.}). \qquad \textbf{(6)}$$

The first term in (6) does measure differences between regional and national growth rates. The second term however is merely the difference between the <u>crude and the standardized national industry growth rates</u>. But measures of the national growth rate of an industry are independent of regional rates: they contain no r_{ij} element. They are instead part of the industry-mix. Thus equation (6) shows that regional-share and industry-mix are mathematically confounded.

Nor is the "corrected" component of regional-share in the first part of equation (6) fully satisfactory because it is in part a measure of region-industry interaction (equation 11). Consequently the regional-share confounds the region effect with the region-industry interaction.

Note that the *standardized national rate* can be calculated as the weighted average of either the standardized regional-growth rates or the standardized industry-growth rates. The standardized national rate equals the overall growth rate under a strictly proportional regional distribution of employment. That is:-

$$\hat{r}_{..} = \sum_{i=1}^{S} \frac{\hat{r}_{i.} E_{i.}^{0}}{E_{..}^{0}} = \sum_{j=1}^{R} \frac{\hat{r}_{.j} E_{.j}^{0}}{E_{..}^{0}}$$

The first part of the traditional regional-share rate presented earlier (equation 10) can now be written as:-

$$\sum_{i=1}^{S} E_{ij}^{0}(r_{ij} - \hat{r}_{i.}) = \sum_{i=1}^{S} E_{ij}^{0}(\hat{r}_{.j} - \hat{r}_{..}) + \sum_{i=1}^{S} E_{ij}^{0}(r_{ij} - \hat{r}_{i.} - \hat{r}_{.j} + \hat{r}_{..}) \quad \textbf{(11)}$$

The first term on the right-hand side of (11) defines employment change due to the region effect (common to all industries in the region) and the second term is the change due to the interaction effects between specific industries and specific regions.

So the first part of the traditional shift-share term can be partitioned into the Ray-Srinath MFP *region effect rate*, which applies to all the industries in the region, and the sum of *region-industry interaction effects*, which reflect the aggregate relationships between specific industries in specific regions.

<u>MFP and the Precise Partitioning of all the Regional Growth-Rate Effects</u>

Multifactor Partitioning achieves three important advantages over shift-share, all of which spring from the use of standardized rates. First it is able to purge the region effect of industry-mix; second it extracts and measures the interactions as separate effects; and third it can be extended to any number of characteristics. Equation (13) is the Ray-Srinath multifactor partitioning equation for two variables (Ray 1990). The left-hand side is identical to the traditional model. Note that MFP measures four components, the first three of which are important in characterizing the structure of employment growth in a region.

$$E_{.j}^{0}(r_{.j} - r_{..}) = \underbrace{\sum_{i=1}^{S} E_{ij}^{0}(\hat{r}_{.j} - \hat{r}_{..})}_{\textbf{(1)}} + \underbrace{\sum_{i=1}^{S} E_{ij}^{0}(r_{ij} - \hat{r}_{i.} - \hat{r}_{.j} + \hat{r}_{..})}_{\textbf{(2)}} + \underbrace{\sum_{i=1}^{S} E_{ij}^{0}(\hat{r}_{i.} - \hat{r}_{..})}_{\textbf{(3)}} + \underbrace{\sum_{i=1}^{S} E_{ij}^{0}(\hat{r}_{..} - r_{..})}_{\textbf{(4)}} \quad \textbf{(13)}$$

The difference between the regional rate and the crude national rate on the left side of the equation has been partitioned into (1) the region effect, (2) the sum of the region-industry interaction effects, (3) an industry-mix effect, and (4) an allocation effect. Note that the second component is the **net** region-industry interaction effect. Any given region will have as many interaction effects as there are industries in the region. The fourth component in equation (13) is the difference between the standardized national rate and the actual national rate. This value, called the allocation effect by Cunningham (1969), is an aggregate index of the effect of disproportionalities on national growth performance.

The standardized regional growth rates use the actual regional growth rate weighted by the national distribution of each industry as in equation (13b).

$$(13b) \quad \hat{r}_{.j} = \sum_{i=1}^{S} r_{ij} \frac{E_{i.}^{o}}{E_{..}^{o}}$$

Interpreting Multifactor Partitioning: the Saskatoon example

Interpreting multifactor partitioning at the individual industry level is again illustrated by the example of Saskatoon. The industry-mix effect, purged of any regional-share effect by using standardized rates, increases to a healthy 2.37 per cent (Table 2). A large percentage of its labour force worked in the oil and mining industries (the fastest growing sector during the study period, 2001-2006). Saskatoon's employment was well represented in other industry fast-growing sectors namely construction, education, and health care.

Table 2 Multifactor Partitioning of Saskatoon's Employment Growth 2001-2006.

KDL 73 regions	growth at standardized national rate of 8.93 %	Difference to Account For	MFP Region effect (-1.79)	MFP Industry-mix effect	MFP Industry-mix %	region-industry interaction	region-industry Interaction %
Saskatoon							
Total	13624	-4589	-2728	1757	1.15	-3615	-2.37
Agric., Foresty, Fishing	1248	-3453	-250	-1123	-8.03	-2079	-14.87
Mining,oil,gas extract.	394	591	-79	1621	36.76	-950	-21.54
Manufacturing	**1010**	**-225**	**-202**	**-1785**	**-15.78**	**1763**	**15.58**
Real estate & leasing	219	-129	-44	195	7.94	-281	-11.45
Science, tech.serv.& mgnt	599	901	-120	509	7.59	512	7.64
Arts. Entertainment &	273	-553	-55	165	5.39	-663	-21.67

Note: These results should be compared with those in Table 1.

The region-effect remains negative, but purged of interaction, it improves from -2.95 per cent using shift-share to -1.79 per cent in the MFP model. Moreover the region effect is precisely that, and it applies equally to every industry in Saskatoon. Attention therefore turns to the interactions as the key to understanding Saskatoon's employment growth. Manufacturing has the largest positive interaction value: it added 1763 jobs to manufacturing. This considerable achievement reflects the linkages of manufacturing to the resource sector, with meat packing and of machinery and the fabrication of steel pipes for the oil and gas industry (Gartner 2008). It is also a tribute to the growth of the life-science industries encouraged by Innovation Place with its Canadian Light Source Synchrotron (Hirsh 2007). The performance of manufacturing in Saskatoon is neither an industry nor a region effect but a return on manufacturing investments made in the region: in short it is an interaction effect.

The Structure of Employment Growth in Western Canada: 2001-2006

The data

The multifactor partitioning in this article uses the seventy-three economic regions into which Statistic Canada divides the ten Provinces. Economic regions are aggregates of census divisions defined in cooperation with the provinces for use in economic analysis. Census divisions are more homogeneous but the cross-tabulated employment totals are frequently too small to provide reliable measures of growth. The results are presented for the thirty economic regions in the four Western Provinces (Appendix I). The 2001-2006 intercensus period is the first in which manufacturing firms faced the full impact of the 1989 Canada-U.S. Free Trade Agreement which ushered in tariff reductions over a ten year period (LaRochelle-Cote 2005).

The multifactor partitioning is limited to the employment-growth data. However a number of other important economic indicators are correlated with it (Table 3). Employment growth has its highest correlations with population growth (r = 0.935), the average income of full-time workers (r =0.610) and the employment rate (r = 0.435).

The growth rates of each of the economic sectors are standardised to remove any bias resulting from their regional distribution (Appendix II). The agriculture, forestry and fishing sector and mining increase the most from standardization: agriculture changes from strong negative to slightly positive. Only manufacturing has a negative standardized growth-rate. The standardized rates for construction and for the service sectors are similar to their crude rates: their regional distribution reflects the distribution of the workforce as a whole.

Table 3 The Correlation Matrix for Employment growth and Selected Variables.

	POP06	POPGRO	**LABGRO**	EMPRATE	UNEMP	ALLYEAR	AVGINC
POP06	1	0.377	**0.342**	0.105	-0.175	0.088	0.386
POPGRO	0.377	1	**0.935**	0.358	-0.259	0.225	0.561
LABGRO	**0.342**	**0.935**	**1**	**0.435**	**-0.315**	**0.142**	**0.610**
EMPRATE	0.105	0.358	**0.435**	1	-0.834	0.666	0.437
UNEMP	-0.175	-0.259	**-0.315**	-0.834	1	-0.740	-0.058
ALLYEAR	0.088	0.225	**0.142**	0.666	-0.740	1	-0.025
AVGINC	0.386	0.561	**0.610**	0.437	-0.058	-0.025	1

Note: the correlations are calculated for the 30 economic regions of Western Canada.
POP06 is the population total in 2006
POPGRO is the population growth rate 2001-2006
LABGRO is the employment growth rate 2001-2006
EMPRATE is the 2001 employment as a % of the population
UNEMP is the unemployment rate 2001
ALLYEAR is the proportion of the population that worked all year
AVINC is the average income workers who worked all year

The MFP Region Effect on Employment Growth in Western Canada

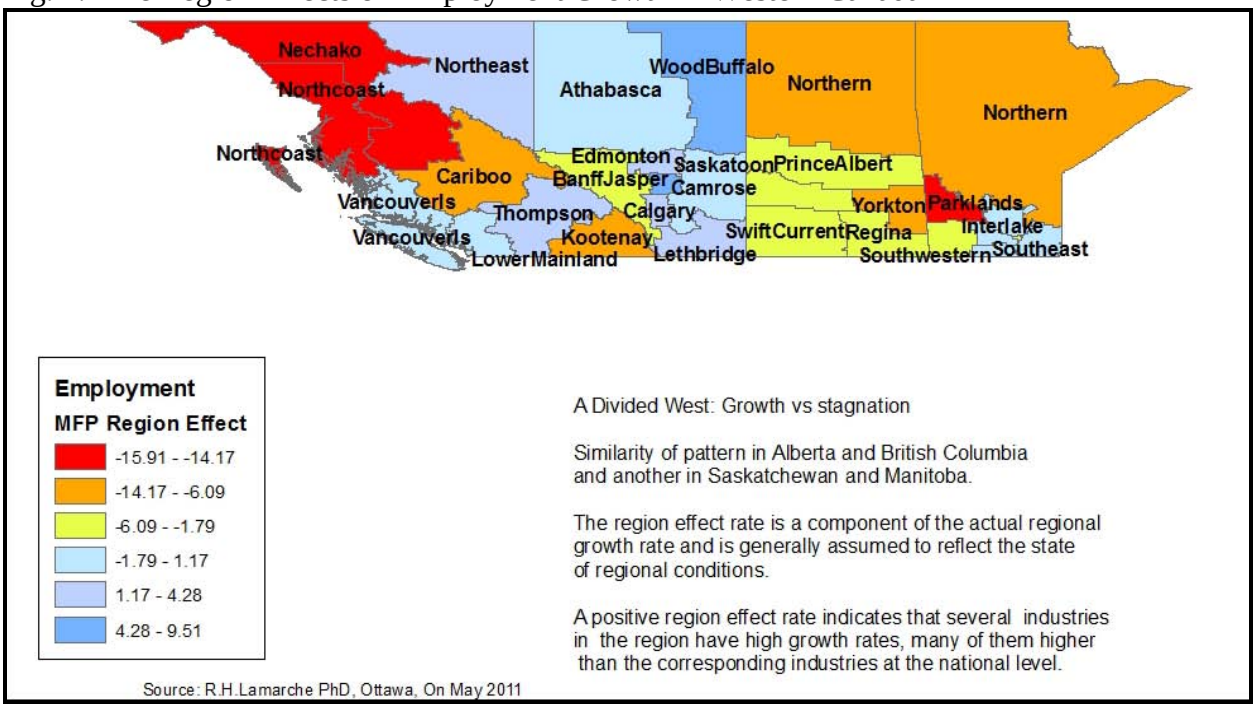
The MFP region effect indexes the intrinsic growth performance of each region purged of any influence of the region's industry-mix. A positive region effect implies that most of the industry-sectors grew at crude rates above the national average. A strong region effect may reflect the sheer population-size of the region and the urbanization economies conferred by size. Or it may reflect proximity to such a region and the relocation within it of economic activity from the larger centre perhaps to take advantage of lower costs of doing business. Equally the population size of a region is a reflection of the advantages of its geographic position which in turn are reinforced by the economies of scale conferred by its size. Conversely remote rural regions are likely to have negative region effects: they are likely to suffer from outmigration and a concomitant negative region effect. Whatever the ingredients of the region effect, it applies equally to all industries in any given region though it differs in size from region to region.

Variations in the region-effect in Western Canada have produced an increasing concentration of population and economic activity within the larger urban centres and urbanization has been more rapid here than in any other region of Canada. The census metropolitan areas now account for about 60 per cent of the total population. However there has been a distinct splintering between the slow-growth provinces of Saskatchewan and Manitoba and the faster-growth provinces of Alberta and British Columbia (Fig 2). Alberta and British

Columbia are the only provinces with a net in-migration from other provinces. Hence Saskatchewan and Manitoba have only 4 regions with a positive region effects, Alberta and British Columbia have 10. Saskatchewan and Manitoba have 10 regions with a negative region effects, Alberta and British Columbia 6.

The regional effect on employment growth in Saskatchewan and Manitoba is expected to be negative for most economic regions because of their population decline (Polese, 2009 p.81 and p 182). Western Canada generally has been disadvantaged by Canada's National Policy of encouraging the growth of manufacturing in the Heartland Provinces protected by high tariffs, and the sale of the Hinterland's commodities at world prices (Lehr 1998).

Fig. 2: The Region Effects on Employment Growth in Western Canada



No region in Saskatchewan had a positive region effect 2001-2006 and it has experienced steady rural outmigration, primarily to Alberta (Fig 3). Saskatchewan is the least urbanized of the Western Provinces but Saskatoon and Regina account for all the net provincial growth that has occurred since 1961, and the population of the rest of the Province is lower now than it was in 1961 (Vander Ploeg 2008). Sales and production of potash declined from 2005 to 2006, but the rapidly growing interest in the Province's huge reserves is contributing to a new mood of optimism in the Province. Manitoba has had a slightly less dramatic decline of rural population than Saskatchewan. However, no province in Canada is as dominated by its capital as Manitoba is by Winnipeg. Winnipeg has two-thirds of the provincial population and accounts for almost 90 per cent of the population growth in the province. Interestingly, Winnipeg itself has a negative region effect notwithstanding its size, and the only regions with a positive region effect in the province are the four economic regions that surround it.

British Columbia and Alberta have outpaced the rest of Canada in population and employment growth (Fig. 4). Alberta's economic growth, in particular, has been extraordinary. Red Deer and Wood Buffalo (the main tar sands region) had the highest region effects in

Canada. Calgary and Edmonton ranked sixth and eight respectively and were the fastest growing large Census Metropolitan Areas in Canada. These four regions, together with Lethbridge, (which ranked 14th in Canada) form a fast-growth economic corridor extending south to north the length of Alberta.

Fig. 3. The Region Effect on Employment Growth in Saskatchewan and Manitoba

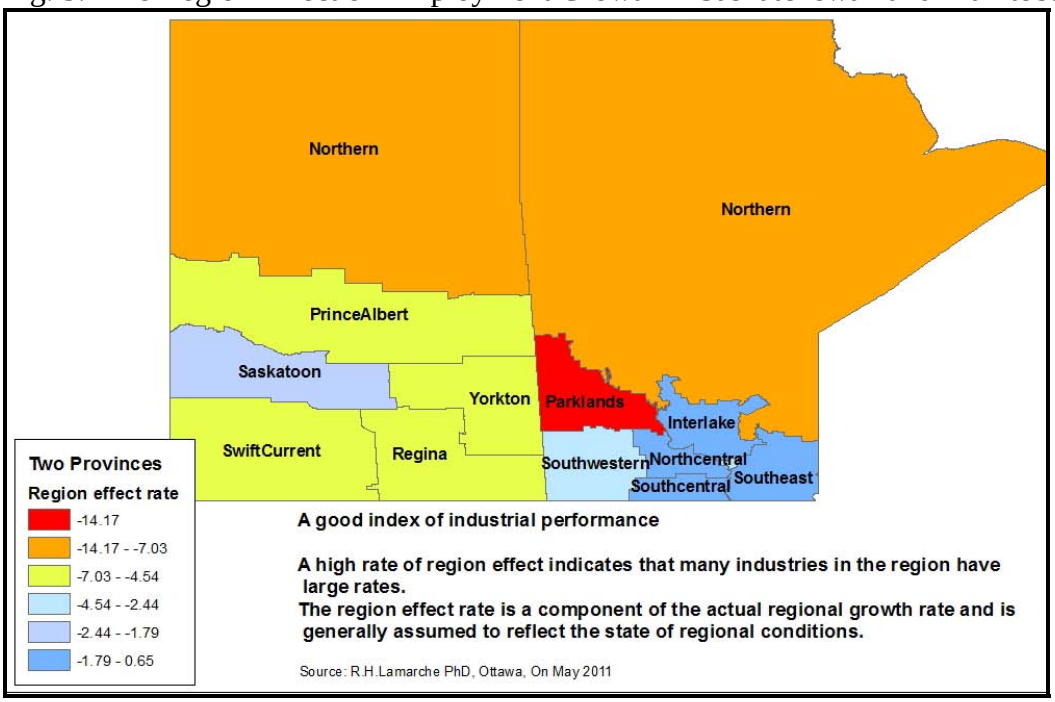


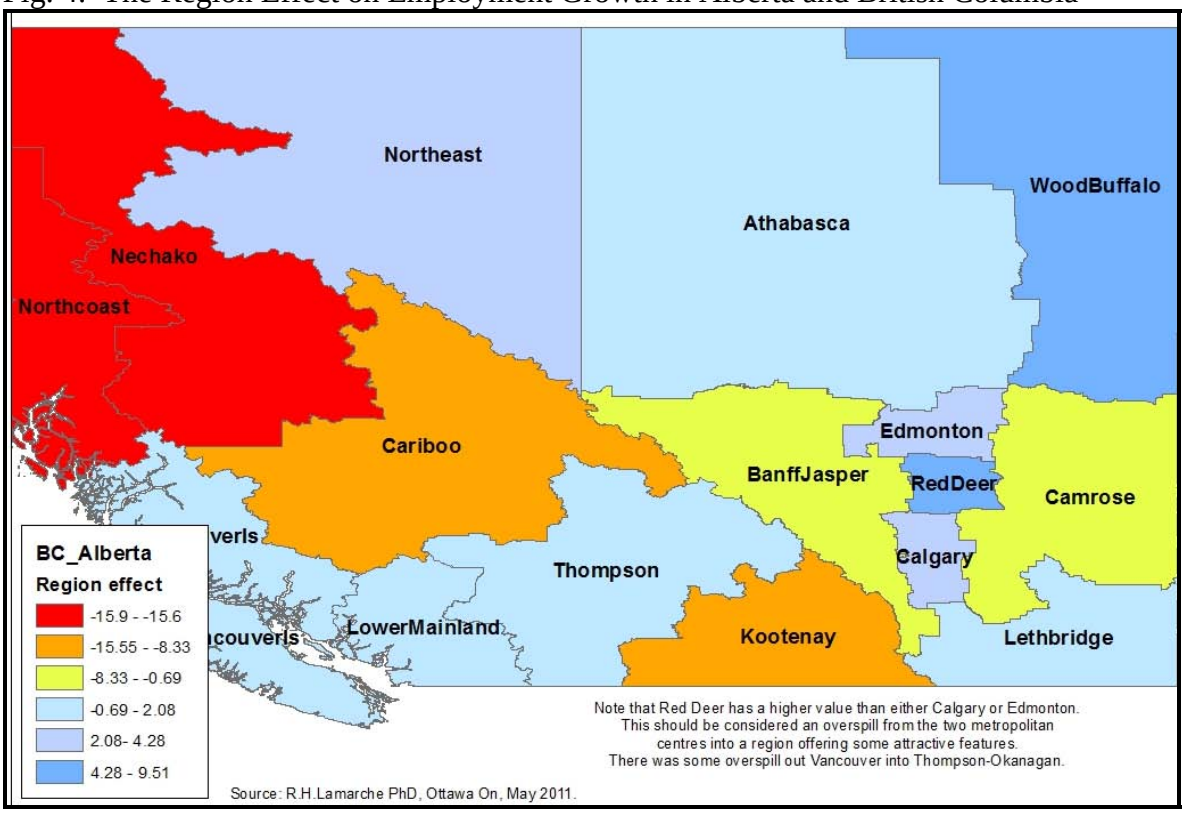
Table 4. A Comparison of the Crude Employment Growth-Rates in Canada: 2001-2006

Region	Highest growth rate	Economic Region	Lowest growth rate	Economic region	range
Atlantic	8.49	Halifax	-3.72	S Coast NFLD	12.21
Quebec	16.09	Lanaudiere	2.46	Gaspesie	13.36
Ontario	12.27	Kitchener	1.04	NW Ontario	12.23
Manitoba	9.10	SE Manitoba	-4.56	Parklands	13.66
Saskatchewan	5.92	Saskatoon	-3.82	Yorkton	9.74
Alberta	21.42	Red Deer	5.56	Banff-Jasper	15.86
British Columbia	13.15	NE BC	-4.90	Nechako	18.05

British Columbia is the most highly urbanized of the western provinces but it also has some of the most remote rural areas (Fig. 4). Consequently it has the greatest disparity in its region effects of any province (Table 4). The population of Nechako and the North Coast declined and these two regions had the lowest region-effects in the country. Both regions had region effects below -15.0 per cent, that is, their employment growth was reduced by more than fifteen percent points during the five year intercensus period as a result of their remote rural

location. In contrast Victoria- Vancouver-Kelowna formed a dispersed fast-growth corridor extending west to east across the Province. The range in region-effect values for British Columbia was 17.2 percentage points compared with 12.6 for Alberta. British Columbia and Alberta stand to gain the most from the increasing trade with Asia and, while the fortunes of Saskatchewan may be on the turn, an examination of the region effect suggests that the divide between the two western and two eastern provinces of western Canada is like to grow wider.

Fig. 4: The Region Effect on Employment Growth in Alberta and British Columbia



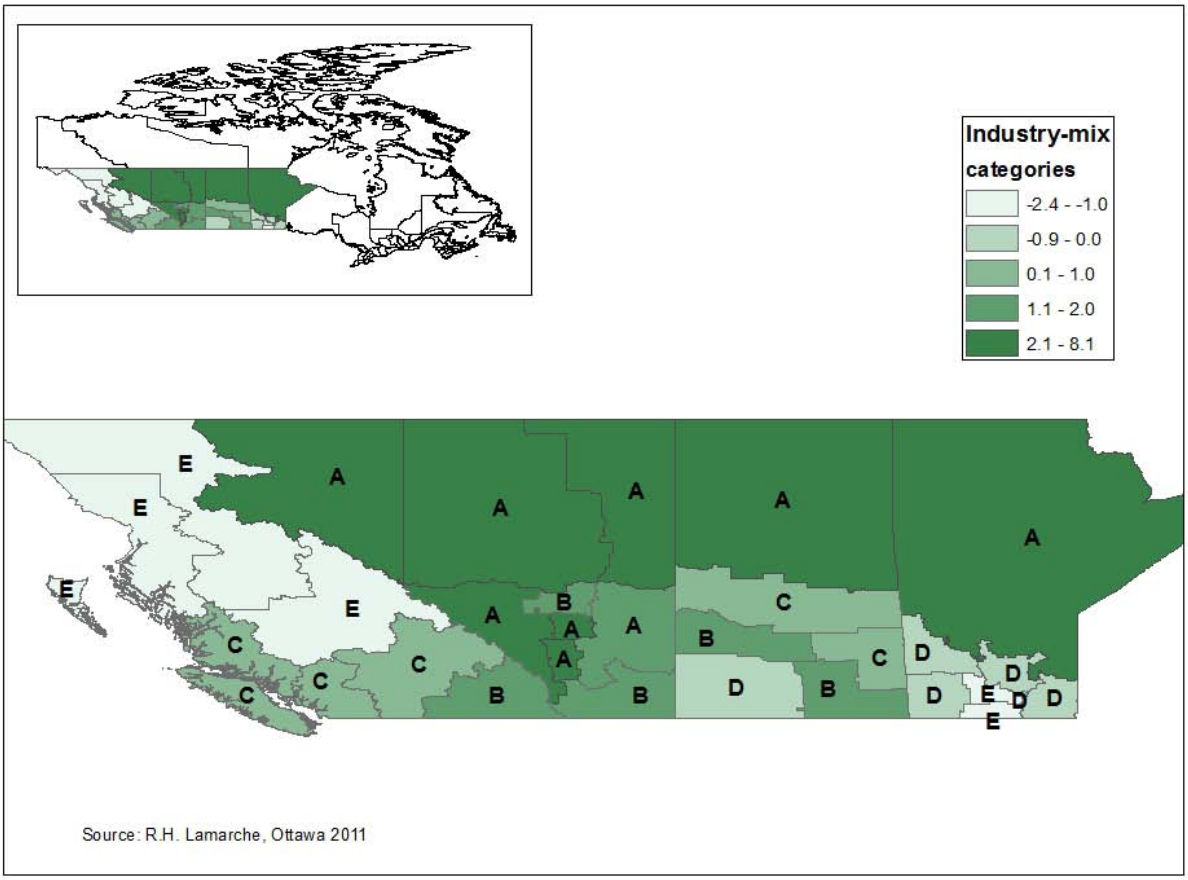
Employment Growth and the Industry-Mix Effect

The industry-mix effect measures the contribution that a region's mix of industries provides to its employment growth. In particular, the contrast between the standardised employment growth in the mining, oil and gas sector (+45.68%) and the decline in manufacturing (-6.85%) is bound to impact on the growth-rates of the regions. The contribution of the mining, oil and gas sector to the regional industry-mix rates is augmented by its concentration: 23 of the 73 economic regions in Canada have twice or more the concentration of mining employment than the national average. Of these, 17 are in Western Canada. The service sectors also have high growth rates but their regional impact is dissipated because their distribution mirrors that of the population. Even in the four western provincial capitals, the proportion of the labour force in the public service sector varies from only 3 per cent more than the national average for Edmonton to 22 per cent more for Victoria (Vancouver Island).

The industry-mix effect reveals a north-south gradient rather than the east-west pattern of the region effect (Fig. 5). The northern mining, oil and gas regions all have very high industry-mix effects. The peripheral rural regions of British Columbia have the lowest. This pattern is as

expected. The most interesting finding is in the results for the largest urban centres. Calgary and Edmonton both have very favourable industry-mixes, contributing to their rapid employment growth in this period. All three major urban centres in Manitoba and Saskatchewan grew at rates below the national average but only Winnipeg had a negative industry-mix.

Fig. 5. The Net Industry-Mix effect on Employment Growth: Western Canada



Note: The range of values represented by each latter category, A to E. is given in Table 6.

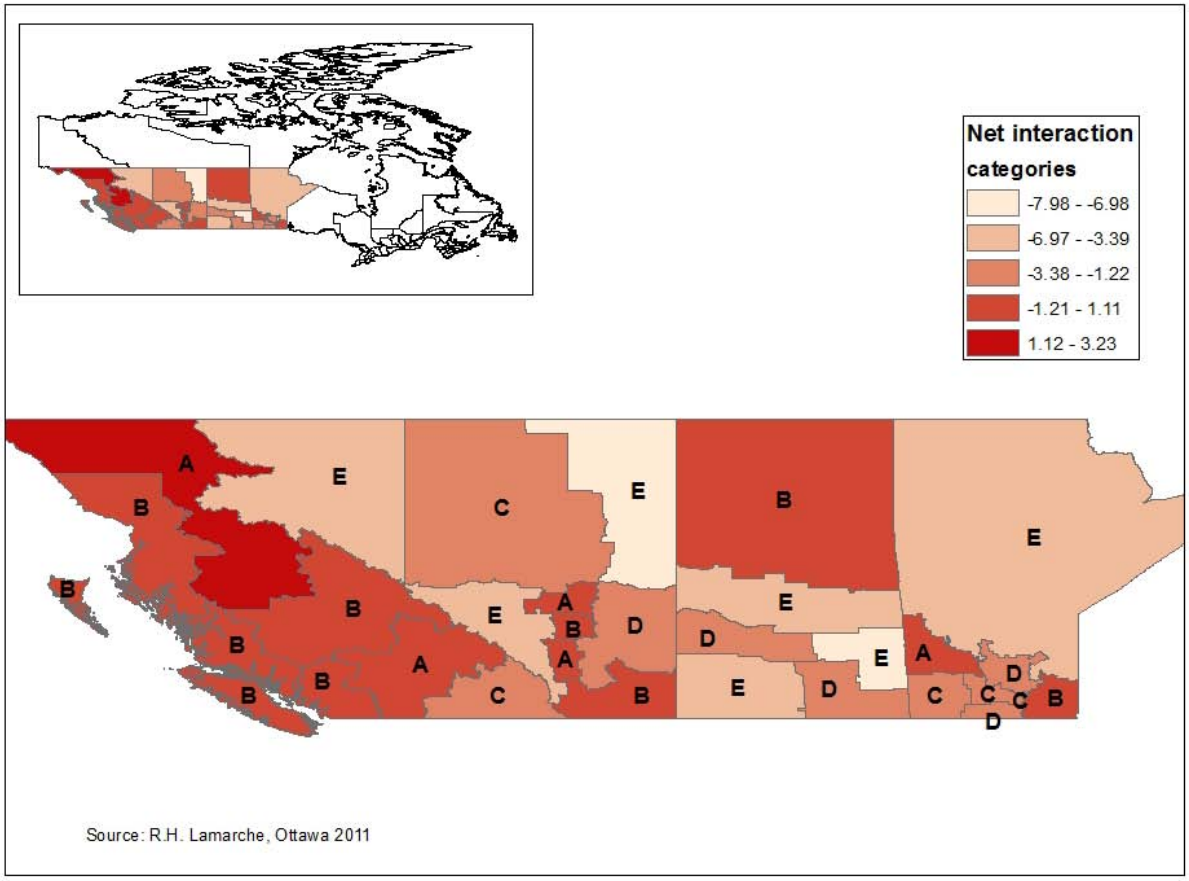
Employment Growth and the Interaction Effects

The regional pattern of the net region-industry interactions is complex, but examination of the interactions for the individual sectors suggests that they are orchestrated by systematic forces of regional restructuring of employment growth (Fig. 6). Manufacturing employment has long been concentrated in the Heartland provinces of Ontario and Quebec as a matter of National Policy and geographic position. However the Hinterland is now outperforming the Heartland by a wide margin, as shown by the distribution of the values for the manufacturing-region interactions (Table 5 and Fig. 7). Western Canada experienced the full range of interaction values for manufacturing 2001-2006. The economic regions with the highest interaction values on manufacturing spanned all four western provinces and included the urban centres of Edmonton, Red Deer, Saskatoon (as noted in the detailed study) and Winnipeg.

Manufacturing in the Hinterland is closely linked with the processing of the region's resources and had been less affected by the shift to free trade than the secondary manufacturing in Ontario and Quebec. And other interactions demonstrate a corresponding shift to the

hinterland of services linked to manufacturing activity, notably finance and insurance; professional, scientific and technical services; and the management of companies and enterprises. The continued faster growth of Canada's heartland comes from its consumer and public services which have generally higher interaction values than in the hinterland.

Fig. 6: The Region-Industry Net Interaction Effect on employment Growth



Note: The range of values represented by each latter category, A to E. is given in Table 6.

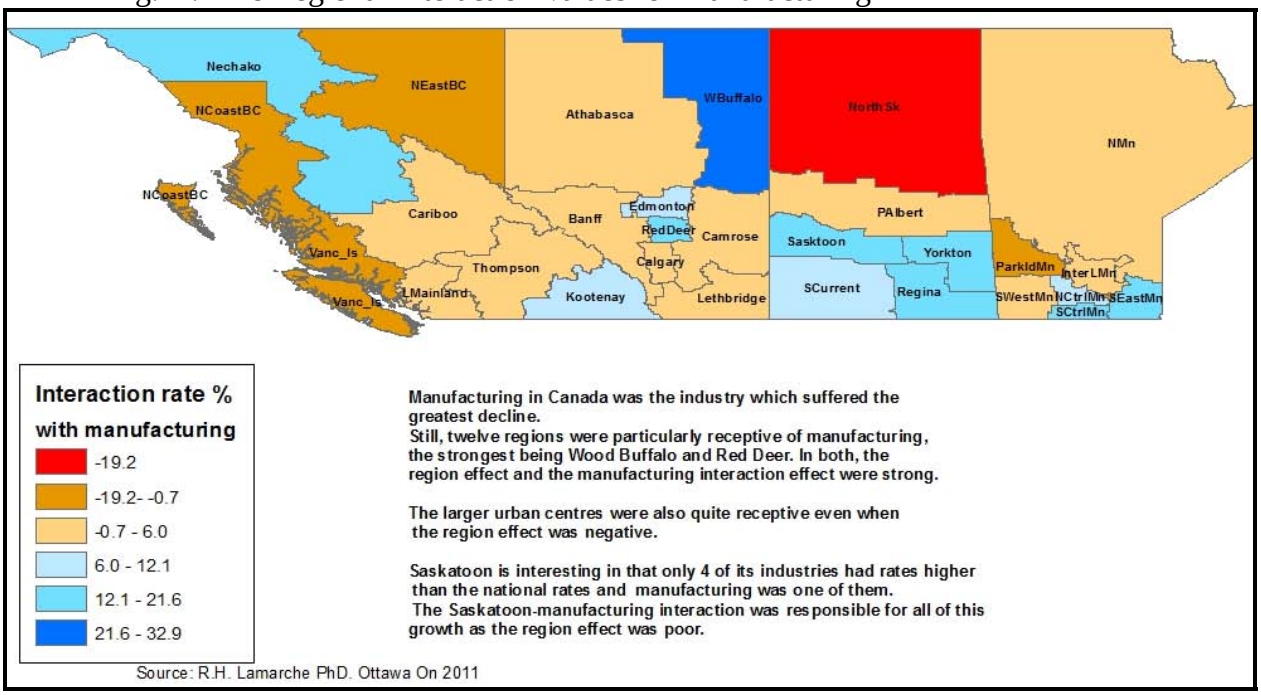
Table 5. Interaction Rates of Employment Growth in Manufacturing: 2001-2006

	Per cent	Of regions	with	Indicated	Range	Of values
region	Below -5.0	-1.0 to -5.0	+1.0 to -1.0	+1.0 to +5.0	+5.0 to 10.0	Above 10.0
Atlantic	*13*	*13*	*13*	**27**	*7*	**27**
N. Periphery	*13*	*0*	*25*	*25*	*0*	**38**
Heartland PQ	*11*	**33**	**33**	*11*	*11*	*0*
Heartland Ont	*18*	**27**	**27**	**27**	*0*	*0*
Man. & Sask	*14*	*7*	*0*	*14*	*21*	**43**
Alberta & BC	*0*	*13*	*6*	**31**	*25*	*25*
Total no of regions	8	11	11	17	9	17

Note: The highest values for the manufacturing-region interactions are in the Hinterland. Their employment growth rates are above what would be expected given their region effect and the national industry effect.

These changes in the economic structure of the heartland and hinterland may well repeat at the regional scale a progression, first identified by Colin Clark at the international scale (1940), for economies generally to experience a sequence of employment shifts beginning with a shift from primary industries to manufacturing, and then from manufacturing to services and the post-industrial society. This trend was observed in Canada by the 1970's (Yeates 1975, pp. 354-357). This same progression occurs for regions within a nation as it does for nations at the international scale. The role of manufacturing in this progression within Canada may be different in character and more muted in importance in the hinterland than in the heartland (Yeates 1975, Wallace 1998, p263, Lehr 1998). But to the extent that the hinterland does follow this progression, the difference in the timing of the changes in the relative importance of manufacturing between the heartland and hinterland suggest the hinterland is one step behind the heartland in the transformation of its economy with the difference that resources in western Canada must continue to play a key role in underpinning manufacturing and the economy in general.

Fig. 7. The Regional Interaction Values for Manufacturing



A Typology of Regional Employment Growth

Steps to a Regional Typology of Employment-Growth

The multifactor partitioning (MFP) of employment-growth provides a springboard to define a regional typology. Three steps are involved in defining each regional type and allocating the economic regions to them. First, the actual values for the three components of growth are allocated to five classes A through E, based on their Canada-wide frequency distribution (Table 6). These are the five classes used for the industry-mix and net interaction maps (Figs. 5 and 6). The five classes for each effect have different value-ranges because each effect has a different frequency distribution. Only 24 of Canada's 73 regions have a positive region effect: the region effect is correlated with population size and there are many more

economic regions with a small population than with a large one. Region-effect class E includes remote rural economic regions in which employment actually declined or had a very low growth rates. The industry-mix effects are evenly divided between positive and negative but the positive values have a much greater range. Industry-mix class A includes those regions which had an extraordinarily high rate of growth which results from their oil and natural gas industry. The net interactions provide the third criterion of classification. Nearly all of these are clustered around or just below zero. Only class A, therefore, has a positive range of values, although class B is only slightly negative.

Table 6. The Allocation of the Region, Industry-mix and Net-interaction Values to Classes

Class	**Region effect** range from to		no of regions in class	**industry mix effect**			**net interaction**		
				range from	to	no of regions in class	range from	to	no of regions in class
A	10.0	2.0	14	8.0	2.0	9	3.0	0.0	18
B	2.0	0.0	10	2.0	1.0	14	0.0	-0.74	19
C	0.0	-3.0	18	1.0	0.0	13	-0.75	-2.0	15
D	-3.0	-6.0	17	0.0	-1.0	19	-2.0	-3.0	11
E	-6.0	-16.0	14	-3.0	-4.0	18	-3.0	-8.0	11

The second step is the allocation of the economic regions to their appropriate class for each of the three effects (Appendix III). The third step is the allocation of the regions to the regional typology, based on their class of each effect. The region effect on employment growth is the most important of the three in defining the regional typology. It not only has a greater range of values than the other two effects, but, as we have seen, it is also more highly correlated with the other selected employment and income variables. It is, therefore, used as the first criterion for identifying the regional types. Industry-mix has a high correlation with the region effect but it has a smaller range of values and lower correlations generally than the region effect. It is used as the second criterion for classification. The net interaction values are far less informative than the individual values as was noted in the example of Saskatoon discussed in the methodological section (Table 2). However, there are eighteen separate interactions for every region, so the classification falls back on the net values. Nevertheless, the net-interaction values distinguish between several of the regional types and it the third criterion used.

Allocating Economic Regions to their Employment Growth Type

The typology presented in this article builds on a shift-share typology by Biffignandi (1993, 2005) with the net-interaction added as a third criterion of classification. The objective of this typology is to identify regional types of regions with common economic and geographic characteristics. Biffignandi typologies were initially designed for the extended shift-share model by Arcelus (1984), but they apply equally well to MPF. Seven of the eight possible regional types recognized in the Biffignandi typology occur in Western Canada, but two of the classes, Types 2 and 6, are subdivided into urban and rural because of the differences in their employment-growth performance. The wide diversity exhibited in the regional structure of employment growth by each regional type occurring in Western Canada is outlined below.

Type 1: Regions of general expansion with strong growth from all three effects
These are the best-performing regions on employment growth with a very strong region effect (A), a good industry-mix (A or B), and very positive net interaction (A or B) effect. The four economic regions in Western Canada that belong to this group form the Lethbridge -Edmonton urban-axis. Their combined MFP classes range from AAA (Calgary) to ABB (Lethbridge). The employment growth 2001-2006 ranged from 12 per cent to 21 per cent compared with the national rate of 9 per cent.

Type 2: Regions with a strong region effect but a weak industry-mix
Type **2** economic regions achieved a strong growth despite a weak industry-mix. Indeed it is this weaker industry-mix that is their distinguishing feature. The group is sub-divided according to whether the region has at least one CMA or is entirely rural in character. The rural regions have a much poorer industry-mix than do the urban and their growth rates are at or below the national average.

2a: urban regions: Three economic regions in this subgroup form a discontinuous urban axis from Victoria to Kelowna. Their MFP classes range from ACA (Thompson-Kelowna region), to BCB (Lower Mainland) and they achieved above average growth rates of between 9 and 12 per cent.

2b: rural regions: The four economic regions in the subgroup encircle Winnipeg but exclude Winnipeg itself. They have lower MFP classes than the 2a regions. The class of these regions ranges from BDB to BED and their growth rates were in the 5 to 9 per cent range.

Type 4: Declining local regions near a macro-region of overall growth
The one region that falls into this category of regional decline near areas of fast growth is the Banff Provincial Park. It has the highest category of industry-mix, and is adjacent to the Lethbridge-Edmonton axis. But apart from the parks-related employment, employment growth has been slow: its employment grew by just 5.6 per cent. The slow growth rate reflects National Parks policy. Its MFP rating is DAE.

Type 5: Regions achieving fast growth in macro region of general decline
This group covers the opposite situation to group 4. They are fast growth regions in areas of general decline. Group 5 regions in Western Canada are all the oil and gas producing areas of Northern Alberta and Northeast British Columbia. Their employment is growing rapidly (11 to 18 per cent) and they have a strong region effect (A or B), a very favourable industry-mix (A) but employment growth is narrowly focussed on the one industry resulting in a very poor net interaction value (C or E).

Type 6: Regions that are declining despite a good industry-mix
This group can be subdivided into (6a) and (6b) according to the level of their relative employment decline, but both subgroups have very poor interaction values. Poor interaction values indicate that the actual growth of the industries in these regions is below their national growth rates of industries in them, even allowing for the low region effects. This disparity between the regional and national growth rates of industries calls for detailed study.

6a. Regions with employment growth below the national average. Two regions in Western Canada belong to this subgroup. Camrose, Alberta (CAD) and Saskatoon (CBD). They have a very good industry mix (A or B) but weak overall employment growth, as shown by their region effects, (C), and interaction values (D). Their employment growth rates were between 6 and 8 per cent.

6b. Economic regions suffering a greater employment decline. Four regions fall into this subgroup, which apart from Regina (DBD) are peripheral regions, namely: North Saskatchewan

(EAB), North Manitoba (EAE) and Kootenay (EBC). Their employment growth rates ranged from 0.0 per cent to 4 per cent.

Type 7: Regions in marked general decline

Four Western regions face declining employment with a poor region-effect and industry-mix performance. The MFP classes of the regions in this group range from CDC for Southwest Manitoba, to DDE for Swift Current, Saskatchewan. Their employment growth range is the same as for Type 6 but they are distinguished by having a poor industry-mix which may well pose greater policy problems. Their employment growth 2001-2006 ranged from -1- to +5 per cent.

Type 8: Urban and rural areas in severe general decline.

Five regions, two of which are urban, exhibit extremely negative region effects and poor industry-mix. In a sense, these are regions that have little to work with and make a poor job with what they do have. Consequently their MFP classes range from ECE for Yorkton to EEB for the North Coast region of British Columbia. They have all experienced an absolute decline in employment of between -5 per cent to -9 per cent

The typology does not consider the actual employment growth so that the employment rates for the different regional types overlap. Nevertheless, for Western Canada, 2001-2006, the employment growth rates were highest for Type 1 regions and lower for Type 2. Type 6 regions all had below national-average employment growth rates, though overlapping with Type 2. Types 7 and 8 were all below the national growth rate and all the Type 8 regions had an actual decline in their employment. The 2006 average income of the labour force with full time work all year is related to the employment growth rates. The average income for Types 1, 2a 3, 4 and 5 is above the national average of $51,221 and Types 2b. 6, 7 and 8 are all below it (Table 7).

Table 7. Average Population and Income Data for each Regional Type

2006 data	Type 1	Type 2a	Type 2b	Type 4	Type 5	Type 6a	Type 6b	Type 7	Type 8
No. of economic regions	4	3	4	1	3	2	4	4	5
Average population per region	666,802	1,218,499	70,304	82,382	138,923	238,735	132,712	257,971	75,244
per cent of Western population	28.02	38.40	2.95	0.87	4.38	5.02	5.58	10.84	3.96
average income	$58,811	$50,844	$40,733	53,438	$55,903	$45,793	$45,666	$42,330	$44,066

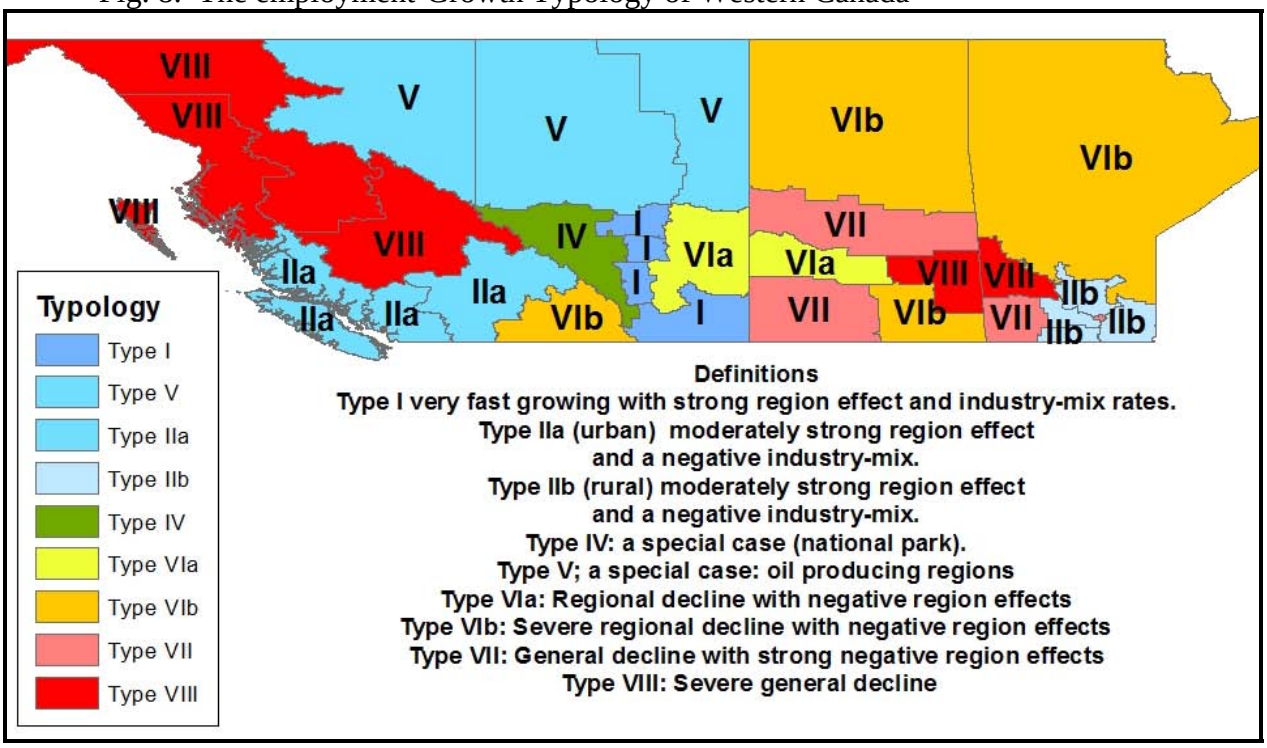
Note: the average income for full time workers in Canada in 2006 was $51 221.

<u>The Map of the Regional Typology for Western Canada.</u>

The most striking feature of the map of the regional typology is the contiguity of the groups of economic regions in each class (Fig. 8). No contiguity constraint is imposed on the allocation of regions to regional types: they are allocated strictly on their class values. Yet even so the typology produces contiguous groupings of economic regions with similar structures of employment growth. This contiguity is imposed by the geography of spatial forces and growth gradients evident in the region and industry-mix effects. The claim made by some economists that advancing technology and globalisation spell the death of distance and the end of geography

is completely contradicted. The geographic characteristic of the regions plays a crucial role in their economic performance and an understanding of them is shown to be an essential prerequisite to any regional planning.

Fig. 8. The employment-Growth Typology of Western Canada



Urban rural contrasts are also clearly important. The extreme rural periphery of British Columbia comprises three of the five Type 8 regions that are in severe decline. Accessibility to large metropolitan centres is of paramount importance to employment growth. The rural periphery will continue to suffer from the outmigration of the better educated and most enterprising young people, except where economic fortunes are reversed by the development of resources. However the achievement of a diversified economy in peripheral resource-rich regions will be constrained by the "intrusive rentier syndrome" (Polese 2009 pp 19-20) in which the high wages paid by the mining, oil and gas sector crowds out other sectors. Nor is employment growth type determined solely by urban size: Saskatoon (289 thousand in 2001) grew faster than Winnipeg (458 thousand) and Red Deer (175 thousand) grew faster than Vancouver (2,437 thousand). And while it is clear that population size matters in the competition for growth, so too does location. The sharp divide in the growth rates between the eastern and western halves of Western Canada applies to their urban growth rates so that Red Deer and Vancouver both grew faster than Saskatoon or Winnipeg.

Policy Conclusions

Three principles, required for the successful formulation of policy, emerge from this examination of the structure of employment growth in Western Canada, namely: 1) the requirement for sound analysis; 2) the recognition of the individual spatial forces that shape the

regional growth patterns; and 3) the need for an appropriate regionalization of employment growth.

The Requirement for Sound Methodology.

Sound policy formulation to address the issue of regional disparities in employment growth and its associated correlates requires an accurate diagnosis of the structure of employment growth. Sound diagnosis in turn requires analysis that is methodologically sound. Past regional-policy formulations to address regional disparities in employment growth have been based on the conclusions drawn from shift-share analysis. The comparison of the two sets of results for Saskatoon (Tables 1 and 2) illustrate how inaccurate and misleading the conclusions drawn from a shift-share analysis can be. This article uses multifactor partitioning of the employment growth data in place of shift-share analysis. Multifactor partitioning (MFP) purges the region effect of industry-mix, and industry-mix of the region effect, and it extracts and measures the interactions as separate effects. Furthermore MFP is easily extended to any number of characteristics, such as the contribution of small firms to employment growth corrected for the industry and region effects. And by partitioning these effects correctly, MFP lays the basis for an accurate diagnosis of the particular employment-growth problems in each region.

The Requirement to Recognize the Spatial Forces that Shape Regional Growth Patterns

The growth forces that shape regional growth differ fundamentally in character, are complexly interwoven, and produce quite different geographies. The national growth rates of individual industries modify the economic structure of the national economy and impact regional economies through their industry-mix. The intrinsic region effects create a changing regional economy. The specific region-industry differences in growth rates produce an economic restructuring of the regions.

Past policies have emphasized the impact of the industry-mix on regional growth rates. It must be admitted that in Canada, as in Britain, large regional differences in growth rates appear to be associated with the large differences in the national growth rates of the industries concentrated in them. However, this interpretation of regional disparities led to a simple dichotomy of regions and a single one-size-fits-all regional policy of encouraging the relocation of manufacturing industry to slow-growth regions. This policy was founded on the assumption, explicitly stated in the Barlow Report, that the industries grow at about the same rate wherever they are located. It thus totally ignored the significance of location factors on the growth of industry. It also failed to recognize the growing importance of the service industries in the national employment growth and so overlooked the opportunity of using the relocation of the more foot-loose services to reduce regional disparities (Yeates 1975).

Industry-mix is unquestionably important, but the analysis presented in this article suggests that it has made a smaller contribution to difference in regional growth rates than has the region effect. Furthermore, the region effect is more closely correlated with other economic variables such as income and unemployment levels. It also seems likely that differences in the region effect are generally of long standing because they reflect the advantages of geographic position and the scale economies offered by sheer size.

The variation in the net interaction values for the different regions is small but significant. However it is the individual interactions that are likely to be critical in any detailed examination of regional performance as well as in understanding the restructuring of the regional economy.

Colin Clark (1940), was the first to recognize that national economies experience a sequence of employment shifts beginning with a shift from primary industry to manufacturing, and then from manufacturing to services and the post-industrial society. Western Canada appears to be following this same progression though the growth of manufacturing is different in character and more muted in importance than in the heartland Canada (Yeates 1975, Wallace 1998, p263, Lehr 1998). But to the extent that the hinterland does follow this progression, the difference in the timing of the changes in the relative importance of manufacturing between the heartland and hinterland suggest the hinterland is one step behind the heartland.

There are, however, a number of caveats that need to be made about the effectiveness of MFP in measuring the spatial forces that shape the regional economy. First, MFP can partition only those effects which have been measured and cross-tabulated. Small firms have, at least in the past, made a disproportionate contribution to employment growth in Canada (Ray 1996). To the extent that they are disproportionately concentrated in particular industries and regions, they affect the MFP results. Foreign ownership and control is also of great importance to understanding the structure of employment growth because it is concentrated among large manufacturing firms in Southern Ontario. There is a concern that foreign firms may respond differently to changing economic circumstances than domestic ones (Ray 1990). The data on these two important characteristics can be accessed only through the confidential Longitudinal Employment Analysis Programme at Statistics Canada and their inclusion was beyond the scope of this analysis. However the MFP easily accommodates a four-way cross tabulation to separate out all these different effects on the changing structure of employment growth.

Not so easily measured or accommodated are the effects of globalisation on the structure of employment growth. The 2001-2006 intercensus period is the first in which the effects of the free trade agreements signed by Canada with the USA and Mexico have been in full force and in which firms in Canada have operated in a changed business environment. The evidence suggests that small Canadian firms have been more severely affected than large foreign-controlled ones (Baldwin and Yan 2010). Western Canada may be less affected by globalisation than Southern Ontario and Quebec: it was the hinterland provinces that paid the price for the high tariffs to protect heartland manufacturing. Western Canada will, nevertheless, face important issues. The question of foreign takeovers and the control of Canada's resources is a very complex one yet there has been no comprehensive study of foreign ownership since the Privy Council Task Force on the Structure of Industry (Watkins 1968). One key concern is the danger of the hollowing out of corporate Canada (Brown and Beckstead 2006, and Baldwin and MacDonald 2009). Whatever the balance of foreign to domestic ownership of Western Canada's resources, the future development of resources will face domestic issues such as environmental impacts and the land rights of native peoples. The way in which these issues are addressed will necessarily have an important impact on regional employment growth.

<u>The need for an appropriate regionalisation.</u>

The classification of Western Canada's economic regions into different types according to their performance on the region, industry- mix and net interaction effects is simply that – a typology and not a regionalisation. There is no contiguity constraint imposed at any stage of the analysis. And yet the map of the typology reveals a regionalisation, in which contiguous groups of economic regions emerge that share common characteristics of growth. Accessibility to the large metropolitan centres is of paramount importance and the rural periphery will continue to suffer from the outmigration of the better educated and most enterprising young people.

Resources too have played an important role propelling parts of the rural periphery to the top ranks of the region and industry-mix effect.

Calgary, with a population of over a million, is the only western region to score a triple "A" rating and it ranks near the top on all three effects. Calgary anchors the fastest-growth region in Western Canada, an urban corridor stretching from Lethbridge to Edmonton. At the other extreme are the rural regions in British Columbia, Manitoba, and Saskatchewan which are in general decline. However a number of large urban centres in Manitoba and Saskatchewan are also in general decline namely Winnipeg, Prince Albert, and Swift Current in Manitoba and Prince Albert in Saskatchewan. Urban size is not enough to guarantee growth: location matters too. Between these extremes of growth and decline are four distinctly different kinds of region with different policy needs.

The temptation in regional planning in Canada has been to believe that what works for one region will work for them all and therefore to adopt a one-size-fits-all regional policy. This typology makes it clear that no single factor can explain regional differences in employment growth. Therefore no single policy can address the various problems that growth or the lack of it are creating. Such single policies ignore geographic imperatives, and what little they do achieve cannot reduce regional disparities. The analysis and typology point to the complexity of the regional policy needs of Western Canada but they provide only a framework for the much more detailed work that needs to be done, emulating the kind of research undertaken in collaboration with government agencies and corporations for the Atlantic and Quebec periphery (Polese and Shearmur 2002). Without it the danger is that regional policy will not be properly focussed and consequently will fail to meet its objectives.

Acknowledgments

Special thanks are due to Dr Lynsey Robertson, Churchill Archives Centre, University of Cambridge for checking the papers of Sir Donald MacDougall, and for establishing his authorship of Appendix II, the Barlow Report; to Jonnie Robertson of the British Library for gathering all their materials on the Barlow Royal Commission; and to Marie Ray for checking through all the available documents relating to the Royal Commission at the British Library and at the National Archives.

APPENDIX I

The Economic Regions of Western Canada: ID, Map Code and Employment Data

MFP ID	Name	Statistics Canada Province & Map Code	Employment 2001	Crude employ growth: 2001-2006	% of labour force in Mining 2001	Manufacturing Location Quotient 2001
44	S E Manitoba	Manitoba 10	45330	9.10	0.93	1.10
45	South Central Man.	Manitoba 20	26795	4.52	0.21	1.34
46	South West Man	Manitoba 30	54070	4.51	0.99	0.62
47	North Central Man.	Manitoba 40	22755	6.15	0.33	0.69
48	Winnipeg	Manitoba 50	332905	4.04	0.14	0.94
49	Interlake Manitoba	Manitoba 60	43030	6.70	0.47	0.77
50	Parklands	Manitoba 70	21285	-4.56	2.34	0.30

51	North Manitoba	Manitoba 80	31195	-0.02	7.15	0.45
52	Regina	Saskatchewan 10	146900	3.37	2.83	0.38
53	Swift Current	Saskatchewan 20	55330	-0.68	3.98	0.41
54	Saskatoon	Saskatchewan 30	152600	5.92	3.34	0.63
55	Yorkton	Saskatchewan 40	43825	-3.83	4.91	0.45
56	Prince Albert	Saskatchewan 50	95585	0.88	4.28	0.47
57	North Sask.	Saskatchewan 60	9780	4.45	9.50	0.36
58	Lethbridge	Alberta 10	124945	11.69	6.26	0.67
59	Camrose	Alberta 20	97990	7.87	9.64	0.36
60	Calgary	Alberta 30	603005	16.25	6.52	0.62
61	Banff-Jasper	Alberta 40	47750	5.56	10.26	0.42
62	Red Deer	Alberta 50	84860	21.42	11.52	0.60
63	Edmonton	Alberta 60	546705	15.00	3.64	0.68
64	Athabasca	Alberta 70	120065	11.31	11.84	0.52
65	Wood Buffalo	Alberta 80	56550	17.52	21.38	0.22
66	Vancouver Island	British Columbia 10	343680	9.27	0.47	0.50
67	Lower Mainland	British Columbia 20	1197830	10.03	0.40	0.73
68	Thompson	British Columbia 30	225895	11.77	1.34	0.77
69	Kootenay	British Columbia 40	72995	0.33	4.14	0.85
70	Cariboo	British Columbia 50	86955	-1.58	1.41	1.15
71	North Coast	British Columbia 60	31695	-8.71	0.79	1.14
72	Nechako	British Columbia 70	21960	-4.90	3.81	1.39
73	North East BC	British Columbia 80	33655	13.15	11.42	0.47

Note: The map of the Statistics Canada Economic Regions is available on the Statistics Canada website ref. 92FO144XIB National Reference Maps b) economic regions. The location quotient for manufacturing is calculated as the percentage of the region's employment in manufacturing divided by the national percentage.

APPENDIX II
The Actual and Standardized Growth Rates in employment by Economic Sector: Canada 2001-2006

	Empl. Growth 2001 to 2006	Empl. Growth 2001 to 2006	
	actual	standardized	difference
industry name	rate(%)	rate(%)	
Agric., Foresty, Fishing	-7.74	0.89	-8.63
Mining, oil,gas extract.	40.84	45.68	-4.84
Construction	21.48	20.98	0.50
Manufacturing	-7.76	-6.85	-0.91

Wholesale trade	7.58	7.09	0.49
Retail trade	9.21	9.22	-0.01
Transport & storage	5.86	6.09	-0.23
Information & cult. Ind.	-0.06	1.35	-1.41
Finance & insurance	8.46	8.08	0.38
Real estate & leasing	17.02	16.89	0.13
Science& tech. & mgnt serv	14.59	16.52	-1.93
Adm. & support & Waste mgnt.	18.09	18.27	-0.18
Education services	12.66	12.94	-0.28
Healt care & social assist.	13.48	13.86	-0.38
Arts. Entertainment & recreation	13.89	14.31	-0.42
Accommodation & food serv.	7.69	8.24	-0.55
Other services except pub. Adm.	9.44	9.71	-0.27
Public administration	8.07	8.28	-0.21

APPENDIX III

The Region, Industry-mix, & Net Interaction Classes and Typology for Western Canada; From Multifactor Partitioning of Employment Data, 2001-2006

		crude	region	industry	net inter-	Regional
	Western Canada	employment	effect	mix	action	Type
Region ID	Regions	growth	class	class	class	
44	Southeast Man	9.10	**B**	**D**	**B**	**2b**
45	South Central Man	4.52	**B**	**E**	**D**	**2b**
46	Southwest Man	4.51	**C**	**D**	**C**	**7**
47	North Central Man	6.15	**B**	**E**	**C**	**2b**
48	Winnipeg	4.04	**D**	**D**	**C**	**7**
49	Interlake Man	6.70	**B**	**D**	**D**	**2b**
50	Parklands Man	-4.56	**E**	**D**	**A**	**8**
51	North Manitoba	-0.02	**E**	**A**	**E**	**6b**
52	Regina	3.37	**D**	**B**	**D**	**6b**
53	Swift Current	-0.68	**D**	**D**	**E**	**7**
54	Saskatoon	5.92	**C**	**B**	**D**	**6a**
55	Yorkton Sask	-3.83	**E**	**C**	**E**	**8**
56	Prince Albert Sask	0.88	**D**	**C**	**E**	**7**
57	Northern Sask.	4.45	**E**	**A**	**B**	**6b**
58	Lethbridge Med Hat	11.69	**A**	**B**	**B**	**1**
59	Camrose Alb	7.87	**C**	**A**	**D**	**6a**
60	Calgary	16.25	**A**	**A**	**A**	**1**

61	Banff-Jasper	5.56	**D**	**A**	**E**	**4**
62	Red Deer	21.42	**A**	**A**	**B**	**1**
63	Edmonton	15.00	**A**	**B**	**A**	**1**
64	Athabasca Alb	11.31	**B**	**A**	**C**	**5**
65	Wood Buffalo Alb	17.52	**A**	**A**	**E**	**5**
66	Vancouver Island	9.27	**B**	**C**	**B**	**2a**
67	L Mainland BC	10.03	**B**	**C**	**B**	**2a**
68	Thompson BC	11.77	**A**	**C**	**A**	**2a**
69	Kootenay	0.33	**E**	**B**	**C**	**6b**
70	Cariboo BC	-1.58	**E**	**E**	**B**	**8**
71	North Coast BC	-8.71	**E**	**E**	**B**	**8**
72	Nechako BC	-4.90	**E**	**E**	**A**	**8**
73	Northeast BC	13.15	**A**	**A**	**E**	**5**

Note: the multifactor partitioning is of the employment data for the 73 economic regions defined by Statistics Canada for the ten provinces. The results for Western Canada only are given in this appendix. The class values are given in Table 7. The Biffignandi typology is described pp 20-22.

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