TRENDS, PEAKS, AND TROUGHS: NATIONAL AND REGIONAL EMPLOYMENT CYCLES IN CANADA

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SUMMARY

When the 2008 global recession hit Canada and national unemployment rates began to rise, the federal government soon found itself under pressure to do something to help. That something ended up being the Economic Action Plan, a multi-billion-dollar spending initiative spread across the country. But, in at least one part of the country, no help was really needed at all. In New Brunswick, the recession had barely any impact on the state of the job market. Federal spending there would have been at best, unnecessary or, at worst, harmful, crowding out private investment while having an inflationary effect on the regional economy. Unfortunately, any informed assessment of how much stimulus is required in each province requires many months of data. Governments, impatient to show they are taking action, hastily create plans that may cause them to spend needlessly — or even harmfully — in some provinces while possibly coming up short in provinces facing the deepest economic crisis.

In this report we show this problem is not unique to the most recent recession. Our analysis uses monthly data on labour market conditions to show that the timing and depth of employment recessions varies widely across provinces and that this has been so in every recession since 1976. These results suggest that, to be effective, spending "action plans" and tax cuts must be targeted to benefit only certain regions of the country at certain times. The time it takes to formulate such targeted responses, and the obvious political challenges they involve, beggars the question of whether a national strategy can ever be designed that takes into account the varying economic conditions of a country with such a wide variety of industries and economic variables.

Examinations of the role played by governments in alleviating the recent recessions in Canada, the United States and elsewhere have emphasized the importance of relying instead on "automatic stabilizers" — pre-established mechanisms such as employment insurance, social assistance, and prescribed tax adjustments — to alleviate the impact of recessions. Before the next recession comes, the federal government — and provincial governments as well — would be wiser to prepare by investing resources in legislating well-designed automatic stabilizers so these processes are in place to naturally kick in precisely where and when they are needed. With the right formula of automatic stabilizers responding quickly and precisely to economic contractions, the main job left for politicians would be persuading the public that resorting to action plans and national strategies is something we are better off avoiding.

INTRODUCTION

A recession in Canada is unlikely to have the same effects in all regions of the country. This is largely due to differences in industrial composition across regions. An energy price shock, for example, will have a significantly different effect on the economies of energy-producing provinces than it will elsewhere. Similarly, a downturn in the U.S. economy may have its greatest impact on manufacturing output in Ontario. Differences in industrial composition will also cause the output effects of monetary policy — reflected in changes to interest rates and the exchange rate — to vary by province. Some shocks may also affect certain industries and, so, certain regions more quickly than others. For example, while the recent financial crisis impacted financial centres immediately, the tightening of credit impacted the rest of the country, only after a lag. Finally, some shocks may affect the industry of some regions but not others; localized droughts and depleted fish stocks are examples. For all these reasons, it would be unusual to find that a recession had the same impact in every region of a country as economically diverse as Canada.

The purpose of this paper is to provide evidence on the timing, period and amplitude of employment cycles in Canada and to gain a better appreciation of how they differ by province. We show that contractions in employment begin and end at different times in different parts of the country and that the depths of employment contractions vary widely by province.

Gaining insight into the timing and depths of employment fluctuations is useful for assessing the effectiveness of discretionary policies introduced by governments to combat recessions. If shocks to the Canadian economy are concentrated in only specific areas of the country, or if they are deeper in some regions than others, then discretionary policy interventions need to be regionally focused to be most effective. Alternatively, a reliance on nationally funded automatic stabilizers that shift fiscal stimulus from expanding to contracting regions will be advisable. Our results will shed light on these issues.

Finally, we show that, since 1976, the employment ratio — defined as the fraction of those of working age able to find employment — has converged across provinces. This is due in part to a remarkable increase in the employment ratio in the Atlantic provinces from distressingly low levels to levels approaching those in Ontario. We show that similar increases in employment ratios, albeit from higher levels, have occurred in Quebec, Manitoba and Saskatchewan.

In the following section we describe the data we use. We then outline our approach to identifying employment cycles and apply that approach to identify the timing of employment contractions and expansions at the provincial level. We then provide summary measures meant to characterize how provincial employment cycles compare across provinces. This is followed by a brief look at how employment ratios have converged to similar levels over our sample period (1976-2012). Finally, we conclude and discuss the implications of our results for governments' response to contractions in employment.

THE DATA

Identifying the peaks and troughs of a business cycle generally involves taking into consideration a great deal of economic data on output, investment, consumption, the financial market and labour-market conditions. Based on long time series of a large number of such data, the National Bureau of Economic Research (NBER) publishes turning points in business cycles in the U.S. The Economic Cycle Research Institute (ECRI) publishes estimates for other countries, including Canada, using a similar methodology.

We do not follow that approach here. One reason for this is data limitations. While data on consumption, investment, financial markets and other critical data series are available nationally, they are often unavailable at the provincial level. Most importantly, data at the provincial level are generally only available annually.

An important type of high-frequency data accessible at the provincial level on a monthly basis is employment data. In Canada, these data are available since 1976 and, based on the calculations of the ECRI, incorporate three major recessions: 1981-1982, 1990-1992 and 2008-2009. Our methodology relies on this availability of employment data at the national and provincial levels.

A second reason for relying on employment data to determine the timing, period and amplitude of economic cycles is to identify how effective discretionary stabilization policy might be at addressing those cycles.[1] The literature examining the impact of economic conditions on election outcomes typically finds that it is labour-market fluctuations that focus the minds of voters and elected policy makers.[2] Discretionary stabilization policy, then, is most likely to occur in response to fluctuations in labour-market conditions and so we concentrate on those fluctuations.

Our focus in the next section is on identifying the timing, period and amplitude of cycles in the ratio of employment to population amongst those aged 15-64 years.[3] We will refer to this as the employment ratio.[4]

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[1]   "Discretionary" policy responses are those based on the subjective judgments of policy makers and that vary depending on circumstances. Their application requires evidence of their need and debate over their design before they are applied. By contrast, "automatic" policy responses take effect immediately and are applied according to previously defined and approved legislation.

[2]   See, for example, Michael Lewis-Beck and Mary Stegmaier ("Economic Determinants of Electoral Outcomes," *Annual Review of Political Science* 3 (2000): 183-219) who review a large volume of literature and find that, amongst economic variables, election results are typically most sensitive to changes in labour-market conditions. Looking at the sub-national level, Jeffrey Cohen and James King ("Relative Unemployment and Gubernatorial Popularity," *The Journal of Politics* 66, 4 (2004): 1267-1282) report that the popularity of U.S. state governors is strongly influenced by labour-market conditions in the state relative to elsewhere.

[3]   Although our focus is on the entire working-age population, a potentially interesting extension of our work would be to identify differences in the timing, period and amplitude of employment fluctuations across provinces by age and sex. The most recent recession, for example, has sometimes been labeled a "man-cession" because of the disproportionately large impact on male employment. See Howard Wall, "The Effects of Recessions Across Demographic Groups," Federal Reserve Bank of St. Louis, September 2009, for a description of how recessions in the U.S. vary in their impact according to age, sex, marital status and race.

[4]   We use monthly provincial employment data from Statistics Canada's CANSIM Table 2820087 covering the period from January 1976 to October 2012. These data represent a three-month moving average of seasonally unadjusted data. These data are available one month after recording and so enable a speedy assessment of movements in employment cycles. Fluctuations in these data in part reflect seasonal influences. We removed those seasonal influences using an algorithm available in the EViews statistical package. Our measure of the employment ratio is therefore a seasonally adjusted three-month moving average of employment, which is then divided by population. The population of those aged 15 to 64 years is also reported in CANSIM Table 2820087.

The employment ratio has a number of advantages as a measure of labour-market conditions and as an indicator of the potential need for policy action. Changes in the employment ratio indicate whether the economy is creating jobs fast enough to maintain employment as a constant fraction of a growing working-age population. An increase in the number of jobs is not necessarily a measure of good economic performance if the size of the working-age population has increased even faster. Similarly, maintaining a constant level of employment when the working-age population declines might suggest a more robust economic performance than suggested by the level of employment alone.

The unemployment rate does something similar to the employment ratio but it suffers from the problem that movements in that rate are affected not only by changes in employment but also by changes in labour-force participation. Thus, a worker withdrawal from the labour force, due perhaps to a discouraging employment picture, is as capable of lowering the unemployment rate as an increase in employment. These changes, however, suggest something very different with regards to the state of the economy and perhaps the appropriate response of policy makers.[5]

THE APPROACH

The methodology of identifying peaks and troughs in the employment ratio, and the period of contraction or expansion that separates them, is conceptually straightforward. A peak in the employment ratio is identified as occurring when, in a given month, the employment ratio in each of a certain number of months before and after that date is smaller in value than in the month under consideration. Similarly, a trough in the employment ratio is identified as occurring when the employment ratio in each of a certain number of months before and after that date is larger in value than in the month under consideration. In the stylized representation below, a peak of the cycle occurs at points A and C while a trough occurs at point B. The period between a peak and a trough is identified as a contraction, whereas the period between a trough and a peak is an expansion.

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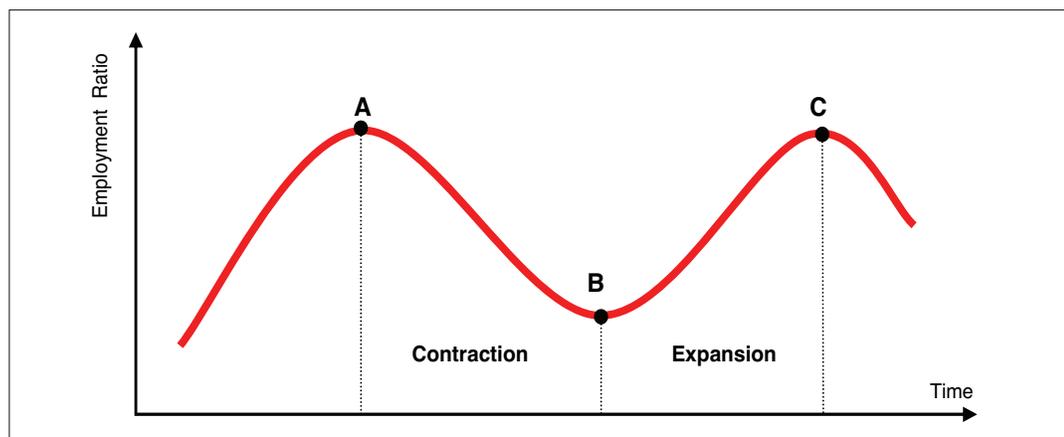
[5] The employment ratio is also easier to adjust for seasonal variation than is the unemployment rate. This is because changes to the numerator of the employment ratio (the level of employment) are small relative to changes in the numerator of the unemployment rate (the level of unemployment). This means that distortions due to seasonal adjustments are less likely to occur when the employment ratio is used.

The application of this approach would be straightforward if data on employment ratios moved as represented in our graph — that is, if the employment ratio increased smoothly over many periods to a peak and then fell smoothly over many periods to a trough. In fact, however, even after applying a seasonal-adjustment algorithm to a three-month moving average of the employment ratio, graphs of the data can form a "jagged" line in the sense that rises and falls can be very short in duration, so that multiple short and shallow expansions and contractions are identified within a narrow period. It is possible, then, to identify a great number of peaks and troughs.

To avoid this problem we follow the general approach introduced by Gerhard Bry and Charlotte Boschan[6] and since widely applied to identifying cyclical turning points.[7] We define a peak (and a trough) as occurring only if the employment ratio in the current period is greater (or, in the case of a trough, less) than the values of the employment ratios in each of the six preceding and following months. Thus a peak and a trough must be separated by at least six months.[8] While this approach eliminates cycles of short duration, it still leaves the possibility of identifying two or more consecutive peaks or troughs without an intervening trough or peak, respectively. In this case, the peak with the higher employment ratio is identified as the beginning of a contraction, while the trough with the lower employment ratio is identified as the beginning of an expansion.

Even with these adjustments, ambiguous cases remain that require further judgment. This is inevitable in exercises like this. The NBER, for example, well-known for identifying business cycles in the U.S., supplements its statistical analysis with a good deal of judgment. The NBER reports:[9]

> In both recessions and expansions, brief reversals in economic activity may occur — a recession may include a short period of expansion followed by further decline; an expansion may include a short period of contraction followed by further growth. The Committee applies its judgment based on the above definitions of recessions and expansions and has no fixed rule to determine whether a contraction is only a short interruption of an expansion, or an expansion is only a short interruption of a contraction. The most recent example of such a judgment that was less than obvious was in 1980-1982, when the Committee determined that the contraction that began in 1981 was not a continuation of the one that began in 1980, but rather a separate full recession.

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[6] Gerhard Bry and Charlotte Boschan, *Cyclical Analysis of Time Series: Selected Procedures and Computer Programs*, Technical Paper no. 20, New York: Columbia University Press, 1971.

[7] A prominent example is: Don Harding and Adrian Pagan, "Dissecting the Cycle: A Methodological Investigation," *Journal of Monetary Economics* 49 (2002). Carlos Altavilla ("Do EMU Members Share the Same Business Cycle?" *Journal of Common Market Studies* 42, 5 (2004)) applies the approach to investigate the business cycles of members of the EU's Economic and Monetary Union, while Maria Dolores Gadea, Ana Gómez-Loscos and Antonio Montañés ("Cycles inside Cycles: Spanish Regional Aggregation," *SERIEs* 3, 4 (2012)) have recently used the approach to consider cycles amongst regions in Spain. Other recent examples include papers by Cesar Calderon and Rodrigo Fuentes ("Characterizing the Business Cycle of Emerging Economies," Policy Research Paper 5343, The World Bank, June 2010) and Stijn Claessens, M. Ayhan Kose, and Marco Terrones ("How Do Business and Financial Cycles Interact?" IMF Working Paper, April 2011).

[8] Bry and Boschan suggested identifying peaks and troughs by looking at data five months before and after the potential peak or trough, though in practice slightly longer and shorter periods have been used. Applications using quarterly data have identified peaks and troughs looking at two quarters (six months) before and after the potential peak or trough. This is, for example, the approach taken by Frédérick Demers and Ryan Macdonald ("The Canadian Business Cycle: A Comparison of Models," Working Paper 2007-38, Bank of Canada, July 2007) who apply this approach to identify turning points in cycles described by quarterly Canadian GDP data.

[9] *The NBER's Business Cycle Dating Committee*, http://www.nber.org/cycles/recessions.html. A detailed description of the judgments and adjustments we have made is available upon request. The appendix provides additional details on the approach we have used.

In general, we were guided by a desire to identify a monthly observation as defining a peak or a trough only if the resulting contraction or expansion is of moderate to significant amplitude. In particular, we identify as an employment contraction only those periods between a peak and a trough when the fall in the employment ratio is greater or equal to two standard deviations of the mean monthly change in the employment ratio for the province over the course of our 37 years of data.

EXPANSIONS AND CONTRACTIONS

Figure 1 presents our results from applying our method to employment at the national level and for Canada's two largest provinces, Ontario and Quebec.

The figure for Canada identifies three major contractions in the employment ratio: September 1981 to January 1983, April 1990 to February 1994, and April 2008 to October 2009. The dates of the first and last of these contractions correspond closely to the dates of Canadian recessions identified by the Economic Cycle Research Institute (ECRI): April 1981 to November 1982 and January 2008 to July 2009 respectively.[10] The dates we identify for the employment recession in the early 1990s define a recession in employment that is considerably longer than the recession identified by the ECRI (March 1990 to March 1992) using a broader set of economic variables. The employment ratio, then, recovered much more slowly in that recession than did the rest of the economy.[11]

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[10] The ECRI employs a large number of data series to identify Canada as having been in recession from April 1981 to November 1982; from March 1990 to March 1992; and from January 2008 to July 2009. See: "International Business Cycle Dates," Economic Cycle Research Institute, http://www.businesscycle.com/ecri-business-cycles/international-business-cycle-dates-chronologies.

[11] This is not unlike what is currently being observed in the U.S., where employment growth has continued to lag behind the rest of the economy, which, in the estimation of the ECRI, officially exited from recession in June 2009.

FIGURE 1:   CANADA AND CENTRAL CANADA
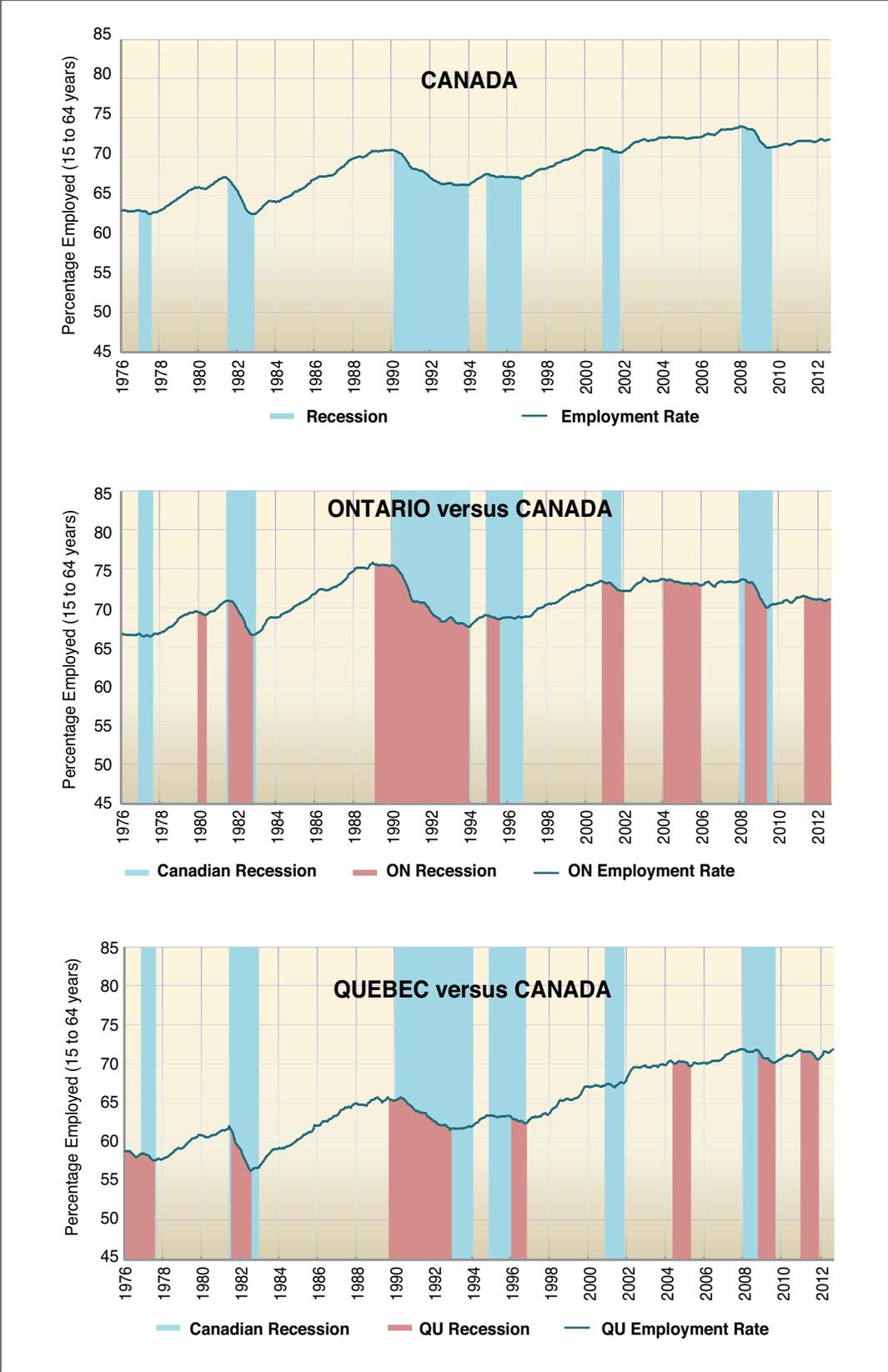
The employment recessions we have identified saw the value of the employment ratio in Canada fall by 4.7 percentage points in the 1981-1983 contraction, by 4.5 percentage points in the 1990-1994 contraction, and by 2.8 percentage points in the 2008-2009 recession. Beyond these major recessions in employment, we identify a number of smaller contractions. Most prominent was a contraction in 1995-1996 that interrupted the recovery following the large 1990-1994 recession. A shorter contraction in 2001 interrupted what was otherwise a long period of expansion until 2008.

In the figures for Ontario and Quebec, the periods defining the contractions in the employment ratio for Canada as a whole are identified by the blue areas. Province-specific contractions are identified by the red areas.

Notable for Ontario is that although the province entered the 1981-1983 employment recession at the same time as Canada, it entered the 1990-1994 contraction 12 months earlier and entered the 2008-2009 employment recession two months after Canada. Quebec's experience was similar. Quebec's labour market also entered the 1981-1983 employment recession at the same time as Canada, but entered the 1990-1994 recession five months before Canada and fell into the 2008-2009 recession eight months after Canada. In both provinces the recovery from the 2008-2009 employment recession has been less certain than that experienced by Canada as a whole. Indeed, by our estimates, Ontario was again in recession throughout 2011 and into 2012. Finally, it is worth noting that the 2008-2009 contraction in the employment ratio was both shorter and shallower in Quebec than in Ontario. Whereas Ontario saw its employment ratio fall by 3.6 percentage points (a fall in the level of employment also of 3.6 per cent) over a fourteen-month period, Quebec's employment ratio fell by only 1.7 percentage points (a 1.8-per-cent fall in the level of employment) over 11 months.

Figure 2 presents our results for the four westernmost provinces: British Columbia, Alberta, Saskatchewan and Manitoba.

British Columbia preceded Ontario and Quebec into the 1981-1983 employment recession by five months. The province then suffered a "double dip" in the form of a second recession beginning eight months after the end of the first. B.C. fell into the 1990-1994 contraction two months before Canada, but that was 10 months after Ontario and three months after Quebec. The 1990-1994 recession in British Columbia was, however, much less severe than those experienced in Ontario and Quebec. The employment ratio fell by only 2.2 percentage points (versus 8.2 and 4.1 percentage points in Ontario and Quebec, respectively), with an increase of 5.7 per cent in the level of employment. The increase in the number of employed in B.C. during that period highlights why it can be misleading to rely on measures of employment without an adjustment for population. The rise in population in the province at that time was much greater than the number of jobs created.[12]

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[12] Several additional examples of rapid population growth causing a fall in the employment ratio despite increases in the level of employment are observed in our dataset: in British Columbia, Alberta, and for the Canadian average during a short 1977 recession; in B.C., Ontario and Canada during the 1995-1996 recession; and in Alberta, Ontario and Canada during the 2001 recession.

FIGURE 2: THE WESTERN PROVINCES (cont'd)
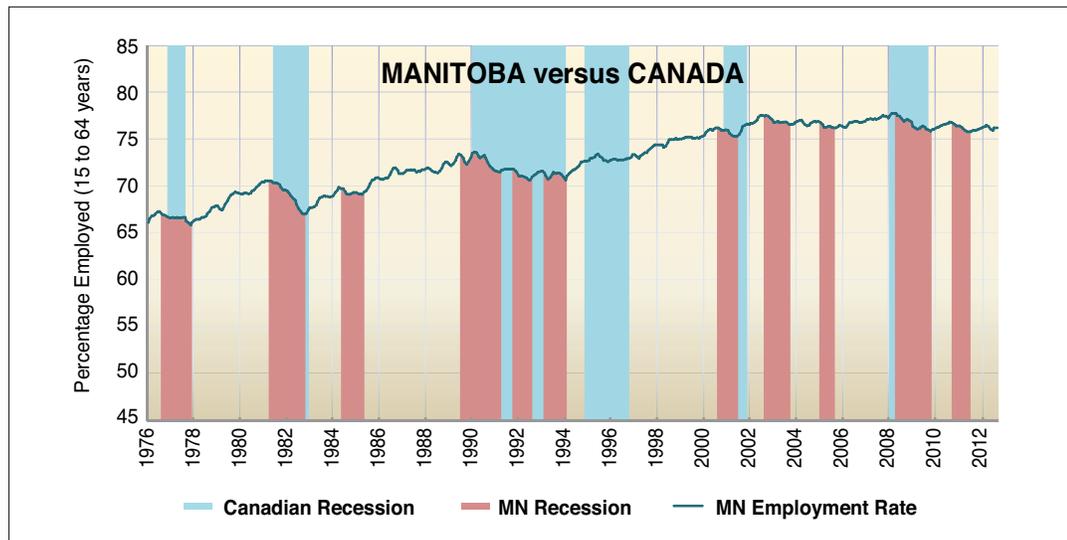
Alberta entered the 1990-1994 employment downturn well after Ontario (by 13 months) and also exited from the downturn nine months before Ontario. As measured by the fall in the employment ratio it was also a less severe recession for Alberta (where the employment ratio fell by 3.6 percentage points) than for Ontario (where the employment ratio fell by 8.2 percentage points). Following the 1990-1994 recession, Alberta's experience is notable for the fact that the employment ratio continued to grow during the 1995 and 1996 Canadian recession at the time when other large provinces — B.C., Ontario and Quebec — suffered slowdowns. Also noteworthy is the short, sharp employment recession in 1986-1987 that coincided with a dramatic fall in energy prices, a period during which the employment ratio was growing in Ontario. The different effects of changes in energy prices on the Alberta and Ontario economies are therefore apparent in our measures. The 2008-2009 employment recession persisted in Alberta 10 months longer than it did in Ontario, but recovery from that recession has been much stronger.

Saskatchewan's labour market is remarkable for the number of short and shallow recessions (and expansions) it has exhibited over the past 37 years.[13] All three of the major Canadian recessions during this period were relatively mild and short-lived in Saskatchewan. The province's recovery from the latest downturn, however, has been unusually prolonged, and recovery only appears to have settled in at the beginning of 2012.

Manitoba, like Saskatchewan, experienced a relatively mild employment contraction in 2008-2009, certainly far milder than those realized in Alberta, B.C. and Ontario. The recession of 1990-1994 was the most prolonged in Manitoba's recent history, but it was followed by an extended period (from April 1994 to September 2000) during which the employment ratio grew steadily.

Figure 3 presents our results for the four easternmost provinces: Newfoundland and Labrador, Prince Edward Island, New Brunswick and Nova Scotia.

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[13] Our figure supports the recent observation by Herb Emery ("Labour Shortages in Saskatchewan," *SPP Research Papers* Vol. 6, No. 4, University of Calgary School of Public Policy (January 2013)) who notes that the labour market in Saskatchewan has shown a remarkable ability to quickly adjust to commodity price booms and busts.

NEWFOUNDLAND and LABRADOR versus CANADA

Percentage Employed (15 to 64 years)

Canadian Recession   NFL Recession   NFL Employment Rate

PRINCE EDWARD ISLAND versus CANADA

Percentage Employed (15 to 64 years)

Canadian Recession   PEI Recession   PEI Employment Rate

NEW BRUNSWICK versus CANADA

Percentage Employed (15 to 64 years)

Canadian Recession   NB Recession   NB Employment Rate
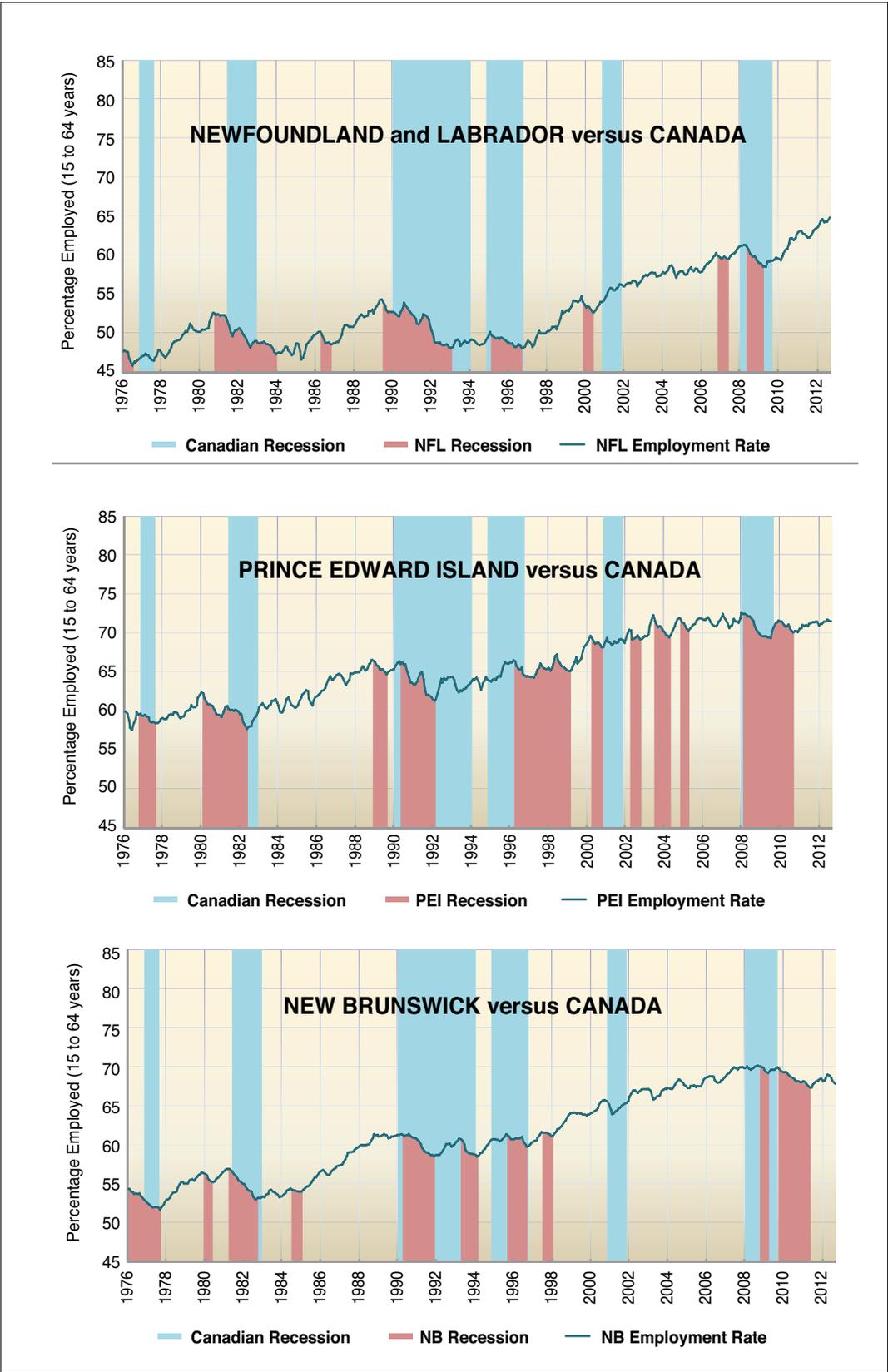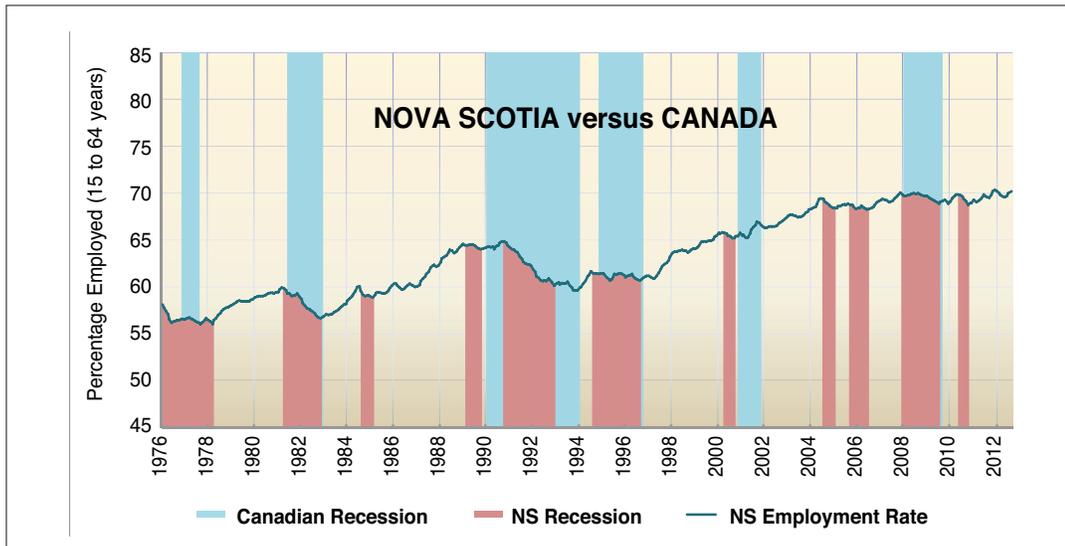
The results for Newfoundland and Labrador are remarkable for a number of reasons. First, our analysis, over the entire period of 37 years, shows there has been an almost 18-percentage-point increase in the employment ratio: from a low of 47 per cent in 1976 to nearly 65 per cent in 2012. More importantly, almost all of the increase (nearly 17 percentage points) occurred since 1997. We discuss this observation in more detail later in the paper. Second, the 1981-1983 employment recession was more prolonged in Newfoundland and Labrador than anywhere else in the country. Indeed, in Newfoundland and Labrador, that recession started in December of 1980, earlier than in most other provinces (an exception is Prince Edward Island where the recession began in April of the same year), and did not end until March 1984, well after the rest of the country. The 2008-2009 employment downturn in Newfoundland and Labrador began later than the Canadian average (by three months) and ended earlier (by five months). However, the fall in the employment ratio (by 2.8 percentage points) was comparable to the fall in the Canadian average, making the recession short-lived but sharp. A third notable characteristic of the Newfoundland and Labrador experience is the powerful recovery in that labour market since 2009. From May 2009 to October 2012 the employment ratio increased by 6.4 percentage points and the level of employment increased by 8.3 per cent. This labour-market performance was the best in the country over that period.

Due to its small size, the employment ratio in Prince Edward Island is more volatile than elsewhere. It is notable that the provincial labour market fell into recession in April 1980, 17 months ahead of the rest of the country. However, the recovery from that and the 1990 downturn was faster than elsewhere.

The labour market in New Brunswick was slow to enter the 2008-2009 employment recession. It then enjoyed a short recovery, but once again slipped into a downturn until July 2011. Nova Scotia's employment experience with the 2008-2009 recession was mild. The employment ratio fell by only 1.2 percentage points, while the level of employment fell by 1.6 per cent.

PATTERNS

In this section we present a number of measures intended to identify the extent to which provincial cycles in the employment ratio are similar.

The *concordance index* identifies the average fraction of time in which two series are in the same phase (either expansion or contraction) of the cycle. It is defined as:

$$CI = \frac{1}{T} \left\{ \sum_{t=1}^{T} S_{xt} S_{yt} + \sum_{t=1}^{T} (1 - S_{xt})(1 - S_{yt}) \right\}$$

where x_t and y_t are two time series, T is the number of observations, and S_{xt} and S_{yt} are variables taking the value of one during expansions and zero during contractions. The index has a value between zero and one where a value of one indicates the two cycles are always in the same phase (a complete concordance) and a value of zero indicates the opposite (a complete disconcordance). A value of 0.5 indicates there is no systematic relationship between the two series.

As noted by Don Harding and Adrian Pagan,[14] long periods of expansion will result in the concordance index taking a value closer to its maximum value, making it appear there is a greater degree of correlation between the cycles than is actually the case. For that reason it is useful to calculate instead a mean-corrected concordance index, defined as:

$$MCCI = \frac{2}{T} \left\{ \sum_{t=1}^{T} (S_{xt} - \bar{S}_x)(S_{yt} - \bar{S}_y) \right\}$$

where $\bar{S}_x$ and $\bar{S}_y$ define the mean values of S_{xt} and S_{yt}, respectively, over the sample period. The MCCI ranges in value between -1 (the two cycles are never in phase) and +1 (the two cycles are always in phase). A value of zero for the MCCI indicates there is no systematic relationship between the two series.

We use the mean-corrected concordance index to identify how closely the employment cycles in province i are synchronized with employment cycles in province j. Table 1 presents our calculations.

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[14] Don Harding and Adrian Pagan, "Synchronization of Cycles," *Journal of Econometrics* 132 (2006).

	NFL	PEI	NS	NB	QU	ON	MN	SK	AB	BC	Canada
NFL	**										
PEI	0.043	**									
NS	0.170	0.108	**								
NB	0.103	0.137	0.159	**							
QU	0.169	0.106	0.192	0.174	**						
ON	0.117	0.038	0.120	0.050	0.173	**					
MN	0.056	0.083	0.120	0.157	0.160	0.163	**				
SK	0.061	0.075	0.026	0.025	0.056	0.089	0.085	**			
AB	0.150	0.132	0.087	0.071	0.141	0.151	0.108	0.088	**		
BC	0.217	0.146	0.192	0.169	0.188	0.131	0.180	0.137	0.193	**	
Canada	0.201	0.086	0.204	0.157	0.194	0.235	0.183	0.071	0.215	0.291	**

Canadian employment cycles are the weighted average of provincial cycles. It would not be surprising, therefore, to find that employment cycles in provinces with the largest shares of the national labour force are most closely in phase with the Canadian cycle. The values of the MCCI reported in the last row of the table offer some evidence of this; B.C. (containing roughly 15 per cent of the Canadian labour force) and Ontario (containing about 40 per cent) are the provinces whose employment cycles are most closely in phase with Canada's. What is surprising is the lack of close synchronization of Quebec with the national cycle, given the size of its labour market (about 25 per cent of the national market). The employment cycles in Saskatchewan and P.E.I. are the least-closely related to the Canadian employment cycle.

Perhaps more interesting is the degree to which provincial employment cycles are in phase with one another. Between provinces, the closest degree of synchronization is between B.C. and Newfoundland and Labrador, while the least synchronization appears between Saskatchewan and New Brunswick. There is very little synchronization between the employment cycle in Saskatchewan and employment cycles in other provinces. Although they have a similar mix of industries, the degree of synchronization of cycles between Ontario and Quebec is not notably larger than it is between those provinces and others with less-similar industry mixes.

Interestingly, these levels of synchronization are very similar to those reported by Altavilla[15] for the member states of the European Union. The business cycle (measured by real GDP) in Germany is the most closely synchronized with the EU with an MCCI of 0.20, while the cycle in Belgium (with an MCCI of 0.07) is the least. Between member states, the synchronization of phases is highest between Germany and Belgium and between Italy and Belgium (MCCI = 0.23) while phases exhibit the least amount of synchronization between the U.K. and Germany (MCCI = 0.01). Despite being members of a monetary union with far more similar political and economic institutions for a much longer period of time (145 years), short-term fluctuations in Canadian provincial economies would appear to be no more closely aligned than those across members of the European Union.

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[15] Altavilla, "Do EMU Members Share the Same Business Cycle?"

A limitation of the concordance index is that it only identifies how often provincial cycles are in phase. It tells us nothing about the amplitude of those cycles or their duration; two measures that, in combination, provide an indication of the loss suffered during a recession. Define the cumulative loss of a recession lasting for *k* periods as:

$$L = \sum_{i=1}^{k} (EMR_i - EMR_p) - \frac{A}{2}$$

where EMR_p defines the employment ratio at the peak of the cycle, EMR_i is the employment ratio in month *i* of the recession and *A* defines the amplitude of the recession measured as the difference between the employment ratio at the trough of the cycle (EMR_k) and the peak of the cycle (EMR_p).[16] The value of the cumulative loss *(L)* identifies the cumulative number of percentage points of the employment ratio lost during a recession.

Table 2 presents measures of the average loss suffered during recessions in each province, and also expresses the size of that average loss as a percentage of the cumulative loss suffered in Canadian recessions.

TABLE 2:   CUMULATIVE LOSSES DURING EMPLOYMENT RECESSIONS, 1976 TO 2012

	NFL	PEI	NS	NB	QU	ON	MN	SK	AB	BC	Canada
Average Cumulative Loss	-36.3	-26.2	-16.1	-14.2	-20.2	-42.2	-10.1	-7.9	-23.6	-25.9	-36.3
Average Provincial Loss to Canadian Average	99.9%	72.1%	44.3%	39.1%	55.7%	116.3%	27.9%	21.9%	65.0%	71.2%	100%
Average Number of Recessions	8	10	11	10	7	8	11	15	9	9	6

Notable in Table 2 is how different the losses are across provinces. Over our period of analysis (1976-2012) Saskatchewan suffered many recessions but they were typically quite shallow. The average recession in Saskatchewan resulted in a cumulative loss only one-fifth as large as that suffered across Canada as a whole. Recessions in Ontario, on the other hand, typically resulted in very large cumulative losses, both absolutely and relative to the Canadian average. Interestingly, while Quebec and Ontario have experienced a similar number of employment recessions since 1976, those in Quebec have typically resulted in noticeably smaller losses than those in Ontario.

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[16] See the appendix for an explanation of this calculation.

A potential explanation of these variations may lie in differences in the sensitivity of interprovincial migration to employment conditions. Thus if there are large movements of people of working-age population into and out of Saskatchewan in response to changes in the business cycle, this may explain the relatively fast adjustments in the ratio of employment to population observed in that province. Provincial differences in the generosity of employment insurance and other temporary income-support programs may also play a role in explaining why the employment ratio adjusts more quickly in some provinces than others when recession hits. These are interesting questions for future research.

Tables 1 and 2 offer interesting summary measures, but suffer from the problem that they represent the *average* level of concordance experienced and the *average* cumulative loss incurred over many recessions. They can, therefore, hide interesting and important differences within individual recessions. To deal with this issue, Figure 4 focuses attention on the provincial impact of Canada's three largest recessions since 1980.

The three panels in Figure 4 are drawn to the same scale, so that the width of each provides a measure of the relative lengths of these recessions. The widths of bars within each panel identify the length of the employment-recession experienced in each province and for Canada as a whole. Finally, the deeper the colour of a bar, the deeper the employment recession suffered by that province. Thus, dark red identifies a recession during which the employment ratio fell by more than 5.5 percentage points. The lightest shading identifies a comparatively mild recession; one in which the employment ratio fell by less than 3.0 percentage points. The start and end dates of each recession are recorded at the beginning and end of each bar, respectively, and the exact fall in the employment ratio is reported in the middle of each bar.

Figure 4 highlights important differences in both the period and amplitude of employment cycles across provinces and over time. The recession of the early 1990s was the most prolonged of the three recessions and this was particularly so for Ontario, which was the first province to enter recession and the last to exit. Saskatchewan, on the other hand, did not enter that recession until 18 months after Ontario and exited from the recession 18 months before. Ontario, therefore, suffered nearly three more years of recession than Saskatchewan did. On the other hand, in the early 1980s, seven other provinces entered recession prior to Ontario. The Ontario economy was also one of the first provinces to exit from that recession.

FIGURE 4:   CANADA'S THREE LARGE EMPLOYMENT RECESSIONS SINCE 1980[17]

1980 - 1984			
Canada	1981-09	4.73	1983-01
NFL	1980-12	5.32	1984-02
PEI	1980-04	4.66	1982-07
NS	1981-06	3.23	1983-01
NB	1981-06	3.89	1982-11
QU	1981-09	5.64	1982-09
ON	1981-09	4.39	1982-12
MN	1981-06	3.61	1982-12
SK	1981-10	1.89	1982-09
AB	1981-08	7.19	1983-03
BC	1981-04	7.14	1983-01

1989 - 1994			
Canada	1990-04	4.49	1994-02
NFL	1989-09	6.21	1993-03
PEI	1990-07	5.05	1992-04
NS	1990-12	4.73	1993-02
NB	1990-06	2.83	1992-01
QU	1989-11	4.08	1993-01
ON	1989-04	8.18	1994-02
MN	1989-09	1.93 / 1991-05 / 1991-12 / 1.21	1992-09
SK	1990-10	1.75	1992-08
AB	1990-05	3.60	1993-05
BC	1990-02	2.22	1993-03

2008 - 2010			
Canada	2008-04	2.75	2009-10
NFL	2008-07	2.84	2009-05
PEI	2008-04	2.58	2010-11
NS	2008-02	1.21	2009-09
NB	08-12	0.93	09-05
QU	2008-12	1.72	2009-10
ON	2008-06	3.57	2009-07
MN	2008-06	1.93	2009-12
SK	2008-12	1.60	2009-10
AB	2008-05	4.52	2010-05
BC	2008-04	4.29	2009-12

Fall in Employment Ratio < 3.0 p.p.	
3.0 p.p. < Fall in Employment Ratio < 5.5 p.p.	
Fall in Employment Ratio > 5.5 p.p.	

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[17] Abbreviations represent British Columbia (BC), Alberta (AB), Saskatchewan (SK), Manitoba (MN), Ontario (ON), Quebec (QU), New Brunswick (NB), Nova Scotia (NS), Prince Edward Island (P.E.I.) and Newfoundland and Labrador (NFL).

Finally, Figure 4 shows that the *depth* of employment-recession differed considerably across provinces and by recession. The downturn in the early 1980s saw Alberta, B.C. and Quebec suffer the deepest job losses, though Quebec's downturn both began later and ended sooner. At 13 months, Quebec's employment contraction was short but sharp. Saskatchewan experienced a relatively mild and short employment cycle during this period. In the early 1990s it was Ontario's turn to bear the brunt of a long and deep contraction; its employment ratio fell by 8.2 percentage points and recovery took nearly five years. B.C., which experienced one of the largest falls in employment in the early 1980s, had a relatively mild recession this time around. In the latest downturn of 2008-2010, Alberta, B.C. and Ontario had the largest falls in their employment ratios, with Ontario this time suffering the mildest contraction amongst those provinces. Quebec, a province similar to Ontario in many respects, saw its employment ratio fall by only half of that of Ontario. As noted earlier, the latest recession caused barely a ripple in New Brunswick.

The presentation of the results in Figure 4 highlights the importance of observing how patterns of employment vary across provincial economies during different recessions. While there is some consistency across those three major recessions — for example, Saskatchewan suffered a shallow and relatively short-lived recession in all three cases — provinces typically had very different experiences across these downturns. British Columbia, for example, suffered a sharp and deep recession in the early 1980s, a prolonged but shallow recession in the early 1990s, and something in-between in the 2008-2010 recession. This is consistent with what we would expect, given how different the economic shocks have been that have impacted provincial labour markets over the past 37 years. The shocks emanating from the recent financial crisis differed from the shocks that induced the recessions of the early 1980s and 1990s. The former was associated with a rapid fall in interest rates, while the latter were associated with equally rapid increases in interest rates. Significant changes to provincial economies over the past 37 years may also have caused those economies to respond differently to even the same shock received previously.

LONG-TERM TRENDS

We scaled the graphs in Figures 1, 2 and 3 with identical vertical axes to make it easier to see the differences in employment ratios across provinces. A useful way of summarizing how these differences have evolved over time is to calculate a weighted coefficient of variation measuring the variability of employment ratios across provinces relative to the national average.[18] A high coefficient of variation indicates that employment ratios differ widely across provinces while a value of zero would indicate that provincial employment ratios are exactly equal.

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[18] To be precise, we calculate a weighted coefficient of variation defined as σ/EMR_C, where EMR_C is the employment ratio for Canada and σ is the standard deviation of provincial employment ratios *(EMR$_i$)* about the national average. That is,

$$\sigma = \left[\sum_i^{10} \frac{EM_i}{EM_c} \left(EMR_i - EMR_C \right)^2 \right]^{1/2}$$ where EM_i measures the level of employment in province i and EM_C measures the level of employment in Canada.

Figure 5 shows that since the mid-1980s, and particularly since the late 1990s, provincial employment rates have become steadily more similar, and this is perhaps particularly so since 1998. Recalling Figures 1, 2 and 3, it is apparent that this convergence of provincial employment ratios is due mainly to other provinces catching up to the levels of employment ratios in Ontario, Alberta and B.C.

FIGURE 5: COEFFICIENT OF VARIATION IN PROVINCIAL EMPLOYMENT RATIOS
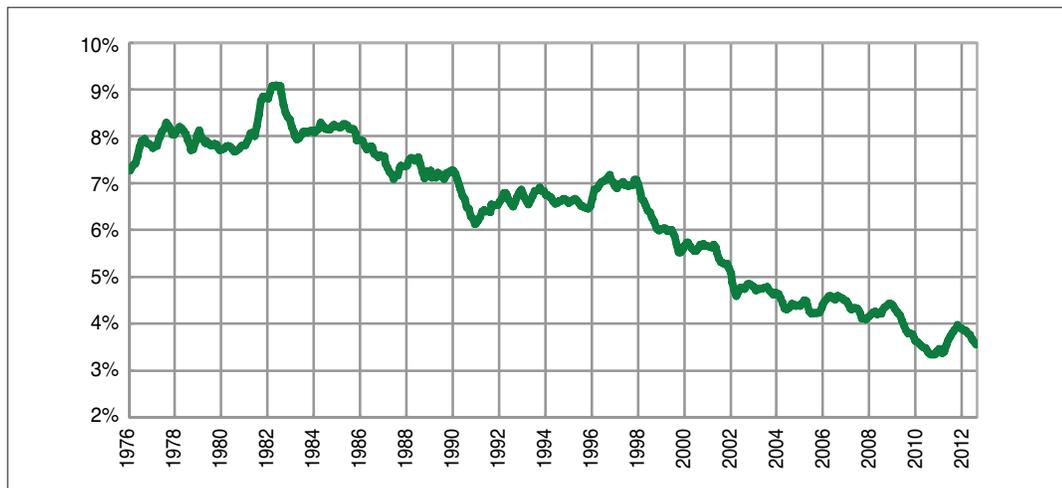
We noted earlier the extraordinary growth in the employment ratio in Newfoundland and Labrador since 1997. In just over 15 years, the employment ratio in that province increased by nearly 17 percentage points. The timing of the rise corresponds closely to the development of offshore oil production (the Hibernia development started production in 1997) and despite the collapse of the cod fishery in 1992. The extraordinary rise in the employment ratio provides a testament to the effects of oil development on the Newfoundland and Labrador economy.[19]

Significant growth in the employment ratio has also been realized in all of the other Atlantic provinces. All have enjoyed increases in their employment ratios of over 10 percentage points and all are within reach of the Canadian average. Newfoundland and Labrador remains seven percentage points below the Canadian average, but it is catching up quickly.

Alberta, which has always led Canada in terms of its employment ratio, remains the leader. However, as of 2012, Alberta's employment ratio is only marginally higher than that of Saskatchewan and Manitoba, two provinces that have enjoyed a slow but steady increase in their employment ratios since 1976. Amongst the western provinces, British Columbia has been throughout, and remains, in fourth place with respect to its employment ratio.

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[19] Between 1997 and 2012, Newfoundland and Labrador, and to a small extent New Brunswick, realized falls in the size of their working-age populations. Part of the reason for the rise in the employment ratio in these provinces was therefore due to a decline in the size of the working-age population. Our data show that over this period, the fall in working-age population accounted for about five of the 17-percentage-point rise in the employment ratio in Newfoundland and Labrador. The fall in working-age population accounted for even less of the rise in the employment ratio in New Brunswick. In all other provinces the rise in the employment ratio occurred despite growth in the size of the working-age population.

An interesting story for central Canada is the upward trend in Quebec's employment ratio, from 59 per cent in 1976 to 72 per cent in 2012. Quebec has caught up to Ontario on this measure after lagging Ontario by nearly eight percentage points in 1976.

The fall in the coefficient of variation in provincial employment ratios is therefore due to the steady rise in employment ratios in the Atlantic provinces, Quebec, Manitoba and Saskatchewan, toward the more or less constant but high levels maintained in Alberta, Ontario and British Columbia.

CONCLUSION

We noted in the introduction that a recession in Canada is unlikely to have the same effects in all regions of the country and that this is largely due to differences in industrial composition across regions. In a recent paper, Sharanjit Uppal and Sébastien LaRochelle-Côté[20] examine employment changes by industry and show that, while some industries expand during both downturns and recoveries, others not only lose employment during the contraction but fail to fully recover during expansions. Some industries follow a countercyclical pattern of gaining employment during downturns and contracting during expansions. The authors report that these patterns change from recession to recession, suggesting that the nature of the shock causing the downturn is important for determining the response of specific industries.

Our focus is on provincial labour markets as opposed to industries, but our results are consistent with those of Uppal and LaRochelle-Côté; due to differences in industrial composition provincial employment cycles vary from one another in terms of timing, duration and amplitude and these differences vary by the nature of the shock responsible for sparking the recession.

What is the significance of these results? Governments, often at the insistence of voters, tend to respond vigorously to employment fluctuations, particularly at times when those fluctuations are large enough to draw the attention of the media. These "calls for action" are typically aimed at the federal government, which is urged to introduce a national "strategy" or "action plan" to deal with the problem. Economists recognize that this type of response is problematic for a number of reasons. The two main issues are related to how quickly governments can formulate an effective response and how quickly the private economy may recover if left to its own devices. The evidence we present raises another concern: a nationally applied policy response will be appropriate for some regions of the country but inappropriate for others; it will be too weak a response in some areas while being too strong in others; and it will be applied too late in some regions and too soon in others.

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[20] Sharanjit Uppal and Sébastien LaRochelle-Côté, "Employment Changes Across Industries During the Downturn and Recovery," Statistics Canada, April 2013.

These findings suggest that, to be most effective, government policy responses must be targeted in terms of timing, size of response, and when and where they are needed the most. To achieve this with the use of discretionary policy is, to say the least, challenging. It is challenging from an economic perspective because, although employment data becomes available quickly, many months of data are required before one is able to suggest whether they represent the onset of a recession. It takes still longer before there are discernible signs of a downturn deep enough to warrant a policy response. At the federal level, government also faces the political challenge of designing a public policy response that directs spending increases or cuts tax rates to some regions but not to others. Provincial government policy responses offer a potential solution to this last problem, but at this more local level there is a greater propensity for policy "leakages" that dissipate a policy's effectiveness and may exacerbate cycles in other provinces. A provincial government response also presumes that employment cycles are similar in terms of timing, period and amplitude across local labour markets within that province. If they are not — and this is most likely to be true in those provinces large enough that policy leakages are minimized — then provincial policy makers face the same challenges as those at the federal level.

Fortunately, there is a solution to these problems. *Automatic stabilizers* are features of government budgets that cause certain tax revenues and expenditures to change in response to the business cycle in a way that keeps incomes higher than they would otherwise be during a recession.[21] As their name suggests, they operate automatically, in the sense that no decision needs to be made by politicians or bureaucrats; the changes in revenue and spending are guided by legislated rules not by ad hoc decisions. This feature means that automatic stabilizers also work to support incomes immediately and only where and when they are needed. To be most effective, the cost of funding automatic stabilizers needs to be shared so that those living in a region enjoying an expansion of employment during a given period are funding the cost of income supports provided to those losing employment in other regions. This makes cyclically sensitive components of provincial government budgets useful for responding to intra-provincial differences in employment cycles, and makes the federal government's budget particularly useful for addressing interprovincial differences. The design of the regular-benefits portion of the federal government's employment insurance program is particularly well-suited for addressing interprovincial differences in employment outcomes by automatically shifting fiscal stimulus from expanding to contracting regions of the country.

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[21] Automatic stabilizers in federal and provincial government budgets include personal income taxes, social assistance payments at the provincial level, and the federal government's employment insurance program.

While debate continues over the effectiveness of the discretionary fiscal and monetary policies introduced in Canada, the U.S., Europe and elsewhere in response to the 2008-2009 recession, there remains widespread agreement over the merits of automatic stabilizers. Olivier Blanchard, Giovanni Dell'Ariccia, and Paolo Mauro,[22] for example, suggest that designing better automatic stabilizers is one of the most promising ways of improving efforts to stabilize the economy. Interesting recent research suggests that the most effective automatic stabilizers may be those that expand the social safety net and, so, simultaneously satisfy both efficiency and equity concerns.[23] We suggest that Canadian policy makers join this chorus singing in favour of relying more heavily on automatic stabilizers. We believe the results we describe in this paper offer strong incentives to redirect their focus away from discretionary policies and toward well-designed automatic stabilizers.

Finally, we suggest attention be paid to investigating the longer-term trends in provincial employment ratios. Over the past few decades, the economies of Atlantic Canada have undergone a transformation that has seen the percentage of the working-age population employed increase by 12 to 17 percentage points. The employment ratios in those provinces are now nearing the Canadian average and three (P.E.I., New Brunswick and Nova Scotia) have now surpassed the size of the employment ratio in the United States.[24] Similarly impressive is the upward trend in the employment ratio in Quebec and the remarkably steady increases seen in Manitoba and Saskatchewan. On the other hand, the employment ratio in Ontario has remained flat over the past three decades, raising questions about what has happened in that labour market to cause it to stagnate relative to other provinces and for its employment ratio to fall, for the first time, below the Canadian average.

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[22] Olivier Blanchard, Giovanni Dell'Ariccia, and Paolo Mauro, "Rethinking Macroeconomic Policy," *Journal of Money, Credit and Banking* 42, s1 (2010):199-215.

[23] See: Alisdair McKay and Ricardo Reis, "The Role of Automatic Stabilizers in the U.S. Business Cycle," NBER Working Paper No. 19000, April 2013.

[24] Data on the employment ratio in the United States, defined in the same manner as the Canadian data used here, is from OECD Stat Extracts (http://stats.oecd.org).

APPENDIX

Measuring Peaks and Troughs of the Employment Cycle

A monthly observation identifies a **peak** if:

$$Y_t > Y_{t-6},\ Y_t > Y_{t-5},\ \dots\ ,\ Y_t > Y_{t-1},\ Y_t > Y_{t+1},\ \dots\ ,\ Y_t > Y_{t+5},\ Y_t > Y_{t+6}$$

where Y_t is the ratio of employment to working-age population in month t. Y_t is calculated as a three-month moving average of seasonally adjusted employment, divided by the three-month moving average of working-age population.

In a similar way, a monthly observation identifies a **trough** if:

$$Y_t < Y_{t-6},\ Y_t < Y_{t-5},\ \dots\ ,\ Y_t < Y_{t-1},\ Y_t < Y_{t+1},\ \dots\ ,\ Y_t < Y_{t+5},\ Y_t < Y_{t+6}$$

When application of this procedure produces two or more consecutive peaks, the peak with the higher value of employment is selected. Similarly, when applying this procedure produces two or more consecutive troughs, the trough with the lower value of employment is selected.

We restrict that a full cycle — consisting of an expansion and a contraction — must have a minimum duration of 12 months, with each phase (either a contraction or an expansion) lasting at least six months.

We require that, to be identified as a trough, an observation must be such that the absolute value of the change in the employment rate, since the previous peak, is at least two standard deviations above the mean change in the employment rate for that province. Thus, in identifying a peak or a trough, we seek to ensure the resulting contraction or expansion is of moderate to significant amplitude.

The Cumulative Loss Function

The diagram below represents a stylized representation of a fall in the employment ratio from its peak (EMR_P) to its trough (EMR_T). In this example, the adjustment of the employment ratio from its peak to its trough value (EMR_T) takes three periods (months). The red line connects the observed values of the employment ratio identified by the blue dots.
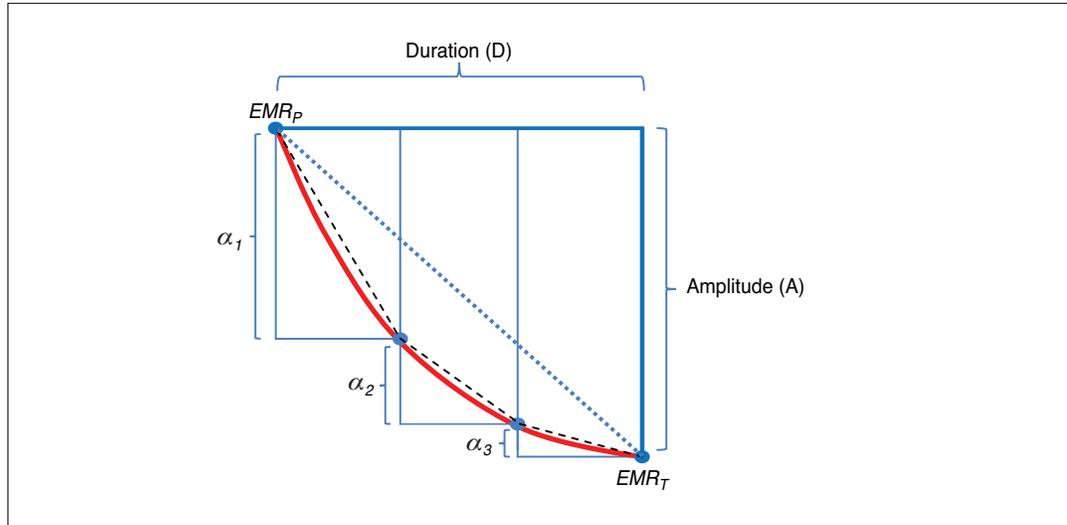
A simple measure of the cost of recession is the area of the triangle made by drawing the dotted line joining EMR_P to EMR_T and is measured by the area ½ AD. This approximation excludes the area between the dotted line and the red curve and, so, depending on the curvature of the red line, can significantly underestimate the measure of loss. The measure of cumulative loss can be improved by measuring the sum of the areas of the three rectangles:

$$\sum_{i=1}^{3}(EMR_i - EMR_p)$$

adjusted to remove the areas of the three triangles defined by:

$$\frac{1}{2}(\alpha_1 + \alpha_2 + \alpha_3) = \frac{1}{2}A \ .$$

(The base of each rectangle and each triangle is one unit.) The curvature of the red line will again determine the accuracy of this improved approximation. In the diagram, our approximation excludes the area between the curved red line and the straight dashed lines and so, again, understates the loss, though by clearly a smaller amount than is the case using the simpler method.

About the Authors

Ronald Kneebone is a Professor of Economics and Director of Economic & Social Policy in The School of Public Policy, both at the University of Calgary. His published research has dealt with issues pertaining to the political economy of government deficit and debt reduction, the history of government fiscal and monetary relations in Canada and the characteristics of Canadian federal, provincial and municipal fiscal policy choices. More recently, his research has examined issues pertaining to the problem of homelessness and income support for persons with disabilities.

Margarita Gres earned an MA in Economics from the University of Calgary in 2011. Her MA thesis investigated the role of the Canadian federal budget in providing fiscal insurance to provincial economies experiencing idiosyncratic shocks; an issue that has recently gained prominence in discussions of the future viability of the European Union. Gres joined The School of Public Policy at the University of Calgary as a research associate in October 2012.

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