Research Paper

Low-Income Intensity During the 1990s: The Role of Economic Growth, Employment Earnings and Social Transfers

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ABSTRACT

All countries look to economic growth to reduce low-income. This paper focuses on the 1990s and assesses the role played by changes in economic growth, employment earnings and government transfers in the patterns of low-income intensity in Canada during the 1990s.   We find that low-income intensity was higher in most provinces during the 1990s than during the 1980s (comparing comparable positions in the business cycle). The largest increases were in Ontario, Quebec and B.C. In particular, in spite of the slow economic growth and falling unemployment between 1993 and 1997, low-income intensity continued to rise. Both increases in the low-income rate and the low-income gaps contributed to this higher level. Employment earnings continued to decline among low-income families over the 1990s, contributing to the increase in low-income intensity in central and eastern Canada in particular. This is related in part to the more severe recession of the early 1990s east of Manitoba, and the lack of recovery among poorer families. During the 1990s changes in government transfers did not offset the fall in employment earnings among lower-income families, as they did during the 1980s, resulting in rising low-income intensity. Declining transfer benefits were associated with a rising low-income gap in some provinces, particularly Alberta. The latest data available at the time of writing was 1999. The strong economic growth of 2000 will likely have reduced low-income intensity, but it remains to be seen if it falls back to the level of the 1980s cyclical peak.

Introduction

All countries look to economic growth to reduce low-income or poverty. An increase in employment and employment earnings associated with economic expansions is seen as the most effective way of reducing low-income rates. But for growth to be effective, expansions must generate substantial employment, families in low-income must share in the employment gains, and the wages received by families at the bottom of the income distribution must be sufficient to reduce low-income rates effectively.

The association between economic growth and poverty has been a topic of some concern in the U.S. in particular during the past fifteen years. Papers in the 1980s asked whether the association between economic growth and poverty had petered out (e.g. Hirsch, 1980; Thornton, Agnello and Link, 1978; Blank and Card, 1993). In general, authors found that the association between economic growth and the rate of reduction of poverty had decreased in the United States. Blank and Card concluded that the failure of poverty rates to respond to robust GDP growth during the 1980s in the U.S. was due to a combination of slow productivity growth and widening wage inequality that accompanied the expansion of the 1980s. During the late 1990s, however, wage inequality stabilized, as earnings among lower wage workers increased significantly in the strong expansion (Card and Dinardo, 2002). In Canada, Zyblock and Lin (1997) addressed the association between the employment rate and low-income for the period 1973-1995 and concluded that while economic growth tended to reduce low-income, this relationship had generally weakened since 1980.

This paper concentrates on the 1990s. When contrasted with the 1980s, economic growth during the recovery period, 1993-1997, was slow. As a result, growth in employment and employment earnings was depressed relative to the 1980s (Picot and Heisz, 2000). Hence, there is reason to suspect that economic growth and the associated employment earnings growth did not play as strong a role in reducing low-income during the 1990s as during the 1980s. However, this paper focuses on the relationship between economic growth and low-income. For Canada, there are a number of concerns regarding the association during the 1990s.

Inequality in *family* market earnings increased substantially (Wolfson and Murphy, 2000) during the 1990s. It is earnings patterns at the family level, not at the individual level, that influence low-income trends. There were also other changes at work that may have affected the relationship between economic growth and changes in low-income. Earnings inequality rose among men, and were stable or declined among women. Women's earnings rose while those of men declined. Similarly, the earnings of young men fell, and those of older men remained stable or were increasing. Employment among the least educated fell relative to more educated workers, and there was some evidence that for younger workers, relative earnings among the least educated fell (Bar-Or et al (1993), Picot and Heisz (2000)).

Finally, within this environment of slow growth in GDP, earnings and employment, the social transfer system was also undergoing change. There was substantial revision to the Employment Insurance system during the 1990s (Lin, 1998). Sargent (1998) constructed an "EI disincentives index" for Canada, and showed that disincentives to work embodied in the EI system fell through the 1990s. Social assistance benefits fell in most provinces between 1989 and 1999 (National Council of Welfare. 2000). While in contrast, the child tax benefit system was substantially

expanded. Hence, beyond economic growth and employment effects, *structural* change in the social transfer benefits received by Canadians may also have contributed to trends in low-income during the 1990s.

The paper addresses four questions. First, was low-income higher in the 1990s than the 1980s? Second, we ask what role changes in employment earnings played in the rise in low-income intensity? Third, what was the "direct" effect of changes in social transfer benefits received (ignoring "indirect" effects associated with behavioural responses to changes in the transfer system and potentially decreasing work disincentive effects) on the rise in low-income intensity? Finally, the paper asks whether the association between economic growth (as measured by change in GDP or unemployment) and low-income has changed during the 1990s. Is economic growth a less effective tool for reducing low-income?

Measuring Low-Income

This analysis employs Statistics Canada's LICO (low-income cut-off) computed on an after taxes and transfers basis. The LICOs used here were established in 1992 and are held fixed (in real terms, as income is deflated using provincial CPIs) at that level over the entire period (1980-1999). Hence, this analyses employs a fixed rather than variable relative low-income cut-off. Although the LICOs are adjusted for family size and size of urban area, provincial LICOs are not available. The national LICO (within family size and size of urban region) is applied to the provinces and regions. For example, for a family of four the same LICO is applied to families living in large urban areas in Ontario and Quebec (e.g. Montreal and Toronto). However, there may be cost of living differences between these cities that are not accounted for in the LICOs. This could introduce a bias for any comparison of *levels* of low-income among provinces. Hence, we do not focus on the relative *level* of low-income among provinces. Rather, we are concerned with *change* in earnings and transfers, and their effect on *change* in low-income *within* each province. To analyze change at the provincial level, we deflate family income with provincial level consumer price indexes so that change in low-income accurately reflects change in consumer prices for a specific province.

Family incomes are computed on an economic family basis, but the computations used for the low-income rate reflect the number of people in low-income, not the number of families. That is, families are weighted by family size in the low-income rate calculation, so in essence the unit of analysis is the individual, with family income applied to that individual.

The analysis is restricted to families with the head (highest earner) aged less than 65 since we are concerned with economic growth and employment effects, and employment earnings play a small role in determining low-income among the elderly.

We compute estimates of the low-income rate and the low-income gap on both a market earnings basis (before taxes and transfers) and a disposable income basis (after taxes and transfers). The same post-tax transfer LICO is employed in both calculations. Market earnings include wages and salaries, self-employment income, investment income, income from private pensions (including public servants), and other market income. Social transfers include EI benefits, social assistance, OAS/GIS/spouses allowance, CPP/QPP benefits, child tax benefits, workers compensation, GST/HST credits, provincial tax credits and other government transfers. It is well

known that the transfer components of income (e.g. EI and social assistance benefits) are underestimated in surveys. In the aggregate, from 75% to 80% of government transfers are captured in the Survey of Consumer Finances (SCF) through the 1980s. Since our concern is primarily with changes through time in transfers and their effect on low-income, we are less concerned with the degree of under-estimation, and more concerned with its stability. The proportion of transfer benefits captured in the SCF remained quite constant through the 1980s at between 75% and 80%, and increased in the 1990s, to the 80% to 87% range (internal Statistics Canada evaluation). Hence, if anything the *decline* in transfer benefits will be underestimated, and the effect of the decline in transfers on the rise in low-income between the 80s and 90s will be underestimated.

In all sections of the paper except that incorporating regression results, we use the Survey of Consumer Finances (SCF) for the years 1980 to 1996, and the Survey of Labour and Income Dynamics (SLID) for 1996 to 1999. The SCF was discontinued, and SLID replaced it. While these surveys produce comparable estimates at aggregate levels, for some regions and income components the estimates differ between the surveys. To overcome this issue, we focus only on change in low-income, not in the level of low-income. Our estimates of change always come from identical surveys; we use SCF to measure change between 1980 and 1996, and SLID for the 1996 to 1999 period. More details regarding this issue can be found in appendix B.

Low-income intensity is a measure of low-income that incorporates information on both the low-income rate (the proportion of the population below the low-income cut-off) and the low-income gap (the "depth" of low-income). The low-income gap is the difference between the low-income cut-off and the average family income (among low-income families), divided by the low-income cut-off. Hence, the gap represents the "depth" of low-income expressed as a proportion the low-income cut-off. A gap of 0.32 means that the average family income of low-income families was 32% below the low-income cut-off. An increase in the gap, say from 0.32 to 0.34, implies an increase in the "depth" of low-income.

We focus on the change in low-income intensity, low-income rate and low-income gap in this paper. The approximate relationship between those three measures is simply:

$$\% \text{ change in intensity} = \% \text{ change in rate} + \% \text{ change in gap}$$

An algebraic description of this approximation can be found in the appendix A. The main point is that the change in low-income intensity is simply the sum of the change in the rate, and the change in the gap. We generally report all three measures–intensity, rate and gap. In all sections of the paper except that incorporating regression results, computations of the change in low-income intensity, rate and gap, and the effect of earnings and transfers on this change are made using the change in natural logarithms. For ease of presentation, this is referred to as a percentage change in the text. Hence, between any two years the change in, say, the low-income rate is

$$\ell n \left[\frac{\text{rate (t2)}}{\text{rate (t1)}} \right], \text{ but this will be referred to as}$$

a percent change for ease of presentation (it is an approximation of percentage change when the change is small).

Low-Income Intensity Among the Population Under 65

Chart 1 displays low-income intensity, rate and gap, based on disposable income, for Canada from 1980 through 1999, the latest year for which data are available. The analysis will focus on Canada.   However, some of the largest changes in low-income occurred in the provinces, particularly Ontario, Quebec and B.C. (Table 2). For the sake of brevity, the details will be presented here only for Canada.   However, when important differences among provinces exist, they will be noted in the text. Since we are concerned primarily with *change over time* in low-income intensity, we have chosen to index the intensity measure.[1]

Chart 1: Low-Income Intensity, Rate and Gap, Canada, 1980-99, Population <65: Based Disposable Income (After Taxes/Transfers) (1980 = 100)
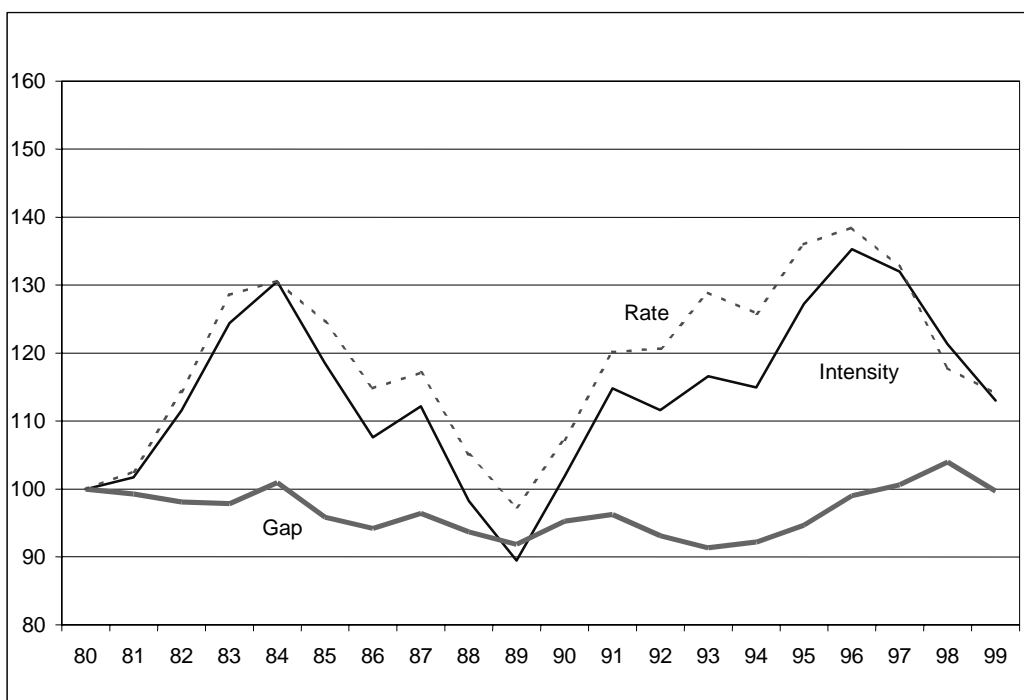
Low-income intensity, which incorporates changes in both the low-income rate and the low-income gap is, not surprisingly, very cyclical in nature. Low-income intensity was higher during the 1990s than during the 1980s. It rose for a longer period following the recession, rising well into the recovery, and the increase was greater. During the 1990s, low-income intensity rose by 53% over the eight-year period following the 1989 cyclical peak[2], peaking at 0.089 in 1997. By way of contrast, low-income intensity rose only 29% over a three-year period following the

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[1]   As noted earlier, although we have reliable measures of the *change* in consumer prices within provinces, we do not have reliable measures of differences among provinces at any point in time in consumer prices and the cost of living. Hence, we can reliably deflate incomes within a province to compute a comparable low-income intensity measure within provinces over time. However, we are reluctant to assume that we have comparable measures of low-income intensity among provinces, since we apply the national LICO, and cannot reliably adjust for differences among provinces in the cost of living at any point in time. Hence the focus on change over time within provinces. The absolute values of low-income intensity are in Appendix Table A-2.

[2]   When unemployment hit a cyclical low of 7.5%

cyclical peak of 1981[3], reaching .085 in 1984. Even though GDP growth was positive during the 1993-1997 period (average annual 3.4%), and unemployment fell from 11.2% to 9.2% (Table 1), low-income intensity continued to rise. No significant fall in intensity was observed until 1998.

To examine changes between the 1980s and 1990s we will compare 1996 to 1986, and 1999 to 1989. The recessions ended in 1982 and 1992 (Cross, 1998). Both 1986 and 1996 were four years into recovery, with unemployment rates of 9.6% and 9.7% respectively; 1989 and 1999 were seven years into recovery expansion, with unemployment rates of 7.5% and 7.6%. At these roughly comparable points in the business cycle, low-income intensity was higher during the 1990s than the 1980s. By 1996 low-income intensity was 26% higher than 1986. Intensity was also higher seven years into the recovery expansion; by 1999 it was 29% higher than in 1989 (Table 2).

Table 1: Low-Income Intensity*, Unemployment Rate, GDP Growth, Canada 1978 - 1999			
	Low-Income Intensity*	Unemployment Rate	GDP Growth
1978	N.A	8.4	4.1
1979	N.A	7.5	4.2
1980	0.065	7.5	1.4
1981	0.066	7.6	3.0
1982	0.072	11	-2.8
1983	0.081	11.9	2.7
1984	0.085	11.3	5.8
1985	0.077	10.5	4.7
1986	0.070	9.6	2.4
1987	0.073	8.9	4.2
1988	0.064	7.8	4.9
1989	0.058	7.5	2.6
1990	0.066	8.1	0.2
1991	0.074	10.4	-2.1
1992	0.072	11.3	0.9
1993	0.076	11.2	2.4
1994	0.074	10.4	4.7
1995	0.082	9.5	2.8
1996	0.088	9.7	1.6
1997	0.089	9.2	4.3
1998	0.081	8.3	3.9
1999	0.075	7.6	5.1
2000	N.A.	6.8	4.4
* Population <65. SCF data from 1980 to 1995, SLID thereafter.			

[3] When unemployment hit a cyclical low of 7.6 %, virtually the same as the 1989 cyclical low value.

Table 2: Percentage Differences in Low-Income Intensity Between the 1980s and 1990s		
	Percentage Difference	
	1996 compared to 1986*	**1999 compared to 1989****
Canada	26%	29%
Atlantic	7%	30%
Quebec	33%	41%
Ontario	36%	39%
Man/Sask	9%	-4%
Alta	25%	6%
BC	37%	46%
* Based on SCF data only.		
** SCF data for 1989, SLID for 1999.		
These percentage changes differ from those in Table 3 for two reasons: (1) percentage change calculations are used here, whereas Table 3 is the change in the natural log of intensity, and (2) Table 3 uses consistent data sets, whereas here SCF is used for 1988, and SLID for 1999.		

Unfortunately low-income data are not available for 2000. Economic growth was very strong during that year, as shown in Table 1. The unemployment rate fell from 7.6% in 1999 to 6.8% in 2000. Low-income intensity would certainly have decreased. However, whether it would have returned to the levels observed during the late 1980s cyclical peak is difficult to say. Declines in low-income intensity can be substantial at the end of a business cycle. During the period of very high economic growth during the last year of the 1980s cycle (1989), low-income intensity fell 10% nationally. However, to return to 1989 levels, low-income intensity in 2000 would have to fall 29%[4] . Even if it did, over most of the 1990s low-income intensity remained above the levels observed during the 1980s cycle.

To summarize, during the mid and late 1990s, low-income intensity was higher in almost all regions than during comparable years in the 1980s. As Osberg (2000) has shown, low-income levels in the Canadian provinces increasingly resembled those in the U.S. during the 1990s. To better understand the underlying causes of this general increase in low-income intensity during the 1990s, we ask:

(1) Whether the increase in low-income intensity was mainly due to increases in the low-income rate or the low-income gap during the 1990s. Did low-income intensity rise because more people were in low-income in the 90s as compared to the 1980s, or because low-income families were worse off than their 1980s counterparts?

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[4]   Declines in unemployment (and increases in employment) may positively affect low-income groups only very late in the business cycle. When labour demand starts to increase during a recovery, employers may turn to higher skilled (and higher paid) workers first. As the labour market tightens, available labour becomes scarcer as unemployment falls, and lower skilled workers may be drawn into employment. Hence, many workers (and families) in low-income may only see the benefit of recovery very late in a business cycle.

(2) Was the rise in low-income in the 90s associated with declines in transfer payments received by families at risk of low-income or with slower growth in employment earnings among low-income earners.

(3) Did the association between economic growth and low-income intensity change between the 1980s and 1990s. If earnings growth among low-income families was lower in the 90s, was this a result of slower economic growth (and a weaker recovery) or because, for any given level of economic growth, employment earnings at the bottom of the labour market were less responsive than in the 1980s.

Chart 2: Low-Income Intensity, Rate and Gap, Canada, 1980-99, Population <65: Based on Market Earnings* (1980 = 100)

* The same after tax/transfer LICO is applied to both market earnings and disposable income

Are More People in Low-Income or is the Low-Income Population Worse off?

The change in low-income intensity is the change in the rate plus the change in the gap, as noted earlier. Measures of the rate, gap and intensity based on disposable income (after taxes and transfers) are shown in Chart 1 for Canada. The rate demonstrates much more cyclical variation than the gap. Over the course of a business cycle, changes in economic conditions affect the number of people in low-income much more than the well-being of those in low-income. This is true whether the gap is measured using market earnings only (before transfers have any effect on the average well-being of low-income families) as shown in the Chart 2, or after taxes and transfers (Chart 1).

However, structural (i.e. long-term) change that excludes cyclical variation does not necessarily follow this pattern. When assessing change among years that are roughly in the same position in the business cycle, such as between 1989 and 1999, both the rate and the gap play a significant role.

Changes in the Low-Income Rate

The low-income rate for the population under 65 peaked during the 1980s cycle at 13.3% in 1984, and during the 1990s cycle at 14.1%[5] in 1996 (Appendix Table A-2). The low-income rate continued to climb through the 1993-1996 period of recovery (from 13.1% to 14.1%), even though unemployment was falling. As we show in later sections, this increase was related to the fact that employment earnings were rising only very slowly while transfers were falling. The peak in the low-income rate during the 1990s varied considerably by region, but in almost all cases the low-income rate rose well into the expansion[6], distinguishing it from the pattern observed during the 1980s recession.

By 1999, the proportion of the population in low-income had fallen from the peak, but remained above the 1989 values in all provinces except the Manitoba and Saskatchewan. For ease of presentation, all change in intensity, rates, gaps, etc. will be expressed in percentage change terms in the text, but they are in fact always change in the change in natural logarithms as noted in the tables. Using this approach, the low-income rate increased 16% in Canada between 1989 and 1999.

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[5]   Based on SCF data, which provides comparable results with the 1980s. According to SLID, the rate was 14.7% in 1996.

[6]   The peak was observed in Atlantic (1997), Quebec (1997), Ont. (1996), Man. (1997), Sask. (1995), Alta (1995), and BC (1996).

Table 3:		Percentage Change in Low-Income, Canada, and the Provinces, Disposable Income, Population <65					
		1981-1989	**1989-1993**	**1993-1996**	**1996-1999**	**1989-1999**	**1981-1999**
Canada	Intensity	-0.13	0.26	0.15	-0.18	0.24	0.11
	Rate	-0.05	0.28	0.07	-0.19	0.16	0.11
	Gap	-0.08	-0.01	0.08	0.01	0.08	0.00
Maritimes	Intensity	-0.33	0.14	0.11	-0.08	0.17	-0.15
	Rate	-0.28	0.16	0.08	-0.08	0.15	-0.13
	Gap	-0.06	-0.02	0.04	0.01	0.03	-0.03
Quebec	Intensity	-0.20	0.37	0.07	-0.20	0.23	0.04
	Rate	-0.15	0.37	0.02	-0.21	0.18	0.03
	Gap	-0.05	0.01	0.05	-0.01	0.05	0.01
Ontario	Intensity	-0.18	0.33	0.24	-0.21	0.36	0.19
	Rate	-0.01	0.32	0.13	-0.25	0.21	0.20
	Gap	-0.17	0.02	0.11	0.03	0.16	-0.01
Man/Sask	Intensity	-0.05	0.09	-0.02	-0.23	-0.16	-0.21
	Rate	0.03	0.12	0.01	-0.18	-0.06	-0.03
	Gap	-0.08	-0.02	-0.03	-0.06	-0.11	-0.19
Alberta	Intensity	0.24	0.05	0.13	-0.06	0.12	0.36
	Rate	0.34	0.19	0.03	-0.16	0.06	0.39
	Gap	-0.09	-0.13	0.10	0.10	0.07	-0.02
BC	Intensity	-0.13	0.34	0.12	-0.14	0.31	0.18
	Rate	-0.02	0.30	0.05	-0.11	0.24	0.22
	Gap	-0.11	0.05	0.07	-0.04	0.07	-0.04

* The change over the 1986-1999 period is the sum of the change over the 1989-1993,
1993-1996, and 1996-1999 period. See section on "Overcoming Potential Bias"
for details. The change over the 89-93 and 93-96 periods are based
on SCF data, and for the 1996-1999 period on SLID data.

Changes in the Low-Income Gap

Over the 1980s cycle the average low-income gap among persons in non-elderly low-income families fell from approximately 33% to 30% (Appendix Table A-2). Persons in low-income families were somewhat better off in 1989 than in 1981 (Chart 1). As we will see, this decline was related exclusively to increases in transfer payments, as reductions in market earnings tended to increase the gap over this period. Changes in transfers, often targeted at people well below the low-income cut-off, can have a significant effect on the low-income gap, often more so than on the low-income rate.

The trends of the 1990s are opposite to those of the 1980s. The "depth" of low-income rose, as the gap increased from 30.8% in 1988 to 33.6% in 1998, in spite of economic expansion. The gains of the 1980s were lost during the 1990s. The gap rose over the 1989-1999 period, from 30.2% to 32.2%. To anticipate later results, we will see that this increase in the gap was associated with declines in market earnings, except in Alberta, where transfer payments fell more quickly than earnings rose, resulting in a substantial rise in the gap.

The Contribution of the Rate and the Gap to Changes in Low-Income Intensity

For Canada, intensity fell by 13% over the 1981-1989 cycle, driven by both declines in the rate (5% fall) and the gap (8%) (Table 3). Over the 1989-1999 period, the 24% rise in low-income intensity was driven by increases in both the rate (increasing 16%) and the gap (increasing 8%). The rise in the gap was concentrated in the last part of the decade, as noted earlier. For Canada as a whole, more people were in low-income, and those in low-income were worse off, at least to 1999.

The Effect of Changes in Employment Earnings on Low-Income Intensity

The 1980s and 1990s were witness to a very turbulent labour market, and unstable earnings patterns for low-income Canadians. Earnings inequality rose significantly during the 1980s (Beach and Slotsve, 1996; Morissette, Myles and Picot, 1994; Wolfson and Murphy, 2000), and workers at the bottom of the earnings distribution saw their real wages fall. The rise in individual earnings inequality ceased during the early 1990s (although continuing to rise for men), but may have risen in the late 90s. However, family earnings inequality continued to rise throughout the 1990s (OECD, 1998; Picot, 1998; Wolfson and Murphy, 2000). The weak economic recovery through 1997 resulted in little improvement in employment and wages for Canadian workers until very late in the decade (Picot and Heisz, 2000). These patterns generally had a negative impact on low-income in Canada. The methodology used to capture the effect of market earnings on low-income is very straight forward. We simply compute the <u>change</u> in low-income intensity, the rate and the gap based on market earnings alone; this reflects the effect of changing market earnings on low-income intensity. [7]

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[7] Market earnings can change due to the interaction of labour supply and demand forces, as well as due to changes in "institutional" features of the labour market, including changes to the social transfer system. No attempt is made here to distinguish the effect of these factors one from the other.

Employment earnings among low-income families fell during both the 1980s and 1990s; by an average $750 over the 1981-1989 period, and $890 over the 1989-1999 period (Table 4). A decline during the recessionary period is to be expected, but even during the 1996-1999 period when economic growth was substantial (3.7% average annual growth in GDP) and unemployment fell from 9.7% to 7.6%, employment earnings declined among low-income families. Furthermore, transfer benefits were falling over this period, and not replacing earnings losses[8], so it seems unlikely that the availability of increased transfer benefits is a plausable explanation for the decline in earnings.

When translated into the effect on low-income intensity, we see that during the 1980s (1981-1989) declining earnings tended to raise both the rate and the gap (Table 5), resulting in a 9% increase in low-income intensity (based on market earnings). The negative effects of employment earnings were equally strong during the 1990s. Over the 1989-1999 period, low-income intensity (based on market earnings) rose 19%, again due to the negative impact on both the rate and the gap. After seven years of recovery, in 1999 market-based low-income intensity was almost as high as during the peak of the 1980s recession (Chart 2).

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[8]   It is conceivable that some of the change in market earnings and transfers among low-income families was due to the change in the type of families found in low-income. For example, if a larger share of the individuals in low-income were in single parent families, then transfers would likely increase and earnings fall in the aggregate. Comparing the family composition of 1989 to 1999, however, we see little change. In 1989, 26% of people in low-income lived in lone parent families, compared to 23% in 1999. A slightly larger proportion were recent (within the last 10 years) immigrants, 10% in 1989, and 11% in 1999. This would tend to marginally reduce earnings, as recent immigrants fare less well in the labour market than others. However, other compositional shifts, notably the aging of the low-income population (11% were aged 45-54 in 1989, compared to 18% in 1999) would likely more than offset this. Hence, we see no major compositional shifts that would tend to underestimate the earnings of low-income families in 1999 compared to 1989.

	Market Earnings	Total Transfers	Social Assistance	UI/EI Benefits	Other Benefits	Taxes	Disposable Income
Table 4: Average Market Earnings and Transfers, Low-Income Families with Head Less than the Age 65 Constant 1996 dollars, Canada							
1981	$6,843	$4,364	$2,166	$720	$1,478	$340	$10,867
1989	$6,094	$5,343	$2,780	$694	$1,869	$466	$10,971
Difference($)	-749	979	613	-26	391	126	103
% Change	-11	22	28	-4	26	37	1
1989	$6,094	$5,343	$2,780	$694	$1,869	$466	$10,971
1993	$5,317	$6,255	$3,619	$787	$1,850	$366	$11,206
Difference($)	-777	912	839	93	-19	-100	235
% Change	-13	17	30	13	-1	-21	2
1993	$5,317	$6,255	$3,619	$787	$1,850	$366	$11,206
1996	$5,427	$5,820	$3,352	$558	$1,910	$385	$10,862
Difference($)	111	-435	-266	-229	60	19	-344
% Change	2	-7	-7	-29	3	5	-3
1996*	$5,398	$5,803	$3,387	$546	$1,870	$378	$10,824
1999*	$5,177	$5,532	$2,864	$361	$2,306	$336	$10,373
Difference($)	-221	-271	-523	-185	436	-42	-451
% Change	-4	-5	-15	-34	23	-11	-4
1989-1999 Difference($)**	-887	206	50	-321	477	-123	-560

* Based on SLID data. All other periods based on SCF.
** Sum of difference over 1988-1993, 1993-1996, 1996-1999 period.

Table 5: Percentage Change in Low-Income, Canada and the Provinces, Market Income, Population <65		1981-1989	1989-1993	1993-1996	1996-1999	1989-1999	1981-1999
Canada	Intensity	0.09	0.38	-0.04	-0.16	0.19	0.28
	Rate	0.04	0.34	-0.05	-0.17	0.12	0.17
	Gap	0.05	0.07	0.01	0.00	0.07	0.12
Maritimes	Intensity	-0.06	0.22	0.00	-0.07	0.14	0.08
	Rate	-0.09	0.18	-0.04	-0.11	0.03	-0.07
	Gap	0.02	0.05	0.04	0.03	0.12	0.14
Quebec	Intensity	0.04	0.34	-0.02	-0.13	0.20	0.23
	Rate	-0.04	0.36	-0.06	-0.13	0.16	0.13
	Gap	0.08	0.01	0.04	-0.01	0.05	0.12
Ontario	Intensity	0.09	0.64	-0.07	-0.24	0.33	0.41
	Rate	0.05	0.49	-0.05	-0.26	0.19	0.24
	Gap	0.04	0.18	-0.03	0.00	0.15	0.18
Man/Sask	Intensity	0.21	0.16	-0.11	-0.22	-0.17	0.04
	Rate	0.15	0.11	-0.09	-0.21	-0.18	-0.03
	Gap	0.07	0.06	-0.03	-0.04	-0.01	0.07
Alberta	Intensity	0.53	0.15	-0.17	-0.08	-0.10	0.43
	Rate	0.40	0.21	-0.06	-0.16	-0.01	0.39
	Gap	0.15	-0.05	-0.12	0.08	-0.09	0.05
BC	Intensity	0.11	0.34	0.07	-0.05	0.36	0.47
	Rate	0.14	0.34	-0.01	-0.03	0.31	0.45
	Gap	-0.02	0.01	0.09	-0.03	0.07	0.05

This story is mainly relevant for central and eastern Canada. The negative impact of market earnings on low-income was heavily concentrated in the provinces between Newfoundland and Ontario where the 1990-1992 recession was most severe. For example, market-based low-income intensity in Ontario rose 33% between 1989 and 1999. Similar but less dramatic patterns are observed in the Maritime Provinces and Quebec. Manitoba to Alberta, on the other hand, saw relatively little increase in market-based low-income intensity during the recession and over the 1988-1999 period. B.C. more closely resembled the eastern provinces, as declining market earnings resulted in a 36% rise in low-income intensity over the 90s.

The "Direct" Effect of Changes in Transfer Payments on Low-Income Intensity, Rate and Gap

The standard approach to determining the "direct" effect of changes in transfers on low-income is to first compute the low-income rate based on market earnings. Transfers and taxes are then added to income to arrive at disposable income, and low-income computed on that basis. The difference between low-income intensity computed before and after taxes/transfers approximates the direct effect of the transfer system (Blank and Hanratty, 1993; McFate, Smeeding and

Rainwater, 1995). It is referred to here as the direct effect because there are indirect effects which are not accounted for in this "accounting" approach. For example, reductions in EI and social assistance during the 1990s might have reduced the work disincentive effect, and increased employment earnings. This possible behavioural response is not accounted for in this approach (see Kim, 2000, for a critique of this methodology).

We will demonstrate the approach by example. During the 1981-1989 period, changes in market earnings increased low-income intensity by 9% (as measured by the change in ln(intensity) between 1981 and 1989, Table 5). This is simply the change in low-income intensity over the period based on market earnings alone. If the *change* in transfer payments and taxes between 1981 and 1989 had had no increased compensating effect, low-income intensity *after* taxes and transfers would also have increased by the same amount (9%) as *before* taxes and transfers. The effect of taxes and transfers would be the same during both 1981 and 1989 and the change in transfers would have had no effect on the *change* in low-income. This is represented diagrammatically in Chart 3, panel A.[9]

Chart 3: Hypothetical Low-Income Intensity
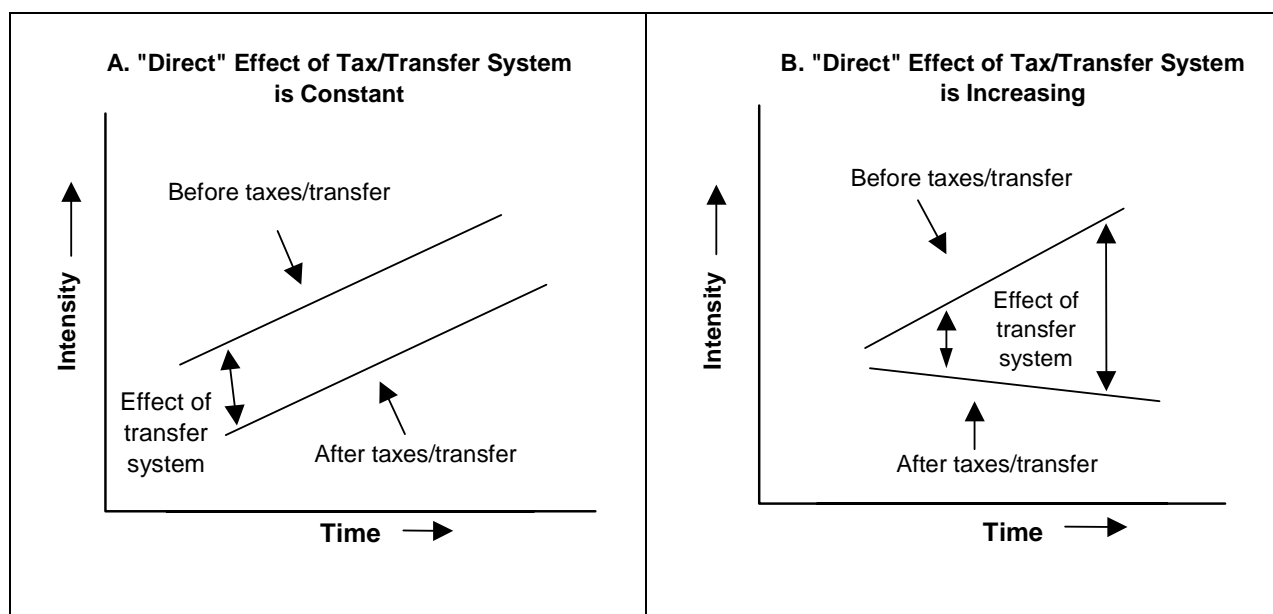
What actually happened? Changes in earnings increased low-income intensity by 9% in the 1980s. But low-income intensity *after* taxes and transfers actually fell by 13% (Table 6), resembling the hypothetical example in panel B of Chart 3. The difference ((-13- (9) = -22%)) reflects changes in transfers and taxes. Hence, changes in earnings patterns tended to increase intensity by 9%, and the direct effects of changes in taxes and transfers tended to reduce it by 22%, the end result being a 13% decline in low-income intensity over the 1980s cycle (Table 6).

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[9] One can use change in "level" or the "growth rate" as the indicator of change in the "effect" of transfer/taxes. For ease of presentation in the diagram, we display the "levels" approach (Chart 4). We use the "growth rate" approach in our calculations since it is consistent with the usual practice of focusing on the percentage reduction in low-income before and after transfers, and more importantly, because it allows for the decompositions discussed in the body of the text.

The story in the 1990s was somewhat different. Changes in market earnings at the bottom end of the earnings distribution drove up low-income intensity, by 19% over the 1989-1999 period. Unlike the 1980s, changes in transfers did not offset the decline in earnings, and if anything tended to marginally increase low-income intensity (by 5%), and the end result was an increase of 24% in intensity.

There were important regional variations, however.

(1) In Alberta, declines in transfers raised low-income intensity by 22%, which was partially offset by higher earnings (10%) for a net change of 12%. The changes in transfers mainly affected the low-income gap, and tended to increase the gap by 16% over the 1990s (1989-1999).

(2) In the remaining provinces over the 1989-1999 period, changes in transfer benefits had a relatively small "direct" effect on the rise in low-income intensity, except to the extent that they did not offset the negative effects of changes in employment earnings, as they did during the 1980s.

(3) Transfers behaved very differently during different parts of the cycle, as one would expect. During the recession years of the 1990s, transfers tended to reduce low-income (by about 14% in Canada). During 1993-1996, however, transfers declined more quickly than earnings rose among low-income families, and they had the effect of increasing low-income intensity by 19% in Canada, and by around 30% in Ontario and Alberta during that period. It is during this period that the trend in low-income intensity (after taxes/transfers) deviates from the pattern of economic growth, in part due to decline in transfer payments. This effect can be seen by comparing Charts 1 and 2, where low-income intensity based on market earnings peaks in 1993, but after taxes/transfers it continues to rise until 1996 or 1997 (depending upon the data source).

	Effect on Intensity of:			Effect on the Rate of:			Effect on the Gap of:		
	△ Market Earnings	△ Transfers	Total Change	△ Market Earnings	△Transfers	Total Change	△ Market Earnings	△Transfers	Total Change
	Tended to change intensity by:			Tended to change the rate by:			Tended to change the gap by:		
Canada									
1981-1989	9%	-22%	-13%	4%	-10%	-5%	5%	-13%	-8%
1989-1999	19%	5%	24%	12%	4%	16%	7%	1%	8%
Maritimes									
1981-1989	-6%	-26%	-33%	-9%	-18%	-28%	2%	-8%	-6%
1989-1999	14%	3%	17%	3%	12%	15%	12%	-9%	3%
Quebec									
1981-1989	4%	-23%	-20%	-4%	-11%	-15%	8%	-12%	-5%
1989-1999	20%	3%	23%	16%	2%	18%	5%	1%	5%
Ontario									
1981-1989	9%	-26%	-18%	5%	-6%	-1%	4%	-21%	-17%
1989-1999	33%	4%	36%	19%	1%	21%	15%	2%	16%
Man/Sask									
1981-1989	21%	-27%	-5%	15%	-12%	3%	7%	-15%	-8%
1989-1999	-17%	1%	-16%	-18%	13%	-6%	-1%	-10%	-11%
Alberta									
1981-1989	53%	-29%	24%	40%	-7%	34%	15%	-23%	-9%
1989-1999	-10%	22%	12%	-1%	7%	6%	-9%	16%	7%
BC									
1981-1989	11%	-24%	-13%	14%	-16%	-2%	-2%	-9%	-11%
1989-1999	36%	-5%	31%	31%	-7%	24%	7%	0%	7%

Note: The change expressed as percentage in the table is measured by the change in the natural logarithms. The change
over the 1988-1999 period is the sum of the change over three sub periods, 1988-1993 and 1993-1996
(both based on SCF data), and 1996 to 1999 (based on SLID data).

The Association Between Economic Growth and Market Based Low-Income Intensity

Slow economic growth during the 1990s and the associated effect on employment earnings resulted in substantial upward pressure on low-income intensity, as noted earlier, particularly in central and eastern Canada. It is change in earnings among poorer families that are reflected in these calculations.

But was slow economic growth alone responsible for the observed earnings changes among poorer families, and the resulting effect on low-income? It may be that the association between economic growth and low-income reduction (through earnings) is weakening. As noted in the introduction, this was observed for both Canada and the U.S. during the 1980s (as compared to the 1970s). Rising family earnings inequality could be a mechanism through which such a weakening takes place (see Chart 4).

Chart 4: Inequality in Family Market Earnings (Gini coefficient), 1980-1997

Source: Survey of Consumer Finances, 1980-1997

To see if this is the case, we turn to provincial level data on low-income and economic growth. The latter is measured using both the percentage change in GDP per capita, and the change in the natural logarithm of the unemployment rate of individuals aged 25-54. The question we ask in this section is the following: has the relationship between economic growth and low-income statistics weakened in the 1993-1999 expansion period compared to the 1983-1989 expansion period? We answer this question using two different dependent variables: the change in low-income intensity and, the change in low-income rate. Both variables are based on disposable income.

In the first column of Table 7, we regress the change in low-income intensity on the following set of explanatory variables: an intercept term, dummy variables for various sub-periods (1981-1982, 1983-1989, 1990-1992, 1993-1999), changes in the natural logarithm of the unemployment rate of individuals aged 25-54, interaction terms between the unemployment rate variable and

specific sub-periods, changes in average transfers (net of taxes) in the bottom decile of the distribution of adjusted-equivalent family disposable income, provincial controls and, demographic controls. The period covered is 1981-1999.[10]

The aforementioned interaction terms allow the effect of unemployment to vary across some sub-periods. The 1983-1989 period is selected as the reference (omitted) period. Following Osberg (2000), we use the change in the *natural logarithm* of the unemployment rate to account for the possibility that decreases in unemployment may be more effective in reducing low-income intensity when they occur at low levels of unemployment. The demographic controls include: changes in the percentage of individuals living in lone-parent families, changes in the percentage of individuals living in families whose major income recipient immigrated 10 years ago or less, changes in the percentage of individuals living in families whose major income recipient immigrated more than 10 years ago and, changes in the percentage of individuals living in families whose major income recipient has a university degree.

The regression results indicate that—as expected—increases in the relative importance of lone-parent families tend to increase low-income intensity. Increases in unemployment and decreases in transfers have a similar effect. The dummy variable for the 1993-1999 period is statistically significant, indicating that—all else equal—the increase in low-income intensity observed during that period was 0.003 higher than that for the 1983-1989 period. However, the interaction term between the unemployment rate variable and the 1993-1999 period is not significant. This suggests that the propensity of lower unemployment to reduce low-income intensity did not change between the 1993-1999 period and the 1983-1989 period.

The second column of Table 7 shows that the same story holds when we compare the 1993-1997 (rather than 1993-1999) period to the 1983-1989 period. We change time periods because, as noted earlier, it was during the 1993-1997 period that low-income intensity continued to rise in spite of increasing economic growth. Interestingly, the adjusted R squared increases by 3 percentage points with this specification, thereby indicating that allowing the patterns to differ between 1993-1997 and 1998-1999 provides a better fit of the model with the data.

In the third and fourth columns of Table 7, we replicate the first two columns for the 1983-191999 period.[11] The results remained essentially unchanged. In the last two columns, we replace the unemployment rate variable (and the associated interaction terms) by the percentage change in in GDP per capita observed during the previous year. We use a one-year lag to allow for the possibility that strong economic growth may take time to improve labour market conditions of low-skilled workers and thus, to reduce low-income intensity.[12] The coefficient on changes in

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[10]   The regressions are run using ordinary least squares. Observations are weighted using the share of the population of each province in the Canadian population in a given year. SCF data are used for the 1981-1995 period while SLID data are used for the 1996-1999 period.

[11]   We restrict the sample to the 1983-99 period in order to make comparisons with specifications which use the lagged changes in GDP per capita as a measure of economic growth. The log causes us to lose the first years in the sample.

[12]   The rationale for lagging changes in GDP per capita is simple: increases in output may first induce increases in hours of work and then increases in hiring of new employees. Combined with the possibility that semi-skilled workers may be hired before low-skilled workers, this explains why economic growth may take time to improve the employment earnings of low-skilled workers and thus, to reduce low-income intensity.

GDP per capita is significant and has the expected sign. Contrary to what we found using the unemployment rate variable as a measure of economic growth, we find no upward shift in low-income intensity during the 1993-1999 (or 1993-1997) period. Rather, the interaction term between the economic growth variable and the 1993-1999 period is now significant and suggests that the relationship between economic growth and low-income intensity has weakened between 1983-1989 and 1993-1999. A similar conclusion applies when we focus on the 1993-1997 period.

All the aforementioned findings hold when we consider changes in low-income rate rather than changes in low-income intensity (Table 8). Hence, while models using changes in unemployment as a measure of economic growth suggest no changes in the relationship between economic growth and low-income intensity (rate), models using growth rates of GDP per capita suggest a weakening of this relationship between the mid-1990s and the 1980s.

The bottom line is that the mid-1990s were somehow different than the 1980s. Chart 5 provides some clues as to why this was the case. During the expansion of 1983 to 1987, market earnings of families in the bottom quintile of the distribution of (adjusted-equivalent) disposable income rose roughly $900 (in 1996 constant dollars). In contrast, they remained essentially unchanged during the 1993 and 1997 expansion. In addition, net transfers (i.e. social transfers minus taxes) fell more during the 1993-97 period ($660) than during the 1983-87 period ($479). As a result, disposable income of these families fell during the 1993-97 period after rising during the 1983-87 period. This suggests that the 1993-97 period did not induce a decrease in low-income intensity (rate) mainly because it did not generate any gains in employment earnings among families in the bottom quintile.

Table 7 : Changes in low-income intensity - regression results.

Period	(1) 1981-99	(2) 1981-99	(3) 1983-99	(4) 1983-99	(5) 1983-99	(6) 1983-99
% Lone-parent	0.212**	0.239**	0.168**	0.197**	0.167**	0.199**
% New immigrants	0.106	0.118	0.124	0.140*	-0.007	0.015
Transfers	-0.010**	-0.010**	-0.011**	-0.010**	-0.010**	-0.009**
d8182	-0.001	0.000	-	-	-	-
d9092	0.002	0.001	0.002	0.002	0.008**	0.008**
d9399	0.003**	-	0.003**	-	0.000	-
d9397	-	0.005**	-	0.005**	-	0.000
lnurate	0.047**	0.044**	0.046**	0.043**	-	-
lnurate*d8182	-0.020	-0.017	-	-	-	-
lnurate*d9092	-0.021	-0.017	-0.019	-0.015	-	-
lnurate*d9399	-0.006	-	-0.004	-	-	-
lnurate*d9397	-	-0.004	-	0.000	-	-
g1	-	-	-	-	-0.200**	-0.196**
g1*d9092	-	-	-	-	0.366**	0.376**
g1*d9399	-	-	-	-	0.138**	-
g1*9397	-	-	-	-	-	0.253**
Adj. R2	0.3185	0.3480	0.3251	0.3544	0.3878	0.4370
Sample size	190	190	170	170	170	170

% Lone-Parent : change in the % of individuals living in lone-parent families.
% New immigrants : change in the % of individuals living in families whose major income recipient immigrated 10 years ago or l
Transfers = changes in average transfers in the bottom quintile of the distribution of (adjusted-equivalent) disposable income.
d9399 = 1 if year is between 1993 and 1999, d9397 = 1 if year is between 1993 and 1997, etc.
lnurate = changes in the natural logarithm of unemployment rate of individuals aged 25-54.
 g1 = growth rate of GDP per capita in previous year.

The dependent variable is the change in low-income intensity. Other controls include 9 provincial dummies (reference group is
Ontario), changes in the % of individuals in families whose major income recipient immigrated more than 10 years ago and chang
in the % of individuals in families whose major income recipient has a university degree.
* : statistically significant at the 10% level; ** : statistically significant at the 5% level.

Table 8 : Changes in low-income rate - regression results.

Period	(1) 1981-99	(2) 1981-99	(3) 1983-99	(4) 1983-99	(5) 1983-99	(6) 1983-99
% Lone-parent	0.283**	0.321**	0.222**	0.263**	0.205**	0.251**
% New immigrants	0.332**	0.355**	0.356**	0.385**	0.123	0.147
Transfers	-0.012**	-0.011**	-0.013**	-0.013**	-0.013**	-0.011**
d8182	-0.001	0.000	-	-	-	-
d9092	0.003	0.003	0.003	0.003	0.011**	0.011**
d9399	0.005**	-	0.005**	-	-0.002	-
d9397	-	0.008**	-	0.008**	-	-0.001
lnurate	0.074**	0.070**	0.072**	0.068**	-	-
lnurate*d8182	-0.033**	-0.031*	-	-	-	-
lnurate*d9092	-0.046**	-0.042**	-0.042**	-0.038*	-	-
lnurate*d9399	0.012	-	0.016	-	-	-
lnurate*d9397	-	0.021	-	0.027	-	-
g1	-	-	-	-	-0.272**	-0.270**
g1*d9092	-	-	-	-	0.430**	0.449**
g1*d9399	-	-	-	-	0.174**	-
g1*9397	-	-	-	-	-	0.335**
Adj. R2	0.3536	0.3806	0.3633	0.3910	0.3283	0.3712
Sample size	190	190	170	170	170	170

% Lone-Parent : change in the % of individuals living in lone-parent families.
% New immigrants : change in the % of individuals living in families whose major income recipient immigrated 10 years ago or
Transfers = changes in average transfers in the bottom quintile of the distribution of (adjusted-equivalent) disposable income.
d9399 = 1 if year is between 1993 and 1999, d9397 = 1 if year is between 1993 and 1997, etc.
lnurate = changes in the natural logarithm of unemployment rate of individuals aged 25-54.
 g1 = growth rate of GDP per capita in previous year.

The dependent variable is the change in low-income rate. Other controls include 9 provincial dummies (reference group is
Ontario), changes in the % of individuals in families whose major income recipient immigrated more than 10 years ago and chang
in the % of individuals in families whose major income recipient has a university degree.
* : statistically significant at the 10% level; ** : statistically significant at the 5% level.

Figure 5 : Changes in Market Earnings, Net Transfers and Disposable Income for Families in the 1st Quintile, 1983-87 versus 1993-97 (1996 constant dollars)
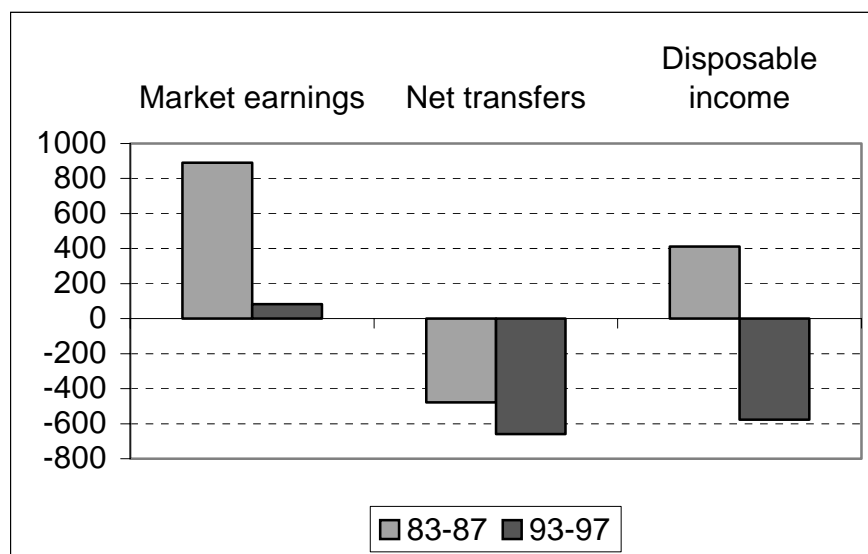
Source: Survey of Consumer Finances.

Conclusion

Low-income intensity was higher in Canada through the mid-and latter half of the 1990s (compared to the 1980s) for a number of reasons. GDP and employment growth was slower during the recovery period of the 1990s than the 1980s (Picot and Heisz, 2000). Hence, so too was the improvement in low-income that is driven by an increase in aggregate employment. In this environment of declining employment earnings among the low-income population, transfer benefits did not expand over the cycle (as they did during the 90s) to replace lost earnings. These factors taken together resulting in higher low-income during the mid and late 90s then during the 1980s.

Seven years into the economic expansion, 1999, both the low-income rate, and the low-income gap, together referred to as low-income intensity, were higher than for a comparable period during the 1980s (1989) in all regions except Manitoba and Saskatchewan.

Earnings declines among poorer families tended to increase low-income substantially during the 1990s as they did during the 1980s. However, this story was primarily relevant for central and eastern Canada and B.C. In the remainder of the west, where the 1990s recession was much less pronounced, the negative effect of changes in employment earnings on low-income was substantially muted.

During the 1980s, increases in transfers more than offset the negative effects of earnings changes, and low-income intensity declined. Over the 1989-1999 period, transfers did not offset the negative effects of earnings patterns. Rather, changes in benefits tended to contribute marginally to an increase in low-income intensity. Changes in transfers typically have a greater impact on the low-income gap than on the low-income rate. Declining transfer benefits had their greatest

effect on low-income intensity in Alberta, and they were associated primarily with increases in the depth of low-income (the gap).

Whether or not the relationship between economic growth and low-income intensity has weakened in the 1990s compared to the 1980s is unclear at this point. What is clear is that, contrary to the 1983-1987 period, the 1993-1997 period did not generate any gains in employment earnings among families most likely to live in low income. Whether or not such a trend will persist in the future remains to be seen. Thus, while it is premature to conclude that a weaker link between economic growth and low-income intensity is now a new feature of the Canadian labour market, the mid-1990s have reminded us of a simple idea: economic growth must generate earnings gains among low-skilled workers to succeed in lowering low-income intensity. This did not occur during much of the recovery of the 1990s.

Appendix A: Low-Income Intensity

The SST index of low-income *intensity* was initially advocated by Sen (1976) and recently adapted by Shorrocks (1995). Since Thon (1979, 1983) proposed a revision of the Sen index that in the limit is identical to the Shorrocks formulation, Osberg and Xu identify it as the SST index. It satisfies the monotonicity and transfer axioms, takes on a values between 0 and 1, and, analogously to Lorenz curves (see Shorrocks, 1995 for a graphical illustration), can be interpreted as the fraction of the area below the line of maximum poverty (the low-income profile obtained when all incomes are zero) filled by the observed low-income gap profile (the cumulative sum of low-income gap ratios after ordering all individuals by the size of their low-income gap from largest to smallest).   In this sense, for any given low-income cut-off, SST exhausts the information available on the distribution of low-income in a population. The SST index would, for example, take on a value of zero when all incomes are above the low-income cut-off, a value of 1.0 when all incomes are zero and a value of 0.5 when all incomes are exactly equal to half the low-income line.

Calculation of the SST index begins with the measure of the "low-income gap," the difference (in dollars) between the low-income cut-off (Z) and actual income of the low-income family (Y_i) and expresses the gap as a ratio of the low-income line as in:

(1) $X_i = (Z-Y_i)/ Z$

where X_i is set to zero for the non-poor, thus defining a variable for the entire population (the poor and the non-poor). In effect, rather than a dichotomy (poor/not poor), low-income is measured as a continuous variable ranging from zero (for the non-poor) to its empirically observed maximum. Unlike the *absolute* dollar value of the poverty gap, the low-income gap *ratio* is comparable among families and individuals and across time.[13]

As with any variable, the low-income gap ratio can be described in terms of its mean (the average depth of low-income in the population) and the shape of its distribution. The SST index is a function of the average low-income gap ratio and the Gini coefficient (G) of low-income gap ratios for the entire population as in:

(2) $P(Y;z) = \mu (X) [1 + G(X)]$

where $\mu (X)$ is the mean of the low-income gap ratios for the entire population including the non-poor and $1 + G (X)$ is an approximation of $G(X)$ for all persons based on first-order Taylor series expansion (Osberg and Xu, 1997).

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[13]   Because the low-income *gap* is expressed as a ratio measure (the gap as a % of the low-income cut-off), it standardizes this information across families whose poverty lines vary due to adjustments for differences in family size or place of residence. This is important when using poverty lines or low-income cut-offs, as in the U.S. and Canada, where equivalence scales that take account of economies of scale are used to estimate the cut-off for different types of families. The usual statistical series on the average dollar value of the gap does not make this adjustment and so is not comparable across families. A low-income gap of say $5,000 may represent a low-income deficit of 20% in one family and 30% in another. In contrast, a child in a family that falls 20% below the cut-off is equivalent to a child in another family 20% below the cut-off irrespective of differences in the absolute dollar value of the low-income deficit.

While the Sen-Shorrocks-Thon index and related measures (e.g. Foster, Greer and Thorbecke, 1984) represent considerable advance in both the theory and measurement of poverty, neither the theory nor the measures have had much impact in part because such indexes do not have a readily intuitive interpretation. As Osberg and Xu (1997, 1998) point out, however, the mean of X_i, i.e., μ (X), is simply the weighted sum of the average low-income gap ratio among low-income families and the average low-income gap ratio of families not in low-income (i.e. zero) where the weights are the corresponding population proportions (i.e. the low-income rate and one minus the low-income rate) so that:

$$(3) \quad \mu \text{ (X)} = \text{(Rate) (Gap)} + \text{(1-Rate) (0)},$$
$$= \text{(Rate) (Gap)}$$

and the SST index can be rewritten as:

$$(4) \quad P(Y;z) = \text{(RATE) (GAP)} [1 + G(X)]$$

For the purpose of decomposing the intensity measure, it is sometimes useful to express Equation (3) in log form as:

$$(5) \quad \ln(P(Y;z)) = \ln(\text{RATE}) + \ln(\text{GAP}) + \ln(1+G(X))$$

so that the overall change in the index between any two points in time (or between two population groups or regions), can be expressed as the sum of the change in its components as in:

$$(6) \quad \Delta\ln(P(Y;z)) = \Delta\ln(\text{RATE}) + \Delta\ln(\text{GAP}) + \Delta\ln(1+G)$$

As shown by Osberg and Xu's (1997) analysis of LIS data, changes in [1 + G (X)] account for very little of the change in the overall poverty profile so that, in practice, changes in low-income intensity can be approximated by the product of changes in the poverty rate and the average poverty gap ratio of the poor. Moreover, when the amount of change is not large, a difference in logs is closely approximated by the more familiar percentage change as in:

$$(7) \quad \% \text{ change in intensity} = \% \text{ change in the rate} + \% \text{ change in the gap}$$

The percentage change equation is an approximation of the logarithmic identity in (5) and is reasonable when the magnitude of change is small but not when it is quite large (say over 30%). In this paper, all computations of the extent of change in low-income intensity, rate and the gap, and the effect of earnings and transfers on this change are computed using the change in the natural logarithms. For ease of presentation, this is referred to as percentage change in the text, however.

Table A-1:	The "Direct" Effect of Changes in Transfers Using Two Different Data Sources, 1993 & 1996		
	A: Using SCF data for both 1993 & 1996		**B: Using SCF data in 1993, and SLID data in 1996**
	Change in transfers tended to change low-income intensity by:		
Canada	15%		18%
Maritimes	11%		20%
Quebec	7%		18%
Ontario	24%		20%
Alberta	13%		8%
Man/Sask	-2%		11%
BC	12%		19%

Table A-2: Low-Income Intensity, Rate and Gap, After Tax/Transfer Income, Population <65

		1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996		1997		1998	1999
																		SCF	SLID	SCF	SLID		
Canada	Intensity	0.065	0.066	0.072	0.081	0.085	0.077	0.070	0.073	0.064	0.058	0.066	0.074	0.072	0.076	0.074	0.082	0.088	0.090	0.089	0.088	0.081	0.075
	Rate.	0.102	0.104	0.116	0.131	0.133	0.127	0.117	0.119	0.107	0.099	0.109	0.122	0.123	0.131	0.128	0.138	0.141	0.147	0.139	0.141	0.125	0.121
	Gap.	0.328	0.326	0.322	0.321	0.332	0.315	0.309	0.317	0.308	0.302	0.313	0.316	0.306	0.300	0.303	0.311	0.325	0.320	0.335	0.325	0.336	0.322
Maritimes	Intensity	0.076	0.078	0.078	0.091	0.085	0.079	0.073	0.077	0.058	0.056	0.057	0.065	0.068	0.064	0.073	0.080	0.072	0.078	0.075	0.084	0.077	0.073
	Rate.	0.136	0.135	0.137	0.158	0.148	0.135	0.126	0.130	0.104	0.102	0.104	0.114	0.120	0.120	0.132	0.143	0.129	0.135	0.139	0.138	0.132	0.124
	Gap.	0.291	0.301	0.296	0.302	0.302	0.306	0.300	0.309	0.289	0.284	0.282	0.296	0.296	0.279	0.287	0.295	0.290	0.301	0.281	0.320	0.304	0.303
Quebec	Intensity	0.068	0.074	0.077	0.083	0.088	0.083	0.079	0.083	0.076	0.061	0.070	0.085	0.073	0.088	0.084	0.095	0.094	0.105	0.092	0.108	0.100	0.086
	Rate.	0.126	0.124	0.136	0.141	0.153	0.149	0.143	0.145	0.135	0.106	0.126	0.150	0.130	0.154	0.149	0.155	0.157	0.175	0.156	0.175	0.161	0.143
	Gap.	0.280	0.309	0.296	0.309	0.300	0.292	0.288	0.301	0.292	0.295	0.290	0.298	0.294	0.298	0.295	0.325	0.315	0.317	0.310	0.328	0.327	0.314
Ontario	Intensity	0.058	0.053	0.064	0.071	0.073	0.061	0.056	0.053	0.049	0.044	0.057	0.063	0.058	0.062	0.059	0.069	0.079	0.076	0.086	0.071	0.068	0.061
	Rate.	0.084	0.081	0.101	0.115	0.107	0.101	0.088	0.086	0.078	0.080	0.090	0.100	0.101	0.111	0.104	0.122	0.127	0.127	0.129	0.116	0.104	0.099
	Gap.	0.350	0.334	0.329	0.318	0.353	0.312	0.324	0.320	0.321	0.282	0.327	0.322	0.299	0.288	0.294	0.295	0.323	0.309	0.348	0.315	0.338	0.317
Man/Sask	Intensity	0.072	0.088	0.085	0.085	0.095	0.097	0.094	0.086	0.088	0.084	0.092	0.104	0.098	0.092	0.090	0.086	0.090	0.102	0.088	0.091	0.085	0.081
	Rate.	0.109	0.131	0.129	0.130	0.148	0.140	0.152	0.141	0.139	0.135	0.144	0.167	0.156	0.152	0.144	0.150	0.153	0.159	0.146	0.149	0.135	0.132
	Gap.	0.343	0.349	0.342	0.342	0.337	0.363	0.322	0.319	0.332	0.323	0.335	0.328	0.331	0.316	0.328	0.300	0.307	0.338	0.317	0.319	0.327	0.318
Alberta	Intensity	0.068	0.062	0.064	0.096	0.109	0.081	0.072	0.093	0.072	0.079	0.071	0.081	0.104	0.083	0.081	0.093	0.095	0.090	0.086	0.099	0.085	0.084
	Rate.	0.088	0.083	0.095	0.141	0.158	0.133	0.119	0.143	0.119	0.116	0.120	0.128	0.165	0.140	0.133	0.148	0.144	0.148	0.129	0.140	0.125	0.125
	Gap.	0.396	0.385	0.348	0.356	0.361	0.316	0.315	0.340	0.314	0.353	0.306	0.330	0.331	0.309	0.316	0.328	0.343	0.317	0.350	0.369	0.354	0.349
BC	Intensity	0.066	0.070	0.081	0.086	0.089	0.096	0.075	0.081	0.063	0.061	0.069	0.071	0.076	0.085	0.090	0.088	0.096	0.103	0.102	0.088	0.078	0.089
	Rate.	0.081	0.102	0.115	0.128	0.141	0.147	0.125	0.128	0.105	0.099	0.106	0.109	0.126	0.134	0.144	0.143	0.140	0.158	0.144	0.140	0.118	0.142
	Gap.	0.418	0.354	0.363	0.348	0.332	0.342	0.312	0.330	0.313	0.317	0.338	0.336	0.310	0.333	0.329	0.320	0.357	0.341	0.370	0.326	0.341	0.326

Source: Data for 1980 to 1995 based on SCF. Data for 1996 to 1999 based on SLID.

Appendix B: Overcoming Potential Bias Due to a Change in Data Sources

Two data sources are employed in this analysis, the Survey of Consumer Finances (SCF) for the years 1980 through 1996 and the Survey of Labour and Income Dynamics (SLID) for 1996 through 1999. At more aggregated levels these data sets produce quite comparable estimates. However, we are interested in the effect of regional level changes in relatively small income components (e.g. transfers) and at this level of analysis significant differences between the two data sources do appear.

To assess the impact of moving from SCF to SLID, we computed the effect of changes in transfers on the low-income rate for the periods 1993-1996 in two different ways. Since SCF data are available to 1997, and SLID data[14] from 1996 to 1999, we compute the effect of changes in transfers on low-income over the 1993-1996 period (1) using only comparable SCF data for all years, and (2) using SCF data in 1993, and SLID data in 1996. The methodology employed is described in the body of the paper. We determine whether the results are comparable when using a consistent SCF series, and a series that combines SCF and SLID data[15]. While the results were very similar for some of the regions, there were a few cases where the magnitude of the effect of transfers on low-income changed significantly depending upon whether one used a consistent time series from the same data source, or combined data from the two sources. For example, in Manitoba and Saskatchewan the change in transfers tended to reduce low-income by 2% over the 1993-1996 period when using the consistent SCF series, and increased it by 11% when using a combination of SCF and SLID.

When faced with contradictory results, it seems prudent to use the consistent series from the same data source, rather than a series that mixes data sources[16]. Fortunately, it is possible to produce the results we need for the 1989 to 1999 period without combining data sources. This is because we are concerned with *change* in transfers and earnings on the *change* in low-income within each province. Because of the overlapping nature of the surveys, we can produce consistent estimates (based on the same data sources) of the change in transfers and their impact on low-income for a number of sub-periods. These effects are then summed over the sub-periods to determine the effects over the entire 1988-1999 period. This is possible because we are not concerned with levels, but with change, and because the methodology employed (based on natural logarithms) allows us to sum changes over three sub-periods to estimate the change over the entire period. To obtain estimates of change over the 1988-1999 period, which is of primary concern to us, we estimate the effects separately for 1988-1993 and 1993-1996 based on a consistent SCF series, and for 1996-1999 based on a consistent SLID series, and then sum over

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[14] SLID started in 1993, but the full sample only came on line in 1996. The larger sample is required to produce reliable results at the provincial levels for some income components of interest.

[15] We carried out the same test for the 1996-98 period, where we could assess the effect of changes in transfer payments on low-income using (1) a consistent series of SLID data for both 1996 and 1998, and (2) a series where we employ SCF data in 1996, and SLID data in 1998. The results of this comparison were similar to the results reported for 1996-98 in the main text.

[16] A single survey (e.g. SCF) will maintain consistency in the manner in which the questions are asked and in the processing system (editing, imputation procedures, etc.) which will render observations more consistent through time than if one switches from one survey to another, where these processes may differ.

these sub-periods to determine the effects over the entire 1988-1999 period (see Appendix B for details).

We prefer this approach to that of attempting to adjust the *levels* in SLID to match those in SCF. In this way, the possible bias in the results due to differences in levels between the two surveys is avoided.

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