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# THE DISTRIBUTION OF FAMILIY INCOME: MEASURING AND EXPLAINING CHANGES IN THE 1980S FOR CANADA AND THE UNITED STATES

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# THE DISTRIBUTION OF FAMILY INCOME: MEASURING AND EXPLAINING CHANGES IN THE 1980S FOR CANADA AND THE UNITED STATES

**ABSTRACT**

This paper attempts to measure and explain recent changes in the distributions of family income in Canada and the U.S. using comparable micro-data for the two countries for 1979 and 1987. Three main sets of conclusions are reached.

First, the distributions of total family income (pre-tax, post-transfer) in the two countries changed differently in the 1980s. Average family income increased faster in Canada than in the U.S., though income inequality increased unambiguously in the U.S., but not in Canada. Imposing a simple structure on the data reveals that the social welfare implications of these changes are generally indeterminate for each country.

Second, changes in the distribution of transfer income had important influences on the distribution of total family income in both Canada and the U.S. Transfer income in Canada increased more rapidly than it did in the U.S. during the 1980s and also became more redistributive in nature. Most notably, the shifts in transfer income left female-headed families in Canada with a higher mean income and less income inequality in 1987 than they had in 1979. Among female-headed families in the U.S., income inequality increased while average income declined.

Third, increased income inequality in the U.S. partly reflects increased earnings inequality, which is itself associated with a widening of education-earnings differentials that occurred in the 1980s. Earnings inequality also increased in Canada in the 1980s, despite the stability of education-earnings differentials.

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## I. Introduction

It is now well known that income inequality increased substantially in the United States during the 1980s. Why it increased, and whether the trend will continue, are still questions that are much debated. Less concern seems to have been devoted to changes over time in inequality in Canada, although this is changing. Yet, with few exceptions, researchers have not attempted to compare trends in income inequality and its correlates between the two countries. Such a comparison could help identify the forces responsible for observed patterns in inequality for the two countries. Indeed, Canada and the U.S. seem to be particularly appropriate for making cross-national inequality comparisons, since the two countries are fairly similar in the extent of the welfare state, the lack of a centrally-controlled wage-setting mechanism, and the nature of the family.

It is inherently difficult to draw conclusions from international comparisons of inequality. As has been pointed out by Lydall (1978), for example, differences across countries in how data are collected, or in any quality-control adjustments that are made by statistical agencies that collect the data, can generate misleading differences in measured inequality. Nevertheless, much use has been made of compilations of inequality measures for several countries, *e.g.*, those collected in Jain (1975), despite the fact that there are differences across countries in the income concept being applied, the definition of an income-receiving unit, and in population coverage (see van Ginneken and Park, 1984). In our view, the preferred method of making such cross-national inequality comparisons is to use comparably-collected microdata -- which we believe is available for the U.S. and Canada -- and to make adjustments so that the underlying

concepts that define an income distribution are as close as possible in the two countries. In this paper, we make such a comparison for the distributions of family income and individual earnings in Canada and the United States in 1979 and 1987.

While a discussion of the literature on recent changes in income and earnings inequality in the U.S. is available (see Beach, 1989; see also Blackburn and Bloom, 1987), we are not aware of any such summary for Canada. Section II of the paper provides such a review. Section III discusses our approach to comparing income distributions across countries and over time, and presents our empirical results for the distribution of family income. Section IV continues the analysis by focusing on the determinants of changes in the dispersion of earnings among males in the two countries. Section V summarizes our findings.

## II. A Review of Studies of the Distribution of Income in Canada

Several recent studies have focused on the topic of changes in the level of economic inequality in the U.S. The prime questions of interest have been the following: is there any evidence of an increasing (or decreasing) trend in the level of inequality? and, if so, what factors can explain the trend? For the most part, these studies can be separated into those that have family income inequality as their focus, and those that analyze individual earnings inequality. (One exception is Blackburn and Bloom, 1987, which analyzes both.) It is apparent from these studies that income inequality among families has been increasing, at least since the 1960s (see Blackburn and Bloom, 1987; see also Levy, 1988). The reasons that have been proposed to explain this trend include changes in the

distribution of family size, the increase in the percentage of families with female heads, and the increased labor force participation rate of women, as well as the commonly suspected changes in the distribution of individuals' earnings. Blackburn and Bloom (1987) argue that the distinction between family income and individual earnings inequality is important over the period because changes in the individual earnings distribution are only part of the explanation for rising family income inequality. Studies of earnings inequality find an upward trend for males (but not for females or for all earners) that seems to have steepened in the 1980s (see Blackburn and Bloom, 1987; Karoly, 1988; Burtless, 1990). Shifts in the demographic and industrial composition of the male working population have been suggested as possible explanations for the increase in male earnings inequality, though the evidence suggests that the increase is largely attributable to changes in the "structure" of wages, *i.e.*, changes in the returns to education and experience, and changes in the mean level of earnings within industries (*e.g.*, see Juhn, Murphy, and Pierce, 1989; Blackburn, 1990).

Many of the issues noted above have also arisen in connection with recent work on the distributions of earnings and income in Canada. As in the United States, there appears to have been an upsurge of academic interest in these topics in the 1980s, and many of the same hypotheses to explain inequality changes have been considered in both countries. In this section, we briefly review the recent literature on inequality (and average income) trends in Canada, with an appendix table further detailing selected aspects of these studies.

One of the earliest studies of Canadian income inequality is Henderson and Rowley (1977). In a detailed analysis using data from the Survey of

Consumer Finances (SCF), these authors discovered a slight upward trend in the inequality of total family income over the years 1965-1973. Since their empirical analysis suggests that income inequality is higher among smaller families and since family size declined in Canada in the years under study, they point to changes in family size as one of the major reasons for the increase. They also find that the decline in the percentage of families with at least one male earner, presumably due to both an increase in female-headed families and a decline in the rate of male labor force participation, is important to the increase, since families with no male earners have higher measured inequality.

Subsequent studies of family income inequality in Canada have also pointed to family-size and labor-force participation rate changes as contributing to movements over time in the level of inequality.[1] Wolfson (1986) extends the time period studied by Henderson and Rowley to 1983; his results suggest that inequality increased in the late 1960s, decreased over the 1970s, but began to increase again in the early 1980s. Like Henderson and Rowley, he finds changes in the size and structure of families to be an important contributor to increased inequality; he also points to the rise in female labor force participation as another factor leading to increased inequality. He explains the fall in inequality over the 1970s in terms of the increases in both transfer and investment income as a percentage of total family income, since increases in both appear to have an equalizing effect on the family income distribution.

Dooley (1988) analyzes changes in the prevalence of "low-income

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[1] As alluded to earlier, this contrasts somewhat with the U.S. literature, which often treats changes in family income inequality as mainly reflective of changes in the earnings distribution for working males.

status" in Canada from 1973 to 1986. Low-income status is similar to the official definition of poverty in the U.S. Like changes in poverty rates in the U.S., changes over time in the proportion of individuals that are in families classified as "low-income" can result from changes in the mean of the income distribution, or from changes in the level of inequality characterizing the distribution.[2] Dooley finds that the low-income proportion fell from 1973 to 1979 -- due both to a decline in inequality and to an increase in the average level of real family income -- but increased from 1979 to 1986 (although not for the elderly, for whom it continued to decrease). Dooley attributes the fall in low-income percentages in the 1970s to declines in family size, increases in the level of government transfer payments, and increases in the level of wives' earnings;[3] the increase in the incidence of low-income in the 1980s is argued to be related to the decline in the real value of husbands' earnings, especially among younger adults. Dooley (1989) focuses on the low-income status of children, finding that declining family size and increasing educational attainment of family heads are most important to the decline in the 1970s in the percentage of children in "low-income" families.[4]

McWatters and Beach (1990) present measures of both average family

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[2]The low-income proportion could also change over time if the real value of the low-income cutoff levels changed; however, Dooley applies the 1986 values of the cutoffs to data from all of the years that he considers.

[3]The family size effect likely works through increasing mean incomes within family-size categories, since (as mentioned above) other research using the same data finds that in Canada inequality tends to be higher among smaller families.

[4]Changes in educational attainment were not studied as a contributor to changes in low-income incidence in Dooley (1988).

income and family income inequality for the years 1965-1987. Like earlier studies, the figures they report suggest increasing inequality in the late 1960s, and falling inequality in the 1970s. Their numbers also suggest that inequality was higher in 1984 than in 1979, but that it declined from 1984 to 1987. On the basis of time-series regressions of quintile shares on various aggregate-level variables, McWatters and Beach show that family income inequality is negatively associated with the rate of male labor force participation and positively associated with the rate of female labor force participation.

Compared to the literature pertaining to U.S. inequality trends, Canadian analyses have paid more attention to changes in the family income distribution and less attention to changes in the distribution of individual earnings. We are aware of only four recent studies for Canada focused on trends in the distribution of individual income or earnings. The study by Buse (1982) uses micro-level data from individual income tax returns to study individual income inequality from 1947 to 1978. Although changes in the definition of income over the period cloud his inferences somewhat, Buse finds there to be an upward trend in inequality over the period as a whole. His time-series regressions also suggest that the overall labor force participation rate is a strong negative correlate of inequality.

While Dooley (1986) does not focus on earnings inequality *per se*, he does consider the extent to which there have been changes in the relationship between annual earnings and two individual characteristics: age and education. His findings suggest a relatively stable age-earnings relationship in the 1970s, and a large decline in the estimated return to schooling in the early 1970s. This latter finding parallels the results of

Freeman (1976) for the U.S. Both authors suggest that the phenomenon of generational crowding can explain some (but not all) of the decline in the return to schooling that they document.

In his 1987 paper, Dooley focuses on how earnings inequality among Canadian men changed from 1971 to 1982. Focusing on seven years from that period, his results reveal no clear trend in the inequality of weekly earnings, or the inequality of annual earnings among full-time, year-round workers. Within age/education groups, however, he finds increases in earnings inequality among less-educated, younger males and declines in inequality among more-educated, older males. Regression results suggest that the unemployment rate was an important factor associated with increased earnings inequality (for some groups) over this period.

Myles, Picot, and Wannell (1988) also study changes in the distribution of individual earnings. They find that from 1981 to 1986 there was an increase in the percentage of male workers in low-wage jobs. However, they also find evidence of an increase in the employment share of what might be described as the upper middle portion of the hourly earnings distribution, so that the change in inequality over the period is not clear. They perform a shift-share analysis that suggests that industry and occupational changes played only a small role in the observed changes in the wage distribution.

To summarize the existing Canadian evidence (which tends to be more consistent across studies than the evidence for the U.S.), Canada appears to have experienced two periods of increasing family income inequality over the last twenty-five years: the late 1960s and the early 1980s. Prior to 1980, there were large increases in real incomes and corresponding declines in poverty rates; since 1980, there has been some reversal of these trends.

The decline in family size in Canada is a factor that leads to higher inequality and, somewhat paradoxically, to lower poverty rates, while the increase in female labor force participation is found to be positively associated with the level of inequality. The evidence that is available on earnings distributions provides little indication of a significant trend in earnings inequality.

With the exception of Buse, and Myles, Picot, and Wannell, all of the studies we surveyed use the Survey of Consumer Finances as their source of data. As noted by Dooley (1986), one problem with using the SCF for this purpose is that, prior to 1977, Statistics Canada did not make available public use samples with information on income non-respondents. However, since 1977, they have imputed income values for non-respondents to the income questions. With the Current Population Survey (CPS) in the U.S., imputed incomes are provided over the entire history of the public use samples. With the CPS it is clear that the characteristics of income non-respondents tend to be different from those of income respondents (*e.g.* see Lillard, Smith, and Welch, 1986), so that the omission of income non-respondents in the Canadian data before 1977 might seriously bias inequality comparisons between the pre- and post-1977 samples.[5] For this reason, our use of the SCF is limited in this paper to the study of patterns and trends in the 1980s.

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[5]This observation suggests that the studies of Canadian income inequality reviewed above (which all use the SCF) may have biased estimates of the change in inequality over the late 1970s. It would be useful to know if using only nonimputed incomes for the Canadian analysis after 1977 would change any conclusions regarding the level of inequality, but there are unfortunately no imputation flags in the Canadian public use samples.

## III. Welfare Comparisons for Families in Canada and the U.S.

### A. Making Welfare Comparisons

For a population of n individuals, let $y_1, y_2, \ldots, y_n$ be the associated incomes subscripted such that $y_1 \leq y_2 \leq \ldots \leq y_n$. The Lorenz curve function is defined as

$$(1) \qquad L(i/n) = \sum_{j=1}^{i} (y_i/n\bar{y}) \qquad \text{for } i \leq n \ ,$$

where $\bar{y} = \sum_{j=1}^{n} (y_i/n)$. In addition to the Lorenz curve, there are also numerous scalar indices that are commonly used to make inequality comparisons between two distributions. Many of the indices, including those used in this section of the paper, satisfy the following property: if the Lorenz curve for one distribution lies above the Lorenz curve for a second distribution at one or more points and never lies below it at any other point, then the inequality index will be lower for the first distribution than for the second. However, the converse does not hold.[6] In what follows we measure inequality using the mean logarithmic deviation (MLD),

$$MLD = \sum_{i=1}^{n} \log(\bar{y}/y_i)/n \ ;$$

the entropy index (E),

$$E = \sum_{i=1}^{n} [y_i \log(y_i/\bar{y})]/(n\bar{y}) \ ;$$

and the Gini coefficient (G),

$$G = \sum_{i=1}^{n} \sum_{j=1}^{n} |y_i - y_j|/(n^2\bar{y}) \ .$$

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[6] In section IV of the paper, we use the variance of logarithms as a measure of inequality since it possesses a convenient decomposition property (outlined in that section). Although it is widely used, the variance of logs does not satisfy the Lorenz-curve property.

Atkinson (1970) was one of the first economists to consider the relation between inequality and social welfare. He showed that under fairly minimal assumptions income distributions could be compared in terms of their implied levels of social welfare on the basis of the location of their corresponding Lorenz curves. In particular, if the Lorenz curve for one distribution lies above the Lorenz curve for a second distribution at one or more values of the ordinate, and if the first distribution's Lorenz curve never lies below that of the second, then the first distribution has (lower inequality and) higher social welfare than the second. Two key assumptions underlie this result: one, that social welfare increases whenever the income received by any member of society increases; and, two, that social welfare is a strictly quasi-concave[7] function of all individual incomes.[8] If the Lorenz curves for the two income distributions cross, nothing can be said about the relative social welfare associated with the two distributions without imposing additional structure on the social welfare function.

The usefulness of Atkinson's result is diminished by two important properties of the social welfare interpretation of Lorenz curve comparisons. As can be seen from equation (1), the Lorenz curve will be

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[7]Strict quasi-concavity implies that the social welfare of the average of any two income distributions will be higher than the social welfare of at least one of the two distributions being averaged. Atkinson actually made a more restrictive assumption about social welfare than quasi-concavity: he assumed social welfare was the sum of individual strictly concave utility functions that were identical for all individuals. The less-restrictive result referred to here is from Dasgupta, Sen, and Starrett (1973), who show that the result holds assuming strict Schur-concavity of the social welfare function (a less restrictive assumption than strict quasi-concavity).

[8]Symmetry across income units in the aggregation of incomes into social welfare is also assumed.

the same for two distributions if either of the following is true: (a) if one of the distributions is an n-fold replication of the other distribution; or, (b) if one distribution consists of incomes from the other distribution all multiplied by a common factor. This property suggests that Lorenz curves can be used to compare the "inequality" levels of income distributions, even if those distributions have different numbers of individuals or different mean incomes. However, these inequality comparisons lose any social-welfare interpretation, since social welfare is by assumption an increasing function of all incomes.

These limitations of Lorenz-curve comparisons can be circumvented by making comparisons of both the mean level of income and the level of income inequality. For example, if the mean of one distribution is higher, and its inequality (in the Lorenz-curve sense) is lower, then the social welfare of that distribution must be higher (given the earlier assumptions); likewise, if the mean is lower and inequality is higher, social welfare must be lower. But this procedure is inconclusive when the mean and inequality move in the same direction. Fortunately, Shorrocks (1983) and Kakwani (1984) have extended the Atkinson result to comparisons of income distributions with different mean incomes. The structure of their result is similar to that of Atkinson: given the same assumptions about the social welfare function, one distribution corresponds to a higher level of social welfare than another if and only if its *generalized* Lorenz curve (GLC) lies above the other distribution's GLC at all ordinates, where the GLC is defined simply as the Lorenz curve multiplied by the mean income, *i.e.*,

$$GL(i/n) = \sum_{j=1}^{i} (y_i/n) \text{ for } i \leq n.$$

GLC comparisons are identical to the following sort of comparison: at the qth n-tile of the population for both distributions, compute the average income of all individuals with incomes less than $y_q$; if this average income is higher, for all q, for one of the distributions, then that distribution must have a higher level of social welfare.[9,10]

In the next subsection, we compare family income distributions in 1979 and 1987, for Canada and the U.S., on both an inequality and a welfare basis. For meaningful welfare comparisons (*e.g.*, for comparing generalized Lorenz curves) it is necessary to express incomes for different years in an identical year's currency. To this end, all incomes are expressed in 1987 U.S. dollars, correcting for inflation in the U.S. using the GNP personal consumption expenditure (PCE) deflator, for inflation in Canada using the consumer price index (CPI), and for the exchange from Canadian into U.S.

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[9] GLC comparisons can also be thought of in the following way. Suppose an expected-utility-maximizing individual has his choice between two probability distributions for determining his income. Assume that the individual's utility function is increasing and quasi-concave in his income. Provided that the GLC's associated with the two distributions do not cross, the individual will choose the probability distribution with the higher GLC. If the GLC's do cross, our assumption about his utility function does not yield a certain prediction about which distribution he would choose.

[10] The method of comparing distributions through generalized Lorenz curves corresponds identically to the criterion for second-order stochastic dominance that has been suggested in the finance literature (e.g, see Hadar and Russell, 1974). It is also possible to compare income distributions on the basis of the criterion for first-order stochastic dominance, which would be appropriate if the restriction to quasi-concave welfare functions were not desirable. The first-order criterion is that the cumulative distribution function for one distribution lie below the cumulative distribution function for a second distribution in order for the first distribution to have higher welfare. The condition for first-order stochastic dominance is stronger than the second-order condition, in the sense that if the first-order condition holds then the second-order condition must also hold, while the converse is not true. Since the assumption of quasi-concavity does not seem overly restrictive to us, we focus primarily on GLC comparisons in our empirical work, although we do make some use of first-order comparisons.

dollars using a 1980 purchasing power parity measure provided by the OECD. Since the most tenuous part of these adjustments relates to the OECD measure of purchasing power parity, the comparisons of average income across countries should be interpreted cautiously.[11] Alternatively, the comparisons that we consider most informative are those relating to how the U.S. and Canadian income distributions are changing differently over time.

B. Results

Comparisons of changes in income inequality across countries are more informative when the data from the countries are more similar -- both in the kinds of income information collected and in the way in which the population being sampled is defined. In this section we use the Current Population Survey for the U.S. and the Survey of Consumer Finances for Canada to study the distribution of family income. These data sources provide information for nationally representative samples of the population of families in the U.S. and Canada, and both employ similar definitions of the family -- two or more related persons living together (using the "economic" family concept for Canada). Both datasets also include information on individuals who live alone or with others to whom they are not related. These individuals are included in our analysis and treated as separate families. Total income also has a similar definition in the U.S. and Canadian data -- cash income received over the preceding calendar year, excluding capital gains and any lump-sum payments received. Although

[11] For instance, if we used the purchasing power parities implicit in the tables provided in Summers and Heston (1988), the average incomes that we report for Canada in the next subsection would be somewhat lower.

several sources of income tend to be under-reported in both surveys -- in particular, some government transfer payments, and investment income -- the extent of under-reporting appears to vary little across countries (and over time within countries). Both surveys also have upper limits on the amount of income from a particular source that can appear in the public use samples; we recoded incomes for some of the surveys so that all samples used would have the same top-code for incomes ($50,000 in 1979 U.S. dollars). For both countries, we use data collected in 1980 and 1988, so that we have income information for 1979 and 1987.

One problem that naturally arises in measuring family income inequality relates to the fact that families of different sizes and compositions may require different amounts of income to be equally well-off.[12] We handle this problem in two ways: first, in addition to focusing on the distribution of total family income, we analyze a distribution of income that is standardized for family size and composition, *i.e.*, "equivalent" income; and, second, we classify all families into one of eight demographic types, our assumption being that all families of a particular type have roughly equal income needs. The eight family-types are: male unrelated individuals; female unrelated individuals; unmarried females living only with one child (under age 18); unmarried females living only with two or more children; married couples living with no children (or any other related individuals); married couples living only with one child; married couples living only with two or more

[12] For example, a distribution where all one-person families receive $10,000 and all two-person families receive $15,000 may be preferable to a distribution where all families receive the average income, although the latter distribution would be considered more equal if no account were taken of family size.

children; and all other families. Disaggregating the data in this manner allows us to examine whether inequality or welfare is changing differently within these relatively homogeneous demographic groups.

The distribution of families according to demographic type is reported in the top panel of Table 1 for the U.S. and Canada in 1979 and 1987.[13] The family breakdown is quite similar in both countries, the primary difference being that U.S. families are more likely to be female-headed, and less likely to consist of married couples with two or more children. Our hope was to capture most of the families in the first seven categories, since comparisons of changes in inequality or welfare among families in the "other" category -- families with children over 18, or with aunts, uncles, grandparents, etc. -- are less valid since the types of families that fall into this category can be quite varied. But somewhat to our dismay, roughly one-fifth of the families in any year fall into the "other" category.

During the 1980s, the only family-type that clearly grew in both countries was males living without relatives; female-headed families and females living without relatives increased their share in the U.S. but not in Canada, where there were instead sizable increases in the percent of families classified as married couples with no children, and in the "other" category. The middle panel of Table 1 reveals that the growth of unrelated individuals as a percent of all families has been due to there being both more formerly-married and more never-married individuals living without relatives. The increase in female-headed families in the U.S. has been

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[13] Although the family distribution is actually measured at the time of the survey (i.e., 1980 and 1988), in order to minimize confusion we will refer to these family distributions as being for 1979 and 1987.

almost entirely due to an increase in families headed by never-married females. The bottom panel shows that two-earner families have increased in both countries (and especially in Canada) among married couples with children. The relatively large growth in female-headed families and unrelated individuals in the U.S. led to the average number of earners per family actually falling in the U.S. from 1979 to 1987, in contrast to Canada, where the average increased.

Estimates of average total family income for each of the family types, and for all families, are reported in Table 2. Among all families, total income grew at an annual rate of 0.7 percent in Canada, but at a rate of only 0.4 percent in the U.S. Income grew for almost all family-types in both countries, the exceptions being female-headed families with two-or-more children, and "other" families, in the U.S. Married couples with children, and families with female heads (with or without children), experienced the largest growth in average income in Canada, while females living alone and married couple families had the highest income growth in the U.S.[14] In both countries, income growth was most rapid among families with no earners, while families with only one earner experienced the slowest income growth over the period.

Table 3 examines the sources of total family income and the strength of their association within families. Income is divided into three sources: total family earnings; property income; and transfer income.[15]

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[14]Using Canadian Census data for 1980 and 1985, Dooley (1990) does not find an increase in average income for lone females with children, though he does report an increase in average transfers received by such families. Whether this difference in findings is due to different ways in which the data were collected or handled, or to differences in the specific years being studied, is not clear.

[15]There is likely to be some misclassification of income in Table 3

One relevant fact evident from Table 3 is that while transfer income increased as a percent of total family income in both countries, the increase in transfers was especially large in Canada. The share of income from property sources increased in the U.S., while the share coming from total family earnings decreased in both countries. The only notable change in the correlations between sources of income was the increased absolute value of the negative correlation between transfer income and total family earnings in Canada, suggesting that transfer income became more redistributive in Canada from 1979 to 1987.

One limitation of using average total-family-income statistics (reported in Table 2) to study changes over time in the average level of economic well-being is that these statistics essentially double-count the contribution of transfers. This is because total family income is a pre-tax, post-transfer measure of income. For instance, an economy that experiences no growth in factor income, but increases the amount of money (frictionlessly) transferred through the government (and therefore the rate of taxation in order to finance the increased transfers), will record an increase in average total family income (as it is measured in Table 2), even though there has been no change in the average well-being of families. Such double-counting is likely to influence substantially our inferences about average income growth, since transfer income increased in both the U.S. and Canada during the 1980s. To circumvent this problem, we measured factor income only (*i.e.*, earnings plus property income) in recalculating

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(if income from privately-held pensions is considered property income) since a lack of detail in the public use samples made it necessary to include all pension income as part of transfer income. Note also that property income is under-reported, by 40 to 55 percent, in both surveys.

average income for the economy as a whole. With this measure, we find that average family-income growth was actually higher in the U.S. (0.18 percent per annum) than in Canada (0.08 percent per annum) from 1979 to 1987, showing that almost all of the growth in average income observed in Table 2 for Canada, and about half of the increase for the U.S., were due to increased transfers. Also, using factor income only shows average income to be roughly $500 higher in the U.S. than in Canada in 1987 (rather than being roughly equal in the two countries, as Table 2 suggests).

Table 4 presents Lorenz curve coordinates for the distribution of total family income (including transfer income) among all families, and within family types. Comparisons of Lorenz curves are made at quintile points of the income distributions.[16] Among all families in the U.S., the Lorenz curve for the 1987 distribution lies below the Lorenz curve for the 1979 distribution, implying that inequality was clearly higher in the U.S. in 1987 than in 1979. No conclusions can be drawn about changes in inequality over this period in Canada, since the Lorenz curve shifts in at the lower quintile points -- reflecting an increase in the share of income going to those families at the bottom of the distribution -- but then shifts out at higher quintile points. The three inequality indices mentioned above are reported in Table 5; focusing only on these would suggest that inequality fell in Canada, though Table 4 tells us that it is possible this conclusion would change if other inequality indices were used. Comparing the U.S. to Canada, we find that family income inequality

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[16] Strictly speaking, the curves should be compared at every point available in order to determine whether they cross. However, a comparison of selected curves at decile (and finer) levels indicates that our substantive conclusions are not sensitive to the fineness of the comparison.

is higher in the U.S. than in Canada in both 1979 and 1987.

One potential explanation for the differences between Canada and the U.S. in the change over time in family income inequality is that the two countries' family-type distributions have shifted differently over time. We might conclude that changes in inequality are largely explained by changes in the distribution of family types if inequality did not change among families within family types.[17] But Table 4 reveals that increased inequality within the U.S. is not due solely to such family-type changes, since the Lorenz curves shifted outward from 1979 to 1987 for seven of the eight family types in the U.S. (the exception being married couples with no children).[18] Income inequality is lower in Canada than in the U.S. for all eight family types.[19] Within family types in Canada, inequality clearly fell for lone females and female-headed families with children, but does not appear to have changed for the other family types (except for married couples with no children, for whom inequality appears to have increased).

To construct generalized Lorenz curves, one can simply multiply the

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[17]It is also true that changes in the variation of average incomes across family types can lead to changes in overall inequality, even if the family-type distribution and the level of inequality within family types remained constant.

[18]The mean logarithmic deviation (MLD) is particularly useful when decomposing inequality into contributions from subgroups of the population (see Bourguignon, 1979). For both countries, we decomposed the observed change in MLD from 1979 to 1987 into portions due to: (a) changes in the percentage of families within family types; (b) changes in mean incomes within family types; and, (c) changes in MLD within subgroups. Roughly one-third of the increase in MLD for the U.S. (.018 points) can be attributed to changes in family-type percentages; changes in family-type percentages also worked to increase MLD in Canada, but the size of its contribution in Canada (.006 points) was only one-third the size of the U.S. contribution. In both countries, changes in group means had a negative impact on MLD, while within-group changes in MLD constituted the major source of change in the overall value for this inequality index.

[19]This is true in both 1979 and 1987.

Lorenz curve coordinates by average income. In order to use only factor income in calculating average incomes, we adjusted each family's income by multiplying it by the ratio of average factor income to average total income.[20] The results are reported in Table 6. For the most part, focusing on this set of generalized Lorenz curves does not change any of the substantive conclusions reached earlier for Canada: for all families, it cannot be said that welfare increased, though for families headed by females (including lone females) social welfare was clearly higher in 1987 than in 1979.

For the U.S., the results suggest that for all families, and within most family types, increases in average income were not large enough to offset increases in inequality and unambiguously increase social welfare from 1979 to 1987.[21] Two exceptions for whom welfare was clearly higher in 1987 are lone females -- whose high rate of growth in average income offset their increase in inequality -- and married couples with no children. The fact that average incomes fell while inequality increased for U.S.

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[20]The same ratio (the one for the economy as a whole) was used for adjusting average total income for each of the family types. This is preferable to using the ratio of these incomes among families in the family type in question, since average well-being for a group is not necessarily related to the average factor income earned by that group. Note that the use of the same ratio in adjusting all incomes implies that the Lorenz curves for the distribution of total family income adjusted in this way will be the same as those reported in Table 4.

It would be even more desirable to analyze an after-tax, after-transfer measure of income. However, there is no information on direct taxes in the U.S., or on indirect taxes in either country, in the data we use. Further, any assignment of the distributional burden of government borrowing or inflation would be highly speculative, given the current state of knowledge on these burdens.

[21]One implication of second-order stochastic dominance comparisons is that a necessary condition for welfare to decrease (increase) is that average income must decrease (increase). Since average income did not decrease for all but one of the family types in the U.S., it follows that welfare for these family types could not have unambiguously declined.

female-headed families with at least two children led to this group being the only one in the two countries that was clearly worse off in 1987 than in 1979.

Our second method for comparing inequality and welfare in a manner that reflects needs differences across families is to standardize the income of each family for the family's size and composition. Thus, we measure the number of "equivalent adults" in families with different numbers of individuals, divide the family's income by the number of equivalent adults, and then weight each family's equivalent income by the number of individuals in the family (so that we are measuring the distribution of equivalent family income across individuals, not families; see Danziger and Taussig, 1979). The equivalence scales we use are those implicit in the U.S. Bureau of Labor Statistics' poverty lines; we also use per capita family income as an alternative standardization (which, it should be noted, takes no account of any household economies of scale, unlike the first standardization described above). Lorenz and generalized Lorenz curves for these two types of distributions are reported in Table 7.[22] These numbers suggest that income inequality fell (or at least did not increase) in Canada from 1979 to 1987, while average income increased,[23] so that both of these family income distributions in 1987 were preferable to those in Canada in 1979. For the U.S., both the inequality and the mean of these distributions increased, leading to the generalized Lorenz curves crossing for the two years and leaving the change in welfare indeterminate.

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[22] We again multiply all incomes by the ratio of average factor income to average total income.

[23] The fifth quintile coordinate for the generalized Lorenz curve is by construction equal to the average income.

In summary, the results of this section suggest that changes in the family income distribution from 1979 to 1987 were very different in Canada and the U.S. While average income (using factor income only) appears to have grown at a somewhat faster pace in the U.S. than in Canada, income inequality clearly increased in the U.S. but not in Canada. In both countries, social welfare can be said to have increased for some family-type groups, but not for all groups. However, if corrections for differences in family needs are made using equivalence scales, it becomes clear that the 1987 Canadian distribution is preferable to the 1979 Canadian distribution, while no clear conclusions about changes in social welfare in the U.S. can be made.[24]

Increases in transfer income seem to have played a large role in keeping income inequality from increasing in Canada. Table 7 also presents inequality measures and distributional comparisons for total family earnings among families with positive earnings. In both countries, average total family earnings grew, but the inequality of earnings also grew. The fact that the inequality of family earnings increased in Canada, while the inequality of family income did not, suggests that the growth of transfer income -- which from Table 3 we know is strongly and increasingly negatively correlated with earnings -- has had an equalizing impact on the distribution of economic well-being in Canada. The fact that inequality

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[24]We also calculated values of the empirical cumulative distribution function for the equivalent income distribution. The results show that the first-order stochastic dominance comparisons lead to the same conclusions about social welfare changes (using the equivalent income distribution) as the second-order stochastic dominance comparisons. This is because the cumulative distribution function for Canada in 1987 has a lower value than the 1979 function at all levels of income, while the 1987 U.S. distribution function lies above the 1979 function at lower income levels but falls below the 1979 function at higher income levels.

clearly fell in Canada only among families headed by females (including lone females) further suggests the importance of increasing transfer income, since these families are the ones most directly affected by changes in transfer policy.

## IV. Changes in the Distribution of Male Earnings

A topic of research that has begun to garner wide attention in the U.S. is the recent increase in the dispersion of earnings among males. As noted in Section III, the inequality of total family earnings increased in both Canada and the U.S. in the 1980s. Earnings inequality among a comparably-defined sample of prime-age male earners also appears to have increased from 1979 to 1987 in both countries. In this section we examine the forces that may have worked to increase earnings inequality among males in both countries, and that have potentially contributed to an increase in family income inequality in the U.S.

We focus our analysis on the earnings of a sample of male workers aged 25-64, who worked full-time year-round in the previous calendar year, and who were either the head of their economic family, or were the husband in a married couple that headed an economic family.[25,26] Descriptive statistics for the samples, which are drawn from the 1980 and 1988 SCF and CPS, are

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[25]The definition of full-time differs slightly in the two countries -- 35 hours or more per week in the U.S., but only 30 hours or more per week in Canada. However, there are relatively few male workers who work between 30 and 35 hours per week in the U.S., so this difference is not likely to be of much importance to our results.

[26]Earnings information is available in the Canadian SCF public use sample of "economic" families (defined as two or more related individuals living together, and unrelated individuals) for the household head (husband if a married-couple family) and wife only. This fact made the restriction to household heads necessary.

presented in Table 8. Using the variance of the natural logarithm of earnings as our measure of inequality, we see that earnings inequality among males increased in both countries during the 1980s, with the increase being slightly larger in the U.S. than in Canada.[27] In addition, characteristics of the samples changed in a very similar fashion in both countries from 1979 to 1987, with educational attainment clearly increasing and the percent married falling. The age composition of the population shows that the baby boom was of longer duration in the U.S., since the age distributions look very similar in 1979, but the entering cohorts in the 1980s were relatively much smaller in Canada than in the U.S.

The coefficients from OLS earnings regressions for both countries in 1979 and 1987 are reported in Table 9. The dependent variable is the logarithm of annual earnings, and the independent variables fall into four classes: age and age squared; three educational-attainment dummies; two marital status dummies; and eight (U.S.) or four (Canada) region dummies. Comparing the estimates across countries for a given year, one sees that the age and marital status coefficients are reasonably similar, but the earnings differences related to education are much larger in the U.S. Over the 1980s, changes occurred in the structure of earnings in both countries, but in very different ways. For instance, there was little change in the age/earnings relationship in the U.S., but in Canada the rate of growth of earnings at the younger ages appears to have increased. The marital status effects decreased in the 1980s in the U.S., but there was no

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[27] Inspection of Lorenz curves reveals that earnings inequality among males increased unambiguously over the period in both countries, as did the other three inequality indices, so that our use of the variance of logs does provide an accurate indication of the direction of changes in earnings dispersion.

(statistically) significant change in the marital status differentials in Canada. Most importantly, there was an increase in the education-related earnings differences in the U.S., but from our estimates there appears to have been no such change in Canada.

Figures 1 and 2 provide more detail concerning the change in the education/earnings relationship by plotting estimates of the education/earnings profile using the complete years of schooling information available in the data (*i.e.*, eighteen education dummies in the U.S., one for each year of education, and five education dummies in Canada). The regressions from which the statistics in these figures are drawn also include as independent variables thirty-nine age dummies (one for each age), and the marital status and region dummies. In the figures, the 1987 regression coefficients were rescaled so that the value for the high-school dummy coefficient was equal to the same country's 1979 value for that dummy's coefficient; any changes in the plotted relationship can thus be interpreted as changes in how workers with a given number of years of schooling are doing relative to high-school-only workers.[28] Inspection of the graphs shows that the only major change for either country is among U.S. workers with 16 or more years of schooling, a group whose relative earnings clearly increased from 1979 to 1987.[29]

Using these estimated earnings equations, the variance of logs can be

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[28]The rescaling involved subtracting the difference between the 1987 and 1979 high-school-dummy coefficients from all of the other 1987 education dummy coefficients (including the zero value for the coefficient for zero years of schooling).

[29]For several recent analyses of the reasons behind the increase in the return to education among males in the U.S., see Murphy and Welch, 1988; Bound and Johnson, 1989; Katz and Revenga, 1989; and Blackburn, Bloom, and Freeman, 1990.

decomposed into variation contributed by the variances and covariances of the independent variables; this allows us to measure the contribution of each independent variable to the increase in the variance of logs (see Blackburn, 1990). In particular, if earnings (w) can be represented as:

$$(2) \qquad w = \exp\left(\sum_{j=1}^{J} \beta_j' \mathbf{x}_j + \epsilon\right) \quad ,$$

where $\mathbf{x}_j$ is a vector of associated independent variables, $\beta_j$ is the corresponding coefficient vector, J is the number of subsets of regressors (*e.g.*, J=4 in this analysis because we consider vectors of age, education, marital status, and region dummies), and $\epsilon$ is an independently distributed error term, then the variance of logs can be represented as:

$$(3) \qquad \sigma^2_{\ln w} = \sum_{j=1}^{J} \beta_j' \Omega_{jj} \beta_j + \sum_{j=1}^{J} \sum_{k=j+1}^{J} 2\beta_j' \Omega_{jk} \beta_k + \sigma^2_\epsilon \quad ,$$

where $\Omega_{jk}$ is the covariance matrix for $\mathbf{x}_j$ and $\mathbf{x}_k$. The coefficient vectors and coefficient matrices were estimated for both countries in both years, and the different components of the decomposition are referred to as "primary variance effects" in Table 10.

The results for the U.S. suggest that the biggest contributor to the the increase in earnings variation from 1979 to 1987 was education (*i.e.*, the composite effect of changes in the covariance matrix for the education dummies and changes in the education-dummy coefficients). The other important contributor to the increase in the variance of logs in the U.S. is the covariance between age and education. Educational attainment actually declined slightly among the youngest cohorts in the 1980s, thereby increasing the covariance between age and education, which added to the increase in the variance of logs since both age and education are

positively related to earnings.[30] In contrast to these results for the U.S., the education effect and the age-education covariance effect are not important to the increase in the variance of logs in Canada; in fact, the difference in the magnitude of these two effects explains 75 percent of the difference between the two countries in the increase in the variance of logs from 1979 to 1987.

For both countries, more than half of the increase in the variance of logs is attributable to the increase in the residual variance (*i.e.*, $\sigma_\epsilon^2$ in equation (3)). Following Blackburn (1990) we also consider the possibility that the magnitude (and therefore the change in the magnitude) of the residual variance is related to the composition (and the change in the composition) of the population. For example, the residual variance may be expected to increase as the age of the working population increases (*e.g.*, as is predicted by the job matching theory of Harris and Holmstrom, 1982). Therefore, we estimated equations with the squared error term ($\epsilon^2$) as the dependent variable, and with the same independent variables as in equation (2); of course, $\epsilon^2$ is not observed, so we used the squared residual from the earnings equations as the dependent variable, *i.e.*, we estimated:

$$\hat{\epsilon}^2 = \exp(\sum_{j=1}^{J} \gamma_j' x_j + \nu) \quad ,$$

where $\hat{\epsilon}$ is the predicted error term from equation (2), the $\gamma_j$'s are vectors of coefficients, and $\nu$ is an error term. Using the estimates of the $\gamma_j$'s

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[30] The change in the variance of logarithms can be more finely decomposed into portions due to changes in the coefficients and changes in the covariance matrices. This decomposition shows that the increase in the education effect in the U.S. is due entirely to changes in the education dummy coefficients, and that the increase in the age-education covariance effect is due entirely to an increase in the covariance between age and education.

for 1979, we estimated how the change in the independent variables would be expected to change $\sigma_\epsilon^2$ by multiplying the change in the average of each independent variable by the associated coefficient from the residual variance equation. The resulting predictions are reported in the "residual variance effects" section of Table 10.

In both countries, marital status changes have tended to increase the residual variance (and therefore the variance of logs), since unmarried (and especially never-married) males tend to have larger unexplained earnings variation. In the U.S., the movement towards the Northeast (where the residual variance is lower) has tended to decrease the variance of logs. The increase in educational attainment has also tended to lower the residual variance. Overall, changes in the residual variance associated with changes in the independent variables sum to zero in Canada, and are slightly negative for the U.S.

Consistent with Juhn, Murphy, and Pierce (1989) and Blackburn (1990), the increase in the variation of earnings that is explained in this section is much less than the total increase in the variation of earnings. This is especially true for Canada, where only 22 percent of the increase in the variance of logs is accounted for by our analysis (35 percent is accounted for in the U.S.). Nevertheless, it is clear that earnings inequality increased more in the U.S. in the 1980s than in Canada (for males). Our analysis suggests this to be predominantly an education-related difference. Insofar as changes in the distribution of individual earnings contribute to changes in the distribution of total family income, the fact that total family income inequality increased in the U.S. but not in Canada in the 1980s also appears to be at least partly related to education.

## V. Summary

*Ex ante*, one might have expected that changes over time in the Canadian and U.S. income distributions would be similar. This expectation would be reasonable if it were true that the labor markets in the two countries have been similar (and to some extent interrelated), and if the nature and role of the family in the two societies have been similar. Our findings do not verify this expectation, but instead suggest that changes in the family income distribution were quite different in the two countries. Average family income from factor-of-production sources (*i.e.*, total income less transfer income) grew slowly, by postwar standards, in both countries, but the rate of growth in average income from 1979 to 1987 was higher in the U.S. than in Canada. However, income inequality among families clearly increased in the U.S. over the same period, while in Canada there was no clear change in inequality (or perhaps a decline in inequality if equivalent income is used). In neither country can it be conclusively said that families were better off in a social welfare sense (assuming welfare is directly related to income), although evidence that social welfare increased in Canada does emerge when we analyze distributions of equivalent and per capita income.

What was different about the countries that led to differences in how the income distributions were changing? One factor that played a role was differences in how the structure of families changed in the 1980s. In the U.S., there was an increase in the relative prevalence of female-headed families with children, but not in Canada; there was also a more pronounced shift towards unrelated individuals in the U.S. than in Canada. Both of these groups tend to have relatively high levels of inequality, so these differential shifts likely played a role in increasing inequality in the

U.S. relative to Canada. Yet, inequality increases occurred within all family types (except one) in the U.S., but did not clearly increase within family types (except one) in Canada, so family-type changes are not the entire story. One especially interesting difference between the countries pertains to how the economic status of female-headed families with children changed in the 1980s, since the economic welfare of these families increased dramatically in Canada, but either remained constant or declined in the U.S. These results suggest that income transfers play an important role in explaining the different changes in inequality in the two countries, since female-headed families are one of the primary recipients of transfer income, and transfer income increased much more over the period in Canada than in the U.S.

While family income inequality increased in the U.S. but not in Canada, earnings inequality among prime-age males increased in both countries in the 1980s. In addition, the increases in earnings inequality in both countries are largely not explained by changes in observable characteristics of the populations (*i.e.*, age, education, marital status, region), though slightly more variation is explained in the U.S. Interestingly, the size of the unexplained portion of the increase in earnings inequality is very similar in the two countries. The primary reason why the explained portion is higher in the U.S. is that the return to education for males increased in the 1980s in the U.S., but does not appear to have increased in Canada.[31]

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[31]While we do not explore this possibility in any detail here, this difference in the change in the returns to education could be due to the more rapid growth in Canada in the supply of more-educated workers (see Table 8).

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Appendix: Studies of Changes in Canadian Income and Earnings Inequality

| Study | Data | Period | Distributional Aspect | Results | Important Factors |
|---|---|---|---|---|---|
| | | | Studies at the Family Level | | |
| Henderson and Rowley (1977) | Survey of Consumer Finances | 1965-1973 | Inequality of family income (Gini coeff.) | trend towards greater inequality over period | declining family size and the decline in families with male earners |
| Wolfson (1986) | Survey of Consumer Finances | 1965-1983 | Inequality of "census" families, with equiv. adjustment | increase from 1965-71, decline to 1979, increase to 1983 | family-type changes and changes in labor force participation, especially among females, are most important; increase in investment and transfer income was equalizing |
| Dooley (1988) | Survey of Consumer Finances | 1973-1986 | low-income status, and mean income, for families | increase in economic status in the 1970s, but a decrease in the 1980s (except for elderly) | decline in family size was important to the increase in economic status, as was the increase in government transfer payments and the increase in wive's earnings |
| Dooley (1989) | Survey of Consumer Finances | 1973-1986 | low-income status among children | decline in low-income percentages over period, though slight increase in the 1980s | declining family size and increasing educational attainment explain all of declining poverty for children in married couples, but only about one-half for female-headed families |
| McWatters and Beach (1990) | published data using the Survey of Consumer Finances | 1965-1987 | inequality and mean incomes for families | large increases in mean, and some decline in inequality, up to 1980; little change in mean, and some increase in inequality after 1980 | increase in women's labor force participation has an increasing impact on inequality, as has the fall in male labor force participation |

Studies of Changes in Canadian Income and Earnings Inequality (continued)

| Study | Data | Period | Distributional Aspect | Results | Important Factors |
|---|---|---|---|---|---|
| | | | Studies at the Individual Level | | |
| Buse (1982) | individual tax returns | 1947-1978 | inequality of individual income | upward trend in inequality (from regressions that control for income definition changes) | changes in the labor force participation rate are the factor most important to changes in inequality, with higher participation leading to lower inequality |
| Dooley (1986) | Survey of Consumer Finances | various years from 1971-1981 | return to education, and age, for males aged 20-64 | decline in the return to education, mostly in 1971-75; no change in age-related differentials | the entrance of the baby boom seems to explain some, but not all, of the change in the return to education |
| Dooley (1987) | Survey of Consumer Finances | various years from 1971-1982 | inequality of weekly and annual earnings | no clear trend for all workers, increases for some young workers, and decreases for some old workers | changes in the unemployment rate are important to changes over time in inequality |
| Myles, Picot, and Wannell (1988) | Survey of Work History (1981); Labor Market Activity Survey (1986) | 1981 and 1986 | inequality and mean of hourly earnings | increase in percentage of jobs at very low wages, but no clear change in inequality | only a small part of the observed change is attributable to industry and occupation shifts |

Table 1
Descriptive Statistics for the Family Population*

| Variable | United States 1979 | United States 1987 | Canada 1979 | Canada 1987 |
|---|---|---|---|---|
| **Percent in Family-Type Group:** | | | | |
| Lone Male | 13.7 | 15.6 | 13.0 | 14.1 |
| Lone Female | 16.8 | 18.0 | 16.5 | 16.5 |
| Female/1 Kid | 2.3 | 2.7 | 1.7 | 1.6 |
| Female/2$^{+}$ Kids | 3.0 | 3.1 | 1.5 | 1.6 |
| Married/0 Kids | 21.3 | 20.5 | 19.7 | 21.1 |
| Married/1 Kid | 8.2 | 7.5 | 8.9 | 7.4 |
| Married/2$^{+}$ Kids | 15.0 | 13.3 | 19.0 | 16.5 |
| Other | 19.7 | 19.4 | 19.7 | 21.2 |
| **Percent of Families With Head Widowed, Divorced, or Separated** | | | | |
| All Families | 26.6 | 28.0 | 19.2 | 19.8 |
| Lone Male | 42.9 | 42.2 | 30.4 | 32.5 |
| Lone Female | 64.8 | 63.2 | 51.6 | 51.5 |
| Female/1 Kid | 74.5 | 66.7 | 73.9 | 59.2 |
| Female/2$^{+}$ Kids | 80.0 | 69.9 | 85.0 | 80.3 |
| Married/0 Kids | -- | -- | -- | -- |
| Married/1 Kid | -- | -- | -- | -- |
| Married/2$^{+}$ Kids | -- | -- | -- | -- |
| Other | 29.1 | 32.4 | 21.2 | 21.5 |
| **Percent of Families With 2$^{+}$ Earners:** | | | | |
| All Families | 39.0 | 37.5 | 40.7 | 44.3 |
| Lone Male | -- | -- | -- | -- |
| Lone Female | -- | -- | -- | -- |
| Female/1 Kid | 6.6 | 7.7 | 6.5 | 8.3 |
| Female/2$^{+}$ Kids | 11.5 | 9.0 | 9.1 | 10.9 |
| Married/0 Kids | 44.2 | 44.4 | 48.1 | 48.3 |
| Married/1 Kid | 69.6 | 76.0 | 66.3 | 77.1 |
| Married/2$^{+}$ Kids | 60.8 | 68.5 | 55.0 | 71.7 |
| Other | 72.1 | 70.2 | 74.2 | 76.5 |
| **Average # of Earners** | 1.34 | 1.29 | 1.27 | 1.43 |

*The family population definition includes unrelated individuals -- individuals living alone or with individuals to whom they are not related -- as separate families. Children are defined as anyone under the age of 18. Sample weights were used in calculating all figures reported in Tables 1-8.

Table 2
Average Total Family Income (in 1987 US Dollars)[1]

| Population Group | United States 1979 | United States 1987 | United States Growth Rate[2] | Canada 1979 | Canada 1987 | Canada Growth Rate |
|---|---|---|---|---|---|---|
| **All Families** | 27043 | 28026 | 0.4% | 26438 | 28066 | 0.7% |
| **Among Family-Type:** | | | | | | |
| Lone Male | 18021 | 19137 | 0.8 | 16281 | 16601 | 0.2 |
| Lone Female | 11846 | 14000 | 2.1 | 11679 | 13398 | 1.7 |
| Female/1 Kid | 13181 | 13497 | 0.3 | 11633 | 13039 | 1.4 |
| Female/2$^{+}$ Kids | 12144 | 11522 | -0.7 | 12789 | 14336 | 1.4 |
| Married/0 Kids | 30231 | 32022 | 0.7 | 28123 | 29675 | 0.7 |
| Married/1 Kid | 33314 | 36759 | 1.2 | 31745 | 34533 | 1.1 |
| Married/2$^{+}$ Kids | 34992 | 36936 | 0.7 | 32921 | 36026 | 1.1 |
| Other | 38037 | 37996 | -0.0 | 37451 | 39149 | 0.6 |
| **Numbers of Earners:** | | | | | | |
| 0 | 10836 | 12466 | 1.8 | 9246 | 12801 | 4.1 |
| 1 | 22836 | 23244 | 0.2 | 21639 | 21527 | -0.1 |
| 2 | 36501 | 39145 | 0.9 | 35633 | 37018 | 0.5 |
| 3$^{+}$ | 48851 | 50561 | 0.4 | 47250 | 48324 | 0.3 |

[1]The conversion to 1987 US dollars used the GNP PCE deflator for the US, the Canadian CPI reported in the Year Book of Labor Statistics, 1987 (Geneva: ILO), and the purchasing power parities developed by the OECD. Total family income includes cash income for all family members, excluding capital gains and one-time lump-sum receipts. Income figures were top-coded at 50,000 1979 US dollars.
[2]These are estimated annual (exponential) growth rates, calculated using the 1979 and 1987 endpoints.

Table 3
Components of Total Family Income

| | United States | | Canada | |
|---|---|---|---|---|
| | 1979 | 1987 | 1979 | 1987 |
| Percent of Income from: | | | | |
| Tot. Fam. Earnings (TFE) | 82.9 | 81.0 | 83.8 | 79.7 |
| Property Income (PI)[1] | 5.7 | 7.0 | 5.8 | 5.3 |
| Transfer Income (TI)[2] | 11.4 | 12.0 | 10.4 | 15.1 |
| Correlation Between: | | | | |
| TFE and PI | .040 | .036 | .013 | .015 |
| TFE and TI | -.423 | -.434 | -.414 | -.453 |
| PI and TI | -.133 | -.094 | -.063 | -.020 |

1. Property income consists of interest and dividend income, but does not include private pension income.
2. Transfer income includes both government cash transfers, and some private cash transfers (e.g., alimony and child support), as well as government and private pension income.

Table 4
Lorenz Curve Coordinates, At Quintile Points, For Total Family Income[1]

| Family Type | United States 1979 | United States 1987 | $\Delta^2$ | Canada 1979 | Canada 1987 | $\Delta$ |
|---|---|---|---|---|---|---|
| All Families | | | | | | |
| 1st Quintile | .039 | .035 | | .043 | .048 | |
| 2nd Quintile | .139 | .131 | + | .151 | .156 | ? |
| 3rd Quintile | .310 | .298 | | .331 | .330 | |
| 4th Quintile | .568 | .558 | | .590 | .585 | |
| Lone Male | | | | | | |
| 1st Quintile | .035 | .031 | | .043 | .046 | |
| 2nd Quintile | .133 | .124 | + | .140 | .147 | ? |
| 3rd Quintile | .302 | .283 | | .316 | .312 | |
| 4th Quintile | .554 | .536 | | .573 | .567 | |
| Lone Female | | | | | | |
| 1st Quintile | .045 | .040 | | .052 | .062 | |
| 2nd Quintile | .143 | .132 | + | .149 | .173 | - |
| 3rd Quintile | .297 | .283 | | .297 | .326 | |
| 4th Quintile | .539 | .528 | | .549 | .566 | |
| Female/1 Kid | | | | | | |
| 1st Quintile | .039 | .031 | | .048 | .070 | |
| 2nd Quintile | .142 | .115 | + | .155 | .183 | - |
| 3rd Quintile | .319 | .270 | | .326 | .335 | |
| 4th Quintile | .581 | .527 | | .573 | .584 | |
| Female/2$^+$ Kids | | | | | | |
| 1st Quintile | .045 | .038 | | .047 | .074 | |
| 2nd Quintile | .152 | .125 | + | .158 | .199 | - |
| 3rd Quintile | .313 | .266 | | .313 | .356 | |
| 4th Quintile | .558 | .502 | | .546 | .583 | |
| Married/0 Kids | | | | | | |
| 1st Quintile | .058 | .059 | | .062 | .071 | |
| 2nd Quintile | .175 | .175 | - | .179 | .189 | ? |
| 3rd Quintile | .351 | .351 | | .365 | .363 | |
| 4th Quintile | .603 | .603 | | .619 | .609 | |
| Married/1 Kid | | | | | | |
| 1st Quintile | .076 | .066 | | .080 | .078 | |
| 2nd Quintile | .216 | .198 | + | .229 | .220 | + |
| 3rd Quintile | .405 | .385 | | .421 | .410 | |
| 4th Quintile | .647 | .633 | | .661 | .651 | |
| Married/2$^+$ Kids | | | | | | |
| 1st Quintile | .076 | .067 | | .083 | .085 | |
| 2nd Quintile | .220 | .203 | + | .234 | .233 | ? |
| 3rd Quintile | .408 | .391 | | .424 | .422 | |
| 4th Quintile | .647 | .637 | | .660 | .660 | |

Table 4 (continued)

| Family Type | United States 1979 | 1987 | Δ | Canada 1979 | 1987 | Δ |
|---|---|---|---|---|---|---|
| Other | | | | | | |
| 1st Quintile | .057 | .051 | | .068 | .072 | |
| 2nd Quintile | .181 | .169 | + | .203 | .205 | ? |
| 3rd Quintile | .369 | .353 | | .393 | .392 | |
| 4th Quintile | .628 | .620 | | .645 | .644 | |

[1]The numbers reported are the Lorenz curve values at ordinates $\frac{i}{n} - .2$ (1st quintile), .4 (2nd quintile), .6 (3rd quintile), and .8 (4th quintile).

[2]This column indicates the direction of change in inequality based on shifts in the Lorenz curves from 1979 to 1987, with a "+" representing an increase, a "-" representing a decrease, and a "?" representing an inconclusive change.

Table 5
Indexes of Inequality for Total Family Income*

| Family Type | United States 1979 | United States 1987 | Canada 1979 | Canada 1987 |
|---|---|---|---|---|
| All Families | | | | |
| MLD | .425 | .466 | .348 | .295 |
| Entropy | .263 | .278 | .229 | .222 |
| Gini | .398 | .411 | .373 | .371 |
| Lone Males | | | | |
| MLD | .601 | .632 | .426 | .361 |
| Entropy | .302 | .325 | .264 | .257 |
| Gini | .416 | .436 | .394 | .394 |
| Lone Females | | | | |
| MLD | .526 | .596 | .469 | .296 |
| Entropy | .299 | .320 | .276 | .231 |
| Gini | .417 | .434 | .407 | .373 |
| Female/1 Kid | | | | |
| MLD | .485 | .578 | .312 | .219 |
| Entropy | .258 | .335 | .238 | .203 |
| Gini | .389 | .449 | .381 | .353 |
| Female/ $2^+$ Kids | | | | |
| MLD | .464 | .543 | .330 | .219 |
| Entropy | .268 | .354 | .266 | .192 |
| Gini | .398 | .457 | .400 | .339 |
| Married/0 Kids | | | | |
| MLD | .250 | .252 | .222 | .191 |
| Entropy | .194 | .188 | .172 | .168 |
| Gini | .343 | .341 | .327 | .324 |
| Married/1 Kid | | | | |
| MLD | .168 | .201 | .150 | .170 |
| Entropy | .129 | .152 | .111 | .119 |
| Gini | .278 | .302 | .258 | .271 |
| Married/$2^+$ Kids | | | | |
| MLD | .186 | .206 | .150 | .125 |
| Entropy | .131 | .144 | .109 | .105 |
| Gini | .275 | .295 | .254 | .254 |
| Other | | | | |
| MLD | .237 | .272 | .184 | .164 |
| Entropy | .170 | .186 | .137 | .132 |
| Gini | .320 | .336 | .290 | .288 |

*MLD is the mean logarithmic deviation. In calculating MLD and Entropy, nonpositive incomes were recoded as $1. Incomes were not recoded in calculating the Gini coefficient.

Table 6
Generalized Lorenz Curve Coordinates, at Quintiles,
for Total Family Income[1]

| Family Type | United States 1979 | 1987 | Δ[2] | Canada 1979 | 1987 | Δ |
|---|---|---|---|---|---|---|
| **All Families** | | | | | | |
| 1st Quintile | 924 | 819 | | 1009 | 1152 | |
| 2nd Quintile | 3340 | 3116 | | 3576 | 3709 | |
| 3rd Quintile | 7422 | 7146 | ? | 7840 | 7863 | ? |
| 4th Quintile | 13622 | 13480 | | 13974 | 13948 | |
| 5th Quintile | 23968 | 24324 | | 23678 | 23828 | |
| **Lone Male** | | | | | | |
| 1st Quintile | 553 | 527 | | 622 | 642 | |
| 2nd Quintile | 2132 | 2081 | | 2048 | 2068 | |
| 3rd Quintile | 4816 | 4773 | ? | 4608 | 4399 | ? |
| 4th Quintile | 8855 | 9022 | | 8349 | 7993 | |
| 5th Quintile | 15972 | 16844 | | 14581 | 14094 | |
| **Lone Female** | | | | | | |
| 1st Quintile | 476 | 494 | | 542 | 708 | |
| 2nd Quintile | 1502 | 1623 | | 1555 | 1969 | |
| 3rd Quintile | 3116 | 3484 | + | 3106 | 3704 | + |
| 4th Quintile | 5663 | 6508 | | 5739 | 6442 | |
| 5th Quintile | 10499 | 12328 | | 10460 | 11375 | |
| **Female/1 Kid** | | | | | | |
| 1st Quintile | 456 | 367 | | 505 | 776 | |
| 2nd Quintile | 1655 | 1371 | | 1612 | 2025 | |
| 3rd Quintile | 3728 | 3203 | ? | 3392 | 3707 | + |
| 4th Quintile | 6786 | 6255 | | 5971 | 6470 | |
| 5th Quintile | 11682 | 11880 | | 10418 | 11070 | |
| **Female/2$^{+}$ Kids** | | | | | | |
| 1st Quintile | 482 | 384 | | 538 | 898 | |
| 2nd Quintile | 1632 | 1268 | | 1805 | 2424 | |
| 3rd Quintile | 3364 | 2693 | - | 3584 | 4335 | + |
| 4th Quintile | 6003 | 5096 | | 6258 | 7090 | |
| 5th Quintile | 10763 | 10142 | | 11453 | 12171 | |
| **Married/0 Kids** | | | | | | |
| 1st Quintile | 1564 | 1706 | | 1558 | 1791 | |
| 2nd Quintile | 4676 | 5096 | | 4514 | 4758 | |
| 3rd Quintile | 9414 | 10203 | + | 9186 | 9156 | ? |
| 4th Quintile | 16238 | 17529 | | 15585 | 15350 | |
| 5th Quintile | 26794 | 28186 | | 25187 | 25194 | |

Table 6 (continued)

| Family Type | United States 1979 | 1987 | Δ[2] | Canada 1979 | 1987 | Δ |
|---|---|---|---|---|---|---|
| Married/1 Kid | | | | | | |
| 1st Quintile | 2250 | 2123 | | 2283 | 2286 | |
| 2nd Quintile | 6380 | 6416 | | 6504 | 6457 | |
| 3rd Quintile | 11964 | 12454 | ? | 11980 | 12016 | ? |
| 4th Quintile | 19095 | 20496 | | 18803 | 19091 | |
| 5th Quintile | 29526 | 32355 | | 28431 | 29319 | |
| Married/2$^{+}$ Kids | | | | | | |
| 1st Quintile | 2358 | 2191 | | 2456 | 2610 | |
| 2nd Quintile | 6811 | 6601 | | 6900 | 7129 | |
| 3rd Quintile | 12652 | 12707 | ? | 12509 | 12915 | + |
| 4th Quintile | 20064 | 20712 | | 19466 | 20174 | |
| 5th Quintile | 31013 | 32511 | | 29484 | 30586 | |
| Other | | | | | | |
| 1st Quintile | 1909 | 1698 | | 2288 | 2398 | |
| 2nd Quintile | 6098 | 5640 | | 6804 | 6818 | |
| 3rd Quintile | 12439 | 11818 | - | 13172 | 13036 | ? |
| 4th Quintile | 21185 | 20729 | | 21644 | 21401 | |
| 5th Quintile | 33712 | 33443 | | 33541 | 33238 | |

[1]The coordinates are expressed in 1987 US dollars, and are corrected for double-counting of transfer income.
[2]This column indicates the direction of change in social welfare based on shifts in the generalized Lorenz curves from 1979 to 1987, with a "+" representing an increase, a "-" representing a decrease, and a "?" representing an inconclusive change.

Table 7
Welfare and Inequality Comparisons for Other Definitions of Income

| Income Definition | United States 1979 | United States 1987 | Δ[1] | Canada 1979 | Canada 1987 | Δ |
|---|---|---|---|---|---|---|
| **Per Capita Income**[2] | | | | | | |
| Lorenz Curve Coordinates | | | | | | |
| 1st Quintile | .050 | .042 | | .063 | .067 | |
| 2nd Quintile | .162 | .148 | + | .183 | .191 | - |
| 3rd Quintile | .329 | .313 | | .353 | .361 | |
| 4th Quintile | .569 | .557 | | .590 | .597 | |
| Gen. Lorenz Curve Coordinates | | | | | | |
| 1st Quintile | 462 | 425 | | 557 | 632 | |
| 2nd Quintile | 1509 | 1500 | | 1619 | 1792 | |
| 3rd Quintile | 3064 | 3170 | ? | 3121 | 3389 | + |
| 4th Quintile | 5298 | 5643 | | 5211 | 5597 | |
| 5th Quintile | 9313 | 10133 | | 8839 | 9382 | |
| Inequality Measures | | | | | | |
| Mean Log. Deviation | .336 | .387 | | .253 | .213 | |
| Entropy | .249 | .273 | | .202 | .187 | |
| Gini Coefficient | .380 | .401 | | .346 | .335 | |
| **Equivalent Income**[3] | | | | | | |
| Lorenz Curve Coordinates | | | | | | |
| 1st Quintile | .052 | .044 | | .064 | .069 | |
| 2nd Quintile | .172 | .157 | + | .194 | .198 | - |
| 3rd Quintile | .350 | .333 | | .377 | .379 | |
| 4th Quintile | .600 | .588 | | .623 | .624 | |
| Gen. Lorenz Curve Coordinates | | | | | | |
| 1st Quintile | 852 | 772 | | 1015 | 1136 | |
| 2nd Quintile | 2816 | 2725 | | 3062 | 3276 | |
| 3rd Quintile | 5739 | 5788 | ? | 5965 | 6275 | + |
| 4th Quintile | 9828 | 10218 | | 9853 | 10325 | |
| 5th Quintile | 16388 | 17380 | | 15827 | 16551 | |
| Inequality Measures | | | | | | |
| Mean Log. Deviation | .305 | .354 | | .227 | .192 | |
| Entropy | .207 | .229 | | .164 | .156 | |
| Gini Coefficient | .350 | .371 | | .315 | .310 | |
| **Total Family Earnings**[4] | | | | | | |
| Lorenz Curve Coordinates | | | | | | |
| 1st Quintile | .038 | .035 | | .044 | .039 | |
| 2nd Quintile | .149 | .139 | + | .166 | .153 | + |
| 3rd Quintile | .328 | .313 | | .352 | .334 | |
| 4th Quintile | .585 | .573 | | .607 | .592 | |

Table 7 (continued)

| Income Definition | United States 1979 | United States 1987 | Canada 1979 | Canada 1987 |
|---|---|---|---|---|
| Inequality Measures | | | | |
| Mean Log. Deviation | .366 | .402 | .310 | .338 |
| Entropy | .239 | .258 | .208 | .230 |
| Gini Coefficient | .379 | .395 | .352 | .371 |
| Average Total Family Earnings, By Number of Earners | | | | |
| 1 Earner | 19568 | 19497 | 18534 | 17521 |
| 2 Earners | 34015 | 36477 | 32579 | 33430 |
| 3+ Earners | 45768 | 47454 | 43338 | 44122 |
| All Families with Earnings | 28076 | 29027 | 26863 | 28063 |

1. This column indicates the direction of change in either inequality or social welfare (whichever is applicable).
2. The per capita income distribution uses total family income (adjusted for transfer double-counting) per person in the family as the income measure for each individual in the family; the distribution is measured across persons.
3. Equivalent income for each person is total family income (adjusted for transfer double-counting) divided by the number of equivalent nonelderly adults in the family; the distribution is measured across persons.
4. The total family earnings distribution uses all earned income of individuals in the family as the income measure; the distribution is measured across all families with positive earnings.

Table 8
Descriptive Statistics for the Male, Full-Time Year-Round, Prime-Age Population*

| Income Level | United States 1979 | United States 1987 | Canada 1979 | Canada 1987 |
|---|---|---|---|---|
| Variance of the Logarithm of Annual Earnings | .286 | .320 | .270 | .288 |
| Percent: | | | | |
| Married | 86.3 | 80.7 | 88.4 | 85.5 |
| Widowed, Div., Sep. | 7.2 | 9.3 | 4.5 | 5.3 |
| Percent in Age Groups: | | | | |
| 25-34 | 33.2 | 32.4 | 34.1 | 30.8 |
| 35-44 | 27.3 | 32.2 | 28.2 | 32.9 |
| 45-54 | 23.0 | 21.9 | 22.9 | 22.9 |
| 55-64 | 16.5 | 13.5 | 14.8 | 13.4 |
| Percent In Education Groups: | | | | |
| Less than High School | 20.3 | 14.1 | 36.2 | 24.9 |
| High School Graduate | 35.5 | 36.4 | 30.1 | 31.5 |
| Some College | 18.1 | 18.9 | 18.9 | 23.3 |
| College Graduate | 26.1 | 30.6 | 14.8 | 20.3 |
| Percent in Region: | | | | |
| Northeast | 20.6 | 24.3 | -- | -- |
| North Central | 24.7 | 24.4 | -- | -- |
| South | 28.6 | 29.8 | -- | -- |
| West | 26.1 | 21.5 | -- | -- |
| Atlantic | -- | -- | 7.0 | 7.3 |
| Quebec | -- | -- | 25.5 | 24.5 |
| Ontario | -- | -- | 38.8 | 39.5 |
| Prarie | -- | -- | 17.2 | 17.0 |
| British Columbia | -- | -- | 11.5 | 11.7 |
| Sample Size | 27626 | 24693 | 16821 | 17954 |

*Prime-age is defined as 25-64. For the U.S., full-time year-round is defined as working an average of at least 35 hours per week for at least 50 weeks over the year; for Canada, it is defined as working 30 hours per week for at least 50 weeks. The samples are restricted to either heads of families or spouses of heads of families. Sample weights were used in the calculations for Tables 9-11 for Canada, but not for the US (where the provided weights vary relatively little).

Table 9
OLS Estimates of Annual Earnings Equations*

| Independent Variable | United States 1979 | United States 1987 | Canada 1979 | Canada 1987 |
|---|---|---|---|---|
| Age | .055 | .056 | .051 | .056 |
| | (.002) | (.003) | (.003) | (.003) |
| $Age^2/100$ | -.057 | -.057 | -.057 | -.061 |
| | (.003) | (.003) | (.003) | (.004) |
| High School Graduate | .274 | .270 | .175 | .152 |
| | (.008) | (.010) | (.010) | (.010) |
| Some College | .372 | .402 | .226 | .222 |
| | (.010) | (.011) | (.011) | (.011) |
| College Graduate | .570 | .652 | .475 | .465 |
| | (.009) | (.010) | (.012) | (.011) |
| Married | .230 | .176 | .220 | .197 |
| | (.012) | (.011) | (.015) | (.013) |
| Widowed, Div., Sep. | .125 | .080 | .107 | .145 |
| | (.016) | (.015) | (.023) | (.021) |
| $R^2$ | .18 | .21 | .13 | .13 |

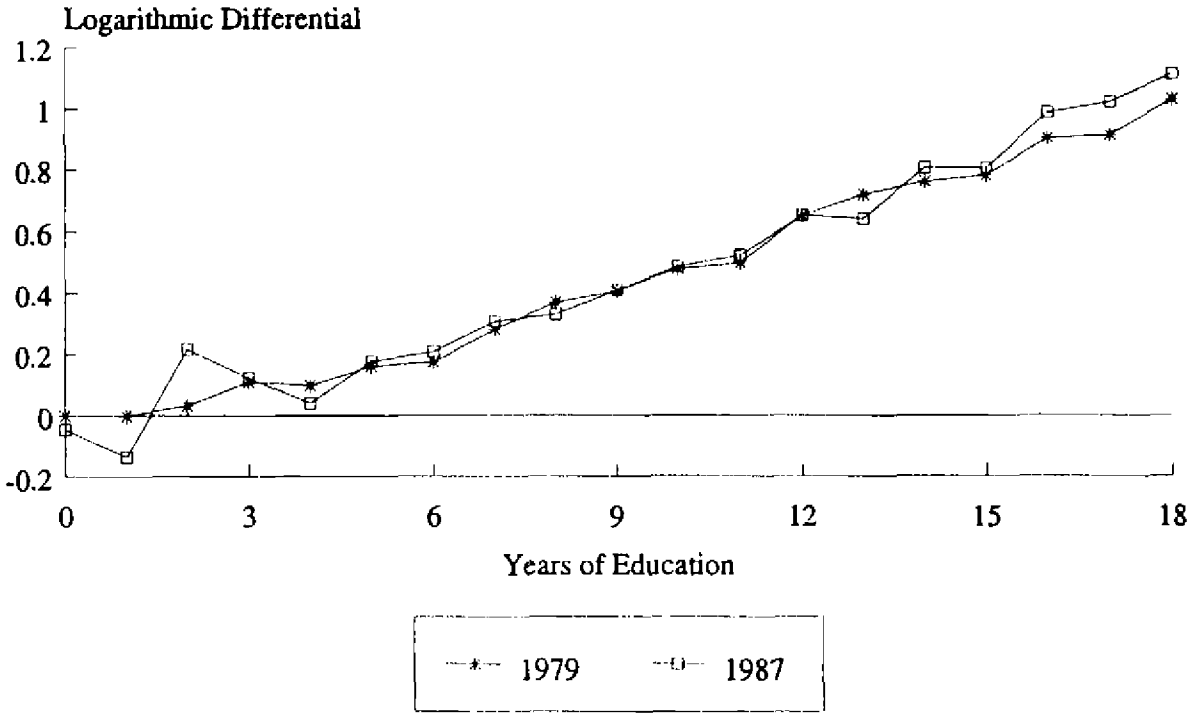
*The regressions also include eight region dummies for the U.S., and four region dummies for Canada, as independent variables. The dependent variable is the natural logarithm of annual earnings.

Table 10
Decomposition of the Variance of Logarithms[1]

| Effect | United States 1979 | 1987 | Δ | Canada 1979 | 1987 | Δ |
|---|---|---|---|---|---|---|
| Primary Variance Effects: | | | | | | |
| Age | .009 | .010 | .001 | .005 | .007 | .002 |
| Education | .043 | .052 | .009 | .025 | .026 | .001 |
| Marital Status | .004 | .003 | -.001 | .003 | .003 | 0 |
| Region | .004 | .005 | .001 | .003 | .003 | 0 |
| COV(Age,Education) | -.004 | .000 | .004 | -.002 | -.002 | . 0 |
| COV(Age,MST) | .002 | .003 | .001 | .001 | .002 | .001 |
| COV(Education,MST) | -.002 | -.001 | .001 | -.002 | -.002 | 0 |
| Residual Variance Effects:[2] | | | | | | |
| Age | -- | -- | -.002 | -- | -- | .001 |
| Education | -- | -- | -.001 | -- | -- | -.002 |
| Marital Status | -- | -- | .003 | -- | -- | .002 |
| Region | -- | -- | -.004 | -- | -- | -.001 |
| Variance of Logarithms | .286 | .320 | .034 | .270 | .288 | .018 |
| Δ Accounted For | -- | -- | .012 | -- | -- | .004 |
| Δ Unaccounted For | -- | -- | .022 | -- | -- | .014 |

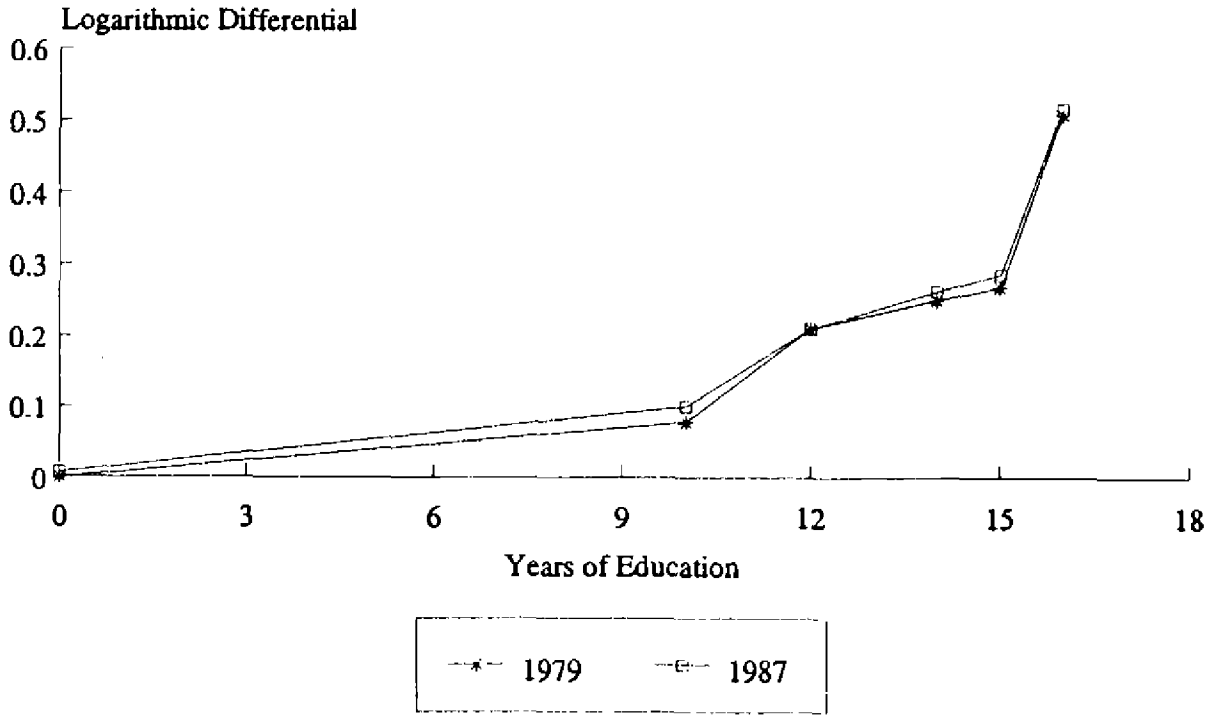
1. The log earnings regressions included two marital status dummies, 39 age dummies, 17 education dummies (5 education dummies for Canada), and eight region dummies (4 region dummies in Canada) as independent variables. The residual variance regressions used the same independent variables. The covariance effects between the region variables and the other three sets of variables were small and inconsequential, and are not reported.
2. The effects were calculated by multiplying the change in the means of the independent variables over the two years (for any one country) by the residual variance equation coefficient estimates in 1979 for that country.

# Figure 1
## Education-Related Earnings Differentials in the United States




The differentials in 1987 were scaled so that the 1979 and 1987 high-school differentials are equal.

# Figure 2
## Education-Related Earnings Differentials in Canada




The differentials in 1987 were scaled so that the 1979 and 1987 high-school differentials are equal.