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Summary of: The Impact of Macroeconomic Conditions on the Instability and Long-Run Inequality of Workers' Earnings in Canada

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I. Introduction

In the 1980s and 1990s, Canada's labour market was influenced by increasing integration with the U.S. economy, the rapid advance of information technology, 'out-sourcing' and non-standard work patterns, fluctuating natural resource prices, increased competition and worker vulnerability, and high immigration. On a macroeconomic level, the economy recovered slowly from the recession of the early 1990s. Some of these developments might be expected to have an impact on the distribution of labour market earnings across workers. Indeed, strictly cross-sectional analyses have shown that earnings inequality increased significantly in Canada in the 1990s.[1]

Understanding the patterns of earnings instability and long-run earnings differences is of economic and policy interest. Increased earnings instability over time, stemming from out-sourcing, industry and workplace restructuring, greater use of contingent and non-standard employment arrangements, declining private-sector unionization rates, volatile primary good prices, or changing occupational demand, indicates an increase in worker vulnerability, as examined by Chaykowski (2005), and in economic insecurity, as discussed by Osberg (1998) and measured by Osberg and Sharpe (2002), and a policy focus on social insurance and capital market imperfections. Increased variability in long-run earnings differentials across workers is related to lifetime earnings patterns, which is closely associated with long-run earnings inequality. This is affected by human capital attainment, long-run labour force participation and work patterns, evolving industry/occupational mix in the economy, and shifting returns to skills and cohort effects that speak to a largely different set of policy issues involving skill, matching, and access to training and efficient usage of such human capital.

This paper builds on our previous work (Beach, Finnie and Gray, 2003), which presented how overall earnings variation showed a structural shift over the 1990s compared to the 1980s. Applying a variance decomposition approach (Gottschalk and Moffitt, 1994) to the Longitudinal Administrative Database (LAD), the present paper examines the variability of workers' earnings in Canada over the 1982–1997 period, showing how earnings variability varied in terms of the unemployment rate and the real gross domestic product (GDP) growth rate; it provides benchmark results on the earnings variability experience of women as well as men, for a broader sample of labour market participants than is regularly employed.

II. The data file and the estimation samples

The data set is Statistics Canada's Longitudinal Administrative Database (LAD) file—a 10% representative sample of all Canadian income tax filers, containing over 1.5 million records per year. The measure of earnings is total annual wage and salary income (henceforth "earnings") as reported on individuals' tax forms. The estimation samples include all paid workers age 20–64 who were not full-time students during the tax year, who received at least $1,000 (in 1997 constant dollars) of earnings, whose earnings exceeded any net self-employment income, and who reported at least two years of above-minimum earnings.

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1. For evidence based on various data sets, a non-exhaustive list of references includes Beach and Slotsve (1996), Burbidge, Magee, and Robb (1997), Heisz *et al.* (2002), Picot (1997), Richardson (1997), and Wolfson and Murphy (1998).

To compare the two decades, we identify two estimation samples: 1982–1989 and 1990–1997. A Broad Estimation Sample (BES) includes any worker-year record that satisfies the inclusion criteria that $2<T_i<8$, where T_i indicates the number of years during which worker i was in the sample during the sub-period. In a Narrow Estimation Sample (NES), a sub-sample of the BES, persons report above-minimum earnings in *each year* of the relevant sub-period. So there are four separate estimation samples for each gender: BES and NES for 1982–1989 and 1990–1997. The estimation samples involve breakdowns by age: 'Entry' (20–24 years), 'Younger' (25–34 years), 'Prime' (25–54 years), and 'Older' (55–64 years). This allows us to examine separate earnings variability patterns over different phases of the life-cycle.

The two sub-periods have similar business coverage.[2] The first, 1982–1989, begins at the end of the 1980–1982 recession and includes the subsequent expansion; the second, 1990–1997, includes the 1990–1992 recession and the following growth period.

There are major differences in earnings outcomes between the BES and the NES samples (Beach, Finnie and Gray, 2003). The BES median earnings levels are noticeably lower than the NES figures, and the ratio of the BES median earnings to NES earnings declined between 1982 and 1997. For both genders, earnings inequality is much greater in the BES than the NES samples. The BES results also show a sizeable increase in earnings inequality, especially for men, in contrast to a slight decrease for the NES.

III. *Variance components by region and time period*

Decomposition is carried out for each age/sex group, time period, and region. In the results by age and sex (Beach, Finnie and Gray, 2003), the breakdown in the total variation is approximately one-third for the transitory component and two-thirds for the permanent component. The significant rise in earnings variability for men is driven primarily by the permanent component; a secondary factor is the increased volatility of workers' earnings about their life-cycle earnings profiles. For women, this latter effect is small, even working to reduce overall earnings variability in some age groups.

As these results are based on *longitudinal* data, the three variance terms differ from conventional inequality or dispersion estimates calculated from cross-sectional data. The latter incorporates long-run earnings differences related to skill levels and work activity across workers, and to transitory differences associated with short-run fluctuations in earnings, at a given point in time,

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2.   The two intervals over which our variances are calculated both span 8 years, and exhaust the entire LAD sample until 1997. They do not, however, reflect identical phases of the business cycle. Given that the macroeconomic conditions were somewhat different during the two time periods, it is possible that the trend effect we attempt to discern between time periods may be confounded with business cycle effects. To address this, we examined the robustness of our calculations of the variances to a change in the time intervals. The buffer years of 1989 and 1990 were omitted, so that the two time periods become 1982–1988 and 1991–1997. This omission generates two intervals each spanning 7 years. Both time periods commence near the trough of a business cycle and end six years into an expansion phase. The resulting changes in earnings variability between the earlier and the later periods (expressed in percentage terms) are slightly larger in the shortened intervals compared to the full intervals of 1982–1989 and 1990–1997. Nevertheless, the signs and the relative magnitudes of the changes over time are quite robust to the change in intervals over which the variance components are calculated. This pattern is consistent with the conjecture that there is a secular trend of increasing earnings variance over time. As the gap between time periods widens (from no gap between adjacent intervals of 1982–1989 and 1990–1997 to a hiatus of 2 years), the contrast between their measures of dispersion is enhanced, suggesting that the business cycle phase is not driving our primary results.

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and the total variance calculated from longitudinal data also incorporates both components, and is the measure most comparable to cross-sectional estimates. However, we use longitudinal data to break out the components. The transitory variance picks up year-to-year deviations in earnings about a life-cycle earnings trajectory and hence estimates earnings *instability*. The permanent variance picks up differences across workers in the average height of their life-cycle earnings trajectories and provides an estimate of *long-run inequality* of earnings.

All three variance terms are higher in the BES sample than in the NES one, as the BES includes workers with relatively low and unstable earnings patterns. But the relative importance of the permanent and transitory components is similar: about two-thirds for the former and one-third for the latter. Variance terms are generally larger for women, but the relative importance of the two variance components remains similar for both genders.

Results indicate that overall earnings variability increased between 1982–1989 and 1990–1997, and the increase was largely confined to men. The greater part of the increase (especially for men) was driven by widening long-run earnings inequality. For men, increased instability of earnings played a secondary role in the overall earnings variance increase; for women, earnings instability decreased substantially, and long-run inequality widened, though only about half as much as for men. As a result, the gap in earnings variances between women and men noticeably declined over this period.

Regional differences are also apparent. Overall earnings variance is the highest in the Atlantic region, followed by Quebec and Alberta (and British Columbia in the BES sample); it is lowest in Manitoba-Saskatchewan and Ontario (for some sub-samples). Long-run earnings inequality is most important in Atlantic Canada, and least so in British Columbia, Ontario and Alberta. Increases in earnings variability among men were greatest in Ontario and Quebec, which experienced severe recessions in the early 1990s and whose manufacturing base experienced substantial restructuring and changing trade patterns. Again, increases in long-run earnings inequality drove the results.

IV.   *Net effects of time shift, age and region*

We categorize the estimating samples into age/sex groups crossed with geographical region to generate a finer breakdown to which multivariate regression can be applied. As there are four age groups for each time period within each of the six regions, 48 cells are generated. In both genders, and in both the BES and the NES samples, the Atlantic provinces show a significantly higher net earnings variance (relative to Ontario), with smaller net positive effects for British Columbia and Alberta, and slight negative effects for Manitoba and Saskatchewan.

Total earnings variance varies with age, more significantly so for men, with the youngest and oldest workers experiencing the highest variances. Among women, total earnings variance generally increases with age, but the differences are generally smaller than those for men. The permanent variance component tends to increase with age, as earnings differentials generally widen over the life cycle, but the earnings instability component tends to decline with age, since job mobility decreases as workers get older, with the exception of older men.

V. *Macroeconomic effects on earnings inequality and instability*

In the next set of regressions, 12 equations are estimated consisting of 3 dependent variables (one for each variance measure) for 4 samples (male BES, male NES, female BES, female NES). The provincial binary variables are replaced by variables reflecting the macroeconomic conditions in each region during each interval: the average unemployment rate, and the rate of real GDP growth. For Canada as a whole, real GDP increased by 31.7% over 1982–1989 and 15.8% over 1990–1997. Ontario had the highest growth rate in the first period (41.0%[3]), Alberta in the second (32.8%). Manitoba and Saskatchewan had the slowest growth in the first period (20.9%), the Atlantic region in the second (9.2%). Ontario led in employment growth over 1982–1989 at 23.6%, but fell to 2.4% over 1990–1997. Quebec was similar, at 18.3% and 1.7%, respectively, but British Columbia experienced employment growth of 20.5% in the first period and 20.2% in the second. While unemployment rates remained high in both periods in Atlantic Canada and Quebec, they rose from averages of 7.5% to 9.1% between periods in Ontario, but declined from 9.3% to 7.9% in Alberta, and from 12.4% to 9.1% in B.C.

VI. *Regression results with macroeconomic indicators*

In the results for the regression equations, including the average unemployment rate and the real GDP growth rate, the age and time-shift effects are similar to those already discussed. For continuous variables such as the macroeconomic indicators, sensitivity is often better represented by elasticities, as presented in Table 1. All three variance measures are more sensitive to fluctuations in the unemployment rate than to changes in the GDP growth rate. This shows up more for men than for women, which is consistent with men being more concentrated in the cyclically sensitive primary, manufacturing, and transportation/construction sectors. The macroeconomic effects on transitory earnings variance or earnings instability occur as expected from conventional labour market arguments. Good economic times are associated with more stable employment patterns, so that earnings instability is reduced; more for men than for women and more within the BES sample, which includes more irregular or intermittent workers. Reduced unemployment rates and thus tighter labour markets also reduce earnings instability, again more for men than for women because of the generally more cyclical nature of the sectors in which men are more concentrated. But this effect is stronger in the more homogeneous NES sample than in the BES sample. This suggests that workplace restructuring during the early 1990s recession applied at least as much to higher-wage jobs of workers fully attached to the labour market as to relatively low-wage jobs and those only intermittently attached to the labour market.

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3. All figures from Statistics Canada (2003): 105, 109.

Table 1: Elasticities for unemployment rates and real GDP growth rates

	Men			Women		
	Total variance	Transitory variance	Permanent variance	Total variance	Transitory variance	Permanent variance
Broad Estimation Sample (BES)						
UR	0.1195*	0.1714*	0.0437	0 .1179**	0.0382	0.1192**
GR	0.0159	-0.0440**	0.0386**	0.0262**	-0.0303*	0.0468**
Narrow Estimation Sample (NES)						
UR	0.3221**	0.3092**	0.3464**	0.2420**	0.1009	0.3067**
GR	0.0451**	-0.0258	0.0766**	0.0550**	-0.0212	0.0878**

Note: ** (*) denotes statistical significance at the 1% (5%) level. UR is an abbreviation for the unemployment rate, and GR is the measure for real growth in GDP.

Gross results and conventional economic theory suggest that in periods of prosperity and economic expansion, wage differentials narrow and low-skilled lower-wage workers disproportionately benefit from tighter labour markets. Thus, earnings inequality should attenuate. On the other hand, in periods of slow growth and economic recession the opposite should happen. These effects should be stronger in the more heterogeneous BES sample than in the NES. And in fact, slower growth over the 1990–1997 period is associated with increases in both permanent and total variance measures. But in Table 1, we observe *positive* effects of GDP growth on permanent variance or long-run inequality across workers and on total variance; these effects are substantially larger in the NES than the BES samples and slightly larger for women than men; all four effects are individually highly statistically significant.

Two explanations of the growing inequality in earnings are: 1) globalization, out-sourcing, and international trade; and 2) skill-biased technological change. These "I.T." hypotheses (Katz and Autor, 1999; Beach, 2004) may affect economic restructuring and workplace reorganization. If such restructuring occurs more in the high-growth and manufacturing-oriented regions of the country, this would explain the widening degree of earnings inequality associated with more high-growth regions, and the positive coefficients of GR on permanent variance in Table 1, as well as why the effects are operating more strongly in the NES sample workplaces than the BES. Adjustment to the "new economy" may happen faster in the high-growth and manufacturing-oriented provinces. If so, this calls for a general re-examination of the arguments for macroeconomic effects on earnings inequality.

VII. Simulation exercise of an economic recovery

There is a strong positive correlation between growth in real GDP and labour market tightness. It makes sense, therefore, to examine the unemployment rate and the GDP growth rate effects *jointly* through a simulation exercise incorporating the above macroeconomic effects. Our scenario uses economic recovery conditions characterized by a one standard deviation increase in the real GDP growth rate (+0.32) combined with a one standard deviation reduction in the unemployment rate (-2.4). The latter effect reduces all variance components; the former has opposing effects on the long-run inequality and the earnings instability components. For the signs of the effects of the percentage changes in the variance components, see Table 2.

Table 2: Macroeconomic prosperity effects on earnings: Total variance and components

Sub-sample	Variance component	Independent effect of unemployment rate	Independent effect of real GDP growth	Joint effect of macro prosperity	Total effect of macro prosperity on total variation
NES males	permanent	positive	positive	negative	negative
	transitory	positive	negative	negative	
BES males	permanent	positive	positive	positive	negative
	transitory	positive	negative	negative	
NES females	permanent	positive	positive	positive	negative
	transitory	positive	negative	negative	
BES females	permanent	positive	positive	positive	negative
	transitory	positive	negative	negative	

Except for NES men, the long-run inequality of earnings (the permanent component) increases with economic prosperity because of the dominance of the GDP growth effect. In contrast, the instability of earnings (the transitory component) is reduced with economic prosperity because of the strong unemployment rate effect combined with the negative growth effect on instability. The joint macroeconomic prosperity effect is stronger on the instability of earnings than on long-run inequality; this holds for both genders and both the NES and the BES samples. And given a climate of macroeconomic prosperity, the reduction in earnings instability dominates the increase in long-run inequality of earnings, generating a net reduction of total variance with greater economic prosperity, even though the share of the permanent component within the total variance is greater. Thus, favourable macroeconomic performance reduces the overall variation of earnings, despite the opposing effects on its two components; it also reduces the ratio of transitory to permanent variance and increases the ratio of permanent to total variance.

VIII. Conclusions

Results indicate an increase in overall earnings variability between 1982–1989 and 1990–1997, largely confined to men. This increase was driven by widening long-run earnings inequality. Increased instability of workers' earnings played a secondary role in the overall increase in men's earnings variability; for women this change was small or, in some age groups, worked to reduce women's overall earnings variability. As a result, the gap in earnings variances between women and men has declined.

In addition, unemployment rates and real GDP growth rates have statistically significant effects on total earnings variability and its two components, with the unemployment rate having much stronger effects in terms of elasticities. The pattern of unemployment rate and GDP growth rate effects on earnings instability are consistent with conventional cyclical labour market arguments: unemployment and earnings instability increase in recessions and decrease in expansions. But the estimated growth rate effect on long-run earnings inequality does not fit conventional arguments, being associated with economic restructuring and workplace reorganization in response to changing trade patterns and information-based technological change.

Finally, when unemployment rate and GDP growth rate effects are considered jointly, macroeconomic improvement reduces the overall variability of earnings, as the reduction in earnings instability outweighs the general widening of long-run earnings inequality across workers.

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