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THE GROWTH OF EARNINGS INEQUALITY IN CANADA

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EXECUTIVE SUMMARY

Inequality in weekly earnings increased in the eighties in Canada. The growth in inequality occurred in conjunction with three facts. First, real hourly wages of young workers dropped more than 10 %. Second, the percentage of employees working 35-40 hours per week in their main job fell and the fraction of employees working 50 hours or more per week rose. Third, there was a growing tendency for highly paid workers to work long work weeks. We argue that any set of explanations of the increase in weekly earnings inequality must reconcile these three facts. Sectoral changes in the distribution of employment by industry and union status explain roughly 30 % of the rise in inequality. The reduction in real minimum wages and the decline of average firm size explain very little of the growth in age-earnings differentials. Skill-biased technological change could have increased both the dispersion of hourly wages and the dispersion of weekly hours of work and thus, is consistent a priori with the movements observed. Yet other factors may have played an important role. The growth in competitive pressures, possible shifts in the bargaining power (between firms and labour) towards firms, the greater locational mobility of firms, the increase in Canada's openness to international trade, and the rise in fixed costs of labour may be major forces behind the growth in weekly earnings inequality in Canada. Whatever these factors are, they increased the dispersion of lifetime earnings as well as the dispersion of annual earnings.

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1. INTRODUCTION

Most of the explanations which have been put forward so far to explain the growth in inequality in annual earnings in the United States centre around the growing dispersion of either weekly wages (e.g. Katz and Murphy 1992), hourly wages (e.g. Bound and Johnson 1992; Murphy and Welch 1992) or both (e.g. Juhn, Murphy and Pierce 1993). Little attention has been paid to the potential influence of changes in the distribution of hours of work. While previous Canadian studies have documented the growth of inequality in annual earnings (Burbidge et al. 1993; Beach and Slotsve 1994; Morissette, Myles and Picot 1994, henceforth MMP; Richardson 1996) or examined changes in the distribution of annual hours (Picot, Myles and Wannell 1990; Macphail 1993; Doiron and Barret 1994; MMP 1994), none of them has analysed extensively changes in the distribution of hourly wages, weekly hours and weekly earnings in Canada during the 1980s¹. This is the first goal of this paper.

While the aforementioned studies have shown that inequality in annual earnings has risen in the eighties, whether inequality in lifetime earnings has increased remains unknown. If low earners enjoyed greater upward mobility and high earners experienced greater downward mobility in the eighties than in the seventies, long-term earnings inequality may have remained unchanged. Is this the case? The second goal of this paper is to answer this question.

Using data from the 1981 Survey of Work History, the 1984 Survey of Union Membership, the 1986-90 Labour Market Activity Surveys, the 1993 Survey of Labour and Income Dynamics and the 1995 Survey of Work Arrangements, we show that inequality in weekly earnings increased in the eighties in Canada. The growth in inequality occurred in conjunction with three facts. First, real hourly wages of young workers dropped more than 10%. Second, the percentage of employees working 35-40 hours per week in their main job fell and the fraction of

employees working 50 hours or more per week rose. Third, there was a growing tendency for highly paid workers to work long work weeks. We argue that any set of explanations of the increase in weekly earnings inequality must reconcile these three facts. We then show that : 1) sectoral changes in the distribution of employment by industry and union status explain roughly 30 % of the rise in inequality in weekly earnings, 2) the reduction in real minimum wages and the decline of average firm size explain very little of the growth in age-earnings differentials and 3) changes in marginal tax rates cannot explain the growing propensity to work 50 hours or more per week.

Recent U.S. studies on earnings inequality (e.g. Bound and Johnson, 1992; Katz and Murphy, 1992) have argued that skill-biased technological change is the major cause of the changes observed in the structure of wages. The polarization of weekly hours of work, which is observed **both** in Canada and in the United States, suggests that other factors, such as the growth in competition induced by international trade or by the greater locational mobility of firms, possible shifts in the bargaining power (between firms and labour) towards firms, and increases in fixed costs of labour resulting from higher payroll taxes may have played an important role in Canada.

Using longitudinal data from the T-4 supplementary tax file, we show that, during the eighties, inequality in earnings cumulated over 10 years rose roughly at the same pace as inequality in annual earnings. Thus the growth of annual earnings inequality has led to a growing dispersion of lifetime earnings.

The paper is organized as follows. First, we define the data sources and concepts used in this paper (section 2). Next, we show that the growth in the dispersion of weekly hours of work and in the correlation between hourly wage rates and weekly hours account for most of the increase in weekly earnings inequality in

Canada (section 3). Hourly wage differentials across age groups and education levels are examined in section 3. In section 4, we examine several explanations for the rise in weekly earnings inequality in Canada. We then show that long-term earnings inequality rose in the eighties (Section 5). Concluding comments follow in section 6.

2. DATA AND CONCEPTS

To examine the role of weekly hours of work and hourly wage rates in explaining the rise of inequality in weekly earnings in Canada over the last decade, we use the 1981 Survey of Work History (SWH), the 1984 Survey of Union Membership (SUM), the 1986-1990 Labour Market Activity Surveys (LMAS), the 1993 Survey of Labour and Income Dynamics (SLID) and the 1995 Survey of Work Arrangements (SWA). These special surveys are the only Canadian surveys which include data on both weekly hours and hourly wage rates **at the job level** and thus which can be used to address this issue. The Labour Force Survey (LFS) does not include hourly wage rates but contains data on weekly hours worked. It can be used to examine trends in the distribution of weekly hours over the period 1976-1995 and to assess whether these trends conform to those found for the period 1981-1995 using SWH-SUM-LMAS-SLID-SWA.

Ideally, we would like to restrict our attention to individuals who are already in the labour market, i.e. who previously made a transition from school to work.

Contrary to LFS, SWH does not distinguish individuals who are full-time students from other individuals. Since SUM is restricted to individuals who are paid workers in the main job they held in **December** 1984, we must select individuals who are paid workers in the main job they held during that specific month.

Furthermore, weekly hours worked are top coded at 99 in SUM. Because of these three restrictions, the sample selected whenever we use SWH-SUM-LMAS-SLID-

SWA consists of paid workers aged 17 to 64, who were working 98 hours or less per week in the main job they held in December ². In contrast, whenever we use LFS, the sample consists of individuals aged 15 to 64, who are not full-time students and who were working 98 hours or less in the main job they held in September. Weekly earnings, weekly hours worked and hourly wage rates are those associated with the main job. The main job is the one with the greatest number of hours usually worked per week ³. Following most of the U.S. literature, we restrict our attention to male workers.

To examine whether long-term earnings inequality has risen, we take advantage of a unique data set. We use longitudinal data from Revenue Canada's T-4 Supplementary tax file. This file covers the period 1975-1993 and contains a 1% sample of all workers who received at least one T-4 supplementary form during this period.

3. INEQUALITY IN WEEKLY EARNINGS : 1981-1993

The gap between low and high wage earners widened during the eighties (Table 1). While average real weekly earnings among men at the bottom quintile fell 4% between 1981 and 1988 - two years in which the unemployment rate averaged 7.5% and 7.8%, respectively - they rose 5% among men at the middle quintile and 9% among those at the top quintile ⁴.

The widening of the gap (as measured by average real weekly earnings) between the top quintile and the bottom quintile is associated with diverging growth in both weekly hours worked and hourly wage rates. Between 1981 and 1988, average weekly hours worked by men in the top quintile rose from 42.6 to 45.0 while those worked by men in the bottom quintile fell from 32.8 to 30.9. Moreover, while real

hourly wages of men in the bottom quintile remained virtually unchanged, those received by men in the top quintile increased by 3.9%.

The growth of weekly hours in the top quintile seems to be interrupted between 1990 and 1993. While the Labour Market Activity Survey of 1990 indicates that men in the top quintile worked 45.1 hours per week, the Survey of Labour and Income Dynamics of 1993 suggests a corresponding figure of 42.8, close to that of 1981. Did weekly hours in the top quintile really fall back to their 1981 value after rising during the eighties ? We do not think so for three reasons. First, while LMAS tends to overestimate the number of hours relative to the Labour Force Survey by 0.4 to 0.8 hours, SLID underestimates weekly hours relative to LFS by 0.7 hours (Appendix 1). As a result part of the decrease observed between 1990 and 1993 may be due to the fact that SLID underestimates weekly hours relative to LMAS. Second, 27% of the individuals initially selected in the SWA sample in 1995 did not report their wages. These individuals tend to be older and slightly more educated - and thus are likely to have longer weekly hours, higher hourly wages and higher weekly earnings - than those who did report their wages ⁵. Because the numbers presented in Table 1 for 1995 refer to the latter group, the estimates of weekly hours are expected to be biased downwards. Despite that, weekly hours at the top quintile amount to 43.9 in 1995 and thus are still higher than in 1981. Third, using data from the Survey of Consumer Finances, we show in Appendix 1 that weekly hours in the top quintile rose between 1981 and 1993. Taken together, these three points suggest that weekly hours of highly paid workers did rise in the eighties and did not come back to their 1981 level by 1993.

In Figure 1, we compare the variance of log weekly earnings resulting from SWH-SUM-LMAS-SLID to that derived from the Survey of Consumer Finances. While there are some differences, both sets of numbers indicate that inequality in weekly earnings rose between 1981 and 1989 and then grew further between 1989 and

1993⁶. The first panel of Table 2 presents trends in the variance of log weekly earnings, log weekly hours, log hourly wages and in the covariance term. Between 1981 and 1988, the variance of log weekly earnings increased by 16 %. In contrast, the variance of log hourly wages, while sensitive to cyclical conditions, shows little change ; it rose only 2% between these two years. Most important, the covariance between log weekly hours and log hourly wages more than doubled between 1981 and 1984, i.e. right after the 1981-82 recession. It then remained at relatively high levels through the eighties.

The second panel of Table 2 assesses how much of that increase in inequality in weekly earnings is accounted for by : 1) changes in the dispersion of weekly hours, 2) changes in the dispersion of hourly wage rates and 3) changes in the covariance between these last two variables. Three points are worth noting for the eighties. First, for periods with roughly comparable unemployment rates (i.e. 1981-1988, 1981-1989) changes in the dispersion of hourly wages explain at most 11% of the growth of inequality in weekly earnings. Second, changes in the dispersion of weekly hours play an important role. They account for roughly one third of the rise in inequality in weekly wages. Third, the increase in the correlation between weekly hours worked and hourly wages rates is the dominant factor ; it accounts for at least half of the increase in inequality. These numbers differ sharply from those derived from Burtless (1990) for the United States. The data from the March Current Population Survey (CPS) suggest that growth in hourly wage dispersion accounted for 86% of the growth of U.S. weekly earnings inequality between 1975 and 1987 while changes in the dispersion of weekly hours have virtually no effect. This result probably explains why previous U.S. studies have paid little attention to the potential influence of work hours.

Admittedly, part of the differences observed between Canada and the United States may be due to differences in the data sets used. The CPS data on hourly

wages is derived by dividing annual earnings in year t by weeks worked in year t and usual weekly hours worked in year t . As Burtless (1990, 110) points out, “respondents are asked to report their usual weekly hours, so their answers will not reflect variations in hours over the course of the year. As a result, some of the variability in annual earnings that ought properly to be attributed to hours will be attributed to wage rates instead”. Our data on hourly wages and weekly earnings is derived by dividing earnings reported for the main job by the number of hours worked in the relevant time interval in that job. Our concept of hours consists of usual weekly hours worked in the main job. These may vary over the course of the year as well. Thus the impact of the aforementioned differences is not clear.

We acknowledge the possibility that the dispersion of hourly wages may have risen more between 1981 and 1988 than SWH and LMAS suggest. The reason is that fewer men reported their earnings on an hourly basis in 1981 (35%) than in 1988 (53%). If individuals who report their earnings on an hourly basis give more accurate answers than the others, this could tend to decrease the variance of reported earnings and thus the variance of hourly wages in 1988, compared to 1981^{7 8}. If this were the case, the contribution of hourly wages to the growing dispersion of weekly earnings may be higher than that found in Table 2⁹.

Our main point, however, is not so much that changes in the dispersion of hourly wages do not matter. As will be shown below, substantial changes in real wages across age groups and moderate changes in wage differentials across education levels took place in the eighties. Our point is that the growing dispersion of weekly hours and the growing correlation between weekly hours and hourly wages - two factors for which little attention has been paid in the U.S. literature - do matter in Canada and are not due to consistency problems between the special surveys¹⁰. Using data from the Labour Force Survey and the Current Population Survey - which provide a consistent time series on usual weekly hours - we show in Figure

2 that the dispersion of weekly hours did increase in the eighties both in Canada and in the United States ¹¹. Using data from the Survey of Consumer Finances, we have shown in Appendix 1 that highly paid workers did increase their weekly hours in the eighties in Canada.

4. RELATIVE WAGE RATES

The small changes in the dispersion of hourly wages registered at the aggregate level suggest that little action has taken place in the distribution of hourly wages during the eighties. This is misleading. While real hourly wages of males aged 35 or more rose by at least 5% between 1981 and 1988, those of men aged 17 to 24 fell by more than 10% (Figure 3). The decline of youth relative wages is widespread ; it is observed for all education levels, in all major industrial and occupational groups (Betcherman and Morissette, 1994).

This increase in hourly wage differentials between age groups is consistent with the rise in weekly/annual wage differences across age groups found in previous studies using data from the Survey of Consumer Finances (e.g. Beach and Slotsve, 1994 and MMP 1994). A more contentious issue is whether wage differentials between education levels have increased. Freeman and Needels (1991) find that the wage gap between university and high school graduates rose during the eighties, but not as much as in the United States. Focusing also on university and high school graduates, Bar-Or et al. (1993, 1) find that "while there appears to have been a decline in the returns to education in the 1970's [...], the return to a university degree did not rebound much during the 1980's ...". Beach and Slotsve (1994) consider all education levels and find that education differentials rose for men employed full-time full year, especially among university graduates.

All three studies, which use data from the Survey of Consumer Finances, measure either annual wages of full year full-time workers (Bar-Or et al. 1993 ; Beach and Slotsve 1994) or both annual and weekly wages of all earners (Freeman and Needels 1991) ¹². Ideally, the issue of whether pay rates have diverged across education levels over the last decade should be addressed using data on hourly wage rates. Secondly, none of these studies controls for workers' differences in industry affiliation or union status ¹³. As is well known, hourly wage rates differ widely across industries (Krueger and Summers 1988) and between unionized and non unionized jobs (Freeman 1984). Thirdly, both Freeman and Needels (1991) and Bar-Or et al. (1993) restrict their attention to university and high school graduates, potentially neglecting changes in the education premium for other education levels.

To deal with these three issues, we estimate a hourly wage equation with the following vector of regressors : 1) one dummy for marital status, 2) four age dummies, 3) four education dummies, 4) sixteen interaction terms between age and education level, 5) 7 industry dummies, 6) one dummy for union status, 7) one dummy for full-time/part-time jobs and 8) four region dummies ¹⁴. This flexible specification allows us to look at the education differentials both within age groups and within industries. It also takes account of the impact of unions in wage setting. We run these regressions for 1981 and 1988.

The results of these regressions are presented in Table 3. For all age groups, the ratio of hourly wages of **university graduates** to those of individuals with **9-13 years of schooling** has either increased or shown little change. It has risen by more than 10 percentage points among men aged 35-44 and 55-64 ¹⁵ but has remained unchanged among men under 35 and has displayed little variation among those aged 45-54. Changes in the education premium occurred in other education levels as well. Among workers aged 25 or more, hourly wages of individuals with

elementary schooling either fell or showed little change relative to those of individuals with 9-13 years of schooling. As a result, the ratio of hourly wages of **university graduates** to those of individuals with **elementary schooling** has widened by at least 10 percentage points among all workers except men aged 45-54 and those aged 17-24. Hence, at least for men aged 25 or more, the evidence does suggest that wage differences between education levels have grown in the eighties.

5. WHY HAS INEQUALITY IN WEEKLY EARNINGS INCREASED IN CANADA ?

In our view, any set of explanations of the increase in inequality in weekly earnings must reconcile the three following facts : 1) real hourly wages of young workers fell substantially between 1981 and 1986 and never returned to their pre-recession level afterwards ; 2) the dispersion of weekly hours worked rose with the onset of the 1981-82 recession and - at least for men- never returned to its pre-recession level; 3) the correlation between hourly wage rates and weekly hours worked increased after 1981 and never returned to its pre-recession level.

Most of the explanations which have been put forward so far to explain the growth in inequality in annual earnings in the United States refer implicitly to the growing dispersion of either **weekly** wages (Katz and Murphy 1992) or **hourly** wages (Murphy and Welch 1992). Little attention has been paid to the potential influence of changes in the distribution of weekly hours of work. In this section, we first review various explanations based on inequality in either weekly or hourly wage rates. Since inequality in hours worked play also an important role, we then ask why the distribution of weekly hours worked has changed in Canada.

5.1 Explanations based on the growing dispersion of weekly or hourly wage rates

De-industrialization and de-unionization

The de-industrialization hypothesis assumes that the distribution of employment shifted away from manufacturing and towards a service sector polarized among a set of high wage "knowledge" jobs on one hand and low wage personal service jobs on the other (Bluestone and Harrison, 1982). Such changes in the distribution of employment by industry should lead to an increase in inequality in **hourly wages** at the aggregate level and may explain part of the decline in real wages of young workers. A second argument, the de-unionization hypothesis, points out changes in the relative importance of the unionized sector as a potential determinant of the growth in earnings inequality (Freeman, 1991). More precisely, because the dispersion of hourly wages is greater in non unionized jobs than in unionized jobs, any decrease in unionization should induce growth in hourly wage inequality.

There are three reasons why de-industrialization and de-unionization are unlikely to explain most of the growth in weekly wage inequality in Canada. First, the changes in the dispersion of weekly hours worked and the growth in the correlation between wages and weekly hours - two important sources of growth in weekly wage inequality - are observed within most industries and within both unionized and non-unionized jobs (Morissette 1995). Second, the decline in unionization has been much less pronounced in Canada than in the United States ¹⁶. Third, most of the decline in youth relative wages remains even after controlling for industry affiliation and union status (Betcherman and Morissette, 1994). To assess the contribution of de-industrialization and de-unionization, we decompose the growth in weekly earnings inequality into : 1) growth in inequality due to changes in the distribution of employment by sector (or changes in **weights**), 2)

growth in inequality **within** sectors and, 3) growth in inequality **between** sectors. The second panel of Table 4 shows the results of these decompositions. The sectors are defined either separately (columns 1-2) or jointly (column 3) in terms of industry and union status. We perform these decompositions using the Theil-Entropy index and the square of the coefficient of variation¹⁷. For both inequality measures, changes in the distribution of employment by industry only or by union status only account for 22% of the growth in weekly wage inequality among men. Changes in the distribution of employment by industry **and** union status explain 28-30% of the rise in dispersion of male weekly wages. As expected, most of the growth in inequality - i.e. between 55% and 62% of the increase observed between 1981 and 1988 - occurs within sectors defined jointly in terms of industry and union status. Thus, while industrial shifts and changes in the unionization rate are significant, they are not the dominant factors behind the growth of weekly wage inequality.

Skill-biased technological change

A third explanation widely used to understand the growth in earnings inequality in the United States is that technological change has increased the demand for highly skilled workers in the eighties, widening the hourly wage differentials between highly experienced/educated workers and young low-educated workers (Bound and Johnson 1992, Katz and Murphy 1992). While hourly wage differentials between age groups have risen substantially, hourly wage differentials between education levels have not increased as much as in the United States. For instance, among American men with 1-5 years of experience, the ratio of hourly wages of university graduates to hourly wages of high school graduates grew from 1.30 to 1.74 between 1979 and 1989 (Murphy and Welch 1992, 300). In contrast, among Canadian men aged 17-24, that ratio grew from 1.27 to 1.35 between 1981 and 1988. Freeman and Needels (1991) argue that the faster growth of the supply of

university graduates in Canada, the greater strength of Canadian unions, faster growth of real GDP and a better external trade have restricted the widening of the wage differentials between education levels in Canada. Yet even though hourly wage inequality has not risen as much in Canada as in the United States, the evolution of hourly wage differentials between age/education groups appears broadly consistent with the technological change hypothesis¹⁸.

Reduction in real minimum wages

Between 1981 and 1988, real minimum wages fell between 6% and 20 %, depending on the province selected. This may have decreased hourly wages of young workers, increasing hourly wage inequality and thus weekly wage inequality. To assess the extent to which the drop in real minimum wages may explain the decline in real wages of youth between 1981 and 1988, we use a crude procedure. We inflate by 20% wages of young workers which were - in 1988 - equal to or below \$4.75, i.e. the highest minimum wage observed that year and imposed both in Quebec and Ontario. We then recalculate the 1988 hypothetical mean hourly wage resulting from this adjustment. When this is done, real hourly wages of young men fall by 15.2% between 1981 and 1988 ; during that period, they actually fell 16.1%. Real hourly wages of young women drop 10.6%, which is very close to the observed decrease of 12.0%. While the procedure outlined above does not take account of potential indirect wage increases which might have been observed among young workers paid **above** minimum wages, it suggests that the decline in real minimum wages is unlikely to explain a substantial fraction of the decrease in youth real wages.

Decline of average firm size

During the eighties, average firm size declined in Canada (Wannell 1991). Specifically, data from the Longitudinal Employment Analysis Program (LEAP) in Statistics Canada show that the proportion of workers employed in firms with less than 20 employees rose from 18.4% to 20.4% while the percentage of individuals employed in firms with 500 employees or more fell from 51.3% to 46.4% between 1981 and 1988. Since young workers are overrepresented in small firms, this change in the distribution of employment by firm size may potentially affect the wage gap between young and older workers. To assess whether this is the case or not, we calculated the hypothetical wage gap which would have prevailed in 1988 had the distribution of employment by firm size remained constant at its 1981 value¹⁹. Between 1981 and 1988, the ratio of hourly wage rates of workers aged 17-24 to those of workers aged 25-64 dropped from 0.72 to 0.60. When we hold the distribution of employment constant to its 1981 value, that ratio remains unchanged at 0.60. This suggests that the decline of average firm size had very little effect on the wage differentials across age groups²⁰.

5.2 Why Has the Distribution of Weekly Hours of Work Changed in Canada ?

Changes in labour supply induced by the stagnation of real annual earnings

A priori, changes in labour supply may be invoked to explain the growth in hours dispersion. In an economy where real annual earnings have been stagnating over the recent years, the growing proportion of employees working 50 hours per week or more could reflect workers' decisions to increase their weekly hours worked in order to maintain or increase their real annual earnings. We do not think this is a dominant factor for two reasons. First, real annual earnings of full year full-time

workers have been stagnating since the mid-seventies. Yet the propensity to work long work weeks started rising **right after** the 1981-82 recession, not in the mid-seventies. Thus, the timing of the two events seems to be problematic. A counter-argument would be that it takes many years of data showing constant real earnings before analysts - and thus, *a fortiori*, households - realize that their real annual earnings have been stagnating and adjust their labour supply accordingly. Second, and more important, the increase in hours worked occurs mainly among workers in the top quintile of the weekly wage distribution. If highly paid workers started working more hours to increase their standard of living, why haven't low paid workers done the same? In fact, hours worked by employees in the bottom quintile of the weekly wage distribution **fell** between 1981 and 1988.

One possible explanation is that low paid workers were more constrained in their choice of hours in 1988 than in 1981 and that this would explain why mean hours in the bottom quintile have not increased. This is not the case. While the extent of rationing did rise somewhat between 1981 and 1988, this cannot explain why the average work week has not risen for workers in the bottom quintile. In 1981, men in the bottom quintile would have preferred to work, on average, 4.3 additional hours per **month** while they would have preferred to work 5.6 additional hours per **month** in 1988²¹. Measured this way, the degree of rationing has increased by 1.6 hours per month, or roughly 0.4 hours per week. Yet if working time had increased by 0.4 hours per week, men in the bottom quintile would have worked on average only 31.3 hours per week (i.e. $30.9 + 0.4$), compared to 32.8 hours in 1981. Another possibility is that the decrease in average weekly hours for workers in the bottom quintile merely reflects growing participation of young students in full-time jobs. The data does not support that contention. Among men aged 25 to 54 - a subsample which excludes most full-time students - average weekly hours worked in the bottom quintile have dropped from 39.0 to 37.8 between 1981 and 1988 while those worked by men in the top quintile have increased from 42.8 to

45.3. Thus, the decline in average weekly hours worked among low-paid workers does not result simply from growth in part-time employment among young workers or full-time students. A third argument assumes that attitudes of low-wage workers towards work differ from those of high-wage workers ; the latter group may have decided to increase their weekly hours to maintain or increase their real annual earnings while the former may have preferred not to do so. This would explain why average weekly hours and the extent of hours rationing haven't increased for low-paid workers.

Changes in labour supply induced by tax changes

Alternatively, some workers may have increased their labour supply in response to the tax changes introduced in the 1980s. The 1988 federal tax reform, while simplifying the structure of tax brackets from ten to three, reduced the top marginal income tax rate from 34% (prior to 1988) to 29%. The reduction in the top marginal income tax rate at the federal level was far from the only tax change which occurred in the 1980s. In Ontario, provincial income tax rose as a percentage of basic federal tax, high income surtaxes were introduced and the level of taxable income sufficient to trigger the high-income surtax has fallen. In addition to socio-economic characteristics of individuals (e.g. marital status, number of children), all these factors must be taken into account to calculate **effective** marginal tax rates. In a recent study, Murphy, Finnie and Wolfson (1993) use the Social Policy Simulation Database and Model (SPSDM) of Statistics Canada to do so. They compute the effective marginal tax rates of Ontario tax filers. In Figure 4, we plot the marginal tax rates along with mean weekly hours for the top quintile of the distribution of annual wages²². The population selected consists of Ontario male paid workers aged 17 to 64. Since SWH-SUM-LMAS and SPSDM can be used jointly only for the period 1984-1990, we restrict our analysis to this time interval.

Are tax-induced changes in labour supply likely to explain fully the changes in the distribution of weekly hours ? The answer is no. Between 1984 and 1986, average weekly hours in the top quintile rose from 43.1 to 47.0. Yet the marginal tax rate in the top quintile remained essentially unchanged during that period. Since average weekly hours in the top quintile rose from 42.6 to 46.2 between 1981 and 1989 - two years roughly comparable in terms of macroeconomic conditions - it is unlikely that the increase observed between 1984 and 1986 reflects simply a cyclical effect.

More fundamentally, changes in the relative supply of various age/education groups cannot fully explain the changes in the structure of either weekly or hourly wages. Between 1981 and 1988, the relative supply of young male employees with 9-13 years of schooling (as measured by their share of total weekly hours worked by male employees) has dropped from 14 % to 10 %. Meanwhile, their real hourly wages fell by 19 %. This simple fact implies that changes in labour demand must be incorporated in any coherent explanation of the growth in inequality in weekly earnings.

6. HAS LONG-TERM INEQUALITY INCREASED IN THE EIGHTIES?

While repeated cross-sectional observations on earnings inequality may yield interesting information on changes in the structure of wages, they are not sufficient to draw inferences about the long-term gap between low and high earners. Consider two economies, A and B, composed each of two individuals. In economy A, Bill and Joe earn \$10,000 and \$50,000, respectively, both at time t and at time $t+1$. In economy B, Bill earns \$ 5,000 at time t and then \$15,000 at time $t+1$ while Joe sees his earnings drop from \$60,000 at time t to \$40,000 at

time $t+1$. Obviously, economy B exhibits a greater degree of inequality in annual earnings at time t than economy A. Yet economy A displays no mobility while economy B allows some individuals to move up and leads others to experience earnings losses. As a result, 'long-term' inequality - i.e. measured in this example over a two-year period - is the same in both economies; cumulated earnings of low earners equal \$20,000 and cumulated earnings of high earners equal \$100,000²³.

The recent growth of inequality in annual earnings raises the possibility that long-term inequality is rising. However, if - as some observers conjecture - the Canadian labour market was more unstable in the eighties than it was in the seventies, there could have been a greater "reshuffling" of earnings across individuals during the last decade than two decades ago. If this were the case, the increase in long-term inequality could be less than the growth of inequality in annual earnings would suggest.

To check whether long-term inequality has risen, we follow individuals over time. Specifically, we select a first cohort of male workers who were aged 18 to 64 in 1975 and who had positive earnings during each year of the 1975-1984 period. We compare the dispersion of earnings of that cohort to that of a second cohort composed of individuals aged 18 to 64 in 1984 and who had positive earnings throughout the 1984-1993 period. We calculate: 1) the average dispersion of annual earnings for each period and, 2) the dispersion of earnings cumulated over 10 years²⁴. To do so, we use three different measures of inequality. The most widely known, the Gini coefficient, is sensitive to changes in the middle of the earnings distribution, the coefficient of variation to movements at the top, and the Theil-Entropy index to movements at the lower end of the distribution. Because attrition will be substantial among old workers, we calculate these measures for eight different age groups.

We select individuals who have positive earnings throughout the period for two reasons. First, the T-4 supplementary file contains no information on why an individual has no earnings in a given year. This could be so either because the individual is out of the labour force during that particular year or unemployed for the whole year. Thus, earnings inequality could be rising either because more workers face long-term unemployment or because more choose to leave the labour force (e.g. through early retirement for older workers or through a return to school for younger workers) or because of a combination of these two events. Since there is no way to distinguish these two events - which may not be rare for workers under 25 or those over 54 - this makes the interpretation of inequality trends problematic. Second, - and more important - individuals who are employed throughout the period represent an important fraction of the labour force and thus, are a meaningful population to study. Of all male workers aged 18-64 in 1984 and who had positive earnings during that year, 60% had positive earnings throughout the 1984-1993 period and 75% had positive earnings during each year of the 1984-89 time interval. These percentages increase to 66% and 80%, respectively, when we consider only male workers aged 25-54 in 1984²⁵. Thus, the sample selected is an important segment of the male workforce²⁶.

Table 5 presents the results of this exercise. Four points are worth noting. First, whatever inequality measure is used, the dispersion of earnings cumulated over 10 years is always lower than the average dispersion of annual earnings. This is so, simply because some individuals who had bad (good) luck in a given year will have higher (lower) earnings in subsequent years and thus change ranks in the earnings distribution (Atkinson and Bourguignon 1992, 6). As a result, the dispersion of earnings cumulated over a time interval longer than one year will be more equal than the 'typical' dispersion of annual earnings. Second, for all three inequality measures and for all workers under 45, long-term inequality rose at least 9% between the 1975-84 period and the 1984-93 period. Third, the growth of the

dispersion is generally higher with the Theil-Entropy index than with the two other inequality measures. This suggests that substantial changes occurred in the bottom of the earnings distribution. Fourth - and more important - long-term inequality generally rose at the same pace as inequality in annual earnings did. For instance, among men aged 25-54 at the beginning of the time intervals considered, the average of Gini coefficients of annual earnings rose 9.2% between the two periods while the Gini coefficients of earnings cumulated over 10 years increased 9.3%.^{27 28}

7. CONCLUSION

Inequality in weekly earnings increased in the eighties in Canada. The increase in inequality occurred in conjunction with three facts. First, real hourly wages of young workers fell substantially. Second, the percentage of employees working 35-40 hours per week declined while the fraction of employees working either shorter or longer hours rose. Third, there was a growing tendency for highly paid workers to work longer work weeks. Any set of explanations of the growth in inequality must take these three facts into account.

The first wave of U.S. studies on the growth of earnings inequality (e.g. Bluestone and Harrison, 1982) argued that industrial shifts in the distribution of employment were largely responsible for the movements observed. This paper, along with subsequent U.S. studies (e.g. Katz and Murphy, 1992), has shown that de-industrialization cannot explain the bulk of the growth in inequality. When combined with changes in the unionization rate, changes in the distribution of employment by industry (at the one-digit level) account for roughly 30% of the growth in weekly earnings inequality. Other factors, such as the drop in real minimum wages and the decline of average firm size explain very little of the growth in age-earnings differentials.

The second wave of U.S. studies (e.g. Bound and Johnson, 1992) has argued so far that skill-biased technological change is the major factor underlying the changes observed in the structure of wages. Surprisingly, little attention has been paid to the potential influence of changes in the distribution of weekly hours of work. Yet the distribution of weekly hours of work has become more polarized both in Canada and in the United States. If one assumes an economy which consists of two types of workers, highly skilled and low-skilled, and if the labour supplies of each type of labour are upward-sloping, an increase in the relative demand for highly skilled workers could increase both the dispersion of hourly wages and the dispersion of weekly hours of work. Thus the growth in the dispersion of weekly hours of work and in the correlation between hourly wages and weekly hours - which was documented in the previous sections - is not inconsistent, a priori, with skill-biased technological change.

However, other factors may have played an important role in Canada. One explanation relies on a theory of internal labour markets and suggests that in response to stronger competitive pressures, Canadian firms may have adjusted in the following way in the eighties. First, to maintain employees' morale among their experienced workforce, they may have cut labour costs mainly by decreasing hourly wages in entry-level jobs, i.e. among young workers. Second, to introduce flexibility in the management of their workforce, they may have increased the use of part-time employment for employees for which training costs/turnover expenditures are low while requiring longer hours for those high-skill/highly paid workers. This would explain the increase in hourly wage differentials across age groups, the growth in the dispersion of weekly hours and the rise in the correlation between weekly hours worked and hourly wage rates.

Another view is that increases in fixed costs of hiring may have made firms reluctant to hire new workers (Business Week 1993). Employer expenditures for

programs like the C/QPP and Unemployment Insurance as well as employer contributions for fringe benefits typically stop when employee earnings rise above a specified level. As a result, it is advantageous for employers to utilize higher paid employees for longer hours instead of hiring additional workers to increase output. The shift to a high skill labour force compounds the problem. When the skills required are firm specific and training costs are absorbed by the employer, an increase in training costs may induce firms to employ trained workers for longer hours rather than to add new employees - whether they would work full-time or part-time - who require additional training costs. Conversely, whenever the skill requirements and training costs are low, high expenditures on supplementary labour income for permanent employees may lead firms to make greater use of part-time workers, for which fringe benefits are usually low or nonexistent.

A third argument is that the relatively slack labour market of the eighties may have shifted the bargaining power (between firms and workers) towards firms. If such a shift occurred, it may have allowed firms to require longer work weeks from part of their workforce and reduce labour costs mainly by cutting wages in entry-level jobs.

Technological changes which increase the locational mobility of firms may have increased competition and/or shifted the bargaining power towards firms. The increase in Canada's openness to trade may also have had these two effects.

Employers' expenditures for C/QPP, UI, Workers' Compensation, private pensions and welfare items (including Quebec and Ontario's payroll tax) have also been rising relative to wages and salaries since the mid-sixties. However, given that these fixed costs of labour increased during the **second half of the seventies** as well as during the eighties, one may wonder why the dispersion of weekly hours has not increased during the second half of the seventies. One possible answer is

that the constraints associated with the growth of these costs did not operate until after the 1981-82 recession, when increasing competitive pressures may have led firms to restructure, trim staff and cut labour costs²⁹.

Whatever factors underlie the growth of inequality, these factors have had a profound impact on the Canadian labour market. They increased the dispersion of cumulated earnings as well as the dispersion of annual earnings.

REFERENCES

- Bar-Or, Y., J. Burbidge, L. Magee, and L. Robb (1993) 'Canadian experience-earnings profiles and the return to education in Canada, 1971-1990.' Working Paper no. 93-04, Department of Economics, McMaster University (Hamilton).
- Beach, C.M. and G.A. Slotsve (1994) 'Polarization of earnings in the Canadian labour market.' Bell Canada Papers on Economic and Public Policy.
- Betcherman, G. and R. Morissette (1994) 'Recent youth labour market experiences in Canada.' Research Paper no. 63, Analytical Studies, Statistics Canada.
- Bluestone, B. and B. Harrison (1982) *The Deindustrialization of America* (New York : Basic Books).
- Bound, J. and G. Johnson (1992) 'Changes in the structure of wages in the 1980s : an evaluation of alternative explanations.' *American Economic Review* 82 : 371-392.
- Burbidge, J., L. Magee and L. Robb (1993) 'On Canadian wage inequality : the 1970s and 1980s.' Working Paper no. 93-07, Department of Economics, McMaster University (Hamilton).
- Burtless, G. (1990) 'Earnings inequality over the business and demographic cycles', in Gary Burtless ed. *A Future of Lousy Jobs ?*, Washington, D.C. : The Brookings Institution.
- Business Week (1993) 'The scary math of new hires.' February 22, 70-71.

Doiron, D.J. and G.F. Barrett (1994) 'Inequality in male and female earnings : the role of hours and wages.' University of British Columbia, Mimeo.

Freeman, R.B. (1984) 'Longitudinal analyses of the effects of trade union' *Journal of Labor Economics*, 2, 1-26.

Freeman, R.B. (1991) 'How much has deunionization contributed to the rise in male earnings inequality?

National Bureau of Economic Research Working Paper no. 3826.

Freeman, R.B. and K. Needels (1991) 'Skill differentials in Canada in an era of rising labor market inequality.' National Bureau of Economic Research Working Paper no. 3827.

Gower, D. (1993) 'The impact of the 1990 changes to the education questions on the Labour Force Survey.' Staff Report, Labour and Household Surveys Analysis Division, Statistics Canada.

Juhn, C., K.M. Murphy and B. Pierce (1993) 'Wage inequality and the rise in returns to skill' *Journal of Political Economy*, 101(3), 410-442.

Katz, L.F. and K.M. Murphy (1992) 'Changes in relative wages, 1963-1987 : supply and demand factors.' *Quarterly Journal of Economics*, 107(1) : 35-78.

Kuhn, P. and A.L. Robb (1994) 'Unemployment, Skill and Labour Supply : Evidence from Canadian Microdata, 1971-1991.' Mimeo. McMaster University.

Krueger, A.B. and L.H. Summers (1988) 'Efficiency wages and the inter-industry wage structure' *Econometrica* ,56 ,259-93.

Macphail, F. (1993) 'Has the great U-turn gone full circle ? : recent trends in earnings inequality in Canada 1981-89.' Dalhousie University, Mimeo.

Morissette, R., J. Myles, and G. Picot (1994) 'Earnings inequality and the distribution of working time in Canada.' *Canadian Business Economics*, Vol 2, no. 3, Spring 1994, 3-16.

Morissette, R. and D. Sunter (1994) 'What is happening to weekly hours worked in Canada ?', Research Paper no. 65, Analytical Studies, Statistics Canada.

Morissette, R. (1995) 'Why has inequality in weekly earnings increased in Canada ? ', Research Paper No. 80, Analytical Studies Branch, Statistics Canada.

Murphy, B., R. Finnie and M.C. Wolfson (1993) 'A profile of high income Ontarians' Paper prepared for the Ontario Fair Tax Commission.

Murphy, K.M. and F. Welch (1992) 'The structure of wages.' *Quarterly Journal of Economics* 107(1), 284-326.

Picot, G., J. Myles, and T. Wannell (1990) 'Good jobs/bad jobs and the declining middle : 1967-1986.' Research Paper no. 28, Analytical Studies, Statistics Canada.

Richardson, D. H. (1996) 'Changes in the distribution of wages in Canada, 1981-1992'. forthcoming, *Canadian Journal of Economics*.

Riddell, W.C. (1993) 'Unionization in Canada and the United States : a tale of two countries.' in David Card and Richard B. Freeman ed. *Small Differences that Matter : Labor Markets and Income Maintenance in Canada and the United States* (The University of Chicago Press).

Wannell, T. (1991) 'Trends in the distribution of employment by employer size : recent Canadian evidence.' Research Paper no. 39, Analytical Studies, Statistics Canada.

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Table 1 : Weekly Earnings, Weekly Hours Worked and Hourly Wages at Selected Quintiles, Male Paid Workers Aged 17-64, 1981-1995 ¹.

Quintiles	1981	1984	1986	1987	1988	1989	1990	1993	1995	%change 1981-88
1st										
Weekly earnings	191	177	175	185	183	186	178	163	-	-4.2 %
Weekly hours	32.8	30.9	31.3	32.2	30.9	31.5	30.5	27.8	27.8	-5.8 %
Hourly wages	6.34	6.06	5.95	6.07	6.37	6.34	6.32	6.35	-	0.5 %
3rd										
Weekly earnings	476	491	487	495	500	500	496	505	-	5.0 %
Weekly hours	40.9	40.7	41.5	41.5	41.7	41.9	41.8	40.8	41.0	2.0 %
Hourly wages	11.91	12.22	11.98	12.16	12.25	12.29	12.07	12.58	-	2.9 %
5th										
Weekly earnings	882	878	939	943	965	979	953	925	-	9.4 %
Weekly hours	42.6	42.0	43.9	44.6	45.0	45.4	45.1	42.8	43.9	5.6 %
Hourly wages	21.23	21.33	21.96	21.71	22.05	22.26	21.72	22.13	-	3.9 %
Average										
Weekly earnings	502	506	516	523	533	536	526	520	-	6.2%
Weekly hours	39.7	38.9	39.9	40.3	40.2	40.5	40.1	38.8	38.9	1.3%
Hourly wages	12.66	12.85	12.82	12.86	13.10	13.12	12.93	13.20	-	3.5%

1. Mean weekly earnings and mean hourly wages expressed in 1986 constant dollars. Workers are sorted by ascending order of their **weekly** earnings and thus quintiles refer to weekly earnings. The sample includes male paid workers aged 17 to 64. The data is taken from the 1981 Survey of Work History, the 1984 Survey of Union Membership, the 1986-1990 Labour Market Activity Surveys, the 1993 Survey of Labour and Income Dynamics and the 1995 Survey of Work Arrangements. Weekly earnings are those earned by paid workers in the main job they held in December (November for the Survey of Work Arrangements). The main job is the one associated with the greatest number of weekly hours usually worked. Weekly earnings and hourly wages are not presented for the 1995 Survey of Work Arrangements because 27% of the individuals initially selected in the sample did not report their wages. For this survey, weekly hours refer to those associated with the remaining sample.

Table 2 : Variance of Log Weekly Earnings, Variance of Log Weekly Hours and Variance of Log Hourly Wages, 1981-1993.

I. Canada 1981-1995

	(1) Variance of log weekly earnings	(2) Variance of log weekly hours	(3) Variance of log hourly wages	(4) Covariance term
1981	0.405	0.117	0.252	0.036
1984	0.473	0.136	0.252	0.085
1986	0.478	0.130	0.275	0.073
1987	0.454	0.123	0.265	0.066
1988	0.469	0.136	0.257	0.076
1989	0.462	0.138	0.258	0.065
1990	0.493	0.142	0.270	0.081
1993	0.500	0.155	0.248	0.097

II. Canada vs United States

Fraction of the change in the variance of log weekly earnings accounted for by changes in the variance of log weekly hours, changes in the variance of log hourly wages and changes in the covariance between log weekly hours and log hourly wages :

	Weekly hours	Hourly wages	Covariance term
Canada			
1981-1988	30 %	8 %	62 %
1981-1989	37 %	11 %	53 %
United States*			
1975-1987	- 1 %	86%	15 %

1. The sample includes male paid workers aged 17 to 64. The data is taken from the 1981 Survey of Work History, the 1984 Survey of Union Membership, the 1986-1990 Labour Market Activity Surveys, the 1993 Survey of Labour and Income Dynamics. Weekly earnings are those earned by paid workers in the main job they held in December. The main job is the one associated with the greatest number of weekly hours usually worked.

* Figures derived from Burtless (1990, p. 113, Table 7). The sample used by Burtless (1990) includes men aged 16 and over. The period considered is 1975-1987. The data is taken from the March CPS tapes.

Table 3 : Hourly wage differentials between education levels, 1981-1988 *.

Age group	17-24		25-34		35-44		45-54		55-64	
Year	1981	1988	1981	1988	1981	1988	1981	1988	1981	1988
Ed1 **	-0.13 (0.010)	0.00 -	-0.13 (0.010)	-0.20 (0.027)	-0.13 (0.010)	-0.26 (0.021)	-0.13 (0.010)	-0.12 (0.019)	-0.13 (0.010)	-0.16 (0.022)
Ed2	0.00 -	0.00 -	0.00 -	0.00 -	0.00 -	0.00 -	0.00 -	0.00 -	0.00 -	0.00 -
Ed3	0.06 (0.011)	0.08 (0.012)	0.06 (0.011)	0.08 (0.012)	0.06 (0.011)	0.17 (0.020)	0.06 (0.011)	0.22 (0.032)	0.06 (0.011)	0.31 (0.044)
Ed4	0.13 (0.012)	0.20 (0.011)	0.13 (0.012)	0.13 (0.014)	0.07 (0.022)	0.20 (0.011)	0.13 (0.012)	0.20 (0.011)	0.13 (0.012)	0.20 (0.011)
Ed5	0.27 (0.011)	0.27 (0.013)	0.27 (0.011)	0.27 (0.013)	0.27 (0.011)	0.37 (0.020)	0.36 (0.024)	0.39 (0.022)	0.27 (0.011)	0.36 (0.032)

* The numbers show wage differentials between workers with a given education level and workers with **9-13 years of schooling**. The ratio of hourly wages of workers with a given education level to those of workers with 9-13 years of schooling equals the antilog of the coefficients presented in the table. Standard errors are between parentheses. The results are based on a regression of the natural logarithm of hourly wages on the following vector of regressors : 1) one dummy for marital status, 2) four age dummies, 3) four education dummies, 4) sixteen interaction terms between age and education, 5) seven industry dummies, 6) one dummy for union status, 7) one dummy for full-time/part-time job and 8) four region dummies.

** Ed1 = no schooling or elementary schooling; Ed2 = 9-13 years of schooling; Ed3 = some post-secondary education; Ed4 = post-secondary certificate or diploma; Ed5 = university degree.

Source : Survey of Work History of 1981 and Labour Market Activity Survey of 1988.

Table 4 : Decomposition of change in inequality in weekly earnings, 1981-88.

I. Inequality measures in 1981 and 1988

	1981	1988	Change in inequality between 1981 and 1988
Theil-Entropy index	0.131	0.149	0.018
Square of coefficient of variation	0.276	0.313	0.037

II. Percentage of change in inequality in weekly wages accounted for by changes in between-group inequality, changes in within-group inequality and changes in demographic weights¹

	(1)	(2)	(3)
Decomposition done by :	Industry ²	Union status	Industry and union status
Theil-Entropy index			
Change in :			
between -group inequality	17 %	6 %	17 %
within -group inequality	61 %	72 %	55 %
demographic weights	22 %	22 %	28 %
Square of coefficient of variation			
Change in :			
between -group inequality	11 %	-3 %	8 %
within -group inequality	68 %	81 %	62 %
demographic weights	22 %	22 %	30 %

1. Percentages may not add to 100 due to rounding.

2. The major industrial groups used are : 1) Agriculture, fishing and trapping, 2) Forestry and mining, 3) Construction, 4) Manufacturing, 5) Distributive services, 6) Business services, 7) Consumer services and, 8) Public services.

Source : Survey of Work History of 1981 and Labour Market Activity Survey of 1988.

Table 5: Short-term and long-term inequality measures, male workers with positive earnings all years, 1975-1984 and 1984-1993

I.	Average of coefficients of variation for annual earnings			Coefficient of variation for earnings cumulated over 10 years		
	1975-84	1984-93	% change	1975-84	1984-93	% change
Age *						
18 - 24	0.503	0.593	17.9 %	0.388	0.459	18.3 %
25 - 34	0.492	0.560	13.8 %	0.442	0.486	10.0 %
35 - 44	0.589	0.642	9.0 %	0.512	0.573	11.9 %
45 - 54	0.687	0.766	11.5 %	0.624	0.667	6.9 %
55 - 64	1.084	1.188	9.6 %	0.957	1.033	7.9 %
18 - 64	0.625	0.705	12.8 %	0.543	0.612	12.7 %
25 - 54	0.583	0.651	11.7 %	0.517	0.571	10.4 %
35 - 44	0.543	0.615	13.3 %	0.477	0.544	14.0 %

* Age at the beginning of the period considered.

Source: T-4 supplementary tax file from Revenue Canada

II.	Average of Theil-Entropy indexes for annual earnings			Theil-Entropy index for earnings cumulated over 10 years		
	1975-84	1984-93	% change	1975-84	1984-93	% change
Age *						
18 - 24	0.134	0.175	30.6 %	0.076	0.100	31.6 %
25 - 34	0.108	0.133	23.1 %	0.083	0.101	21.7 %
35 - 44	0.128	0.150	17.2 %	0.103	0.124	20.4 %
45 - 54	0.164	0.192	17.1 %	0.137	0.156	13.9 %
55 - 64	0.313	0.389	24.3 %	0.253	0.315	24.5 %
18 - 64	0.151	0.185	22.5 %	0.113	0.142	25.7 %
25 - 54	0.130	0.155	19.2 %	0.103	0.124	20.4 %
35 - 44	0.118	0.146	23.7 %	0.093	0.116	24.7 %

* Age at the beginning of the period considered.

Source: T-4 supplementary tax file from Revenue Canada

III. Age *	Average of Gini coefficients for annual earnings			Gini coefficients for earnings cumulated over 10 years		
	1975-84	1984-93	% change	1975-84	1984-93	% change
18 - 24	0.278	0.319	14.7 %	0.215	0.248	15.3 %
25 - 34	0.243	0.269	10.7 %	0.217	0.240	10.6 %
35 - 44	0.260	0.278	6.9 %	0.238	0.257	8.0 %
45 - 54	0.291	0.313	7.6 %	0.269	0.287	6.7 %
55 - 64	0.387	0.443	14.5 %	0.346	0.400	15.6 %
18 - 64	0.284	0.314	10.6 %	0.250	0.280	12.0 %
25 - 54	0.261	0.285	9.2 %	0.237	0.259	9.3 %
35 - 44	0.251	0.278	10.8 %	0.227	0.252	11.0 %

* Age at the beginning of the period considered.

Source: T-4 supplementary tax file from Revenue Canada

Appendix 1

In this appendix, we deal with three issues. First, we show that hourly wage dispersion within groups is higher in the Survey of Work History of 1981 than during all subsequent years. Following Juhn, Murphy and Pierce (1993), we first regress the natural logarithm of hourly wages on a vector of regressors defined in Table A1. We then calculate the standard deviation of regression residuals as well as the distance between various percentiles of the regression residuals. The results provide estimates of hourly wage inequality within groups defined jointly in terms of age, education, industry and union status, among other things. They are presented in Table A1.

Table A1 : Inequality Measures Based on Regression Residuals¹.

Men	1981	1984	1986	1987	1988
Standard deviation	0.44	0.38	0.41	0.40	0.39
Percentile differential :					
90-10	1.01	0.86	0.90	0.89	0.90
90-50	0.45	0.41	0.44	0.44	0.44
50-10	0.56	0.45	0.46	0.45	0.46
75-25	0.51	0.44	0.45	0.44	0.46
75-50	0.24	0.21	0.23	0.22	0.23
50-25	0.27	0.23	0.22	0.22	0.23
Sample size	19,131	17,084	18,930	22,288	18,587

1. Results based on a regression of the natural logarithm of hourly wages on the following vector of regressors : 1) one dummy for marital status, 2) four age dummies, 3) four education dummies, 4) sixteen interaction terms between age and education, 5) seven industry dummies, 6) one dummy for union status, 7) one dummy for full-time/part-time job and 8) four region dummies.

Source : Survey of Work History of 1981, Survey of Union Membership of 1984 and Labour Market Activity Surveys of 1986 to 1988.

Second, we compare average weekly hours from the special surveys (SWH, LMAS, SLID, SWA) to those derived from the Labour Force Survey. We show that while LMAS overestimates weekly hours by 0.4 to 0.8 hours relative to the Labour Force Survey, SLID underestimates weekly hours by 0.7 hours relative to LFS. (Table A2). Since the Labour Force Survey provides a consistent time series on weekly hours, this suggests that SLID underestimates weekly hours relative to LMAS. This may explain part of the decrease in weekly hours at the top quintile observed between 1990 and 1993.

Table A2 : Average weekly hours worked in the main job held in September by male paid workers aged 17-64 : special surveys vs Labour Force Survey.

	1981	1986	1987	1988	1989	1990	1993
1) Labour Force Survey	40.1	40.0	40.1	40.1	40.3	40.1	39.7
2) Special Surveys	40.1	40.4	40.8	40.9	41.0	40.6	39.0
3) = 2) - 1)	0.0	0.4	0.7	0.8	0.7	0.5	-0.7

* For all years except 1995, the figures refer to usual weekly hours worked in the main job held in **September**.

Third, we present evidence from the Survey of Consumer Finances which shows that, since the second half of the eighties, highly paid workers have worked longer work weeks than they used to at the end of the seventies.

To derive a measure of hourly wages from the Survey of Consumer Finances, we divide annual wages and salaries at time t by the number of weeks worked at time t and the number of hours usually worked per week at time t+1. Since Kuhn and Robb (1994) have shown that, due to

reporting errors in either weeks worked or annual wages and salaries, workers in the top decile of the **hourly** wage distribution have unexpectedly : 1) low weeks worked, 2) high weeks of unemployment and, 3) high weeks of non-participation in the labour force, we exclude the top 10% of the hourly wage distribution.

We then calculate mean weekly hours at the bottom, middle and top quintile of the distribution of **weekly** earnings of the remaining sample. Since the Survey of Work History of 1981 and the Labour Market Activity Survey report the biggest increase in weekly hours among men in the top quintile, we restrict our attention to male workers. The results from the Survey of Consumer Finances are presented for the years 1977, 1979, 1981, 1986, 1988, 1991 and 1993. To be clear, numbers shown for, say, 1977, result from annual wages and salaries earned in 1977, weeks worked in 1977 and hours usually worked per week in April 1978 (i.e. at the time the SCF interview was conducted). The results are compared to those from the Survey of Work History of 1981 and the Labour Market Activity Surveys of 1986 and 1988. They are presented in Table A3.

Table A3 : Mean Weekly Hours at the Bottom, Middle and Top Quintile of the Distribution of Weekly Earnings, Male Workers : Comparing SWH-LMAS and SCF Data¹.

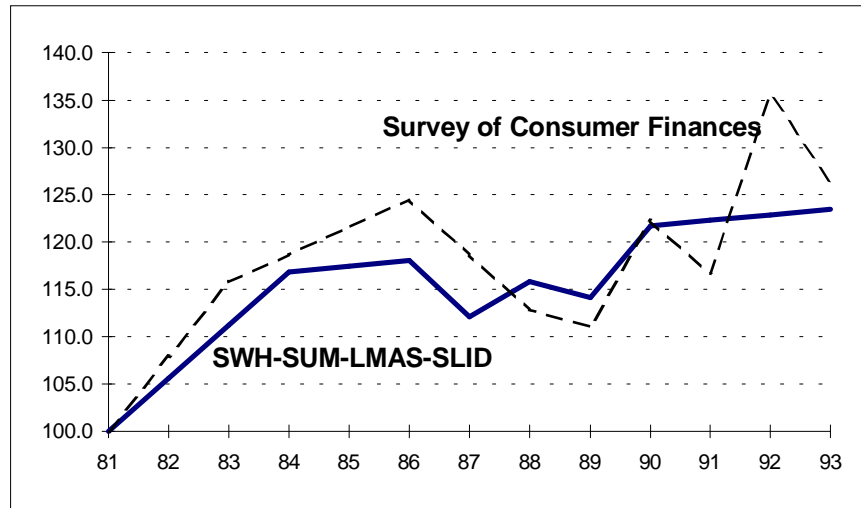
	1977	1979	1981	1986	1988	1991	1993
I. SWH 1981 and LMAS							
Bottom quintile	-	-	32.3	30.5	30.2	-	-
Middle quintile	-	-	41.2	41.5	41.7	-	-
Top quintile	-	-	43.6	44.6	46.1	-	-
II. Survey of Consumer Finances²							
Bottom quintile	39.6	38.9	37.9	37.7	36.3	34.7	33.8
Middle quintile	41.8	41.6	41.4	42.0	42.2	41.9	42.5
Top quintile	43.1	43.7	43.3	44.7	44.9	44.9	45.3

1. For all data sets, the top decile of the hourly wage distribution is excluded.

2. The sample consists of male workers with positive annual wages and weekly hours of work.

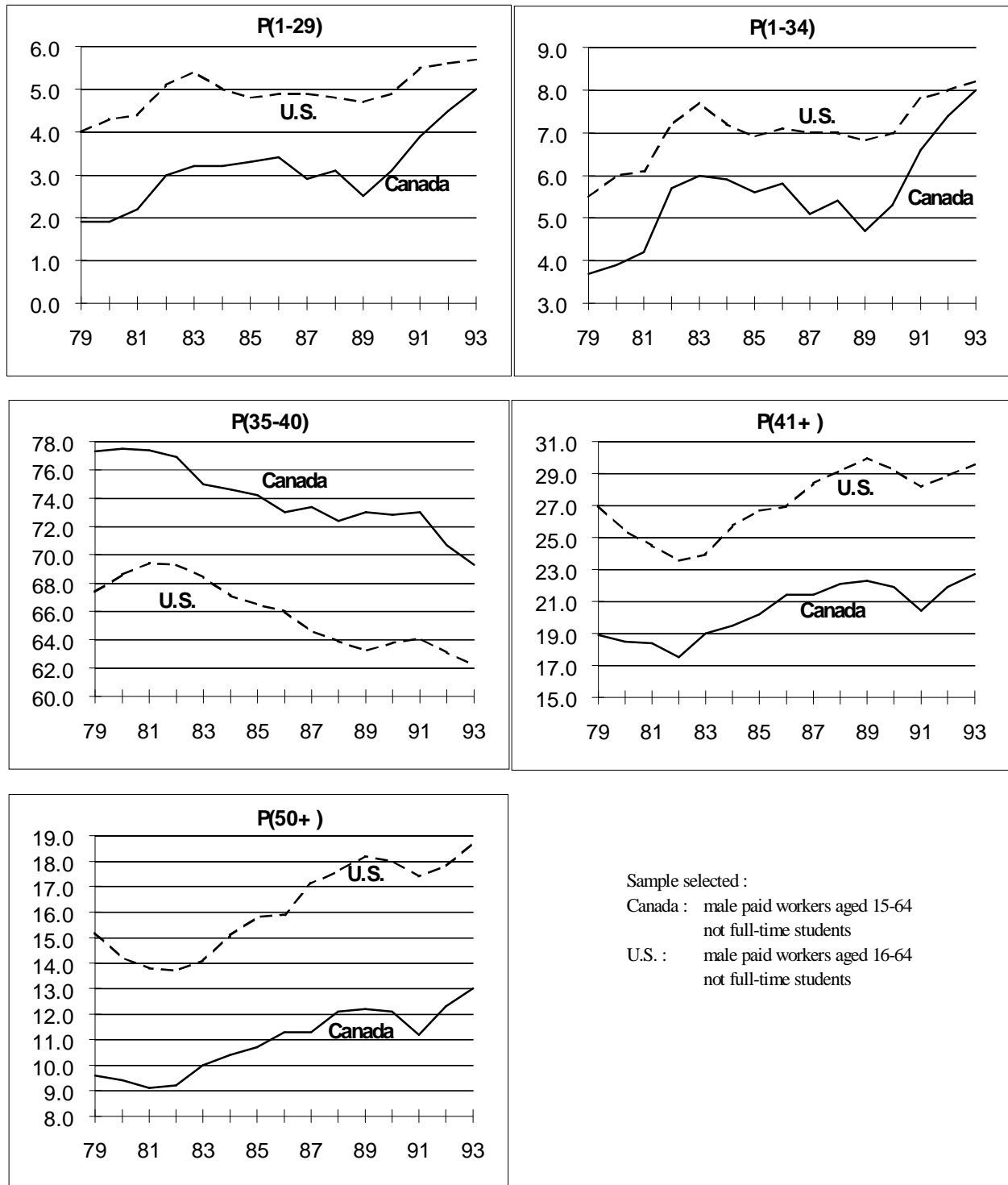
While the two panels of Table A3 exhibit some differences for weekly hours of work in the bottom quintile in a given year, they show the same trends. Between 1986 and 1993, male workers in the top quintile (of the distribution of weekly earnings) of the truncated sample worked between 44.7 and 45.3 hours per week, compared to 43.1 - 43.7 hours between 1977 and 1981. This is consistent with the increase in the length of the work week (from 43.6 to 46.1 hours) observed between 1981 and 1988 with the Survey of Work History and the Labour Market Activity Survey. Furthermore, all data sets suggest that hours worked in the bottom quintile have declined in the eighties.

Figure 1 : Variance of log weekly earnings for male paid workers aged 17-64, 1981-1993 (1981 : 100).



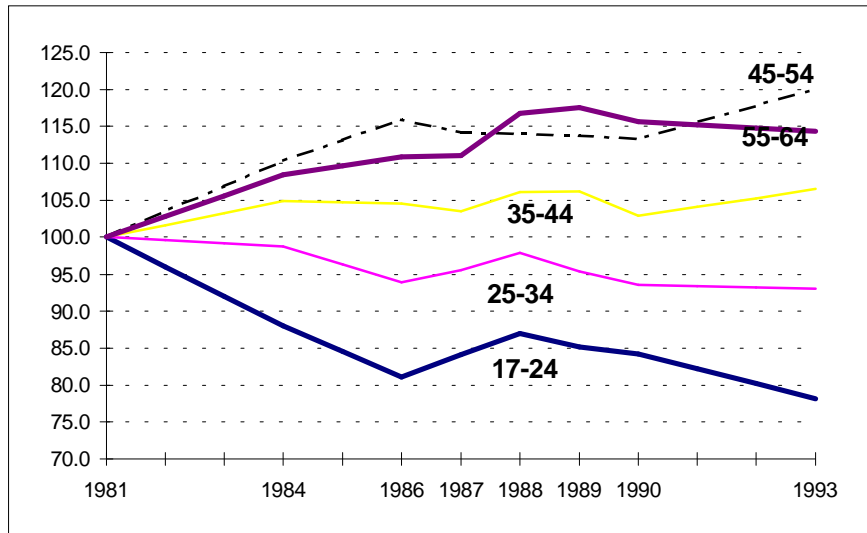
Note: The sample used for the Survey of Consumer Finances consists of men aged 17-64, earning at least 2.5% of male average annual earnings, with positive weeks worked and no self-employment income. The years for which we have SCF data are 1981, 1983, 1986, and 1988 to 1993. The sample used for the special surveys (SWH-SUM-LMAS-SLID) consists of male paid workers aged 17-64 working in their main job in December. The years for which we have data are 1981, 1984, 1986-1990, 1993. Whenever data is not available, we interpolate the numbers.

Figure 2: Percentage of male paid workers working between x and y hours per week in the main job, P(x-y), Canada and the United States, 1979-1993.



Sample selected :
 Canada : male paid workers aged 15-64
 not full-time students
 U.S. : male paid workers aged 16-64
 not full-time students

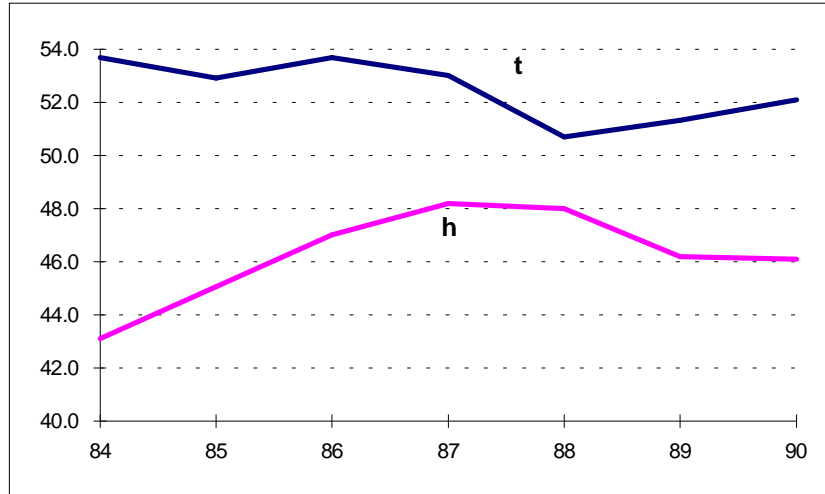
Figure 3 : Indexed real hourly wages in full-time jobs, by age, 1981-1993 (1981 : 100)



* Male paid workers aged 17-64 employed full-time in their main job in December.

Source : Survey of Work History of 1981, Survey of Union Membership of 1984, Labour Market Activity Survey and Survey of Labour and Income Dynamics of 1993.

Figure 4 : Effective marginal tax rates and average weekly hours at the top quintile, Ontario male paid workers, 1984-1990.



Note : t = effective marginal tax rate (in percent); h = average weekly hours worked in the main job.

Source : Social Policy Simulation Database and model, Survey of Union Membership of 1984 and Labour Market Activity Surveys of 1986-1990.

Notes

1 The following studies have examined changes in the distribution of annual hours. Picot, Myles and Wannell (1990) observed that both changes in hourly wage rates and in annual hours played an important role in the growing polarization of annual earnings. Macphail (1993) found that changes in inequality in annual hours worked were predominant in determining trends in earnings inequality during the eighties. Doiron and Barrett (1994) focused on the importance of annual hours worked and hourly wage rates in explaining differences in earnings inequality between men and women. They concluded that the larger female inequality in annual earnings was due to a greater inequality in the distribution of hours of work. They also found that changes in earnings inequality between 1981 and 1988 were generated mainly from movements in the hours distributions. Beach and Slotsve (1994), Burbidge et al. (1993) and MMP (1994) have documented the increase in inequality in annual earnings observed in Canada over the last decade. Yet none of these studies has analysed extensively changes in the distribution of hourly wages, weekly hours and weekly earnings in Canada during the 1980s. This paper fills this gap by doing so.

2 The only exception is the 1995 Survey of Work Arrangements which provides data for the main job held in November. We use the SWH-SUM-LMAS-SLID-SWA cross-sectional **master** files. To exclude some records with extremely high hourly wage rates, we further restrict the sample to individuals earning no more than \$ 300 per hour (in constant dollars of 1989). All calculations in this paper are based on sampling weights.

3 Since SWH, SUM, LMAS, SLID and SWA have different questionnaires, one may ask whether the data resulting from these various surveys is consistent over time. All these surveys are based on the survey design and sampling frame of the Labour Force Survey. While the questions used in SWH and SUM to collect data on weekly hours refer to the number of **hours usually worked**, those used in LMAS and SLID refer to the number of **paid hours usually worked**. One of the important findings of the study is that the dispersion of weekly hours worked has increased through the eighties. One could argue that this result is simply due to the conceptual difference noted above. This is not the case. Using the Labour Force Survey - which provides a consistent time series of weekly **hours usually worked** over the period 1976-1994 - we confirm this finding.

Hourly wage rates are calculated by dividing the usual wage or salary workers report (on a hourly, daily, weekly, monthly or annual basis) by the number of hours worked during the relevant time interval. Two points are worth noting. First, the set of categories used to collect the amounts reported differ slightly over time. While all surveys contain the four categories "per hour", "per week", "per month" and "per year", some include "bi-weekly" wages (SUM and LMAS) while others include "total earnings from this employer during the reference year" (SWH). Since the four categories defined above account for 90% or more of all observations in SWH, SUM and LMAS 1986, this should not pose a problem. Second for each of these four categories, the formulas used to calculate hourly wage rates are **identical** for both SWH and LMAS. The only difference is - as noted above - that SWH measures hours usually worked while LMAS measures **paid** hours usually worked. Since most of our findings are based on these two surveys, it is reasonable to think that these findings

reflect actual changes taking place in the labour market rather than data consistency problems.

4 Most of the comparisons made in this paper for the 1980s are based on the years 1981 and 1988. Two reasons justify that. First, the labour market conditions are roughly comparable for these two years. Second, changes in the coding of education levels do not allow comparisons after 1988. Specifically, the only comparison that can be made after 1988 is between the "0-10 years of schooling" category and the "11-13 years of schooling" category (Gower 1993).

5 Among those who did not report their wages, 31.2% were aged 45 or more, compared to 25.1% for those who did report their wages. Similarly, 19.0% of the former group are university graduates, compared to 17.3% for the latter group.

6 The main difference occurs in 1992 and is due to the fact that when using SWH-SUM-LMAS-SLID, we need to interpolate the data between 1990 and 1993 while we do have data for 1992 with the Survey of Consumer Finances.

7 We assume implicitly either : 1) that the covariance between the true earnings and the error term is not negative or 2) if the covariance is negative, that it does not offset completely the variance of the error term.

8 We also looked at trends in within-group inequality in a formal way. For 1981, 1984, 1986, 1987 and 1988, we regressed the natural logarithm of hourly wages on the following vector of explanatory variables : 1) one dummy for marital status, 2) four age dummies, 3) four education dummies, 4) sixteen interaction terms between age and education, 5) seven industry dummies, 6) one dummy for union status, 7) one dummy for full-time/part-time job and 8) four region dummies. Following Juhn, Murphy and Pierce (1993), we then computed the standard deviation of the residuals as well as the differences between percentiles of the residual distribution. The results of this exercise are presented in Appendix 1 (Table A1) and show that within-group inequality fell between 1981 and 1984 and then remained fairly constant. This is consistent with the idea that the decrease in within-group inequality between 1981 and 1988 may be partly due to the increase in the fraction of individuals reporting their earnings on an hourly basis between these two years.

9 Let p_i , h_i and w_i be log weekly earnings, log weekly hours and log hourly wages. Then :

$$w_i = p_i - h_i \quad (1)$$

$$\text{Var}(w) = \text{Var}(p) + \text{Var}(h) - 2\text{Cov}(p,h) \quad (2)$$

where $\text{Var}()$ and $\text{Cov}()$ denote the variance and the covariance of the relevant variables, respectively. Suppose that observed log weekly earnings p'_i are measured with error and deviate from their true value p_i by a random term $e_i \sim N(0, s_e^2)$, where e_i is independent of p_i and h_i . In other terms, $p'_i = p_i + e_i$. Then equations (1) and (2) change as follows :

$$w'_i = p_i - h_i + e_i \quad (3)$$

$$\text{Var}(w') = \text{Var}(p) + \text{Var}(h) - 2\text{Cov}(p,h) + s_e^2 = \text{Var}(w) + s_e^2 \quad (4)$$

Equation (4) implies that both the variance of log hourly wages and the variance of log weekly earnings increase by the same amount, i.e. s_e^2 . Since the variance of log weekly hours $\text{Var}(h)$ is not affected by the measurement error involving weekly earnings, it will remain constant. It follows that

the covariance between log weekly hours and log **hourly wages**, $Cov(w,h)$, will also remain constant, i.e. $Cov(h,w) = Cov(h,w')$. Thus the contribution of hourly wages to the change in the variance of log weekly earnings will increase while the contribution of $Var(h)$ and of $Cov(h,w)$ will decrease. The Pearson correlation coefficient between log weekly hours and log hourly wages will change from :

$$r(h,w) = Cov(h,w) / \sigma [Var(h)*Var(w)] \quad (5)$$

to :

$$r(h,w') = Cov(h,w') / \sigma [Var(h)*Var(w)] \quad (6)$$

and will decrease since $Cov(h,w) = Cov(h,w')$ and $Var(w') > Var(w)$. Thus, an increase in measurement error will decrease the absolute value of the correlation coefficient. This implies that a **decrease** in measurement error will increase the absolute value of the estimated coefficient. Thus, part of the increase in the correlation coefficient between log weekly hours and log hourly wages could be due to an increase in the accuracy of reported earnings, which in turn could be explained by the growth in the fraction of workers reporting earnings on an hourly basis between 1981 and 1988. Between 1981 and 1988, the Pearson correlation coefficient between log weekly hours and log hourly wages rose from 0.10 to 0.20.

10 It must be pointed out that the increasing correlation between hours and hourly wage rates does not necessarily mean that highly paid workers received higher weekly earnings **because** they increased their weekly hours. Although this would be a valid interpretation for hourly-paid workers, it may not hold for salaried workers. A second interpretation is that firms may have altered the annual wage/weekly hours package they offer some highly paid employees, i.e. they may have offered higher annual wages **conditional** on higher weekly/annual work hours. This would : 1) increase inequality in annual/weekly earnings, 2) increase the dispersion of weekly hours, 3) increase the correlation between weekly/annual hours and hourly wage rates and 4) leave the dispersion of hourly wage rates unchanged (assuming the annual wage increase equals roughly the annual increase in hours). This second interpretation is consistent with the four aforementioned facts that we observe in the data. Most important, - as we will argue below - both scenarios could have been **caused** by factors such as the growth of competition within industries and from abroad, skill-biased technological changes and increases in fixed labour costs.

11 Between 1981 and 1988, the Gini coefficient of usual weekly hours worked in the main job increased by 18% for Canadian men.

12 More precisely, the sample used by Freeman and Needels (1991) consists of **heads of household and spouses**.

13 Obviously, this will affect how coefficients will change through time only if the distribution of employment by industry or union status changes. This was the case between 1981 and 1988. First, the relative importance of services-producing industries rose. Second, while the unionization rate remained fairly constant in the aggregate, it fell substantially for young workers.

14 The age variable is defined in discrete terms in SWH and thus cannot be used as a continuous variable in the regressions. The age groups are the following : 17-24, 25-34, 35-44, 45-54 and 55-64. The education levels are the following : 1) none or elementary, 2) 9-13 years, 3) some post-

secondary, 4) post-secondary certificate or diploma and 5) university degree. The major industrial groups are : 1) agriculture, fishing and trapping, 2) forestry and mining, 3) construction, 4) manufacturing, 5) distributive services, 6) business services, 7) consumer services and 8) public services. The categories "not married", "aged 17 to 24", "9-13 years of schooling", "Consumer Services", "Not unionized", "Part-time" and "Ontario" are the reference groups. Regressors also include a constant term. The dependent variable is the natural logarithm of hourly wages. When we run these regressions, some interaction terms are not statistically significant at the 5% level. Thus, the wage equations are re-estimated using only the statistically significant interaction terms. The numbers presented in Table 3 are based on this last set of regressions.

15 The percentage wage differential between workers with a given education level and those with 9-13 years of schooling equals the antilog of the coefficients presented in Table 3 minus 1 and expressed as a percentage. For instance, male university graduates aged 35 to 44 earned 31 % higher wages than those with 9-13 years of schooling in 1981, where 31 % equals $\exp(0.27) - 1$. Similar calculations for 1988 lead to a wage gap of 45 %, i.e. $\exp(0.37) - 1$. Hence, the wage gap between male university graduates aged 35 to 44 and their counterparts with 9-13 years of schooling rose by 14 percentage points between 1981 and 1988.

16 In our sample, the proportion of men in unionized jobs decreases from 41.9 % in 1981 to 39.4 % in 1988. In contrast, the unionization rate in the United States has declined from roughly 30% in 1970 to 16% in 1990 (Riddell 1993).

17 Since the **square** of the coefficient of variation and the Theil-Entropy index are decomposable - the Gini coefficient is not - the decomposition is done using these two inequality measures. The formulas used for the decomposition are the following. The square of the coefficient of variation (CV^2) = $\sum p_i cv_i^2 r_i^2 + \sum p_i (1 - r_i^2)$; Theil-Entropy (TE) = $\sum p_i r_i \ln(r_i) + \sum p_i r_i TE_i$, where $r_i = m_i / m$, m_i are mean earnings of group i, m are overall mean earnings, p_i is the proportion of individuals in group i, and cv_i^2 and TE_i are measures of inequality for group i. The results of Table 5 are derived by changing r_i first, then changing group-specific measures of inequality and finally changing p_i .

18 The relative unemployment rates by education level also provide some evidence of an increasing demand for high-skill workers. Between 1981 and 1989, the ratio of the unemployment rate of individuals with 0-8 years of schooling to that of university graduates rose from 3.0 to 3.9 among individuals aged 15-24 and from 3.3 to 3.7 among individuals aged 25-34.

19 Since the Survey of Work History of 1981 does not contain information on firm size, we proceeded as follows. First, we calculated the distribution of employment by firm size for 1981 and 1988 using the LEAP file. We defined four size classes (less than 20 employees, 20-99, 100-499 and 500 employees or more). We calculated the **change** in the proportion of workers employed in these size classes between 1981 and 1988. Second, we added that change to the percentage of workers employed in these size classes from LMAS 1988.

20 Two opposite forces play a role here. The increase in the proportion of small firms - which employ a disproportionate share of young workers - tends to decrease average wages of young

workers. However, the decrease in the proportion of large firms - in which older workers are overrepresented - tends to pull down average wages of these workers. Thus, the net effect of these two factors is unknown a priori.

21 The degree of rationing is calculated as follows. In the Survey of Work History of 1981, whenever an individual works less than 6 hours per day or 5 days per week or 4 weeks per month, the following question is asked : "...how many additional hours per month would you have preferred to work for this employer ?". If the number of additional hours is greater than zero, the next question is asked : "What were the reasons why you did not work these additional hours ?" One possible reason is that "additional hours [were] not offered by [the] employer". The average number of additional hours men in the bottom quintile would have preferred to work per month is obtained simply by : 1) summing the total number of additional hours per month which were not worked because they were not offered by employers and, 2) dividing the resulting number by the number of men in the bottom quintile. The same procedure is used for the Labour Market Activity Survey of 1988.

22 We calculate a distribution of hypothetical annual wages by multiplying weekly earnings by 52 weeks.

23 For simplicity, we assume a discount rate of 0%.

24 Calculations on cumulated earnings were made for nominal earnings, real earnings and real earnings discounted at 3% and 7%. The resulting inequality values differed very little across these four earning concepts. To avoid duplication, we present the results based on nominal earnings. Other results are available upon request.

25 Of all male workers aged 18-64 in 1975 and who had positive earnings during that year, 60% had positive earnings throughout the 1975-1984 period and 74% had positive earnings throughout the 1975-1980 period. These percentages rise to 66% and 78% for men aged 25-54 in 1975. To avoid spurious increases of inequality measures sensitive to extremely high earnings, the sample selected excludes workers with real annual earnings of \$1 million or more (in 1989 constant dollars).

26 The sample sizes are substantial. For men aged 18-64 with positive earnings during each year of the 1975-1984 (1984-1993) period, we have a sample of 35,143 (38,912) observations. The corresponding sample sizes for men aged 25-54 are 25,289 (29,325).

27 These four conclusions hold when we shorten the time intervals and consider the periods 1975-80 and 1984-89. Among men aged 25-54, the average of the short-term Gini coefficients increased 10.6% while the long-term Gini coefficients rose 11.9% between these two periods. To find which segments of the earnings distribution were most affected, we calculated average earnings in the bottom, middle and top quintile. The results are unambiguous. Whether based on annual earnings or on cumulated earnings, the gap between the top quintile and the bottom quintile rose mainly because low earners lost ground relative to the middle quintile. For instance, among men aged 25-54 at the beginning of the period and with positive earnings all years, the (average across years of the) top/bottom quintile ratio of annual earnings rose 25% between 1975-80 and 1984-89, with the

top/middle ratio growing 4% and the middle/bottom ratio rising 20%. For cumulated earnings, the corresponding growth rates are 20%, 4% and 15%, respectively.

28 One disadvantage of selecting men with positive earnings all years is that such a sample excludes individuals who are the least successful in the labour market, i.e. those who remain unemployed for one year or more. To take this into account, we also calculated the ratio of mean earnings in the top quintile to mean earnings in the bottom quintile for a sample of men aged 25-50 at the beginning of the period and who had positive earnings at the beginning of that period. Since most males aged 25-50 are in the labour market - the participation rate of men aged 25-54 varied between 92% and 95% between 1975 and 1993 - we minimize the cases where a value of zero earnings results from non-participation. Because most of them have already made a transition from school to work and because very few of them are likely to experience early retirement, we minimize the chances of inequality trends being contaminated by changes in the participation rate. For that sample, the top/bottom ratio of annual earnings (averaged across years) rose 13% between 1975-80 and 1984-89 while the top/bottom ratio of cumulated earnings (i.e. earnings cumulated over 6 years) increased by 21% between these two periods. Hence, whether we focus on males with positive earnings all years or on males with positive earnings at the beginning of the period, long-term earnings inequality rose at least as much as inequality in annual earnings during the eighties.

29 Ideally, one would like to construct, for each industry, measures of the intensity of competition and of the supplementary labour income and use these as regressors to explain trends in the dispersion of weekly hours. While one could construct measures of competitive pressures from the longitudinal version of the Census of manufactures (e.g. looking at trends in market shares transferred from growing to declining firms), it is impossible to produce reliable estimates of supplementary labour income for 2-digit industries.