RESILIENCE REVISITED: ASSESSING THE IMPACT OF THE 2007-2009 RECESSION ON 83 CANADIAN REGIONS WITH CLOSING THOUGHTS ON AN ELUSIVE CONCEPT

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Abstract

Viewing the 2007-2009 recession as an exogenous shock, the paper proposes an assessment of the 'resilience' of 83 Canadian regions using two metrics: the unemployment rate (UR); employment growth (EG). The assessment serves a laboratory for a reflection on 'resilience' as a useful concept in economic geography. Results vary depending on interpretations of 'resilience' and metric used. If EG, 65 regions 'rebounded' (positive after the shock) but only 36 recovered pre-recession growth paths and only 14 qualify as 'resilient' if a 'resistance' criterion is added. If UR, 19 regions 'rebounded', differences due to varying labour force responses. We conclude that 'resilience' is an elusive concept whose operational definition must remain problematic.

Key Words:

Resilience; Regions; Labour Markets, Local Economies, Canada

Résumé

Prenant la récession de 2007-2009 comme exemple d'un choc exogène, nous proposons une analyse de la « résilience » de 83 régions canadiennes en utilisant deux indicateurs : le taux de chômage (TC); la croissance de l'emploi (CE). L'analyse nous sert de laboratoire pour un regard critique sur « résilience » comme concept utile en géographie économique. Nos résultats varient en fonction de l'indicateur employé et de l'interprétation donnée à la résilience. Si l'indicateur est CE, 65 régions ont « rebondi » (CE positive après le choc), mais seulement 36 ont retrouvé le rythme de croissance d'avant la récession, et seulement se qualifient comme « résilientes » si nous retenons aussi le critère « résistance » (au choc). Si l'indicateur est TC, 19 régions ont rebondi, les différences attribuables aux réactions variables des travailleurs. Nous concluons que « résilience » demeure un concept difficile à saisir, dont la définition opérationnelle restera problématique.

Mots clés :

Résilience; régions; marché du travail; développement local; Canada

INTRODUCTION

The concept of regional resilience has spawned a lively debate among economic geographers. It is an attractive concept, conjuring up positive images of cities and regions able to successfully resist outside shocks and bounce back from the abyss. But, like many concepts in the social sciences, bridging the gap between an intuitively pleasing notion and its empirical operationalization remains an unresolved challenge.

In this paper, we have chosen to address the issue via an attempt at an empirical application; specifically, the response of 83 Canadian regions to the 2007-2009 global recession, example of an exogenous shock. The questions we ask are simple: how 'resilient' were Canadian regions in the face of the shock: which succeeded in resisting, which bounced back and which did not? But, as we shall see, the answers are not simple.

The empirical exercise serves in turn as a laboratory, so to speak, for a broader reflection on the usefulness of 'resilience' as a concept in economic geography. Our focus is not on the philosophical underpinnings of the concept, whose origins lie in ecology and the natural sciences; but on measurement.

RESILIENCE - AN OPEN-ENDED CONCEPT?

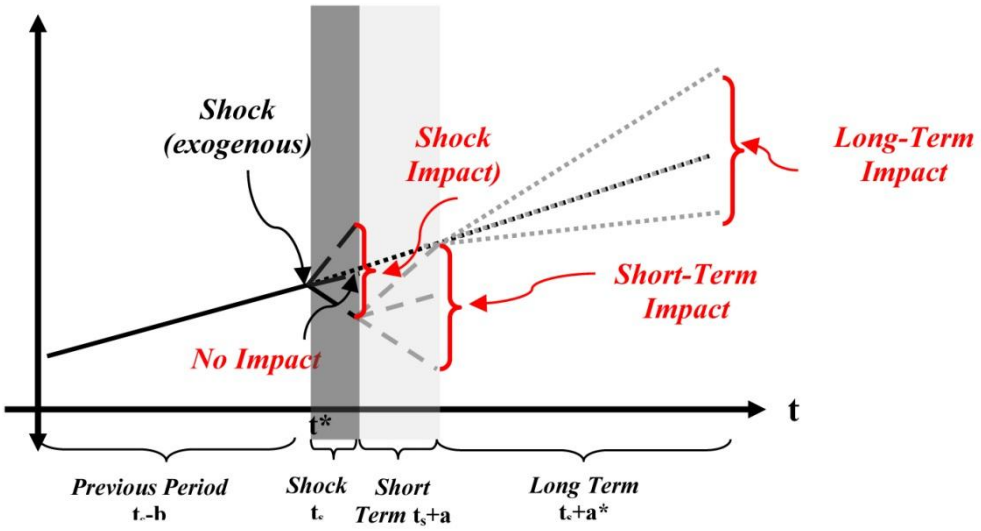
In October 2005, in the wake of Hurricane Katrina that devastated New Orleans, a panel came together to consider the question: "Is New Orleans a Resilient City" (Lang and Danielson 2006). The panel failed to come to agreement on whether or not New Orleans was or was not a resilient city. This should come as no surprise. They had no universally agreed-upon framework to guide them. Several authors have expressed doubts on 'resilience' as an analytical concept (Carpenter *et al.*, 2001, 2005; Hanley, 1998; Hassink, 2010; Hudson, 2010; Pike *et al*, 2010.). Carpenter *et al* (2005) suggest that the concept can only be approached via surrogates and 'resilience' inferred indirectly. Christopherson *et al.* (2010: 3) frankly admit that one reason for its popularity is its malleability. It can mean different things to different people. However, in the end if the concept is to be useful, a minimal consensus is required on what should be measured and how.

In its most straightforward meaning, the concept refers to the ability of an entity (being, group, region…) to bounce back from a shock to recover its initial form or pre-shock growth path. In analytical terms, we require a variable or set of variables, **y**, whose evolution is examined before, during, and after a shock over given time periods (**t**). **Y** can be employment, income, GDP, the unemployment rate or other chosen performance indicators. Possible scenarios are portrayed on Figure 1, where impacts of a shock are decomposed into three stages: initial ($\mathbf{t_s}$), short-term

($\mathbf{t_s+a}$), and long-term ($\mathbf{t_s+a^*}$). Regions may be unaffected (no impact) or even witness a positive evolution; say a drop in unemployment during the shock (dashed black upward line in $\mathbf{t_s}$). The more frequent reaction, one would expect, is the downward slopping (dashed black) line.

Over the short-run ($\mathbf{t_s+a}$), three reactions are possible, illustrated by grey dashed lines: a continuation of the downward trend heralded by the shock; a rebound, but without recuperating the pre-shock growth path ($\mathbf{t_s-b}$); a sharp rebound bringing it back to the pre-shock growth path. 'True' resilience would imply that the region fully recuperate, over time recovering its former growth path over the long run ($\mathbf{t_s+a^*}$), illustrated by the middle black-grey dotted line. The two other dotted lines in $\mathbf{t_s+a^*}$, one above and one below, illustrate breaks in the growth path, the region embarking on a faster long-term growth path or, alternatively, assuming a slower growth path. The possibility of long-run decline is not considered on Figure 1.

Figure 1 - Schematic Representation of Alternative Resilience Scenarios



The point of the exercise on Figure 1 is that 'resilience' can come in several combinations[1]. In figure 1, all cases have survived and overcome the shock, even if growth is slower after than before. Polèse (2010) calls this **a**-Resilience and is, he argues, a quasi-universal trait of cities and thus not a terribly useful concept. No example exists in modern times of a large city that has actually succumbed – disappeared - due to an outside shock, although small resource-based communities have died. Various studies have, time and again, documented the remarkable ability of cities to bounce back, be it from the atomic bomb, allied bombings, hurricane Katrina or other disasters (Bosker *et al*. 2008, Brakeman *et al*. 2004, Davis and Weinstein 2002, Lang and Danielson 2006, Vale and Campanula 2005). Davis and Weinstein (2002) argue that resilience is

[1] On figure 1, there are potentially 27 (3^3) possible reactions to the shock, the decomposition of the final outcomes quickly becoming complex.

built into cities, mirroring locational fundamentals (natural harbours, soil fertility, climate…) and the accumulated infrastructures (roads, canals, railways, institutions …) that give locations economic value.

A more intriguing question is the ability of a city or region to change in the face of outside shocks, which Polèse (2010) calls **b**-Resilience. Christopherson *et al.* (2010) see 'adjustment' and 'adaptability' as components of regional resilience. However, this would seem to fly in the face of the 'standard' linear model of resilience (recovered trend line). A parallel literature has emerged that sees no contradiction between resilience and multiple post-shock growth paths, indeed seeing it as a component of resilience (Holling, 1973; Pimm, 1984; Walker *et al*., 2006). In this equilibrium-based literature, 'resilience' and multiple equilibria are not incompatible (Cross, 1993; Göcke, 2002; Holling, 2001; McGlade *et al*., 2006; Setterfield, 2010,). The challenge then becomes measuring the return of regions to *new*, defined, steady-state equilibria and defining the proper time-frame. A parallel issue is separating out the role of 'resilience' (an endogenous attribute) in the trajectory of post-shock growth paths from that of other effects (exogenous). Whatever the merits of the equilibrium-based approach, once the possibility of new equilibria is accepted, the definition of resilience becomes open-ended.

The difficulty of unambiguously identifying 'resilience' scenarios is illustrate on Figure 1 by the slower-rising grey dotted long-term line (**t_s+a***). Recent history suggests that this is not an uncommon scenario. Many West German cities after World War II fall in this class (Bosker *et al*. 2008). In Canada, Montreal witnessed a sudden (and seemingly permanent) lowering of its historical growth rate following the political upheavals of the 1960s (Polèse and Shearmur 2004). But, Montreal continued to grow with current employment and GDP levels well above those in the 1960s. For such cases, the exogenous shock produced a break in historical growth paths, moving to a new slower 'equilibrium' growth path.

By the same token, a downward break cannot be excluded as a form of resilience; that is, if it leads to a new 'equilibrium' allowing the community to survive, not an uncommon scenario for resource-dependant Canadian regions where demand is determined by external forces (Hall and Hall, 2008, Polèse and Shearmur, 2006). Dubé and Polèse (2013) argue that emigration is an entirely rational option when the resource is depleted or the mine closes; sign of a workforce 'adjusting' to changing demand conditions. A research tradition exists in Canada in which emigration is seen as an adjustment mechanism, not necessarily a negative attribute (Coulombe, 2006; Drewe 1986; Gu and Sawchuck 2006). Are such 'adjustments' a form of resilience? Perhaps; providing they lead to a new (lower but stable) equilibrium between labour demand and supply.

The possibility of downward breaks as a form of resilience raises a parallel issue: whose resilience: regions; workers? We shall not enter into this debate except to note that region-based trends as illustrated on Figure 1 need to be interpreted with caution. A downwards sloping curve may hide forms of regional and / or individual adjustment compatible with the notion of resilience. For urban areas, a growing literature is accumulating on 'shrinking cities' (Hollander *et al* 2009, Martinez-Fernandez *et al* 2012, Popper and Popper 2002) founded on the premise that shrinkage may sometimes be the best option to ensure future prosperity.

Martin (2012), with explicit focus on recessionary shocks, arguably provides the most complete attempt of an operational definition of resilience, drawing on various strains. Regional resilience is no longer uniquely tied to the recovery of a former growth path, drawing on a research tradition in evolutionary economic geography which sees resilience as a multidimensional concept (Boschma and Martin 2010, 2007, Hill *et al*.2008, Pendall *et al.* 2010, Pike *et al*. 2010, Simmie and Martin, 2010; Swanstrom 2008,). Martin (2012) ties upward or downward breaks to the broader notion of 'hysteresis', which Romer (2001) defines as a condition in which a temporary shock permanently shifts the region's growth path. Negative hysteresis (a downward break), seen in this light, becomes a variant of Schumpeterian destruction, a disruption on the way to a more competitive, albeit smaller, local economy (Caballero and Hammour 1994, Martin 2010).

Consistent with his multidimensional perspective, Martin (2012) decomposes resilience into: 1) *resistance*, degree of sensibility or depth of reaction of a regional economy to a recessionary shock; 2) *recovery*, speed and degree of recovery from a recessionary shock; 3) *re-orientation*, adaption / restructuring in response to shock; 4) *renewal*, resumption of pre-recession growth path or shift to a new growth path. For our study of Canada, the dimensions suggested by Martin (2012) serve to organize the trajectories of the 83 regions in the face of the 2007-2009 recession. They also, as we shall see, bring out the difficulties of attaching unambiguous 'resilience' labels to given regions and situations.

CONCEPTUAL FRAMEWORK AND METHODOLOGY

Our approach is descriptive with no attempt at formal modelling. Impacts of the recessionary shock are observed via two metrics: *i*) changes in the unemployment rate, decomposed into labour demand and supply components; *ii*) changes in total employment. These are our **y** variable depicted on Figure 1. Impacts are in turn analyzed on four dimensions: 1) *resistance*; 2) *rebound*; 3) *recuperation*; 4) *adjustment*. *Resistance* refers to the degree to which the region was negatively affected by the shock, driving down employment and/or pushing up unemployment. *Rebound* refers to the degree to which the same regional indicators (employment, unemployment rates) rebounded in the subsequent period. *Recuperation* refers to the degree to which the region

recovered the position prior to the recessionary shock. *Adjustment* refers to the degree to which the labour force reacted to the shock by migrating and/or withdrawing from the labour force. Given the short time period elapsed since the end of the recession (2007-2012), economic renewal and restructuring are not considered,

The use of the employment variable is straightforward, requiring little explanation. Our approach to the unemployment rate requires more explanation, which focuses on the interplay between labour demand and supply as determinants of unemployment, allowing us to partly address the question: whose resilience.

Decomposing Unemployment Rates

Changes in the unemployment rate are decomposed, accounting for population change, into variations in local *labour force participation rates* and *employment rates*, where the former is used as proxy for labour supply and the latter for demand. For region **i** in time **t** the former is equal to the ratio of the labour force ($\mathbf{lf_{it}}$) to the population aged fifteen (15) or older ($\mathbf{p_{it}}$) while the latter ($\mathbf{er_{it}}$) is equal to the ratio of employed persons ($\mathbf{e_{it}}$) to the population aged fifteen or older, where $\mathbf{pr_{it}} = (\mathbf{lf_{it}} / \mathbf{p_{it}})$ and $\mathbf{er_{it}} = (\mathbf{e_{it}} / \mathbf{p_{it}})$. The unemployment rate for region **i** in time **t** ($\mathbf{ur_{it}}$) is defined by the % difference between the number of individuals willing to work (the labour force) and those effectively employed, where $\mathbf{ur_{it}} = (\mathbf{lf_{it}} - \mathbf{e_{it}}) / \mathbf{lf_{it}}$. Modifying the denominator, according to a constant, the decomposition of the unemployment rate is obtained by the difference of the labour force participation rate and the employment rate (equation 1):

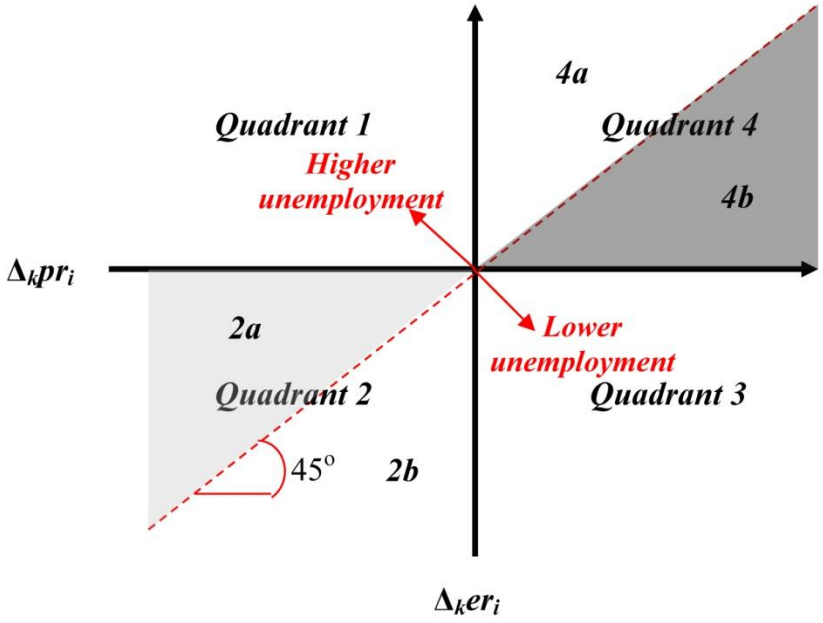
$$\mathbf{ur_{it}} \approx (\mathbf{lf_{it}} - \mathbf{e_{it}}) / \mathbf{p_{it}} = (\mathbf{lf_{it}} / \mathbf{p_{it}}) - (\mathbf{e_{it}} / \mathbf{p_{it}}) = \mathbf{pr_{it}} - \mathbf{er_{it}} \qquad (1)$$

This transformation in turn allows us to decompose changes in regional unemployment rates as functions of changes in relative aggregate supply and demand (equation 2).

$$\Delta_{\mathbf{k}}\mathbf{ur_{it}} = \Delta_{\mathbf{k}}\mathbf{pr_{it}} - \Delta_{\mathbf{k}}\mathbf{er_{it}} \qquad (2)$$

Where **k** is the time elapsed between the first observation (**t**) and the second observation (**t+k**) of the given indicators (**t+k - t = k**).

Figure 2 – Schematic Representation: Variations in Relative Labour Supply and Demand – Local Unemployment Outcomes



Changes in regional unemployment rates are illustrated by means of a two-dimensional model (Figure 2) where the **y** axis measures changes in the labour force participation rate ($\mathbf{\Delta_k pr_i}$) and the **x** axis measures changes in the employment rate ($\mathbf{\Delta_k er_i}$). The location of a region on the figure gives the net impact of the interaction between the two variables for a given time period **k**. In a perfectly flexible and mobile labour market, adjustment would be instantaneous with all regions located on the 45^o diagonal. Unemployment rates would neither rise nor fall as workers either withdraw from the labour force or emigrate in response to falling labour demand. The opposite scenario would operate during periods of rising demand with new workers entering the labour force and / or new workers coming into the region.

The two most probable scenarios are shaded. The first is located in the lower triangle in quadrant 4 (4b). This triangle identifies the typical growth scenario in which relative employment ($\mathbf{\Delta_k er_i}$) is growing faster than labour supply ($\mathbf{\Delta_k pr_i}$). The second shaded triangle is quadrant 2a, a recession scenario where both rates are falling, but employment more so. Quadrants 1 and 3 are unsustainable in the long run, but not impossible in the short term. Quadrant 1 signifies a growing unemployment rate due to falling employment rates and rising labour force participation. Quadrant 3 signifies falling unemployment rates, but with the inverse relationship. On the long term, the majority of cases should fall in Quadrants 2 (recession) or 4 (expansion).

DATA

All data are drawn from the *Statistics Canada Labour Force Survey* (LFS), accessible on-line (Stat Can, on-line). In addition to Canada-wide and Provincial series, information is published at two sub-provincial spatial levels: by Census Metropolitan Area (CMA), urban agglomerations with populations over 100,000; and by Economic Region (ER), statistical-administrative spatial units. The survey is applied to sample households among the working age population (15 years and older) for both spatial levels, Households are followed over a six month period, with a sixth of the panel replaced each month. As with all surveys, results are subject to sampling errors, especially for smaller spatial units and shorter time periods.

The principal advantages of the LFS are its continuality and frequency, the only source in Canada for monthly and annual series. Among its disadvantages, related to the survey nature of the data, are the sometimes wide fluctuations in monthly results due to seasonal variations, sampling errors, geographical assignation or insufficient sample size. We thus choose to work with annual data, which while not entirely eliminating sample-induced fluctuations do reduce their scale.

The arbitrary nature of Economic Region (ER) definitions is also problematic. Ideally, we would have liked to work with ERs as they cover all of Canada. However, ERs are not necessarily defined along labour market criteria, unlike Census Metropolitan Areas (CMAs), delineated in accordance with daily commuting patterns. ERs, on the other hand, are administrative units defined by the Provinces. Thus, in Ontario, Economic Region 570 (Windsor-Sarnia) includes Windsor, a CMA, and towns and counties that do not fall into Windsor's labour market shed. At the other end of the spectrum, in Quebec, ER 445 (Laval) is a bedroom community lying entirely within the Montreal CMA.

A new integrated geography was constructed using both spatial data sets. To take an example, the Windsor CMA was extracted from ER 570 creating two units: 1) the Windsor CMA; 2) a new smaller 570, dubbed Sarnia. Other examples entailed more complex manipulations. The new integrated geography is made up of 83 spatial units: (excluding the three Territories), comprising 51 unmodified ERs, 18 CMAs, and 14 modified economic regions (Figure 3). Although this new geography constitutes an improvement, it remains a second best. Some spatial units cover vast expanses, making it difficult to attribute outcomes to particular places. Thus, the Côte-Nord & Nord-du-Québec economic region covers an area several times the size of France, encompassing several urban areas and territories of aboriginal peoples.

A major limit of the data is the absence of migration flow data. For the mechanics underlying changes in labour force participation rates, we would have liked to be able to distinguish between resident withdrawals from (or entries into) the labour force from the emigration (or immigration). The examination of population change (ages 15 and over) allows us to make assumptions about the probable importance of migration; but this remains a second-best.

Figure 3 – Study Regions

Figure 4 – Canada. Unemployment Rate and Employment Growth (change from previous year) 1995-2012

RESULTS

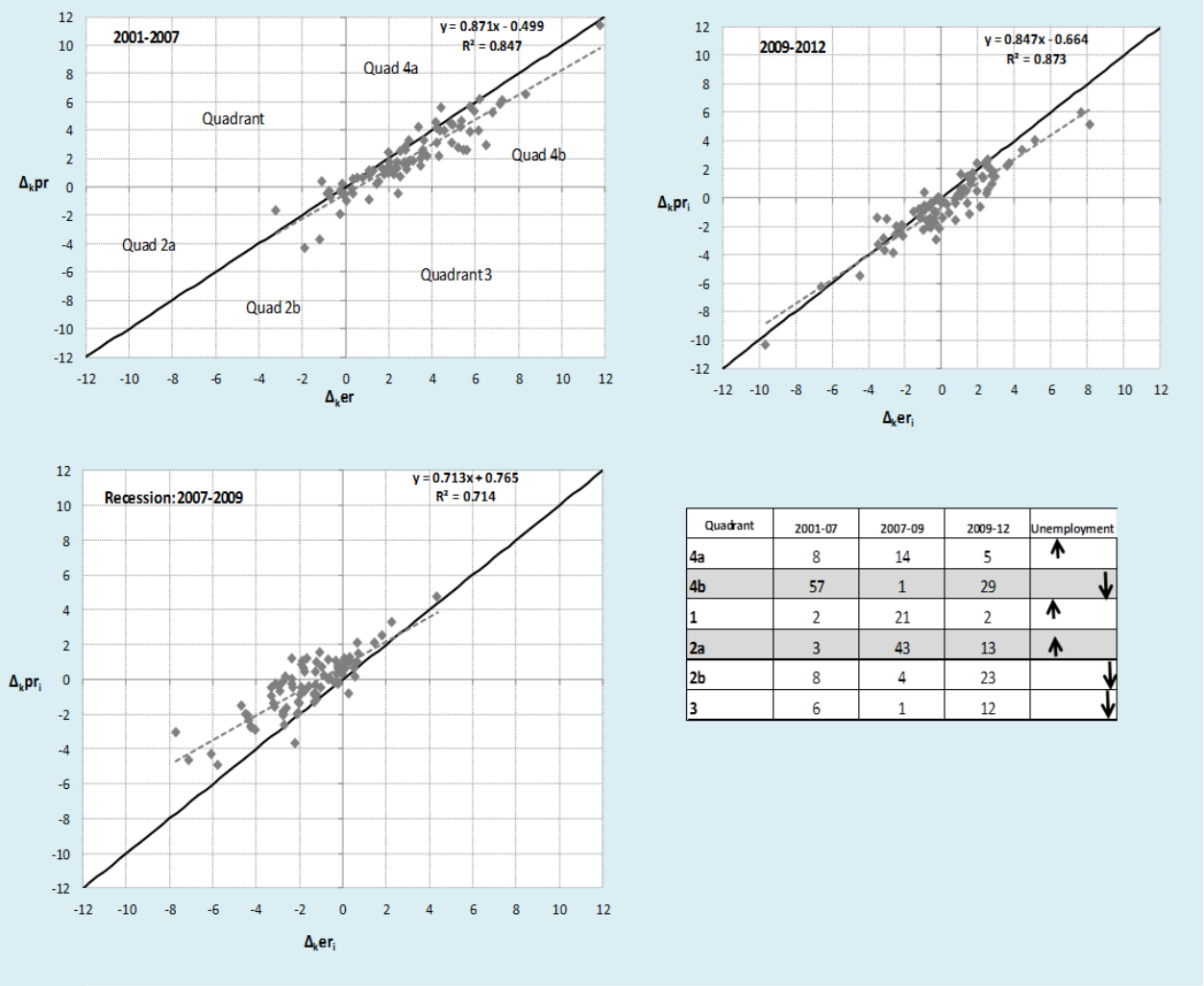
In accordance with figure 1, the data is organized around three time periods: the years prior to the recession[2] (**t_s-b**) 1995-2007; the recession years (**t_s**) 2007-2009; the three years (**t_s+a**) following the recession (2009-2012).

We begin with a rapid overview of trends for Canada as a whole (figure 4). The twelve years preceding the recessionary shock were, barring a few bumps, a period of continued employment growth with falling unemployment rates. Employment growth began to fall in 2007 with 2008-2009 the only interval for which employment growth was negative (falling below the zero line: left-hand y axis), the unemployment rate jumping from 6.0 to 8.3 (right-hand axis). Although a 'shock' to the system, the impact was not overly severe. Both indicators rebounded after 2009, the unemployment rate falling to 7.3 in 2012. However, for both indicators, the post-recessionary levels were below those for the years just preceding the recession.

With reference to the notions of resistance, rebound, and recuperation, Canada as a whole would qualify as an example partial resistance (the shock was relatively mild), rebound, but of only partial recuperation. Three years after the recession, the unemployment rate was still one point above that for the year before. We now turn to the regional impacts of the recession, beginning with local labour market dynamics.

[2] For the regional analysis the pre-recession years are divided into two sub-periods.

Figure 5 – Relative Changes in Employment and Labour Force Participation Rates: 83 Regions. Three Time-Periods



Quadrant	2001-07	2007-09	2009-12	Unemployment
4a	8	14	5	↑
4b	57	1	29	↓
1	2	21	2	↑
2a	3	43	13	↑
2b	8	4	23	↓
3	6	1	12	↓

Regional Labour Market Dynamics[3]

Figure 5 illustrates the decomposed elements ($\Delta_k pr_i$; $\Delta_k er_i$) of the unemployment rate as depicted on figure 2 for 83 Canadian regions before, during, and after the 2007-2009 recession. The appendix shows detailed results by region for the last two periods.

The results are consistent with expectations. As we advance along the three periods, the distribution of dots (where each represents a region) moves from a majority in quadrant 4b, the growth quadrant (2001-2007), to quadrant 2a, the recessionary quadrant (2007-2009), and finally

[3] The discussions and interpretations surrounding particular regions draw heavily on the authors' accumulated knowledge of Canada's regional economies. Thus, references are not systematically provided for statements on the attributes of particular places. Two sources often consulted are Bourne *et al* (2011) and Statistics Canada *Community Profiles* (Stat Can on-line a)

to a more mixed distribution (2009-2012) with a plurality nonetheless in the growth quadrant and the majority with falling unemployment rates, located below the diagonal.

Figure 5 sends two messages. *First*, the recovery is not complete; the growth quadrant captures a smaller number of regions (29) in the post-recessionary period than in the pre-recessionary period (57). *Second*, despite this apparently partial recovery, the great majority of regions (64) saw their unemployment rates fall. The explanation lies in quadrants 4b and 3, both falling below the 45^{o} diagonal. For a significant number of regions in which employment rates fell during the post-recessionary period, participation rates fell even further (2a), signifying that the labour force 'adjusted' by either withdrawing from the labour force or by migrating to regions where employment grew more rapidly. For the years 2007-2008, Bernard (2011) found that migration rates of work-age cohorts for smaller urban areas were on average over twice those for the eight largest metropolitan areas (populations above 500,000: shown in bold in the appendix). Participation rates can also fall independently of labour market conditions where non-workforce populations (aged above 15) are growing due to an influx of post-secondary students, retirees, and other cohorts not necessarily seeking employment.

Quadrant 3 is an a priori incongruous combination, unsustainable on the long run, suggesting labour force withdrawals (or out-migration) coloured by past experience. Among the observations in quadrant 3 in 2009-2012 are Windsor and Woodstock, cities in Southern Ontario reliant on the auto industry, hard hit by the recession (both fall in quadrant 2a in 2007-2009). Central Newfoundland, Thunder Bay, and Sudbury have histories of decline. In short, we should not expect participation rates to vary symmetrically across regions; worker reactions to recessionary shocks are, figure 5 suggests, are not only a function of current conditions.

The overall portrait, however, is that of rational labour markets where supply 'adjusts' to demand fairly rapidly and the system tends to 'equilibrium', although the equilibrium may be moving. Figure 5 also gives regression equations, R^2, and regression lines (grey doted) for each relationship. The R^2 is respectively 0.85 for the pre-recession period, 0.71 for the recession years, and 0.87 for the post-recession years. Even for the relatively short time-periods considered, participation rates respond fairly well to changing employment rates, keeping unemployment rates within bounds. The match between changing supply and demand weakens during the recession (a flatter regression line), but bounces back afterwards to pre-recession levels. The adjective 'resilient' thus seems appropriate, applied here to the dynamics of a whole system, although resilience means that some regions will see a decline in the equilibrium point between supply and demand in absolute employment terms.

Table 1 - Regions grouped by 'Resilience' Components: Labour Market Indicators

	Resistance	Rebound	Adjustment*	Population Change (%)	Scenario #
Region / Indicator	$\Delta_s er_i + \Delta_a er_i$	$\Delta_s ur_i + \Delta_a ur_i$	$\Delta_s pr_i + \Delta_a pr_i$		
Gaspesie	**3,07**	**-2,36**	0,72	*-0,6%*	**1**
Abitibi-Temiscamingue	**1,50**	**-1,90**	-0,40	2,0%	
Outaouais	0,34	**-1,36**	-1,02	1,9%	
Chaudiere-Appalaches	0,60	**-0,96**	-0,36	2,4%	
South Coast NL	**3,19**	**-0,80**	***2,39***	***-7,4%***	
Saguenay	**1,11**	**-0,74**	0,37	0,6%	
Cote-Nord & Nord QC	**1,57**	**-0,63**	0,95	*-0,7%*	
Couronne-Villes satellites	**1,51**	**-0,49**	1,02	6,2%	
Regina	**2,97**	**-0,42**	*2,55*	**9,7%**	
Avalon Peninsula	**5,11**	**-0,40**	*4,71*	5,1%	
Central NL	0,38	**-0,39**	-0,01	*-2,8%*	
Bas-Saint-Laurent	**2,46**	**-0,27**	*2,19*	*-0,7%*	
Moose Mountain	**3,32**	**-0,07**	*3,25*	4,4%	
Thunder Bay	-1,16	-0,95	-2,12	*-0,5%*	**2**
Lac-Saint-Jean	-2,82	-0,65	**-3,47**	*-0,9%*	
Woodstock	*-3,50*	-0,50	**-3,99**	2,5%	
Norwest ON-NM	-1,67	-0,18	-1,85	*-4,2%*	
Estrie NM	*-8,85*	-0,07	**-8,92**	1,4%	
Swift Current - Moose Jaw	*-4,56*	-0,02	**-4,57**	0,7%	
Southeast MB	**1,48**	0,19	*1,67*	**10,9%**	**3**
Southwest MB	**5,85**	0,32	*6,18*	1,3%	
North Shore NS	**2,25**	0,55	*2,80*	*-1,3%*	
Quebec City	**1,64**	0,57	*2,22*	6,0%	
Interlake	**1,77**	0,58	*2,35*	4,4%	
Edmonton	**0,77**	0,64	*1,41*	**11,0%**	
Kitchener	**0,94**	0,78	*1,72*	**7,9%**	
Prince Albert & North SK	**2,34**	0,79	*3,13*	3,5%	
St. Catharines - Niagara	**0,90**	0,80	*1,70*	1,9%	
Moncton	**0,94**	0,95	*1,89*	6,6%	
Cape Breton	**1,82**	0,97	*2,79*	*-4,5%*	
Wood Buffalo - Cold Lake	0,65	0,59	*1,24*	**17,6%**	
Lethbridge - Medicine Hat	0,08	0,28	0,36	6,5%	
Windsor	-1,56	0,10	-1,46	*-1,0%*	**4**
North Central MB	-0,52	0,15	-0,37	6,4%	
NortheastON-NM	-1,10	0,16	-0,94	*-1,5%*	
South Central MB	-2,27	0,18	-2,09	**12,4%**	
Hamilton	-1,88	0,25	-1,63	6,2%	
Gatineau	-2,08	0,31	-1,77	**10,6%**	
Stratford - Bruce Peninsula	-0,43	0,32	-0,12	*0,4%*	
West Coast & Labrador	-1,91	0,55	-1,36	*-2,2%*	
Sherbrooke	-0,94	0,57	-0,36	6,7%	
Halifax	-0,78	0,60	-0,18	**8,2%**	
P.E.I.	-0,49	0,63	0,14	6,8%	
Winnipeg	-1,54	0,64	-0,90	**7,3%**	
Sudbury	-1,86	0,78	-1,07	2,3%	
Ottawa	-0,10	0,86	0,75	**9,2%**	
Kingston	-1,75	0,86	-0,88	5,5%	
Montreal	-1,84	0,92	-0,92	6,8%	
Toronto	-2,61	1,09	-1,51	**10,4%**	
Calgary	-3,06	1,13	-1,93	**13,0%**	

Table 1 -Continued

Region / Indicator	Resistance $\Delta_s er_i + \Delta_a er_i$	Rebound $\Delta_s ur_i + \Delta_a ur_i$	Adjustment* $\Delta_s pr_i + \Delta_a pr_i$	Population Change (%)	Scenario #
Athabasca - Peace River	*-3,56*	0,10	**-3,46**	3,6%	**5**
Centre-du-Quebec	*-7,78*	0,29	**-7,49**	4,0%	
Camrose - Drumheller	*-3,52*	0,32	**-3,20**	2,7%	
Muskoka - Kawarthas	*-3,83*	0,32	**-3,51**	2,9%	
Vancouver Island NM	*-5,68*	0,52	**-5,16**	6,0%	
Annapolis Valley	*-3,35*	0,64	**-2,71**	*-0,8%*	
Barrie	*-4,27*	0,72	**-3,54**	**7,9%**	
Saskatoon - Biggar	*-3,30*	0,88	-2,41	**12,4%**	
Kootenay	*-3,77*	0,89	**-2,88**	3,8%	
Banff - Jasper	*-5,92*	1,00	**-4,93**	6,2%	
Red Deer	*-4,79*	1,09	**-3,70**	**8,3%**	
Fredericton - Oromocto	*-5,19*	1,13	**-4,05**	6,3%	
Sarnia	-3,13	0,50	**-2,63**	*-1,3%*	
Yorkton - Melville	-2,86	0,21	**-2,65**	*-1,7%*	
Ontario-East	-2,77	0,01	**-2,76**	1,4%	
Mauricie	-2,97	0,01	**-2,95**	2,3%	
Cariboo	0,47	*1,52*	*1,99*	*-0,5%*	**6**
Yukon	-0,49	*1,87*	*1,38*	**10,7%**	
Abbotsford	-1,30	*2,62*	*1,33*	**9,9%**	
Edmundston - Woodstock	-1,45	*1,59*	0,14	*-3,6%*	
Oshawa	-1,65	*1,72*	0,06	**10,8%**	
Thompson - Okanagan	-1,80	*1,55*	-0,25	5,6%	
Saint John - St. Stephen	-2,04	*2,73*	0,69	3,0%	
Vancouver	-2,25	*1,73*	-0,52	**11,0%**	
Simcoe	-2,46	*1,16*	-1,30	3,6%	
Pembroke	-2,47	*1,44*	-1,04	1,0%	
Victoria	-2,55	*1,32*	-1,23	6,6%	
Southern NS	-2,62	*1,37*	-1,25	*-4,0%*	
North Coast BC & Nechako	-2,86	*1,47*	-1,39	*-1,9%*	
Campbellton - Miramichi	*-4,89*	*2,26*	**-2,63**	*-5,1%*	**7**
Parklands & North MB	*-5,04*	*2,18*	**-2,85**	-5,0%	
London	*-5,16*	*1,40*	**-3,76**	5,9%	
Lower Mainland NM	*-7,36*	*1,62*	**-5,75**	**10,8%**	
Northeast BC	**5,35**	*1,74*	7,09	-0,2%	no class

Table 1 shows the results for the 83 regions, where **resistance** = $\Delta_s\mathbf{er_i} + \Delta_a\mathbf{er_i}$, **rebound** = $\Delta_s\mathbf{ur_i} + \Delta_a\mathbf{ur_i}$, and **adjustment** = $\Delta_s\mathbf{pr_i} + \Delta_a\mathbf{pr_i}$. For the first component a region is said to be resistant if the sum of the difference between the indicators is positive. Reasoning is inversed for the latter two elements; falling (negative) unemployment rates and participation rates are interpreted as, respectively, indicators 'rebound' and 'adjustment' The term 'adjustment' is thus used here in a restricted sense, limited to emigration or withdrawals from the labour force. Results on table 1 are organized around two rules: a) following an z-score transformation of values allowing us to classify indicators as falling in low, middle or high ranges (shown, respectively in *italics*, normal font, and **bold**); b) according to the classification scheme on table 1a.

Table 1a – Alternative Resilience Scenarios: Labour Force Indicators

	Resistant / Hard hit	Rebound	*Adjustment*
Scenario / Indicator	$\Delta_s er_i + \Delta_a er_i$,	$\Delta_s ur_i + \Delta_a ur_i$	$\Delta_s pr_i + \Delta_a pr_i$
1 – Resistant and Rebounds	Positive : ≥ 0	*Negative: ≤ 0*	Indeterminate
2 – Hard hit, Rebounds, Adjusts	*Negative: ≤ 0*	*Negative: ≤ 0*	*Negative: ≤*
3 – Resistant, Rebound (weak), No adjustment	Positive : ≥ 0	Positive : ≥ 0	Positive : ≥ 0
4 – Hit (mild), Rebound (weak), Adjusts (weak)	*Negative: ≤ 0*	Positive : ≥ 0	*Negative: ≤ 0**
5 – Hard hit / Rebound (weak), Adjusts	*Negative: ≤ 0*	Positive : ≥ 0	*Negative: ≤ 0*
6 – Hit (mild), No rebound	*Negative: ≤ 0*	Positive : ≥ 0	Indeterminate
7- Hard hit, No rebound, Adjusts	*Negative: ≤ 0*	Positive : ≥ 0	*Negative: ≤ 0*

*Some opposing values

The results reveal a diversity of outcomes. The first two groups - nineteen (19) regions - exhibit falling unemployment rates over the recession and post-recession period that as such would be considered resilient[4]. The first twelve also rank high on 'resistance'. The Gaspesie region of Quebec is on top with the sharpest fall in unemployment over the combined recessionary and post-reactionary periods. This is a surprising result for readers with knowledge of Canada's regional economies. Gaspesie is a rural region with an economic base in fishing, forestry, and mingling. Its population has declined over the last three decades. A large paper mill closed in 2002, followed by the closure of a smelter and mine. The fishing industry has been in decline since the late 1980s, following the collapse of ground fish (cod) stocks. It is difficult to imagine a less propitious candidate for the 'resilience' label. Yet the results on table 1 suggest that it both 'resisted' and 'recuperated. South Coast Newfoundland, also among the top 12, is an equally surprising case, a string of fishing villages whose population has been declining over last two decades.

A probable explanation for this *a priori* incongruous result is that employment in the two declining regions fell less sharply or rebounded more rapidly because their economic base, already hollowed out, contained no or few industries affected by the recession (finance, automobiles, other heavy industry…). In both regions, populations continued to decline. The Avalon Peninsula of Newfoundland (the city of St. John's) is a counter example with a growing population, also in the first group and thus seemingly unaffected by the recession, with a rising employment rate, largely fuelled by the discovery of off-shore oil deposits. In short, table 1 shows similar 'resilience' results for opposing growth scenarios. The common attribute of group 1 is 'resistance' to the recession (rising employment rates), which begs the question whether 'resilience' is a proper concept for regions where the exogenous shock had no (or only a short-lived) impact.

[4] The discriminant criterion is 'rebound'. All regions with falling unemployment rates are included in the first two groups, including those falling in the middle range.

Group 2 includes regions hard-hit by the recession (negative employment rate change) but which bounced-back, ranking positively on 'rebound'. This small group (only six) is also a mixed bag, including Thunder Bay, a port city on Lake Superior, the Lac St Jean region (aluminum and paper), Woodstock (automobiles), and rural Northwest Ontario (mining and forestry). All registered slow or negative population growth. All but one also registered high on adjustment; that is; sharply falling labour force participation rates. Their 'rebound' (falling unemployment rates) was, we may assume, largely a product of workers emigrating.

The next group, although with rising unemployment rates, is also close to our intuitive understanding of resilience: rising employment rates (resistant) and rising participation rates, but with the latter rising faster, thus producing unemployment. The majority also saw population growth. Quebec City with strong population growth and rising employment and participation rates conveys the image an urban region seemingly unaffected by the recession, again begging the question whether 'resilience' and 'resistant' can be applied together.

Going down to less 'resilient' classes, Windsor, Hamilton (group 4), and Oshawa (group 6), industrial cities in Southern Ontario, exhibit negative values on 'resistance'. However, labour force dynamics differ. In Windsor, with a declining population and negative participation rate, emigration appears to be the dominant response, while labour market withdrawals seem more common in Hamilton, and Oshawa exhibiting a 'counter–adjustment' scenario (positive participation rates and population growth). Similar (negative) employment impacts solicited different labour market reactions, bringing us back to expectations. One could argue that Oshawa is the most 'resilient' of the three, for its workers did not flee or abandon the workforce, even attracting new workers. Many workers seem to think that Oshawa will bounce back. Otherwise, why would they stay or new workers arrive?

Classes 4 and 5 illustrate the differing countervailing role of participation rates. Of the 18 cases in the first group, twelve are CMAs, including Canada's two largest metropolitan (Toronto and Montreal), while group 5 (15 cases) houses only one CMA (Saskatoon), recalling our earlier comments on the difference between large urban areas and smaller regions.

Figure 6 illustrates labour force and population dynamics for four groups of cities and regions, showing changes over the recessionary and post-recessionary period (2007-2012) for, respectively, the unemployment rate, employment rate, and labour force participation rate, where change in the unemployment rate is equal to the difference between the former two. Population change is also given (line) with values indicated on the secondary **y** axis on the right-hand side of each graph.

Figure 6 - Four Groups of Regions Compared - Labour Market Indicators 2007-2012

The four industrial cities in southern Ontario saw their employment rates drop. The principal difference, as noted earlier, is in the 'adjustment' reaction of workers. The four resource regions saw their population decline, but with no apparent link to variations in the employment rate. For next group (mid-sized cities), the three growing cities - Moncton, Quebec City, and St John's - continue to attract workers, the graphs suggest, at a more rapid rate than increases in employment. The disconnection between short-term employment swings and population dynamics is even more apparent for Canada's four major metropolitan areas and corporate centres[5]. All saw unemployment rates go up over the recessionary and post-recessionary period and their employment rates fall. Yet, all also saw their population grow.

Summarizing findings so far, the operationalization of 'resilience' using labour market indicators, specifically unemployment rates, is not without problems, leading to the (odd) result in the Canadian case that resource-dependant regions with histories of emigration are among the most 'resilient'. By the same token, the results beg the question whether regions seemingly unaffected

[5] Ottawa is not included because, although of similar size, is not a major corporate or regional centre. Ottawa's dominant industry is the Federal government.

(or less affected) by a recessionary shock can be called 'resilient' for they had little to bounce back from. Decomposition of the unemployment rate reveals that Canadian labour markets react as would be expected to cyclical shocks, 'adjusting' to changing demand conditions, which in turn begs the question of whose resilience: workers or regions? Labour market dynamics in the face of recessionary shocks are not the same for all regions, not necessarily soliciting the same response in large urban areas as in regions with limited economic bases. If population growth is the criterion, Canada's large metropolitan areas are 'resilient', exhibiting growing populations despite the failure of unemployment rates to fall (rebound) to pre-recessionary levels.

Figure 7 - Four groups of regions compared -Employment Growth (annualized growth rates)

Table 2 - Regions grouped by 'Resilience' Components: Employment Growth

	Resistance	Rebound	Recuperate 1	Recuperate 2	Scenario
Region / Indicator	**Δt_s**	**Δt_s+a**	**Δt_s+a -Δt_s-b**	**Δt_s+a - Δt_s-b***	**#**
Avalon Peninsula	**0,011**	**0,041**	**0,026**	**0,027**	**1**
Southeast MB	**0,012**	**0,036**	**0,011**	**0,012**	
Regina	**0,024**	**0,031**	**0,022**	**0,020**	
Kitchener	0,004	**0,029**	**0,005**	**0,007**	
Moose Mountain	0,006	**0,027**	**0,018**	**0,028**	
Yukon	0,003	**0,031**	**0,005**	**0,017**	
Southwest MB	**0,038**	0,010	**0,007**	**0,007**	
Prince Albert & North SK	**0,026**	0,007	0,002	0,005	
Couronne-Villes satellites	**0,012**	0,021	-0,003	0,005	
North Central MB	**0,014**	0,009	0,003	0,004	
Bas-Saint-Laurent	0,005	0,009	0,003	0,001	
Gaspesie - Les Iles	0,001	0,020	**0,011**	**0,013**	
Interlake	0,003	**0,022**	0,001	0,003	
Saguenay	0,000	0,009	0,001	-0,005	
Cariboo	*-0,056*	**0,043**	**0,031**	**0,037**	**2**
St. Catharines - Niagara	*-0,020*	**0,026**	**0,016**	**0,012**	
Outaouais	*-0,022*	**0,024**	**0,013**	**0,014**	
South Coast NL	*-0,031*	**0,022**	**0,046**	**0,022**	
Kootenay	*-0,037*	0,018	0,003	**0,009**	
Lac-Saint-Jean	*-0,053*	0,018	0,002	**0,006**	
Stratford - Bruce Peninsula	*-0,022*	0,014	**0,009**	0,000	
West Coast & Labrador	*-0,045*	0,012	**0,008**	**0,007**	
Central NL	*-0,026*	0,011	-0,004	**0,006**	
Woodstock	*-0,028*	0,009	-0,011	0,001	
Thunder Bay	*-0,023*	0,008	**0,008**	**0,008**	
Windsor	*-0,029*	0,007	**0,006**	-0,009	
NortheastON-NM	*-0,026*	0,006	0,004	0,004	
Abitibi-Temiscamingue	-0,007	**0,021**	0,010	**0,019**	
P.E.I.	-0,001	**0,020**	0,007	0,004	
Northeast BC	-0,016	**0,036**	0,013	**0,025**	
Cote-Nord & Nord QC	-0,014	0,017	0,021	**0,024**	
North Shore NS	-0,004	0,012	0,006	0,002	
Oshawa	-0,004	**0,029**	0,002	-0,001	
Lower Mainland NM	*-0,032*	0,016	*-0,032*	-0,010	**3**
London	*-0,023*	0,007	-0,010	-0,011	
Sarnia	*-0,036*	0,003	-0,006	-0,006	
Thompson - Okanagan	-0,005	0,012	-0,020	-0,011	
Sudbury	-0,013	0,006	-0,017	-0,008	
Cape Breton	-0,007	0,003	-0,002	-0,001	
Barrie	-0,017	0,016	-0,017	*-0,023*	
Red Deer	-0,014	0,014	*-0,034*	*-0,029*	
Simcoe	-0,009	0,005	-0,013	*-0,020*	
Athabasca - Peace River	-0,013	0,004	*-0,034*	*-0,017*	
Camrose - Drumheller	-0,015	0,002	*-0,029*	*-0,018*	
Muskoka - Kawarthas	-0,017	-0,002	*-0,032*	*-0,021*	
Montreal	-0,001	0,013	-0,006	-0,008	

Table 2 - Continued

	Resistance	Rebound	Recuperate 1	Recuperate 2	Scenario
Region / Indicator	**Δt_s**	**Δt_s+a**	**Δt_s+a -Δt_s-b**	**Δt_s+a - Δt_s-b***	#
Quebec	**0,009**	**0,023**	-0,004	0,000	4
Edmonton	**0,016**	**0,029**	-0,006	-0,001	
Ottawa	**0,009**	**0,023**	0,003	-0,006	
Wood Buffalo - Cold Lake	**0,026**	**0,042**	-0,010	-0,009	
Toronto	0,003	0,018	-0,002	-0,009	
Chaudiere-Appalaches	0,003	0,009	-0,006	-0,004	
Vancouver	0,006	0,020	-0,005	-0,003	
Winnipeg	0,006	0,012	-0,001	-0,002	
Lethbridge - Medicine Hat	**0,010**	0,015	-0,007	-0,003	
Calgary	**0,011**	0,020	-0,020	*-0,027*	
Saskatoon - Biggar	**0,024**	0,008	*-0,024*	-0,013	
Victoria	0,003	0,005	*-0,029*	*-0,017*	
Sherbrooke	**0,018**	0,004	-0,010	*-0,028*	
South Central MB	**0,023**	0,012	-0,017	-0,006	
Abbotsford	**0,015**	0,015	-0,016	-0,009	
Moncton	**0,030**	0,007	-0,007	-0,011	
Halifax	**0,020**	0,009	-0,009	-0,013	
Kingston	0,007	0,004	-0,013	-0,008	
Hamilton	0,005	0,006	-0,008	-0,011	
Gatineau	**0,022**	0,009	-0,021	-0,016	
Banff - Jasper	0,000	*-0,006*	*-0,033*	*-0,028*	5
Saint John - St. Stephen	**0,019**	*-0,014*	*-0,030*	*-0,023*	
Ontario-East	0,006	*-0,014*	*-0,029*	*-0,029*	
Vancouver Island NM	0,005	*-0,018*	*-0,056*	*-0,033*	
Edmundston - Woodstock	0,000	*-0,020*	*-0,022*	*-0,029*	
Estrie NM	**0,009**	*-0,050*	*-0,070*	*-0,047*	
Norwest ON-NM	-0,024	*-0,007*	-0,001	0,005	6
Pembroke	-0,013	*-0,002*	*-0,026*	*-0,025*	7
Southern NS	-0,008	*-0,024*	*-0,033*	*-0,035*	
Centre-du-Quebec	-0,002	*-0,028*	*-0,058*	*-0,043*	
Fredericton - Oromocto	-0,001	*-0,007*	*-0,032*	*-0,030*	
Yorkton - Melville	-0,023	*-0,005*	-0,026	-0,005	
Annapolis Valley	-0,024	*-0,006*	-0,020	*-0,021*	
Campbellton - Miramichi	-0,048	*-0,017*	-0,020	*-0,022*	
Mauricie	-0,015	-0,001	-0,016	-0,010	
Swift Current - Moose Jaw	-0,013	*-0,012*	-0,017	-0,010	
North Coast BC & Nechako	-0,006	*-0,018*	-0,001	-0,005	
Parklands & North MB	*-0,026*	*-0,025*	*-0,031*	*-0,025*	

Employment Growth

We now approach resilience from another perspective, looking at variations in employment growth. The 'adjustment' element disappears. A 'recuperation' component is introduced. **Resistance** = employment growth (Δ**E**) in $\mathbf{t_s}$ (2007-2009); **Rebound** = Δ**E** $\mathbf{t_s}$**+a** (2009-2012); **Recuperation 1** (short-term) = (Δ**E** $\mathbf{t_s}$**+a) -** (Δ**E** $\mathbf{t_s}$**-b)** (2001-2007); **Recuperation 2** (long-term) =

(ΔEt_s+a – ($\Delta E\ t_s-b^*$)(1995-2007). Growth rates are annualized to allow for comparisons between time-periods. For **Recuperation 2,** we posit that a region recuperated its long-term growth path if it attained or exceeded the annual growth rate for the twelve years preceding the recession. Strong deviations (negative or positive) would indicate breaks in the growth path or hysteresis as defined by Martin (2012).

Table 2a – Alternative Resilience Scenarios: Employment Change

	Resistant / Hard hit	Rebound (t_s +1)	*Recuperation*:
Scenario / Indicator	Δ t_s (2007-2009	Δ t_s+a (2009-2012);	Δ t_s+a - Δ t_s-b*1995-2007
1 – Resistant and Resilient	Positive : ≥ 0	Positive : ≥ 0	Positive : ≥ 0
2 – Standard Resilience	*Negative: ≤ 0*	Positive : ≥ 0	Positive : ≥ 0
3 - Stunted Recovery	*Negative: ≤ 0*	Positive : ≥ 0	*Negative: ≤ 0*
4 - Delayed Break / Negative Hysteresis	Positive : ≥ 0	Positive : ≥ 0	*Negative: ≤ 0*
5 - Break / Negative Hysteresis	Positive : ≥ 0	*Negative: ≤ 0*	*Negative: ≤ 0*
6 – Interrupted Decline	*Negative: ≤ 0*	*Negative: ≤ 0*	Positive : ≥ 0
7- Accelerated Decline / Negative Hysteresis	*Negative: ≤ 0*	*Negative: ≤ 0*	*Negative: ≤ 0*

Description

	Attributes
1.	Shock has little impact on growth path
2.	Shock drives down employment, rebounds, and recovers or improves upon growth path
3.	Shock drives down employment, rebounds, but fails to recover growth path
4.	Shock has little impact in t_s or t +1, but heralds slower growth path
5.	Little immediate impact, but triggers slower growth path
6.	Hard hit, no rebound, but resumes previous growth path
7.	Hard hit, no rebound, slower subsequent growth path.

Results are shown on table 2 following the same z-score transformation as in table 1 for the classification of high, middle, and low ranges. Possible resilience scenarios are summarized on table 2a. Figure 7 illustrates annualized employment variations for the same regions as figure 6.

Scenario 1 (*Resistant and Resilient*) has 14 observations of which 8 were also classified 'resistant' on table 1. Among the first six that are now 'resistant' but were not on table 1 are Kitchener (the home of BlackBerry) and the Yukon, whose unemployment rates did not fall (thus not on table1), an outcome of higher labour market entries where perceptions of 'resilience' were, we may assume, a factor driving labour market dynamics. Considering table 2, those perceptions were not unjustified as both regions succeeded in returning to their pre-recession growth path.

Two traditionally declining regions remain in the 'resistant + resilient' class: Gaspésie and Bas-St-Laurent, two neighboring Quebec regions. For Gaspésie, the high values for 'recuperation' suggest a true break in its growth path, explaining the apparent anomaly of its top ranking on resilience on table 1. Gaspésie is, in sum, an example of positive hysteresis**,** with growth higher after than before the recession. The data does not allow us to say why the break occurred; only that it did. Regina and St. John's (Avalon) are also examples of positive hysteresis. Both were

historically slow growing cities until recently. One may question, however, whether the recession was a factor in positive hysteresis since the recession had only a mild immediate impact.

Scenario 2 (*Standard Resilience*) analogous to the second class on table 1, again mirrors the notion of 'bouncing-back' from an exogenous shock. This class now includes 19 cases of which 11 that improved over their historical growth path (strong values on last column). The principal difference with table 1 is the relative unresponsiveness of participation rates (recall the lower R^2 for 2007-2009 on figure 5). Among the sharpest employment declines during the shock, but also the strongest rebounds and positive recuperation, we now find South Coast Newfoundland. It seems that the recession gave a positive jolt to the region. Employment is very volatile in this small region (figure 7), explaining the high value for recuperation 1 (short-term)[6]. Employment growth was negative in the period just prior to the recession, suggesting that the jolt preceded the recession.

The second group is again a mixed bag; but interestingly (as in table 1) houses no large metropolitan areas. This should come as no surprise; 'resilience', as defined here, means opposing swings in growth rates, first negative, then positive; which one would expect to be more common for smaller regions and regions with specialized economies. Large diversified urban areas are, by definition, less prone to violent swings, recalling earlier comments on the inherent resilience of large cities. Of the four CMAs in this group, three are industrial cities in southern Ontario (St Catherine's, Windsor, and Oshawa, plus Woodstock (automobiles). Employment rebounded after the recession, but not sufficient in Windsor to fully regain long-term historical growth rates.

Thunder Bay is also an example of positive hysterias, but also of a rebound from a severe shock (strong negative value on 'resistance'). Thunder Bay ranked high, recall, on 'adjustment', indicating continued labour force withdrawals (mostly via emigration we may assume) with a corresponding decline in its unemployment rate. Thunder Bay would thus qualify as an example of Schumpeterian destruction or, alternatively, of a 'shrinking city' renewing itself through downsizing. Should Thunder Bay be called a resilient city? We would argue 'yes'; that is, if the criterion is a survival and an employment base concomitant with a reasonably prosperous community[7].

Scenario 3 (*Stunted Recovery*) is less clear-cut. There are no examples of deep shocks, sharp rebounds, and no recuperation. In all cases, rebounds are in the middle range. Three industrial southern Ontario cities fall in this class: London, Brantford (Simcoe) and Sarnia, none of which

[6] Prudence is called for in the interpretation of results for small regions because of possible sample size induced errors.

[7] At a more informal level, one of authors of this article well remembers meeting Thunder Bay's local economic development officer some time ago. His evaluation of his city's prospects was unambiguous: "We know we will lose population. But, we want to go down to a level which is concomitant with a solid renewed economic base" (cited from memory).

fully recuperated their previous growth path. Montreal is also in this class; but does not significantly deviate from the three other major metropolitan centres (figure 7). The initial shock was minor before rebounding.

The other three large metropolitan areas are in scenario 4: *Delayed Negative Hysteresis*. Edmonton, Quebec City, Winnipeg and Ottawa are also in this class, might thus be dubbed the big city scenario. With one exception (South Central Manitoba), there are no rural areas in this group. Given the weight of large urban areas, scenario 4 mirrors the recession's impact, globally, on the Canadian economy (recall figure 4): a relatively mild initial impact, rebound, but heralding a period of generalized slower employment growth. Again, the results do not allow us to infer that negative hysteresis is attributable to the recession..

Scenario 5 (*Downward Break*) represents an *a priori* clearer case of negative hysteresis with the downward break occurring immediately after the recessionary shock. However, this is a mixed bag with no obvious common thread suggesting why the recession might have heralded a downward break. Vancouver Island (outside Victoria) is not a declining region, which suggests that the downward break was due a particular event, but for which we do not have sufficient information[8]. Scenario 6 (*Interrupted Decline*) has one region: Northwest Ontario. The recession hit hard with no rebound, followed by continued negative growth path, but less so than its historical path. The region was classified 'resilient' on table 1 due to falling unemployment, ranking high rank on 'adjustment'. Arguably, this is another example of positive shrinkage, bringing us back to the question of how declining regions whose situation improved (still declining, but less) should be labelled.

The last scenario (*Accelerated Decline*) is *a priori* unambiguous: the recession drove down employment with no rebound, the regions continuing on their downward growth paths; but at even faster (negative) rates. The break coincided with the recession. Again, it is difficult to see a common thread. The majority are rural areas. One (Swift Current-Moose Jaw) was classified 'resilient' on table 1 (group 2), attributable to its strong showing on 'adjustment'. We are back full circle to the debate on whose resilience and to what purpose. The Swift Current-Moose Jaw area is an agricultural region in Southern Saskatchewan whose population has been slowly declining over the last twenty-five years, but which has systematically maintained an unemployment rate below the Canadian average (Stat Can on-line). The authors of this paper are inclined to think that this is also a form of resilience.

[8] Scrutiny of the original data shows a drop in employment of some 1,700 jobs between 2010 and 2012 (about 10% of the labour force).

SYNTHESIS AND CONCLUSION

Regional Resilience and the 2007-2009 Recession: Findings for Canada

Impacts of the recession on 83 Canadian regions were analyzed over four dimensions drawing on the conceptual framework proposed by Martin (2012) - resistance, rebound; recuperation, and adjustment – using two metrics: the unemployment rate; employment growth.

For Canada as a whole, the data show the nation to have been relatively 'resistant' to the recession. The recession drove down employment and pushed up the unemployment rate, but not dramatically. Both indicators rebounded after. However, neither indicator recuperated fully to pre-recession levels. This was also the typical pattern for Canada's largest metropolitan areas. We could thus conclude that Canada is an example of imperfect resilience.

Regional labour markets behaved as expected. The statistically positive relationship between changing participation rates (a proxy for labour supply) and employment rates (a proxy for demand) weakened during the recession, but returned to pre-recession levels after. The overall portrait points to generally 'resilient' regional economies, but where 'resilience' can be interpreted differently for different types of regions. For large urban areas 'resilience' might mean holding on to the labour force despite a fall in employment while it might mean the opposite for a region whose resource-based collapsed, where 'resilience' might mean divesting itself of part of its labour force enabling it to move to a new (smaller) equilibrium population.

The 83 local economies displayed diverse scenarios. If employment growth is the criterion, 65 regions 'rebounded' to varying degrees (positive post-recession growth) but only 36 succeeded in recuperating pre-recession growth. Only 14 qualify as 'resilient' if the 'resistance' criterion is added (employment did not fall during the recession).

19 regions 'rebounded using the unemployment rate, rising labour force participation rates making the difference, sometimes annulling the effects of employment rebounds. Quebec City, Moncton, and Kitchener (home of BlackBerry) saw their employment rates improve; but with rising unemployment rates. If the 'resistance' criterion is added, the number of regions that qualify as 'resilient' falls to 13.

If a hard initial shock (steep fall in employment; steep rise in the unemployment rate) is a prerequisite, thus negative ratings on 'resistance', the number of 'resilient' regions that 'rebounded' falls to 6 on the unemployment metric and to 19 on the employment metric. St. John's' (Newfoundland) economy continued to expand during the recession and its unemployment rate barely budged. Surely, it resisted well, but can it also be called 'resilient"?

Among ‘resistant’ regions were historically declining regions. Gaspesie in Quebec, a peripheral region, registered a continuous fall in unemployment, little affected by the recession because, we argued, its economy was already hollowed out. Other resource-dependant regions, hard hit by the recession, saw their unemployment rates ‘rebound’ in part through emigration. Thunder Bay’s population continued to decline. Both registered positively on ‘rebound’ (on both metrics) and on ‘recuperation’, improving over their pre-recession growth paths, examples, thus, of ‘resilient’ declining regions.

Closing Thoughts: Is Resilience a useful Concept?

Looking at reactions to the 2007-2009 global recession, we asked whether Canadian regions were ‘resilient’. Our attempt at an answer leads us to the conclusion that no single answer exists. Should we thus also conclude that ‘resilience’ is a useless concept? Not necessarily. ‘Resilience’ like other concepts in the social sciences cannot be easily rendered by numbers and figures. Without going into a clichéd discourse on Plato’s cave, it is in the very nature of concepts (ideal representations) to be elusive.

Richard Florida’s ‘creative class’ (Florida, 2002), one of the most successful concepts in recent times, provides a useful analogy. There are at least two similarities with ‘resilience’. *First*, the concept describes a positive attribute potentially applicable to all, which undoubtedly goes some way in explaining its success. Who is not ‘creative’ and, by the same token, who (or what place) is not ‘resilient’? *Second*, there is no consensus in the literature on how, precisely, to operationalize the concept. The identification of ‘creative’ cities and of ‘resilient’ cities can continue to nurture a cottage industry of competing studies with the no necessary consensus in sight.

A common problem in the Canadian case was the difficulty excluding players; deciding what regions were NOT resilient. Barring unending decline and eventual disappearance, all scenarios can be set in a resilience framework. Several historically declining regions exhibited surprising ‘resilience’. Regions reacted to the recession via emigration, keeping unemployment rates in check, followed in several cases by an improved employment performance. Population (or employment) decline and resilience are not, in short, automatic opposites, a point also made in the varied literature on shifting equilibria (hysteresis), Schumpeterian destruction, and shrinking cities. The differing responses to shocks invite the question whether ‘resilience’ is a concept uniformly applicable across all regions, big and small, urban and rural, industrial and resource-dependant.

The interpretation of the ability to ‘resist’ a shock was also problematic. Several regions were only mildly affected by the recession and thus deemed ‘resistant’. Should they be considered since ‘resilience’ implies bouncing-back from a shock? Is ‘resistance’ a valid dimension of resilience? The literature is not clear on this; nor are we of one mind.

Plato’s cave notwithstanding, if measurement is the objective (we can never escape it), the thorniest issues are the definition of **y** (recall figure 1) and the appropriate time frame. The **y** used here were the unemployment rate and employment growth. But, **y** could equally be something else. The time-frame used here was twelve years prior to and three years after the shock, too short for definite statements on resilience, the reason we did not address local economic restructuring and renewal. What should the proper time-frame be? We do not have an answer. If ‘resilience’ means the ability to survive shocks, then it is difficult to point to regions or cities that do not qualify. Taking a particularly dramatic case at the time writing (Detroit’s bankruptcy in July 2013), history suggest that Detroit will eventually rebound to be hailed as an example of ‘resilience’ in…twenty, thirty, fifty…years?

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APPENDIX - REGIONS GROUPED BY QUADRANT (RE: FIGURE 2) WITH CORRESPONDING VALUES FOR 2007-2009 AND 2009-2012

2007-2009	Δpr	Δer	Δuc	Q ID
Edmundston - Woodstock	2,12	0,69	1,43	**4a**
North Central MB	1,16	0,09	1,08	
Prince Albert & North SK	3,29	2,28	1,01	
Cape Breton	1,07	0,07	1,00	
Halifax	1,24	0,36	0,88	
Estrie NM	1,48	0,75	0,73	
Ontario-East	1,01	0,33	0,67	
Moncton - Richibucto	2,50	1,84	0,66	
Saint John - St. Stephen	2,12	1,46	0,65	
Couronne-Villes satellites	0,63	0,14	0,49	
Southwest MB	4,73	4,39	0,35	
Gatineau	0,31	0,02	0,28	
Bas-Saint-Laurent	0,96	0,70	0,26	
Sherbrooke	0,63	0,56	0,08	
Northeast BC	1,16	-2,31	3,47	**1**
Kitchener	1,21	-1,64	2,85	
Pembroke	1,03	-1,82	2,85	
Thompson - Okanagan	0,15	-2,61	2,76	
Simcoe	0,82	-1,91	2,72	
Abbotsford	1,50	-1,03	2,53	
Central NL	0,64	-1,77	2,41	
Sudbury	0,03	-2,32	2,35	
Edmonton	0,96	-1,21	2,18	
Victoria	0,41	-1,73	2,14	
North Coast BC & Nechako	1,14	-0,65	1,79	
Vancouver Island NM	0,41	-1,25	1,66	
Hamilton	0,67	-0,93	1,60	
Moose Mountain	1,01	-0,29	1,31	
Lethbridge - Medicine Hat	0,20	-0,82	1,02	
Southern NS	0,78	-0,20	0,98	
South Central MB	0,60	-0,19	0,79	
Avalon Peninsula	0,69	-0,04	0,74	
Saskatoon - Biggar	0,45	-0,13	0,58	
North Shore NS	0,31	-0,25	0,56	
Kingston	0,00	-0,54	0,54	
Cariboo	-3,09	-7,69	4,60	**2a**
Red Deer	-1,52	-4,69	3,17	
Windsor	-0,25	-3,10	2,85	
Athabasca - Peace River	-0,49	-3,29	2,79	
Calgary	-0,17	-2,75	2,58	
Stratford - Bruce Peninsula	-0,40	-2,92	2,52	
London	-2,01	-4,47	2,45	
Lower Mainland NM	-4,68	-7,11	2,43	
Banff - Jasper	-0,99	-3,30	2,31	
Barrie	-2,05	-4,35	2,29	
St. Catharines - Niagara	-0,69	-2,86	2,16	
Vancouver	-0,29	-2,34	2,05	
Woodstock	-2,37	-4,30	1,93	
Yukon	-0,27	-2,11	1,85	

2009-2012	Δpr	Δer	Δuc	Q ID
Regina	2,40	2,39	0,00	**4a**
Yukon	1,64	1,62	0,02	
Outaouais	2,67	2,55	0,12	
Quebec	2,40	2,00	0,41	
Ottawa	1,64	1,08	0,56	
Yorkton - Melville	0,03	-0,17	0,20	**1**
Campbellton - Miramichi	0,32	-0,89	1,21	
Gatineau	-2,08	-2,10	0,02	**2a**
Abbotsford	-0,17	-0,26	0,09	
Fredericton - Oromocto	-3,34	-3,45	0,10	
Edmundston - Woodstock	-1,98	-2,14	0,16	
Winnipeg	-0,39	-0,56	0,17	
Centre-du-Quebec	-6,32	-6,57	0,25	
Moncton - Richibucto	-0,61	-0,90	0,28	
Saskatoon - Biggar	-2,87	-3,17	0,30	
Kingston	-0,88	-1,21	0,33	
Southern NS	-2,03	-2,42	0,39	
Sherbrooke	-1,00	-1,49	0,50	
Parklands & North MB	-1,52	-2,98	1,46	
Saint John - St. Stephen	-1,43	-3,51	2,08	
Central NL	-0,65	2,15	-2,80	**3**
Windsor	-1,21	1,54	-2,75	
Woodstock	-1,62	0,80	-2,42	
Thunder Bay	-0,42	1,42	-1,84	
Barrie	-1,49	0,08	-1,57	
Sudbury	-1,10	0,46	-1,57	
Thompson - Okanagan	-0,41	0,81	-1,22	
Chaudiere-Appalaches	-0,07	0,82	-0,89	
Norwest ON-NM	-0,48	0,34	-0,82	
Montreal	-0,43	0,05	-0,47	
Vancouver	-0,22	0,09	-0,32	
Prince Albert & North SK	-0,16	0,06	-0,22	
Athabasca - Peace River	-2,97	-0,28	-2,69	**2b**
Red Deer	-2,18	-0,10	-2,08	
Simcoe	-2,11	-0,55	-1,56	
Calgary	-1,76	-0,32	-1,45	
Pembroke	-2,07	-0,66	-1,41	
Hamilton	-2,30	-0,95	-1,36	
Banff - Jasper	-3,94	-2,63	-1,31	
Camrose - Drumheller	-1,57	-0,38	-1,19	
Vancouver Island NM	-5,57	-4,43	-1,14	
London	-1,74	-0,70	-1,05	
North Central MB	-1,53	-0,61	-0,92	
Victoria	-1,64	-0,82	-0,82	
Lower Mainland NM	-1,07	-0,25	-0,82	
Estrie NM	-10,40	-9,60	-0,80	
Ontario-East	-3,77	-3,11	-0,66	
Toronto	-1,00	-0,35	-0,66	
South Central MB	-2,69	-2,08	-0,61	

Appendix - continued

2007-20012	Δpr	Δer	Δuc	Q ID	2009-2012	Δpr	Δer	Δuc	Q ID
Oshawa	-1,40	-3,17	1,77	**2a**	Muskoka - Kawarthas	-1,43	-1,11	-0,32	**2b**
Toronto	-0,51	-2,26	1,75		North Coast BC & Nechako	-2,53	-2,21	-0,32	
Kootenay	-4,30	-6,05	1,75		Halifax	-1,42	-1,14	-0,28	
West Coast & Labrador	-2,68	-4,24	1,55		Swift Current - Moose Jaw	-2,63	-2,50	-0,13	
Camrose - Drumheller	-1,62	-3,14	1,51		Annapolis Valley	-0,67	-0,61	-0,06	
Sarnia	-2,75	-4,22	1,47		Mauricie	-0,93	-0,90	-0,03	
Montreal	-0,49	-1,89	1,40		Cariboo	5,08	8,17	-3,09	
P.E.I.	-0,43	-1,56	1,13		Stratford - Bruce Peninsula	0,29	2,49	-2,20	
Campbellton - Miramichi	-2,95	-4,00	1,05		Kitchener	0,51	2,58	-2,07	
Fredericton - Oromocto	-0,71	-1,74	1,03		Abitibi-Temiscamingue	0,96	2,81	-1,85	
Wood Buffalo - Cold Lake	-0,92	-1,93	1,01		Northeast BC	5,93	7,66	-1,73	
Thunder Bay	-1,69	-2,58	0,89		**Edmonton**	0,45	1,98	-1,53	
Southeast MB	-0,33	-1,22	0,89		Lac-Saint-Jean	1,45	2,94	-1,49	
NortheastON-NM	-1,86	-2,71	0,85		Moose Mountain	2,24	3,62	-1,38	
Lac-Saint-Jean	-4,93	-5,77	0,84		St. Catharines - Niagara	2,39	3,75	-1,36	
Parklands & North MB	-1,34	-2,05	0,72		Gaspesie - Les Iles	1,53	2,78	-1,25	
Annapolis Valley	-2,03	-2,74	0,70		South Coast NL	3,31	4,46	-1,14	
Interlake	-0,01	-0,67	0,66		Avalon Peninsula	4,01	5,15	-1,14	
Muskoka - Kawarthas	-2,07	-2,72	0,65		Cote-Nord & Nord QC	1,78	2,87	-1,09	
Norwest ON-NM	-1,37	-2,01	0,64		West Coast & Labrador	1,32	2,33	-1,00	
Winnipeg	-0,51	-0,98	0,47		Couronne-Villes satellites	0,39	1,37	-0,98	
Cote-Nord & Nord QC	-0,83	-1,30	0,46		Sarnia	0,12	1,10	-0,98	
South Coast NL	-0,93	-1,27	0,34		Kootenay	1,42	2,28	-0,86	
Ottawa	-0,89	-1,19	0,30		Lethbridge - Medicine Hat	0,16	0,91	-0,75	
Quebec	-0,19	-0,35	0,17		Southeast MB	2,01	2,71	-0,70	
Swift Current - Moose Jaw	-1,94	-2,06	0,11		NortheastON-NM	0,92	1,61	-0,69	
Mauricie	-2,03	-2,07	0,04		Saguenay	0,60	1,24	-0,65	
Centre-du-Quebec	-1,17	-1,20	0,04		Bas-Saint-Laurent	1,24	1,76	-0,52	
Yorkton - Melville	-2,68	-2,69	0,01		P.E.I.	0,58	1,07	-0,50	
Gaspesie - Les Iles	-0,82	0,29	-1,11	**3**	Wood Buffalo - Cold Lake	2,16	2,58	-0,42	
Abitibi-Temiscamingue	-1,35	-1,30	-0,05	**2b**	Interlake	2,36	2,44	-0,08	
Chaudiere-Appalaches	-0,29	-0,22	-0,07		Oshawa	1,46	1,52	-0,05	
Saguenay	-0,22	-0,13	-0,09		Cape Breton	1,72	1,75	-0,03	**4b**
Outaouais	-3,69	-2,20	-1,48		Southwest MB	1,44	1,47	-0,03	
Regina	0,15	0,57	-0,42	**4b**	North Shore NS	2,49	2,51	-0,01	