Looking for Smoking Guns:
The Impact of Taxes and Transfers on Canadian Income Inequality

Marc Frenette,
Business and Labour Market Analysis Division
Statistics Canada

David A. Green,
Department of Economics, UBC, and
Research Fellow, Institute for Fiscal Studies

Kevin Milligan
Department of Economics, UBC, and
NBER

August, 2009

Abstract

In this paper, we investigate the relationship between the substantial changes in tax and transfer programs and the movements in after-tax income inequality over the 1980s and 1990s. We show that in the 1980s, tax and transfer programs became more redistributive, offsetting substantial increases in market income inequality. In the 1990s, the tax and transfer system stopped undoing the increases in market income inequality, leading after-tax income inequality to rise. Even so, tax and transfer programs were more redistributive in 2000 than in the 1980s. Much of the changes occurred at the provincial level, with social assistance payments first increasing (in the late 1980s) then decreasing (in the late 1990s) and with surtaxes on high income earners being first imposed and then subsequently removed.

Keywords: income inequality, redistribution, taxes, social transfers.

1. Introduction

In an earlier paper (Frenette, Green and Milligan, 2007), we showed that market income inequality rose substantially, and at roughly the same rate, in the 1980s and 1990s. When taxes and transfers are considered, however, different patterns emerge. In the 1980s, after-tax income inequality actually declined slightly, indicating that taxes and transfers more than offset the rising trend in market income inequality. In contrast, the 1990s featured a substantial rise in inequality of after-tax income. Thus, it appears that while taxes and transfers continued to reduce the overall level of inequality, they no longer un-did the upward trend in underlying inequality.[1] These results arose in the context of a decade of considerable change in the tax and transfer systems: the employment insurance system was overhauled; in most provinces, reforms to social assistance systems were implemented; the Child Tax Benefit system was expanded; and, toward the end of the 1990s, tax rates began to be cut.

In this paper, we take the next steps in understanding how these policy changes affected overall inequality in Canada. In principle, the new type of tax and transfer system, with its more specific targeting of transfers to low-income families and its attempts to help individuals improve their skills, might ultimately yield lower inequality. The broad patterns described above suggest that this potential may not have been fulfilled. However, a deeper understanding requires precise information on the various tax and transfer systems in place in Canada in the last two decades to be sure of what role those systems have played. More specifically, we ask a series of questions, the answers to which may shed light on the issues. Were the tax and transfer systems (applied to a given population) more redistributive in the 1980s than in the 1990s? Did they undo the underlying trends in market income inequality in the 1980s because they were inherently more redistributive or because they changed in the extent to which they redistributed income over the decade? What specific aspects of taxes and transfers were most important in changes in the redistributiveness of the system? Tax cuts? Cuts to social assistance? Finally, who would be predicted to benefit and who to lose from the shift in redistribution systems?

In our analysis, we use the Census data approach previously developed in Frenette et al. (2007). This approach involves the imputation of taxes paid for each family in the

Census using reduced form regressions fitted to administrative tax data with regressors that are found in both the tax and Census data. We also fit similar functions to Census data with the dependent variables being various types of reported transfer income. We then use these functions to calculate counter-factual after-tax income distributions where we take a particular population (for example, all families in the 1990 Census) and re-calculate their after-tax incomes under various combinations of actual tax and transfer systems. We then run regressions of calculated changes in taxes and transfers as we move across systems on variables such as family status, age, etc. to see who would be most affected by the changes. Note that our analysis takes market income as exogenous—we do not attempt to model behavioural responses. Thus, we are looking for smoking guns— in the sense of likely candidates for the sources of changes in after-tax income inequality—rather than final answers. In future work, we hope to build on the information gathered here by explicitly modeling behavioural responses. This means we do not interpret the counter-factual after-tax income distribution obtained by applying our estimated 2000 tax parameters to the 1990 market income distribution as representing what the 1990 distribution would have looked like had the 2000 tax system been in place in 1990. Rather, we interpret our approach as a way to summarize the sets of policies, where we summarize them by showing their effects on a given population. We believe this is more informative than presenting average tax or benefit rates directly since it incorporates interactions among the various taxes and transfers at the points in the income distribution where they actually have their effects.

The answers from our counter-factual exercises are interesting. We find that the level of income redistribution was highest in 1995 (among the years we investigate: 1980, 1985, 1990, 1995, and 2000). We also show that this was largely driven by changes at the provincial level, where both transfers under social assistance and surtaxes on top-earning families increased over the 1980s (and had not yet been substantially reduced). Large increases in redistribution in both the tax and the transfer systems contributed to maintaining after-tax income inequality at a relatively constant level in the 1980s in the face of rising market income inequality. In contrast, the 1990s saw first a slow-down, and then a reversal in the trend toward increasing redistribution. After 1995, tax and transfer systems became less redistributive, though they were more redistributive in 2000 than in

the 1980s. The one main exception to this was social assistance, which was far less redistributive in 2000 than in the 1980s (as measured by the log of the ratio of the 95th to the 5th percentile of the income distribution).

The paper proceeds in six sections, including the introduction. In the next section, we describe the Census data and our tax and transfer imputation functions. In the third section, we set out basic inequality patterns and present counterfactual distributions showing the differential roles of taxes and transfers. In the fourth section, we continue this investigation, examining the impacts of sub-components of taxes and transfers. In the fifth section, we consider who has benefited and who has lost under the tax and transfer system changes across the 1980s and 1990s decades, considering impacts by income group and other characteristics. In section six, we provide some discussion on patterns between 2000 and 2005, though data differences prevent us from providing a complete analysis of this period. Section seven contains conclusions.

2. Data

Our analysis is centered on the Canadian Census, using the years 1980 to 2000, and to a much lesser extent, 2005 (because of data comparability issues). We use the micro-data version of the file, in which 20% of Canadian households are interviewed. Frenette et al. (2006) argued that Census data likely provides the most reliable source for computing income inequality for Canada over an extended period of time, and Frenette et al. (2007) extended this argument to after-tax income inequality.[2] This reliability stems from response being mandatory by law in the Census and from the structure of the questionnaires, which was remarkably stable between 1980 and 2000 for the variables of interest in this study. The main drawback to the Census data is the lack of information on taxes paid. To solve this problem, Frenette et al. (2007) propose and implement a tax imputation procedure using administrative tax data. In that paper, the goal was to impute taxes in order to arrive at a measure of after-tax income. Here, we build on that procedure by imputing taxes and transfers from different years to a fixed set of families, allowing us to examine how changes to the tax and transfer system have influenced inequality.

The imputation procedure is reduced-form in nature. We build a rich regression model consisting of observable characteristics known to influence taxes and transfers and

that are available in the Census. We then regress taxes (or transfers) on these characteristics, and use the estimated coefficients to impute a value to each of our individual Census observations.

An alternative approach might use a tax and benefit calculator to impute taxes and transfers following the rules laid out in legislation. However, a calculator approach requires more information (for example: childcare expenses, pension contributions, charitable donations) and must make assumptions about what tax credits and transfers are claimed. In contrast, our imputation approach requires less information and takes account of any systematic errors made in tax filing. Frenette et al. (2007) provide a more extensive discussion of the imputation procedure, including evidence that the imputed distribution of after-tax income from the administrative data matches very closely what is observed in the actual administrative data.

An analysis of redistribution requires assumptions about the incidence of taxes and transfers. If a change in taxes leads to an adjustment of pre-tax incomes, then the individual will not bear the full incidence of the tax. Previous work (for example, Davies et al. 1984; Vermaeten at al. 1994; Lee 2007) shows results to be sensitive to assumptions about incidence. Without consensus on where tax shifting parameters should be set, we take the conservative approach of assuming no tax shifting in order to focus attention on changes in the legislated parameters of the tax and transfer system.

The details of the imputation differ substantially for taxes and transfers. For the tax imputation, we employ Statistics Canada's T1 Family File (T1FF), which is based on administrative tax filing records grouped into family units. Taxes paid (separately at the federal level and for each of the ten provinces) are regressed on a flexible function of observable characteristics, following exactly the regression models outlined in Frenette et al. (2007). This gives us a regression model of the tax system for each year, including both provincial and federal income taxes. We do not model payroll taxes.[3] Given a set of families with the requisite observable characteristics, we can therefore impute income taxes paid for any year in the T1FF to the set of families.

For the transfers, we perform the imputation from a regression model using Census data. The Census data contains far more useful determinants of transfer receipt than the tax data. The transfers we consider are social assistance (SA)[4], unemployment /

employment insurance benefits (UI/EI), and child benefits. Seniors' benefits are excluded from the analysis since we view retirement and pensions as separate issues outside the scope of this paper—all the results presented here use a sample excluding all families with an individual aged 65 and older. Each of the three transfers is modeled separately, using a very detailed set of individual characteristics including wages, weeks worked, hours worked, age, sex, province, and the local unemployment rate. In all cases, we find that modeling transfers in two stages works best in terms of predictive power. In the first stage, we model and predict the receipt of the transfer using a probit specification. In the second stage, we apply OLS to model and predict the amount of transfer income received among recipients only. As with the tax models, the code used to generate the transfer coefficients is available upon request.

It is important to state the limitations of our approach. We do not deal with the complete set of taxes, government spending received in kind, and transfers that together represent the complete fiscal system. Also, to the extent that our regression models are not sufficiently rich, this does remove some within-group variation in taxes (or transfers) and introduce individual level measurement error. However, we show in Frenette et al. (2007) that our tax imputation models do a very good job of re-generating the distribution of after-tax income when applied to the tax data for any year. The reason we do not base our analysis on tax data alone is that its coverage is incomplete before 1992, when the introduction of the GST credit insured almost universal tax filing. The pre-1992 period is not a problem for our tax imputation because, as we show in Frenette et al (2007), our regression correctly predicts zero taxes paid for most non-filers.

In Table 1, we show that our prediction approach also works for transfer income. We show percentiles and related inequality indices of total income (pre-tax) based on the actual distribution taken from the Census data. We also show percentiles and indices when we replace actual with predicted EI benefits, child transfers and SA benefits, individually (in columns 3-5) and then altogether (column 6). The table shows that the distribution of income is hardly disrupted as we predict different components of transfer income using our methodology. More importantly, the log ratios are very similar throughout, with the possible exception of the log (P90/P10) ratio once social assistance is predicted (a small change is noted). However, our focus in this paper will be on the

tails of the distribution, captured by the log (P95/P5) ratio. Thus, while our models (or perhaps any model) cannot be expected to predict taxes or transfers precisely for particular individuals, they do an excellent job of predicting most of the income distribution with a high level of precision. This serves our purposes well in this paper, as we seek to understand how tax and transfer systems have disrupted the distribution of income, as opposed to how specific individuals fared.

Table 1: Percentiles and inequality indices based on actual and predicted equivalent income, Census 1990

|	Actual income	Income when employment insurance is predicted	Income when child related transfers are predicted	Income when social assistance, worker's compensation and other transfers are predicted	Income when all transfers are predicted
P1	716	688	688	506	0
P5	5,815	5,757	5,710	5,766	5,813
P10	9,582	9,669	9,462	8,668	8,804
P25	18,896	18,862	18,803	18,905	18,764
P50	30,613	30,607	30,679	30,643	30,711
P75	44,730	44,730	44,730	44,730	44,774
P90	61,385	61,431	61,395	61,434	61,480
P95	74,834	74,837	74,818	74,837	74,903
P99	119,622	119,720	119,585	119,680	119,761
Log (P95/P5)	2.555	2.565	2.573	2.563	2.556
Log (P90/P10)	1.857	1.849	1.870	1.958	1.943
Log (P75/P25)	0.862	0.864	0.867	0.861	0.870

Notes: All income figures are in 2000 constant dollars. Similar accuracy was achieved with other years.
Source: Statistics Canada, Census of Population.

In Table 1, as well as in the remainder of the paper, we present our results in terms of family incomes. These are constructed by adding market income and imputed taxes and transfers for each individual and then combining these for family members to obtain a measure of after-tax family income.[5,6] We set predicted taxes for individuals under age 15 (the lower age limit of our tax estimation sample) to zero. Once we have created family incomes, we adjust for family size to create comparability across families to account for needs and economies of scale. We use a standard adjustment to do so—dividing income by the square root of the size of the family to generate 'equivalent incomes'. In addition, we count individuals in the analysis. In other words, a family of four will be given twice the weight as a family of two (since twice as many people are involved in the former). Finally, we convert all incomes to 2000 dollars using the national Consumer Price Index (CPI).

3. Basic Patterns and Decompositions

We begin our investigation with plots of key log percentile ratios of the market and after-tax income distribution for each Census year in Figure 1. The log percentile ratios provide simple measures of inequality that help emphasize movements in the tails of the distributions, which is where we argued the most important action is located (Frenette et al., 2007). Since other inequality measures, such as the Gini coefficient, show similar overall patterns, we have chosen to present all of our results only in terms of the percentile ratios to simplify the exposition. For the log percentile ratios, an increase of 0.1 log points implies approximately a ten percent increase in the ratio; a movement from a log ratio of 3.0 to 3.5 implies that the ratio of percentiles increases by more than 50 percent. For this reason, what might appear to be subtle movements in the log ratio represent large relative movements in income inequality.

Figure 1: Log ratios of equivalent family market and after-tax income
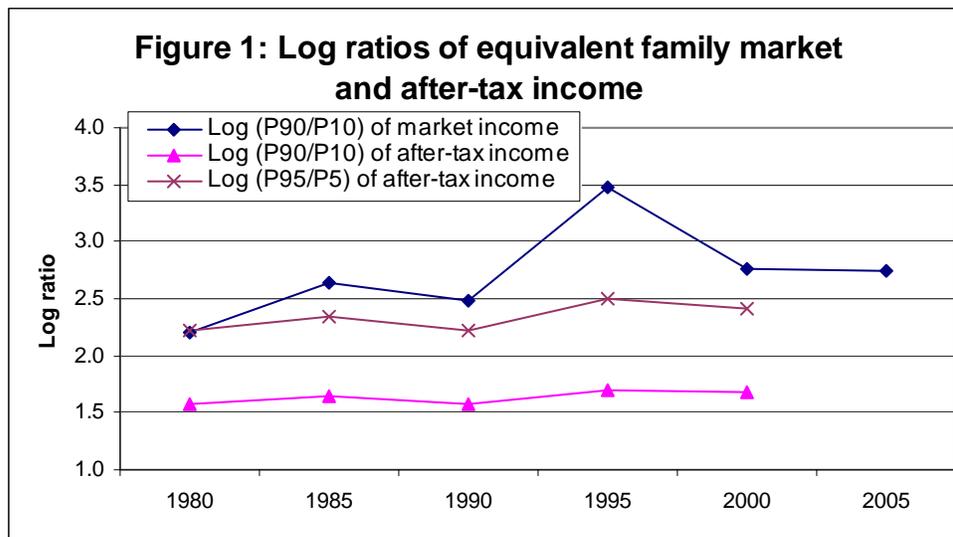
Source: Statistics Canada, Census of Population.

A key conclusion from Figure 1 is that market income inequality growth was roughly similar in the 1980s and the 1990s. The log (P90/P10) ratio grew by 12.8% between 1980 and 1990 and by a further 11.4% between 1990 and 2000. In addition, the figure shows strong increases in inequality in the recessionary first half of each decade (particularly between 1990 and 1995), a movement that Frenette et al. (2007) show is driven mainly by movements in the lower half of the distribution. This fits with loss of income for lower paid workers who bear the brunt of layoffs in recessionary times.
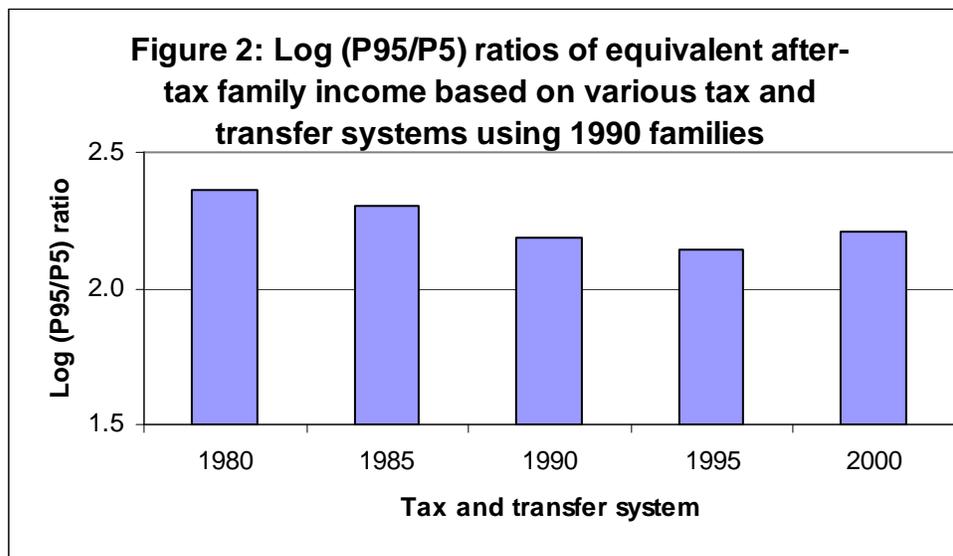
Movements in the lower half of the distribution also drive the declines in market income inequality that occurred in the second (boom) half of each decade. However, in each case, the recoveries in the booms were not enough to offset the steep increases in inequality that arose during the recessions and market income was much more unequally distributed by 2000 than it was in 1980.

The log (P90/P10) line for after-tax income in Figure 1 is much lower than that for market income (reflecting the equalizing tendency of the tax and transfer system) but it also follows a different pattern over time. The same pattern is observed for the log (P95/P5) line, and we turn to it for the remainder of the study in order to better focus on the tails of the distribution.[7] While inequality in market income rose in the 1980s, inequality in after-tax income as measured by these percentile ratios was essentially constant between 1980 and 1990 but then grew by 9.3% between 1990 and 2000. The implication is that the tax and transfer system fully undid the growth in market income inequality in the 1980s but was not nearly as successful in countering the inequality growth in the 1990s. The goal of this paper is to understand this change in the performance of the redistributive system.[8] Finally, the period between 2000 and 2005 is characterized by a flat trend in market income inequality. Because of data comparability issues regarding transfer income, we will not include this period in most of our investigations, but will return for a brief discussion of it in section six.

As a first step in that investigation, in Figure 2 we plot the log (P95/P5) ratios associated with a series of counterfactual after-tax income distributions. In particular, we apply the tax and transfer systems from each of our sample years to a common population: families from the 1990 Census. Thus, in each case, we form estimated values for transfers and taxes for each family in the 1990 Census using the parameters from our estimated reduced form tax and transfer regressions and the relevant characteristics (various types of market income, marital status, number of children, etc.) recorded for the family in the Census. We adjust all values for inflation. By using the estimated parameters from each of the different years (1980, 1985, 1990, 1995 and 2000) we obtain an estimate of the impact of that year's tax and transfer income on the families' after-tax incomes. To re-iterate our statement from the introduction, we recognize that this

exercise misses any behavioural responses to the different systems but we still believe it will be useful in helping us to understand the differences in the various systems.[9]

We do not include standard errors in Figure 2 or the remaining figures and tables because they do not add anything to the exposition. Our exercise consists of applying reduced form tax and transfer coefficients to a specific group of individuals. Because we are using those individuals as a means of aggregating the tax and transfer impacts, they do not constitute a source of statistical variation in our calculations (to see this, note that we could, alternatively, have generated a set of fictive individuals to use in our aggregation exercise). The tax coefficients are obtained using the whole population of tax filers and, so, can be viewed as population parameters. Thus, the only source of variation that would imply a need for creating standard errors for the bars in figure 2 is from the estimated transfer coefficients. However, these are calculated from such large samples that inference is effectively not an issue.[10]

Figure 2: Log (P95/P5) ratios of equivalent after-tax family income based on various tax and transfer systems using 1990 families

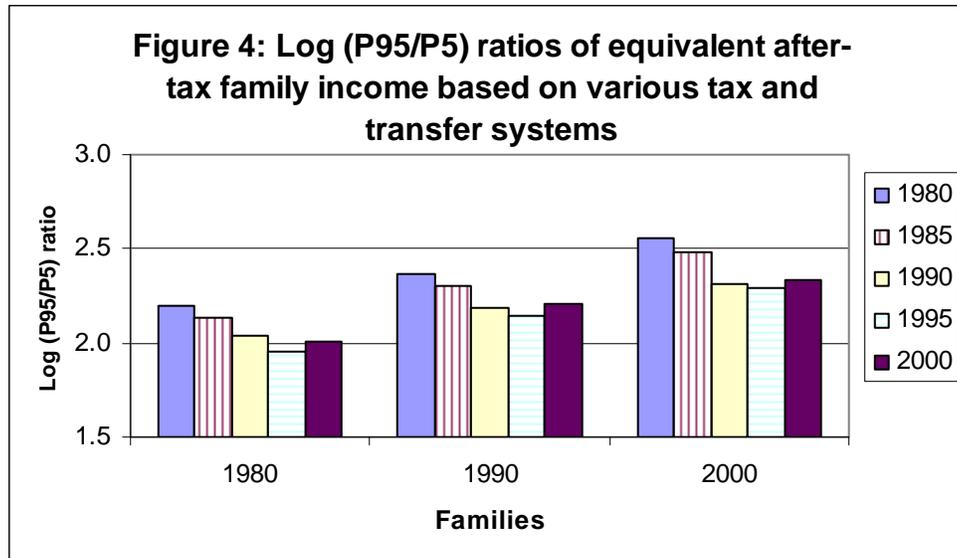Source: Statistics Canada, Census of Population.

The plot in Figure 2 tells an interesting story: the tax and transfer systems in 1990 and after were considerably more redistributive than those in the 1980s.[11] Between 1985 and 1990, the tax and transfer system became much more redistributive. This trend continued to some extent in the early 1990s and then reversed itself in the late 1990s. But even with this reversal, the tax and transfer system in 2000 was much more redistributive than those in place in 1980 and 1985. The most redistributive system among those we

examine was the one in place in 1995. We have also analyzed the log (P75/P25) ratio, and confirmed that these trends hold up closer to the middle of the distribution.

Figure 3: Log (P95/P5) ratios of equivalent after-tax family income based on 1995 tax and transfer system
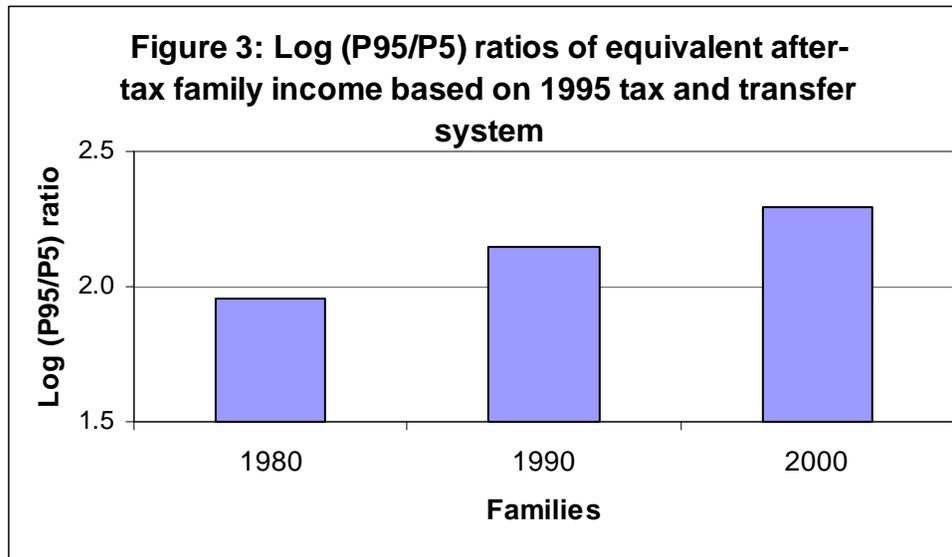
Source: Statistics Canada, Census of Population.

Figure 3 contains plots of the log (P95/P5) ratio using the 1995 tax and transfer system in combination with three of our Census samples in turn. This shows the pattern of inequality in after-tax income that would have arisen if the most redistributive system had been in place throughout our period of investigation (and if there had been no behavioural responses). The figure makes clear that even if this system had been applied consistently throughout the 1980s and 1990s, it would not have undone the rise in market income inequality and changing demographics. Together, the evidence to this point implies that the undoing of the rise in market income inequality in the 1980s arose not from a particularly redistributive tax and transfer system in place throughout that decade but because taxes and transfers were changed in a way that offset the rising inequality.

Figure 4: Log (P95/P5) ratios of equivalent after-tax family income based on various tax and transfer systems

Y-axis: Log (P95/P5) ratio (1.5 to 3.0)
X-axis: Families (1980, 1990, 2000)

Legend: 1980, 1985, 1990, 1995, 2000

We now combine the analysis in Figures 2 and 3 by showing how the systems in place in the five years would have affected inequality for families in 1980, 1990, and 2000. The results are plotted in Figure 4. We know from Figure 1 that market income inequality increased considerably over this period and it is possible that different tax and transfer systems have different impacts on inequality in more versus less unequal societies. This is also what Lambert and Pfähler (1992) find. All of the bars for the year 2000 families are higher, reflecting the higher degree of underlying inequality. They also portray a more discontinuous pattern of change over time with the increase in the extent of redistribution between the 1985 and 1990 systems being particularly large. Indeed, working with this population, the 1980s is represented as a period of rapid increase in the extent of redistribution in the tax and transfer system while the 1990s show little change in comparison. Given the greater inequality in market income in 2000 compared to 1980, the implication is that the changes in the tax and transfer system in the late 1980s had particularly large effects on families in the tails of the market income distribution. Further analysis on transfer changes (not shown here) suggest that the late 1980s changes appear to have been particularly beneficial to low earners, who are more heavily represented in the 2000 population.

Table 2: Equivalent after-tax family income distributions based on various tax and transfer systems using 1990 families

System	Percentile of equivalent after-tax family income						
	5	10	25	50	75	90	95
1980 tax and transfer	5,694	8,631	17,078	26,536	37,679	50,412	60,475
1985 tax and transfer	5,968	9,025	17,236	26,440	37,271	49,823	59,632
1990 tax and transfer	6,425	9,534	17,157	25,867	36,135	47,777	57,253
1995 tax and transfer	6,639	10,378	17,859	26,005	35,800	47,406	56,631
2000 tax and transfer	6,245	10,236	17,846	25,935	35,952	47,680	56,783
1980 transfer	5,826	8,539	16,507	25,456	35,998	47,740	56,833
1985 transfer	6,073	8,976	16,812	25,595	35,943	47,741	56,827
1990 transfer	6,425	9,534	17,157	25,867	36,135	47,777	57,253
1995 transfer	6,307	10,236	17,891	26,223	36,209	47,835	56,997
2000 transfer	5,960	10,027	17,686	25,819	35,913	47,456	56,407
1980 tax	6,308	9,654	17,736	26,933	37,832	50,421	60,986
1985 tax	6,300	9,616	17,599	26,699	37,450	49,813	60,022
1990 tax	6,425	9,534	17,157	25,867	36,135	47,777	57,253
1995 tax	6,673	9,683	17,121	25,611	35,717	47,365	56,787
2000 tax	6,639	9,756	17,314	25,900	36,197	48,056	57,535

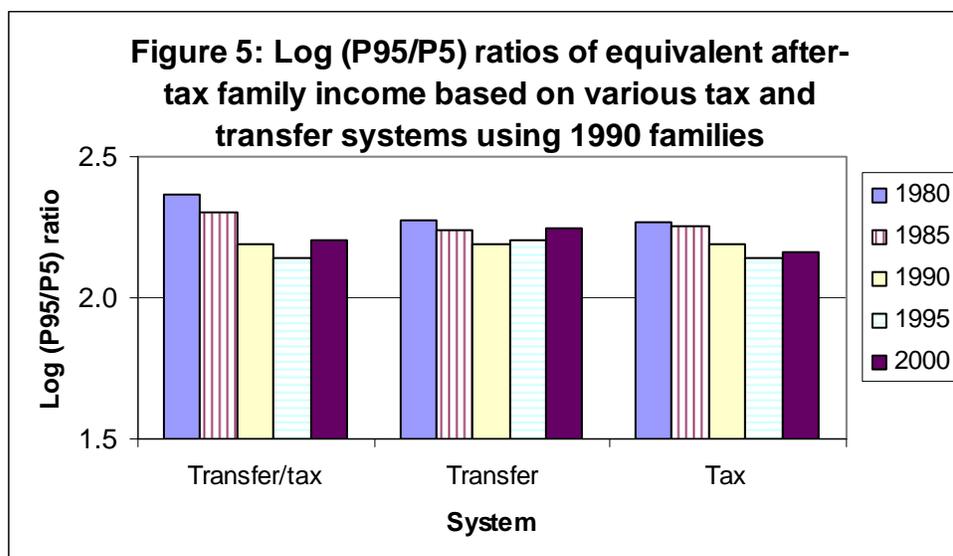Note: All figures are in 2000 constant dollars.
Source: Statistics Canada, Census of Population.

We close the initial analysis with a more detailed set of results for the 1990 families under the different tax and transfer systems. Table 2 presents these results for different income percentiles and separately for the tax and transfer systems. Inspecting this table provides insight into the nature of the shifts in the entire distribution that underlie the inequality movements we have been describing. The top panel of the table shows the tax and transfer systems together. The 5th percentile of the counterfactual distribution increases by approximately 13% by moving from the 1980 to the 1990 system, rises slightly more between the 1990 and 1995 systems, and then declines by 6% when we move from the 1995 to the 2000 system. In comparison, the 95th percentile declines by 5% between 1980 and 1990 systems, declines slightly more between the 1990 and 1995 systems then grows by about 0.3% when we move from the 1995 to the 2000 systems. Thus, moving across the various tax and transfer systems creates mirror image movements in the tails of the distribution but with the movements in the lower tail being larger in percentage terms. Examining the other percentiles, the shift from the 1990 to the 1995 system appears to be particularly beneficial to families whose incomes place them in the 10th to 25th percentile range. Meanwhile, all the percentiles above the 50th show the

same pattern as the 95th, with declining real levels as we move from 1980 through to the 1995 system and then slight rebounds with the use of the 2000 system. The overall conclusion is that the upper and lower halves of the after-tax income distribution move in mirror image as we progress across the various tax and transfer systems with the impacts on the lower tails being more important.

The rest of Table 2 breaks down this analysis into the impact of the transfer system and then the tax system. For transfers, the 5th percentile results indicate that the 1990 system was actually the most generous for the lower tail of the distribution, with the 5th percentiles of the counterfactual distributions increasing in value as we move from the 1980 to the 1990 systems but declining for subsequent systems. Interestingly, while the 5th percentile declines between the 1990 and 1995 systems, the 10th and 25th percentiles increase substantially as we move between these systems, again implying that retrenchment affecting the lowest income earners started before 1995. The upper half of the distribution exhibits a pattern of first rising then declining incomes as we move sequentially across transfer systems but the income movements are quite small in proportional terms, as one might expect.

In the bottom portion of Table 2, we present percentiles from the exercise in which we only allow the tax system to vary. All the percentiles from the 25th and above share a common pattern of declines as we move across subsequent tax systems up to 1995, followed by a small reversal as we move from the 1995 to the 2000 tax system. The largest decline occurs as a result of moving from the 1985 to the 1990 tax system. These movements in the upper part of the distribution are much larger than those witnessed as a consequence of changing the transfer system. Interestingly, the 5th percentile moves in the opposite direction, showing improvements as we move from the 1980 through to the 1995 systems. The increases associated with moving from the 1980 to the 1990 systems are much smaller than those induced by moving between the transfer systems in these years.

Figure 5: Log (P95/P5) ratios of equivalent after-tax family income based on various tax and transfer systems using 1990 families

Source: Statistics Canada, Census of Population.

This breakdown into transfer and tax influences is shown graphically in Figure 5. We use the 1990 families and each of the five transfer and tax systems. The result in the middle set of bars (the transfer simulations) fits broadly with the pattern we obtain using the entire tax and transfer systems: an increase in the extent of redistribution between 1980 and 1995, with a reversal in the second half of the 1990s. The movements, though, seem more muted than when both systems are allowed to vary. The right set of bars isolates the effects of the tax system. The results indicate that changes in the tax system in the late 1980s moved the system sharply toward greater redistribution. This trend continued, to a slightly smaller degree, between 1990 and 1995 and was then reversed in the late 1990s. Thus, changes in both the tax and transfer systems were associated with an increase in redistributiveness in the 1980s and to a (mild) reversal of this in the late 1990s. Indeed, the measured roles of each system are nearly identical, with the move to the 1990 system from the 1980 system reducing the log (P95/P5) ratio by 0.07 log points when we change the transfer system and 0.08 points when we change the tax system. Similarly, shifting from the 1995 to the 2000 transfer system implies a 0.05 log point increase in our fitted ratio while the same shift for the tax system implies a 0.02 increase.

4. The Effects of Main Subcomponents of the Tax and Transfer System

To this point, we have presented our discussion in broad terms: discussing overall changes in the tax and transfer systems without trying to relate those changes to the

systems. We turn now to investigating which specific tax and transfer changes may be driving the overall patterns.

4.1 Tax System Changes

To investigate the contribution of the tax system to the observed trends in income inequality, we ran several simulations using the Canadian Tax and Credit Simulator, or CTaCS (Milligan, 2007).[12] We argued in Section 2 that the calculator approach has the disadvantage of assuming full compliance and requiring unavailable information on various credits and deductions taken by a family. However, for examining what would happen under counterfactual tax systems, the calculator approach is necessary since the imputation method can only account for the actual observed tax system. While the calculator approach may not be the best to estimate the level of taxes, it is useful for examining changes to taxes.

We begin by gathering income data from the 1990 Census. From the individuals file of the Census, we take percentiles of the distribution of the measure of taxable income described in section 2. For each percentile of the distribution, we create one fictive individual residing in each of the ten provinces and inflate the incomes using the CPI, giving values for each of the 21 years spanning 1980 to 2000.[13] Since each year's tax system is constructed to apply to nominal incomes in the given year, using inflation adjusted incomes from a single base year implies that only real changes to the tax system—and not changes in the income distribution—will be reflected in the simulation output. Each simulated individual is then put through the tax calculator to find an after-tax income for each province and year.[14] The series is collapsed back to the national level using 1990 provincial population weights.

The results appear in Figure 6. We graph five particular percentiles of the taxable income distribution: p20, p50, p90, p95, and p99. For each, we set the 1980 value equal to 100 and graphed the resulting index. To understand movements in an inequality measure such as the log (P95/P5) ratio, one would also want to understand the path for P5. However, we have omitted the line for P5 since its path is almost perfectly constant at 100—these individuals pay little tax in any year since their incomes are below the Basic Personal Exemption in most years. This implies that any contribution of the tax system to inequality measured by a log (P95/P5) ratio comes almost entirely through movements at

P95. Each line in the figure reflects the developments in the tax system over the 20 year period from 1980-2000.
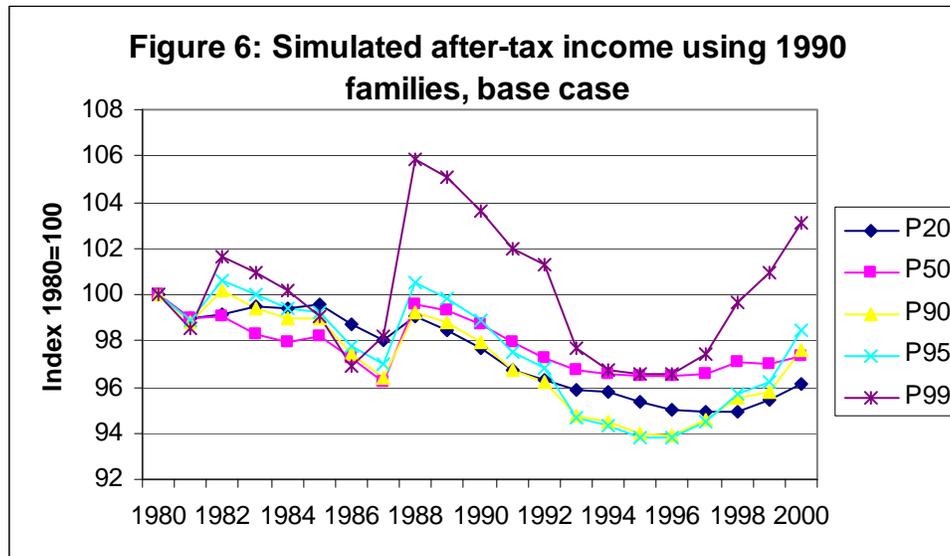
Figure 6: Simulated after-tax income using 1990 families, base case

The analysis falls neatly into three distinct time periods. The first period evident in Figure 6 is from 1980-1987. In 1982, a change to tax brackets and rates had its largest impact on higher income individuals, showing up as a jump in after-tax income at P99, and to a lesser extent at P95, in our simulation for 1982. From then until 1987, three factors led to a slide in after-tax incomes. First, tax parameters were only partially indexed, starting with the "6 and 5" program of 1983-1984 and continuing through the partial indexation (CPI less three percent) announced in the 1985 federal budget. Second, provincial tax rates increased. For example, Ontario's rate went from 44% to 50% and a new surtax was also implemented. Third, federal surtaxes were introduced in 1985 and expanded in 1986. While the first two of these effects were mostly proportional and thus had less impact on inequality (at least among taxpaying families), the surtaxes bore most heavily on higher incomes. As after-tax income at P95 was slightly lower in 1987 than in 1980 while P5 was the same, the net impact of the tax system on inequality was toward more equal after-tax incomes over this period.

The second era starts in 1988 with a major tax reform that changed many deductions into credits, consolidated tax brackets down to three, and lowered the top rate

from 34% to 29%. The change to credits was a relative benefit to lower income individuals, but the lower tax rates benefited higher income individuals much more. In Figure 6, a large spike at P99 is evident in 1988, but P50 actually had a larger increase in after-tax income than P90 and P95, owing to the relative benefit of the credits at lower incomes. However, after-tax incomes were still lower in 1988 than in 1980 for all groups, with the exception of P99, which saw a large increase, and P95, which saw a smaller increase. Between 1988 and 1995, the same three factors as the earlier era eroded after-tax incomes: partial indexation, provincial tax and surtax increases, and federal surtax increases. By 1995, P95 after-tax income had declined 6.2 percent relative to its 1980 value. Since the effect of the tax changes on P5 after-tax incomes was negligible, this suggests that the tax system became more redistributive over the 1980-1995 era.

The final era evident in Figure 6 runs from 1995 to 2000, with sharply increasing after-tax incomes at each of the percentiles in the graph. The increases are larger at higher percentiles, meaning that this increase led to higher inequality—especially when measured against the unchanging after-tax income at P5. The three factors leading to the decreases in after-tax income in 1980-1995 each reversed over the 1995-2000 period, but with starkly different magnitudes. Full indexation of the federal system was not restored until 2000, meaning that the downward drift of after-tax incomes due to bracket creep continued until 1999. Federal surtaxes were partially lifted in 1999 and 2000, giving a differential boost to those at higher incomes. But again, this was only at the end of the decade. The largest factor in the post-1995 increases was changes in provincial taxes. Most notable was Ontario's decrease of over 30% in the provincial tax rate. However, Ontario was not unique—every province lowered rates in the 1995-2000 period.

Figure 7 looks more deeply at the relative contribution of the three main factors that drove the changes in after-tax income. We ran simulations holding constant different aspects of the tax system (one at a time), focusing on P95. As with Figure 6, results for P20 to P95 looked quite similar. When these results are compared with the base—the actually observed tax system—we can assess the impact each factor had on after-tax incomes. Our first counterfactual tax reform keeps provincial taxes at 1980 rates for the entire period. A large difference between this counterfactual tax system and the base system is evident in Figure 7, suggesting that provincial tax changes were a large driver

in the tax contribution to inequality trends. In particular, the mid-90s trough in P95 after-tax income is 3.8 percentage points higher with 1980 provincial taxes than with the actual tax rates. More sharply, the fast 2.4 point increase in P95 income from 1995 to 1999 in the actual system shows up as a 1 point decline in the counterfactual system, indicating that the large increase in after-tax incomes at P95 post-1995 was driven largely by these provincial tax changes.

Figure 7: Simulated after-tax income at P95 using 1990 families
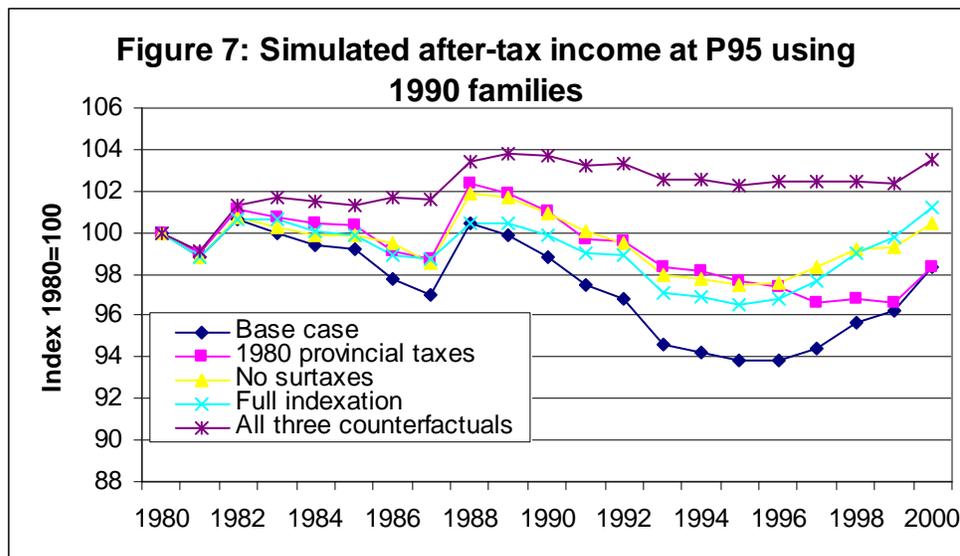
Source: Kevin Milligan, Canadian Tax and Credit Simulator (CTaCS) and Statistics Canada, Census of Population.

The other two reforms displayed in Figure 7 are a removal of provincial and federal surtaxes and full indexation throughout the 1980s and 1990s. From 1985 to 1998, a fairly constant gap of 1.5 to 2 points can be seen between the base system and the counterfactual system without surtaxes. The 'U' shape in the 1990s persists, but is less deep in the counterfactual system without surtaxes. The gap shrinks in 1999-2000 as one of the federal surtaxes is removed and Quebec and Alberta lower their surtaxes. The line showing the evolution of P95 with full inflation indexation follows the same time trends as the base system, but at a higher level of after-tax income. The impact of indexation, while strong at P95, was also strong for all tax-payers. So, by increasing taxes among those who pay, limited indexation did reduce inequality relative to those not paying taxes (such as individuals at P5).

The top line in Figure 7 shows the impact on P95 when we hold constant provincial base tax rates, provincial and federal surtaxes, and indexation, all at the same time. This line jumps near to 102 in 1982, then snakes within a fairly narrow band between 102 and 104 for the rest of the years. This suggests that most of the cross year variation for P95 observed in the base case can be accounted for by these three factors.

To summarize, our simulations have led us to two important findings about the contribution of the tax system to inequality trends over the 1980-2000 era. First, the tax system became more redistributive over the 1980-1995 period, reflecting a mix of fiscal factors from de-indexation to the 1988 tax reform to provincial and federal surtaxes. Second, the large increase in after-tax income at higher income percentiles if we switch from the 1995 to the 2000 system using a constant population was driven primarily by provincial base tax rate changes, with some assistance from the removal of federal and provincial surtaxes.

4.2 Transfer System Changes

Canada's transfer system has three major components: UI/EI, social assistance, and tax based benefits. We now discuss the major policy changes that occurred for each of these three transfers over the 1980s and 1990s.

The unemployment insurance (UI) system changed very little through the 1980s but underwent significant reforms in the 1990s, aimed at moving the system from supplying "passive" benefits to providing "active" support for movement back to work. In 1993, workers who quit their jobs no longer had access to benefits, although this was softened somewhat in later years. In 1994, there was a change in the rules on how weeks of benefit eligibility were calculated, reducing the number of weeks of benefits available to a worker with a short number of weeks on the job. The transition to the renamed Employment Insurance program in 1996 unleashed a major set of reforms. Notably, experience rating provisions made benefits less generous for workers who had used the UI system heavily in the previous 5 years. In the end, those provisions were not enforced but there were cuts to benefits, increases in weeks of work requirements in order to qualify, and reductions in weeks of potential receipt. In part because of these reforms and in part because of changes in the composition of work, the proportion of the unemployed

who actually received unemployment benefits went from 83% in 1990 to 44% in 2004, and in Ontario that proportion was only 30% in 2004 (Battle et al., 2005).

Another major federal initiative was the overhaul of the Child Tax Benefit system. In 1993, the new Canada Child Tax Benefit (a non-refundable tax credit) replaced the Family Allowance (a refundable tax credit). The benefits were income-tested, leaving high income families without tax recognition of their children. Kesselman (1993) provides details and an analysis of the design and implementation of the new system. Further, in 1998 the federal government in collaboration with the provinces (outside Quebec) and territories introduced the National Child Benefit program. The base Canada Child Tax Benefit amount remained the same at $1,020 annually per child, reduced for family net incomes above $25,921. The National Child Benefit added a new Supplement that started out at $605 for one child, an extra $405 for the second, and $330 for the third, with the full Supplement phased out between the income range $20,921 to $25,921. By 2000, the Supplement amounts had increased by more than 50%. As part of the program, many provinces reduced SA payments by the amount of the Supplement (termed "clawing back" the Supplement) and thus the Supplement would effectively only go to families not on SA. New Brunswick and Newfoundland chose not to claw back the Supplement, allowing for increases in welfare incomes by the amount of the supplement in their provinces at the time of the initiation of the programme. Other provinces integrated the Supplement with other transfers or reformed their social assistance structure to remove incremental benefits for larger families.[15] While the structure changed substantially, the total amount spent on child benefits by the federal government only increased by a total of 4 percent in real terms between 1994 and 2000.

The final transfer we consider is social assistance (SA), which consists of 10 different provincial systems (plus systems for the territories).[16] Up until 1996, the federal and provincial governments shared the costs of the welfare systems under the Canada Assistance Plan (CAP). The CAP involved targeted funding for welfare expenditures with significant strings attached. The provinces had to maintain systems that provided benefits to anyone in need, included an appeals process, and could not impose provincial residency requirements. Beginning in 1996, federal contributions to welfare were lumped together with health and education transfers to the provinces in a block grant system
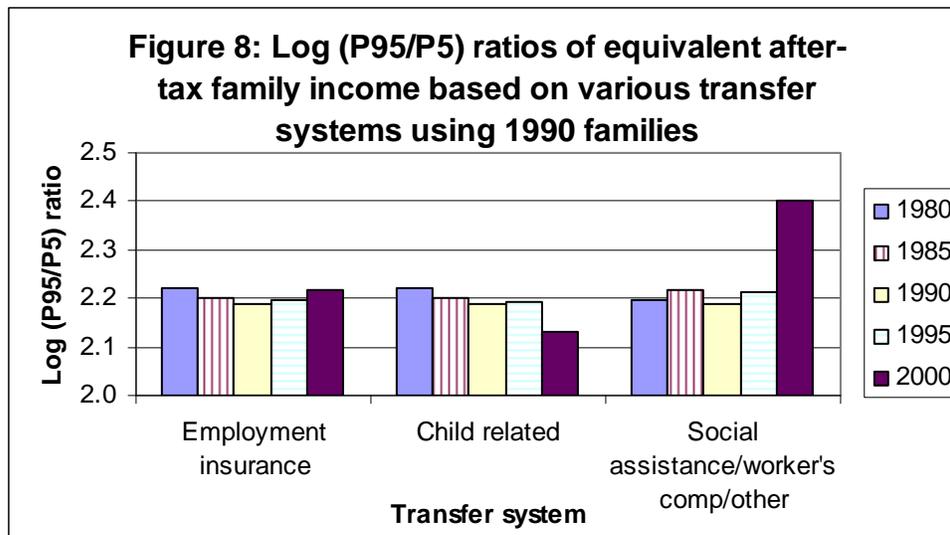
known as the Canadian Health and Social Transfer. Federal transfers to the provinces were also cut at the same time. Just as importantly, the only remaining welfare-related requirement under the block grant system was to ban residency requirements, leaving provinces with substantial leeway to reduce the scope of their welfare systems.

The changes in the funding relationship coincided with complete overhauls of the welfare systems in several provinces. In conjunction with this, all provinces moved towards linking benefit receipt to job search, training and, in some cases, work. It also meant a sharper delineation between "employables" and those who faced challenges in working outside the home, such as the disabled and lone parents with young children. Often welfare reforms included substantial cuts to benefits for "employables" but much less so for others. The various reforms also often included initiatives to perform closer reviews of cases and opening "snitch lines".

While these general patterns held virtually universally across provinces, some provinces implemented larger reforms than others. Thus, B.C. instituted a major set of reforms under the title "B.C. Benefits" beginning in 1996. Following these reforms, the overall welfare caseload fell from over 11% of the population in 1995 to approximately 7% by 2000. Alberta put in place large reforms in 1993. As in the later B.C. reforms, Alberta implemented more reviews of cases, greater enforcement of rules that cut or eliminated benefits for individuals living with another adult (so called "spouse in the house" rules) and no benefits to individuals who quit their jobs without cause. Similarly, after several years of increased benefits and access to welfare, Ontario saw a substantial cut in benefits to all recipients other than the disabled by approximately 22% in 1995. The remaining provinces brought in reforms in the later 1990s and early 2000s that also emphasized links to employment but were generally smaller in scope. Thus, with the main exception of Alberta (which made its adjustments earlier) access to SA was tightened and SA benefits were reduced across Canada after 1995.

With these changes in mind, we turn to examining the impacts of changes in sub-components of transfer income on after-tax income inequality. To do this, we plot the log (P95/P5) differentials for the counterfactual in which we only vary specific components of the transfer system using our regression imputation (Figure 8). The result for employment insurance is a shallow U-shaped pattern with the log (P95/P5) differential

falling from 2.22 in 1980 to 2.19 in 1990 and then rising back to 2.22 in 2000.[17] In the middle set of bars, it is the child tax benefits that are allowed to vary. The pattern in this figure is almost identical to the employment insurance results up to 1995 but departs radically from it after 1995 as the expansion of the National Child Benefit generates a decline in the differential from 2.19 in 1995 to 2.13 in 2000. Finally, the right set of bars contain the same effects but from variation in the social assistance systems.[18] Changes in social assistance led to increased inequality when moving from the 1980 to the 1985 system, a decline in inequality in the late 1980s then increases across both halves of the 1990s, with the increase due to the shift from the 1995 to the 2000 systems being particularly large. Indeed, the SA systems constitute the one area that was less redistributive at the end of the period (2000) than in the 1980s. The patterns in the 1990s fit with the wave of social assistance system tightening that swept across the provinces, particularly after 1995, and with results in Finnie et al. (2004) showing that declines in benefit rates in the late 1990s were associated with strong declines in SA use.[19] The pattern between 1995 and 2000 may also be partially explained by the social assistance claw-back from the NCBS in most provinces.

Figure 8: Log (P95/P5) ratios of equivalent after-tax family income based on various transfer systems using 1990 families

Source: Statistics Canada, Census of Population.

Taken together, the patterns in Figure 8 indicate that the reduction in inequality seen earlier in Figure 5 as we move from the 1980 through to the 1990 transfer system results from the combination of different components of the transfer system. The decline

in the redistributiveness after 1995 is partly due to changes in the UI/EI system but stems mainly from the reduced generosity of the social assistance systems. This impact would have been even greater if it had not been partially offset by the expansion of the child tax benefit system. Finally, note the small size of the effects of the EI reforms relative to those from the changes in social assistance systems: as with the tax system, much of the story of both the increase in the redistributiveness of the transfer system in the late 1980s and the decline in its redistributiveness in the late 1990s occurs at the provincial level. In the case of EI, this is not surprising since the main changes happen in the tails of the income distribution where EI use is generally smaller than in the middle of the distribution.

5. Who benefited?

With the substantial changes in the tax and transfer systems over the 1980s and 1990s, an immediate question of interest is who is likely to have gained and lost from the shifts (again, abstracting from behavioural responses)? In this section, we create counterfactual after-tax incomes for a given population (the entire 1990 sample of families) using various combinations of the tax and transfer systems. We will focus our attention on the 1980, 1990 and 2000 systems in order to provide descriptions that are closely related to what we presented in Figure 1. Our approach is first to subtract the after-tax income predicted for a family under one system from that predicted for the same family under another system. We then regress these differences on alternating sets of covariates to determine what observable features characterize the families most affected by the tax and transfer system changes.

In Table 3, we present this exercise, regressing the changes in predicted incomes under different systems on the market income of the family. This allows us to see how the tax and transfer changes affected families in the lower, middle and upper portion of the distribution of market incomes. The table presents coefficients on a set of dummy variables corresponding to various market income categories.[20] The first set of columns indicate that just changing the transfer system from that in place in 1980 to the one in place in 1990 increases after-tax income for everyone, with the positive effect generally declining with market income. The main exception to this pattern is at the very bottom, with those who had zero market income not gaining as much as those with incomes in the

$1 to $30,000 range. This raises the possibility that even in the 1980s, the transfer system was being changed to put more emphasis on market attachment.

Table 3: Mean predicted change in equivalent after-tax family income by market income category when shifting systems using 1990 families

Equivalent family market income	Shifting from 1980 to 1990 system			Shifting from 1990 to 2000 system		
	Transfer	Tax	Tax and transfer	Transfer	Tax	Tax and transfer
0	466	129	599	210	178	390
1 to 5,000	873	102	1,000	343	257	608
5,000 to 10,000	1,011	-246	791	663	210	877
10,000 to 15,000	957	-464	514	697	195	896
15,000 to 20,000	648	-605	57	578	142	724
20,000 to 30,000	508	-890	-366	158	108	269
30,000 to 35,000	237	-1,190	-939	-9	109	102
35,000 to 40,000	169	-1,403	-1,220	-102	124	24
40,000 to 45,000	85	-1,624	-1,525	-160	142	-16
45,000 to 50,000	42	-1,904	-1,851	-300	117	-181
More than 50,000	201	-3,648	-3,435	-574	65	-508

Note: All figures are in 2000 constant dollars.
Source: Statistics Canada, Census of Population.

The second set of columns show the estimated coefficients associated with changing only the tax system. Here the effects are positive for those with incomes under $5,000 per year but negative for everyone else and become more negative as market income increases. Combined, the shift from the 1980 to the 1990 tax and transfer system applied to a constant population (represented in the third set of columns) generates increased after-tax incomes for families with equivalent market incomes below $20,000 and negative effects for higher earning families. The overall effect is strongly redistributive in that positive income effects rise as we move lower in the market income distribution and the negative effects at the top end become larger in size as we move higher in the distribution. The one exception to this is the zero earners, who benefited from the shift in systems but not as much as those with small positive market earnings.

In the right set of columns, we repeat this exercise but examine the shift from the 1990 to the 2000 system. For the transfer system alone, these changes are again redistributive, with the biggest gainers being those with market incomes between $5,000 and $15,000. As in the 1980s, the zero earners do not experience as much of an increase as those with small positive earnings. However, unlike the 1980s, when every group examined generally benefited from the changes in the transfer system, the 1990 to 2000 shift brought a more targeted transfer system as the families with equivalent market income over $30,000 are calculated to experience a decline in their after-tax income as a

result of the shift. It may appear surprising that transfers to low income families increased in a decade that included tightening of the EI and social assistance systems. As Table 2 indicates, it is important to distinguish between the first half of the 1990s, when social assistance was made more generous in some provinces (notably Ontario) and the second half of the decade when cuts to social assistance were offset to some degree by expansion of the child tax benefit. In results not shown here, we find that changes in the SA systems led to increases in disposable income in the bottom half of the distribution between 1990 and 1995 then declines between 1995 and 2000. Together with the changes in the child benefit system, these net out to a small net positive movement at the bottom of the distribution across the whole decade.

The 1990s tax changes are also quite different from those between the 1980 and 1990 systems. In particular, while the 1980s system changes reduced after-tax income for those with market incomes over $5000, the 1990s changes led to increased incomes for every group examined. The largest increases are for those at the bottom, making the changes redistributive but only mildly so as the differential impacts are not large across the market income distribution in general. Combining these tax and transfer system changes again yields a generally redistributive shift but one that is much smaller in magnitude than that witnessed in the 1980s. Only families with equivalent market incomes above $40,000 actually lost income from the system changes. Interestingly, those losses came from a drop in transfer income rather than increased taxes.

In analysis not shown here, we break down the impact results by province, family type, and immigrant status. For the 1980s, the largest negative impact was in British Columbia, with smaller impacts in the Atlantic provinces. In the 1990s, Quebec is distinguished as the only province with further decreases in net income; all other provinces show increases. Across family types, both the 1980s and 1990s saw relative improvements for single families with children compared to couples and families without children. Most of these changes are driven by the transfer rather than the tax side. Finally, Canadian-born and more settled immigrants saw their situations get worse in the 1980s, while newer immigrants did better owing to transfer improvements. In the 1990s, all three of these groups showed higher net incomes.

6. The 2000-2005 period

To this point, we have confined our discussion to the period between 1980 and 2000. We have data for the 2005 Census, but the data collection and questions include some important differences relative to earlier Censuses, so we have not used the 2005 year in our main investigations. The data on market income is comparable enough to allow a rough picture of what has happened since 2000 and we can also provide some insight into tax changes using the tax calculator.

There are two key differences between the 2005 Census and earlier Censuses for our purposes. First, respondents were given the option of allowing Statistics Canada to access their tax records for income related variables rather than answering questions directly, saving respondents considerable time. Not surprisingly, 82.4% took this option, and 87.8% of these were successfully linked to tax data. The remainder (27.7%) answered questions of the same type as used in earlier Censuses. The move from full survey data to (mainly) tax data has implications for the reporting of transfer income. We know that EI and SA income tends to be under-reported in survey data relative to administrative records (Kapsalis, 2001). Second, questions in earlier Censuses force us to group together SA benefits with worker's compensation and other transfers. This is not the case when data come from the tax records. Third, the survey component of the 2005 data also changed. The question pertaining to "other transfers" previously instructed respondents "Do **not** include child tax benefits." No such instruction appears in the questionnaire for the 2005 data. Thus, for all of these reasons, differences in results generated from moving from the 2000 to the 2005 transfer system in our simulations are likely to be partially explained by differences in data quality.

The market income data is of consistent quality for our purposes, however. We compared the changes in market income inequality between the 2000 and 2005 Censuses with inequality changes generated purely from tax data and found that they matched very closely. Both show an essentially flat inequality trend in this period, with virtually no movement at P90 and at P10.

We know from an examination of provincial laws and regulations that social assistance generosity changed in conflicting ways between 2000 and 2005. BC reduced access to its welfare program in 2001 while Ontario expanded its program somewhat. In

general, though, this was not an era of substantial program changes. Similarly, there were no significant changes to EI in this period. In contrast, the federal government increased the number of tax brackets and reduced effective marginal tax rates on incomes in the middle two brackets. Together, these implied a reduction in the progressivity of the tax system. Using the tax calculator extended to this period, these tax changes increased the 90th percentile of the net of tax income distribution by about 5% while having little impact on the 20th percentile. Together, this information on tax and transfer changes appear to imply that disposable income inequality likely increased between 2000 and 2005 (resulting from changes to the taxes), although the data does not allow us to say to what extent.

7. Conclusions

Between 1980 and 1990, there was essentially no growth in inequality in after-tax income in Canada in spite of a strong increase in inequality in underlying market income in that decade. In contrast, between 1990 and 2000, market income inequality rose at a similar pace to that in the previous decade but after-tax income inequality also rose. Taken at face value, this appears to imply that sometime after 1990, the tax and transfer systems became less redistributive. In this paper, we use a combination of "reduced form" tax and transfer functions plus Census data for 1980, 1985, 1990, 1995 and 2000 to examine what underlies this apparent shift.

One of the key results from our investigation is that, when applied to a common population (and ignoring behavioural responses), the post 1990 tax and transfer systems are substantially more redistributive than those from the 1980s. Indeed, the 1995 system is more redistributive than any other one that we investigate over this two decade period. Moreover, while the 2000 system represents a reduction in redistributiveness relative to 1995, it is still much more redistributive than the 1980 systems and, possibly, even more than the system in place in 1990.

Another interesting finding is that most of the "action" in changes in the redistributiveness of tax and transfer systems over this period took place at the provincial level. At one end, social assistance systems became more redistributive in the late 1980s and early 1990s, and then less so after 1995. By 2000, the provincial social assistance systems were considerably less redistributive than in any previous year. At the other end,

substantial provincial surtaxes on high income earners were introduced in the late 1980s. In the late 1990s, these were removed and cuts were made to other income taxes.

One correlate of these results is that no single tax and transfer system in place over the years that we examine was, on its own, capable of offsetting the persistent growth in market income inequality. If the 1995 system (the most redistributive system among those we examine in these decades) had been used throughout the 1980s and 1990s (again, ignoring any behavioural responses), we estimate that both decades would have witnessed increases in after-tax income inequality. The lack of increase in after-tax income inequality in the 1980s did not result from changes in income passing through the same redistributive structure existing at the beginning of the decade. Instead, the steady after-tax income inequality of the 1980s arose because the tax and transfer system increased its redistributiveness over that decade. In the 1990s, the tax and transfer systems ceased becoming more redistributive, allowing the changes in pre-tax inequality to pass through to increases in after-tax inequality.

References

Battle, K., M. Mendelson and S. Torjman. 2005. "The Modernization Mantra: Toward a New Architecture for Canada's Adult Benefits." *Canadian Public Policy* 31(4):431-37.

Davies, J.B., F. St-Hilaire and J. Whalley. 1984. "Some Calculations of Lifetime Tax Incidence." *American Economic Review* 74(4):633-49.

Finnie, R., I. Irvine and R. Sceviour. 2004. "Welfare Dynamics in Canada: The Role of Individual Attributes and Economic Policy Variables." Working Paper No. 231, Analytical Studies Branch, Statistics Canada, Ottawa.

Frenette, M., D.A. Green and G. Picot. 2006. "Rising Income Inequality in the 1990s: An Exploration of Three Data Sources." In *Dimensions of Inequality in Canada*, ed. D.A. Green and J.R. Kesselman. Vancouver: University of British Columbia Press.

Frenette, M., D.A. Green and K. Milligan. 2007. "The Tale of the Tails: Canadian Income Inequality in the 1980s and 1990s." *Canadian Journal of Economics* 40(3):734-64.

Frenette, M., F. Hou, R. Morissette, T. Wannell and M. Webber. 2008. *Earnings and Income of Canadians Over the Past Quarter Century, 2006 Census*. Catalogue no. 97-563-X. Ottawa: Statistics Canada.

Heisz, A. 2007. "Income Inequality and Redistribution in Canada: 1976 to 2004." Working Paper No. 298, Analytical Studies Branch, Statistics Canada, Ottawa.

Kapsalis, C. 2001. "An Assessment of EI and SA Reporting in SLID." Working Paper No. 166, Analytical Studies Branch, Statistics Canada, Ottawa.

Kesselman, J.R. 1993. "The Child Tax Benefit: Simple, Fair, Responsive?" *Canadian Public Policy* 19(2):109-32.

Kesselman, J.R. and R. Cheung. 2006. "Taxation Impacts on Inequality in Canada: Methodologies and Findings." In *Dimensions of Inequality in Canada*, ed. D.A. Green and J.R. Kesselman. Vancouver: University of British Columbia Press.

Lambert, P.J. and W. Pfähler. 1992. "Income Tax Progression and Redistributive Effect: The Influence of Changes in the Pre-Tax Income Distribution." *Public Finance* 47(1):1-16.

Lee, M. 2007. "Eroding Tax Fairness: Tax Incidence in Canada, 1990 to 2005." Vancouver: Canadian Centre for Policy Alternatives.

Milligan, K. and M. Stabile. 2007. "The Integration of Child Tax Credits and Welfare: Evidence from the Canadian National Child Benefit Program." *Journal of Public Economics* 91(1-2):305-26.

Milligan, K. 2007. *Canadian Tax and Credit Simulator*. Database, Software and Documentation, Version 2007-1.

Morissette, R. and Y. Ostrovsky. 2005. "The Instability of Family Earnings and Family Income in Canada, 1986 to 1991 and 1996 to 2001." *Canadian Public Policy* 31(3):273-302.

National Council of Welfare. 1997. *Another Look at Welfare Reform*. Ottawa: National Council of Welfare.

National Council of Welfare. 2005. *Welfare Incomes, 2004*. Ottawa: National Council of Welfare.

Vermaeten, A., W.I. Gillespie, and F. Vermaeten. 1995. "Who Paid the Taxes in Canada, 1951-1988?" *Canadian Public Policy* 21(3):317-43.

Vermaeten, F., W.I. Gillespie and A. Vermaeten. 1994. "Tax Incidence in Canada." *Canadian Tax Journal* 42(2):348-416.

Notes

[1] Heisz (2007) reaches the same conclusions using Survey of Consumer Finance and Survey of Labour and Income Dynamics data. The work by Frenette et al. (2007) is based on Census data. Heisz also discusses the relative redistributiveness of the 1980s and 1990s tax and transfer systems but, unlike the current paper, does not break the system impacts down into their components or construct clear counterfactuals as we do.

[2] More specifically, the combination of the Survey of Consumer Finances (SCF) and the Survey of Labour and Income Dynamics (SLID) appear to suffer from under-representation of families in both tails of the income distribution that leads to distortions in the level, long run trend, and cyclicality of income inequality measures. Since we wrote those papers, Statistics Canada has created new weights for the SCF and SLID data that are adjusted using the distribution of individual (not family) T4 wages and salaries (not income) from the administrative files. The resulting data series perform better in matching the inequality patterns found in Census data. However, while this re-weighting exercise results in a better match to Census data on inequality measures that emphasize the middle of the income distribution (such as the Gini coefficient), it still results in differences in measures emphasizing the extreme tails of the distribution (such as the log ratio of the 95th to the 5th percentile). In fact, there was virtually no change in the newly weighted SCF and SLID data relative to the older version in incomes at the very bottom of the distribution, and only moderate changes at the very top. Thus, we still view the Census data as superior for measuring income at the tails.

[3] Frenette et al. (2007) show that the inclusion of payroll taxes changes the measures of inequality very little.

[4] Social assistance benefits are part of a larger residual category of transfers in the Census. It includes all transfers not listed below. Of note are worker's compensation benefits and other provincial and federal benefits (other than child related ones). However, the largest and most volatile component by far is social assistance.

[5] We re-assign negative predicted tax values to zero. The number of such re-assignments is small and in Frenette et al. (2007) we show that this approach does not introduce significant biases.

[6] We use census family information in our analysis. Statistics Canada defines a Census family as "a married couple and the children, if any, of either or both spouses; a couple living common law and the children, if any, of either or both partners; or, a lone parent of any marital status with at least one child living in the same dwelling and that child or those children." See http://www.statcan.ca/english/concepts/definitions/cen-family.htm. We also include single people (labeled by Statistics Canada as non-family individuals). Note that many studies on income inequality (including Frenette et al., 2007) use a larger concept of the family – the economic family – which may include two or more census families living in the same household, as long as there is a relationship of blood, adoption, or marriage between them. Since our measures of inequality are unchanged when we move from one family definition to the other, and since the current study requires computationally intensive micro-simulations, we opted for using the census family definition in the current paper (aggregating to the economic family would have required an extra step for each micro-simulation). In practical terms, the distinction between the two concepts is inconsequential: there are only 0.15% fewer census families in our sample than there are economic families. This is lower than published estimates, and is due to our focus on families with no seniors, as well as our inclusion of unattached individuals in our definition of the family.

[7] Note that we can not report the log (P95/P5) ratio for market income since the 5th percentile is always equal to zero.

[8] Morissette and Ostrovsky (2005) show, further, that the transfer system serves to reduce differences in earnings instability across different parts of the family market income distribution.

[9] Note that it is possible that the tax and transfer regressions fit the actual tax and transfer distributions in a given year in part because any important unobservable family characteristic effects are picked up by observable variables to the extent the two are correlated. If the observables and unobservables have a different correlation in 1990 than, say, 2000 then our projected impact of the 2000 system for the 1990 sample will be off. We have no way of assessing this statement since it is based on unobservables but it is worth keeping in mind.

[10] To illustrate this, we re-calculated Figure 2 after first subtracting two times the associated standard error from each transfer coefficient and then adding two times the standard error. The resulting patterns matched those in Figure 2 almost exactly. Thus, Figure 2 shows a .17 log point decline between the 1980 and 1990 systems while the same calculation after subtracting 2 standard errors from the transfer coefficients was a .15 decline and the result after adding 2 standard errors was a .16 decline.

[11] This pattern is also evident in a table in Kesselman and Cheung (2006). However, they do not provide an extended discussion or investigation of this pattern. Vermaeten et al. (1995) find a substantial increase in redistribution in the tax system in the period 1969-1988, which fits with what we find for the 1980s.

Notes

[12] Developed by Kevin Milligan, the CTaCS (including the database, software, and documentation) is available at http://www.econ.ubc.ca/kevmil/ctacs,

[13] We experimented with forming families but found that the simulations showed very similar trends for individuals and for families over this time period. For this reason, we proceed using just an unattached individual.

[14] We account for federal and provincial income taxes, Canada/Quebec Pension Plan premiums, and Unemployment Insurance / Employment Insurance premiums. For the premiums, only the employee-paid components are included. The basic personal amount and credits/deductions for Canada/Quebec Pension Plan premiums, and Unemployment Insurance / Employment Insurance premiums are accounted for. We do not account for RRSP, charitable contributions, or other deductions or credits. Accounting for these other deductions and credits would lower average tax rates in each year, but would have little impact on the patterns across years. The increasing use of RRSPs through time has likely lowered the average tax burden of higher income individuals differentially, but our simulations will not account for this. It should be noted, however, that RRSP participation has been roughly constant since the mid-1990s and so is unlikely to be important in understanding the increase in after-tax inequality in the late 1990s.

[15] Milligan and Stabile (2007) use the cross-province variation in the treatment of the National Child Benefit Supplement to study the impacts of the work incentive on welfare take-up and employment of single mothers.

[16] The discussion in this section relies heavily on National Council of Welfare (1997, 2005).

[17] It seems possible that we could understate the impact of the UI/EI system using the log (P95/P5) ratio. This system is more heavily used by families closer to the middle of the distribution. However, the

constructed log (P90/P10) ratios associated with the counterfactual exercise of varying only the UI/EI system take values of 1.64, 1.61 and 1.64 in 1980, 1990 and 2000, respectively. Similar, the constructed log (P75/P25) ratios take values of 0.75, 0.74, and 0.75 for the same years. Thus, there is no evidence of larger effects of changes in the EI/UI system on inequality in the middle of the distribution.

[18] Recall that the transfer category in the Census that contains social assistance also contains other, residual transfers. The most notable other category is worker's compensation but the category movements appear to be dominated by social assistance, based on tax data.

[19] We purposefully use the phrase "associated with" because, as we acknowledge, it is not our goal to attempt to establish a causal link. Further, it seems likely that the benefit rate movements examined are partly proxying for other changes in the SA systems, including diversion policies that made access generally more difficult.

[20] Note that these are equivalent incomes. Thus, for a family of four, the top income category would actually correspond to market incomes of $100,000 or more since our equivalent incomes are obtained by dividing total family income by the square root of the family size.