The Role of Taxes and Transfers in Reducing Income Inequality

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The role of income redistribution through the tax-and-transfer system as a mitigating factor against rising market income inequality has long been a subject of interest. For example, Kenworthy and Pontusson (2005, 1), who studied redistribution in several member countries of the Organisation for Economic Co-operation and Development (OECD) over the period from 1980 to 2000, conclude that, contrary to the "widespread rhetoric about the decline of the welfare state, redistribution increased in most countries during the period, as existing social-welfare programs compensated for the rise in market inequality."

Although this conclusion also applies to Canada, it appears to do so only in part. For instance, Beach and Slotsve (1996) show that the rise in market income inequality in the 1980s was offset by a corresponding increase in the redistributive effect of the transfer system, which in turn prevented an increase in total income inequality in that decade. Extending these results to the mid-2000s, Heisz (2007) and Frenette, Green and Milligan (2007) describe the continued rise in market income inequality in the 1990s, which gave way to an even larger increase in inequality than was the case in the 1980s. They find that, although the tax-and-transfer system initially expanded in the early 1990s to offset the higher level of market income inequality, it then contracted later in the decade. As a result, after-tax income inequality did increase during the 1990s. Although the expansion and contraction of the tax-and-transfer system in the 1990s was in part a consequence of cyclical factors associated with the 1990-92 recession, Frenette, Green and Milligan (2009) conclude that it was also due to the reduced impact of government redistribution, and they point to changes in employment insurance (EI) and social assistance programs as important contributors.

In this chapter, we have two objectives. First, we review the literature and the stylized facts on income redistribution through the tax-and-transfer system. We

examine the "direct redistributive effects" of taxes and transfers (the difference between pre- and postredistribution income inequality), update the evidence and determine the relative contribution of the main components of transfers (EI, social assistance, child benefits and benefits to seniors) and income taxes (provincial and federal).

Second, we contribute to the Canadian literature by drawing the distinction between *redistribution* and *progressivity* in taxes and transfers, following the methodology developed by Kakwani (1977, 1984), Lambert (1985), Kim and Lambert (2009) and others. In this context, redistribution is the amount by which inequality is reduced by a tax or transfer, while progressivity is the amount by which a tax or transfer differs from proportionality (across the income distribution). The amount of redistribution generated by a tax or transfer depends on both its progressivity and the size of the tax or transfer. Intuitively, for two equal-sized taxes or transfers (in terms of the average tax or transfer rate), the more progressive tax or transfer would have a larger redistributive effect. We acknowledge that tax-and-transfer programs are designed to pursue many objectives aside from their effect on income inequality, and the results presented in this chapter are not intended to be an evaluation of these policies or programs. Nevertheless, we feel that decomposing inequality and redistribution into these components provides meaningful indicators that analysts and policy-makers can use to evaluate the effect of changes in the tax-and-transfer system on income inequality.

Methodology

The methods we use to measure income redistribution are what Kesselman and Cheung (2006) describe as "global indices of progressivity," which summarize the effects of transfers or taxes on the entire distribution of income.[1] Kesselman and Cheung note that these measures are "especially useful in tracking progressivity over time, or comparing progressivity across countries" (2006, 361). They also note that these indices fall into two camps: those that measure the redistributive effects of taxes or transfers, and those that measure departures from proportionality, or progressivity.

The first type, attributed to Musgrave and Thin (1948) and Reynolds and Smolensky (1977) and commonly used in the empirical literature on income inequality in Canada, indicates the difference between preredistribution and postredistribution measures of inequality. In this chapter, we describe redistribution as the absolute difference in pre- and postredistribution Gini coefficients — an index that ranges between 0 and 1, where 0 represents complete equality

and 1 represents complete inequality — but it is also possible to describe redistribution by comparing other measures of inequality, such as income quantile ratios. The difference between pre- and postredistribution inequality can also be expressed in absolute or relative (percentage) terms.

Defining preredistribution income as income coming from market income sources, denoted M, and postredistribution income as income measured after government transfers and income taxes, denoted AT, and their respective Gini coefficients as G_M and G_{AT}, total redistribution from taxes and transfers, R, can be measured as

$$R = G_M - G_{AT}. \tag{1}$$

Defining pre-tax, post-transfer income as "total income" and its Gini as G_T, separate redistribution indices for taxes (subscript t) and transfers (subscript b) can be described as

$$R_t = G_T - G_{AT} \tag{2}$$

and

$$R_b = G_M - G_T. \tag{3}$$

The second type of global progressivity indices, those that measure departures from proportionality, are less common in the empirical literature in Canada than redistribution measures such as R. Indicators of progressivity measure to what extent a tax or transfer is "targeted" toward particular segments of the income distribution. A progressive transfer provides more benefits to lower-income individuals, while a progressive tax applies a higher tax rate to those with higher incomes. In contrast, a proportional tax or transfer applies the same tax or benefit rate to everyone and produces no change in overall inequality. In this chapter, we use an index of progressivity derived by Kakwani (1977, 1984). The Kakwani index has two advantages. First, it has an intuitive interpretation: like the Reynolds and Smolensky measure of redistribution, R, it can be derived using concentration curves (the Gini is derived from a Lorenz curve, which is a particular type of concentration curve). Second, it can be related to R.

For taxes,

$$R_t \sim \frac{t}{1-t} P_t, \tag{5}$$

where P_t is the Kakwani progressivity index for taxes and t is the average tax rate. For transfers,

$$R_b \sim \frac{b}{1+b} P_b, \tag{8}$$

where P_b is the Kakwani progressivity index for benefits and b is the average benefit rate.

Equations (5) and (8) provide a statistical representation of the idea that the amount of redistribution generated by a tax or transfer depends upon both its progressivity and the average tax or benefit rate. Estimates of redistribution, progressivity and average tax and benefit rates can be also be defined for individual or aggregate taxes or transfers in the same way. Note that relationships described in equations (5) and (8) are approximates.

In appendix A, we present a more detailed description of the progressivity indices for taxes and transfers and how they relate to the redistribution indices of taxes and transfers, as well as additional equations used in this chapter.

The Canadian Literature on Income Redistribution

A NUMBER OF KEY EMPIRICAL STUDIES HAVE LOOKED AT INCOME REDISTRIBUTION IN Canada.[2] Heisz (2007) and Frenette, Green and Milligan (2009) provide a convenient starting point. In the former, the author compares pre- and post-redistribution Gini coefficients calculated using survey data from 1976 to 2004 to describe redistribution. In the latter study, the authors compare pre- and postredistribution inequality over the period from 1980 to 2000 using census data at five-year intervals. The basic storyline from these studies is that increases in market income inequality during the recessions of the 1980s and 1990s were completely offset by a tax-and-transfer system that became more redistributive, such that there was no increase in after-tax income inequality up to 1995. During the second half of the 1990s, government redistribution through the tax-and-transfer system declined, market income inequality remained high and after-tax income inequality rose.

A central motivation of these two papers was to determine whether the tax-and-transfer system became less redistributive over the periods studied. This question is difficult to answer, however, since redistribution can change both with

structural changes in government programs or tax policy — such as through the addition, change or elimination of a transfer program — and as a result of changes in the underlying market income distribution. All else being equal, redistribution through the transfer system is expected to rise during an economic recession, for example, as more individuals fall into lower-income brackets where transfer income is expected to be higher. Frenette, Green and Milligan (2009) address this issue by modelling income redistribution through the tax-and-transfer system and applying the model parameters to a constant market income distribution. In this way, they are able to conclude that the tax-and-transfer system itself was most redistributive in 1995 (based on five-year-interval census data). Heisz (2007) applies a different methodology but comes to a similar conclusion. Frenette, Green and Milligan also look at components of the tax-and-transfer system to uncover some of the factors underlying changes in redistribution, and find that changes in social assistance, EI and child benefits all played important roles.

Sharpe and Capeluck (2012) examine the redistributive effects of the tax-and-transfer system by province, drawing on data from Statistics Canada and the OECD with a focus on interprovincial and international differences. They find that income redistribution is higher in Atlantic Canada and Quebec than in the rest of Canada. For instance, market income inequality was about equal in Ontario and Quebec in 2011, but higher levels of tax-and-transfer income redistribution in Quebec yielded a lower level of after-tax income inequality in that province. At the national level, the size of inequality reduction achieved through government redistribution was modest in Canada compared with that in other OECD countries. For example, if one thinks of Sweden as a high-redistribution country and the United States as a low-redistribution country, Canada's level of redistribution is closer to the latter.

Milligan (2013) looks at redistribution through the tax system using census data for the period from 1980 to 2005. In particular, he examines the reduction in income inequality generated by refundable tax credits such as the goods and services tax (GST) credit and the Canada Child Tax Benefit, and finds that these credits play an important role in increasing income and hence reducing income inequality in the lower half of the income distribution.

In his discussion of redistribution through taxes and transfers, Davies (2013) emphasizes the policy implications and argues that more income equality could be achieved for a given amount of government spending if programs were

more "targeted" toward lower-income recipients. He also provides additional useful background information on the evolution of the tax-and-transfer system in Canada. In appendix B, we provide a summary of some of the changes in tax policy and transfer programs that are likely to have affected redistribution and progressivity over the study period.

Our Data Sources

The main sources of data we use in this chapter are Statistics Canada's Survey of Consumer Finances (SCF) for the period from 1976 to 1997 and the Survey of Labour and Income Dynamics (SLID) for the period from 1993 to 2011. The SCF is Statistics Canada's main source of household income statistics from 1976 to 1995, while the SLID is the main source from 1996 to 2011.[3]

Our variables are defined in the same way as in Statistics Canada's databases and in Canadian literature such as Heisz (2007), Frenette, Green and Milligan (2009) and Sharpe and Capeluck (2012). Market income is the sum of income from market sources. It includes income from earnings, net self-employment income, income from assets such as rents and private pension plans, and income from other market sources. Market income thus represents income before government transfers. Total income is the sum of market income and government transfers. We include the following federal and provincial government transfers:

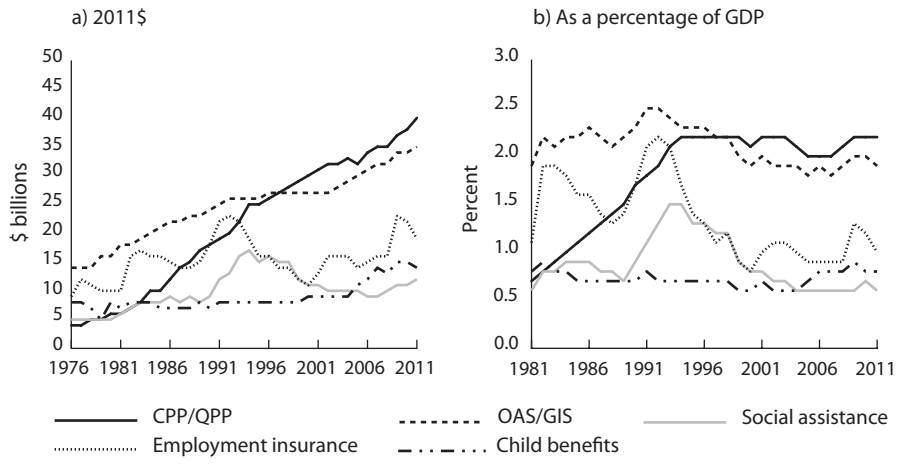
- EI benefits;
- social assistance benefits;
- Old Age Security (OAS) and Guaranteed Income Supplement (GIS) benefits;
- Canada Pension Plan and Quebec Pension Plan (CPP/QPP) benefits;
- child benefits;
- workers' compensation benefits;
- GST and provincial tax credits;
- the Working Income Tax Benefit; and
- other smaller transfer programs.

We group workers' compensation benefits, GST and provincial tax credits, the Working Income Tax Benefit and other transfer programs into a single "other transfers" category.[4] It should be noted that the CPP/QPP and EI transfers differ from other transfers in that they are paid for from payroll taxes contributed by

working individuals, and their receipt is linked to individuals having contributed to these programs in the past. One could also argue that the CPP/QPP is a savings program, and should not be counted as income. However, we follow the convention used by Statistics Canada and in most Canadian research and count CPP/QPP and EI benefits as income.

Figure 1a shows the total amounts of each of these transfers reported in the survey data (in 2011 dollars), while figure 1b standardizes the size of the transfers by expressing them as a percentage of total gross domestic product (GDP); we have omitted the lines for "other transfers" to improve the readability of the figures. In 2011, CPP/QPP and OAS/GIS represented the largest transfer programs, at $40 billion and $35 billion, respectively. Relative to GDP, the CPP/QPP increased in importance up to 1994, after which it stabilized at about 2.2 percent of GDP. EI, child benefits and social assistance accounted for $19 billion, $14 billion and $12 billion in income, respectively, in 2011. As a percentage of GDP, income from EI and income from social assistance have declined considerably since the 1990s. EI income fell from above 2 percent of GDP in the early 1990s to less than 1 percent through most of the 2000s, although we note an increase in EI income in 2009 and 2010 coinciding with the economic downturn in those years. Income from social assistance fell from a peak

Figure 1
Transfer income by source, Canada, 1976-2011



Sources: Authors' calculations based on Statistics Canada, Survey of Consumer Finances, 1976-1997, and Survey of Labour and Income Dynamics, 1993-2011, CANSIM table 380-0063.

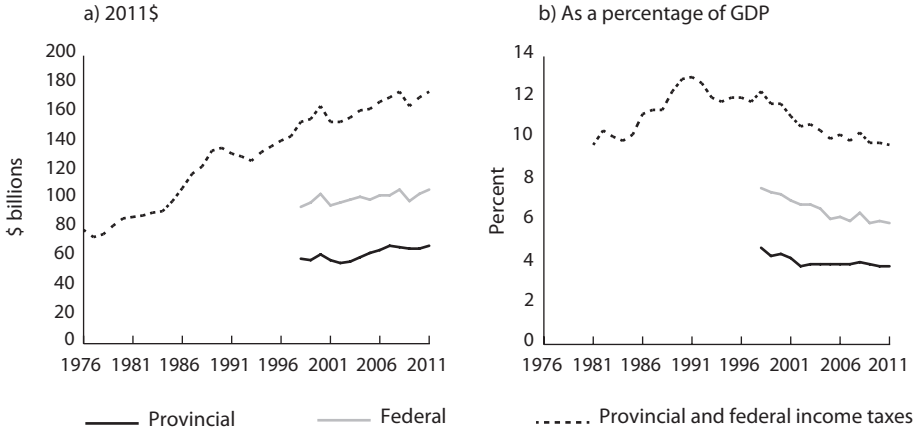
of 1.5 percent of GDP in 1994 to just more than 0.5 percent by the end of the period. Income from child benefits, however, rose in real terms over the period, doubling from about $7 billion in the late 1970s to about $14 billion in recent years.

As we describe in more detail in appendix B, these broad trends in transfer incomes reflect important policy initiatives. Changes in CPP/QPP income reflect the maturation of the public pension system (Myles 2000), with 35.2 percent of seniors receiving CPP/QPP benefits in 1976, rising to 76.5 percent in 1993 and to 92.1 percent in 2011.[5] Changes in EI transfer income reflect cyclical factors as well as successive program changes since the 1970s that have reduced EI benefit levels and tightened eligibility requirements (see Finnie and Irvine 2011). As well, changes in provincial social assistance programs and related federal transfers in the early 1990s reduced the use of social assistance and lowered average benefit rates (Banting 2005; Finnie, Irvine and Sceviour 2005; Frenette, Green and Milligan 2009). As well, changes in provincial social assistance programs and related federal transfers in the early 1990s reduced the use of social assistance dramatically and lowered average benefit rates (Banting 2005; Finnie, Irvine and Sceviour 2005; Frenette, Green and Milligan 2009). Child benefits — at the federal level including, in earlier years, the Child Tax Credit and Family Allowance program, and more recently the Canada Child Tax Benefit, the National Child Benefit Supplement and the Universal Child Care Benefit, as well as various provincial programs — have also undergone numerous changes over the period. As we describe below, newer programs such as the Canada Child Tax Benefit and the National Child Benefit Supplement are designed to target lower-income recipients, with benefits clawed back and reduced to zero above certain income levels.

After-tax income is total income less federal and provincial income taxes. Figure 2 shows total income taxes paid in levels and as a percentage of GDP. It also shows federal and provincial taxes separately after 1998, the first year these are disaggregated in the survey data. Expressed as a percentage of GDP, income tax paid has fallen steadily since the late 1990s, reflecting a number of tax-rate reductions at both the federal and provincial levels (see appendix B for more details).

We could also have included other taxes, such as payroll, property and sales taxes, as well as other transfers, both direct and indirect. However, using the more limited definition of income used by Statistics Canada (with one exception, as we discuss below) allows us to compare our results directly with commonly reported statistics, and conforms with the definitions used in most of the literature on income inequality in Canada.

Figure 2
Federal and provincial income taxes paid, Canada, 1976-2011



Source: Authors' calculations based on Statistics Canada, Survey of Consumer Finances, 1976-1997, and Survey of Labour and Income Dynamics, 1993-2011, CANSIM table 380-0063.

When studying family income, it is important to take into account the fact that households with higher incomes tend to be larger than those with lower incomes, and that larger families can enjoy economies of scale (for example, they can share the cost of housing). For these reasons, like most researchers, we conduct our analysis at the level of the individual, using measures of "adult-equivalent-adjusted" income.[6] This means that, for the remainder of the study, we sum income variables to the household level and convert them to adult-equivalent units.

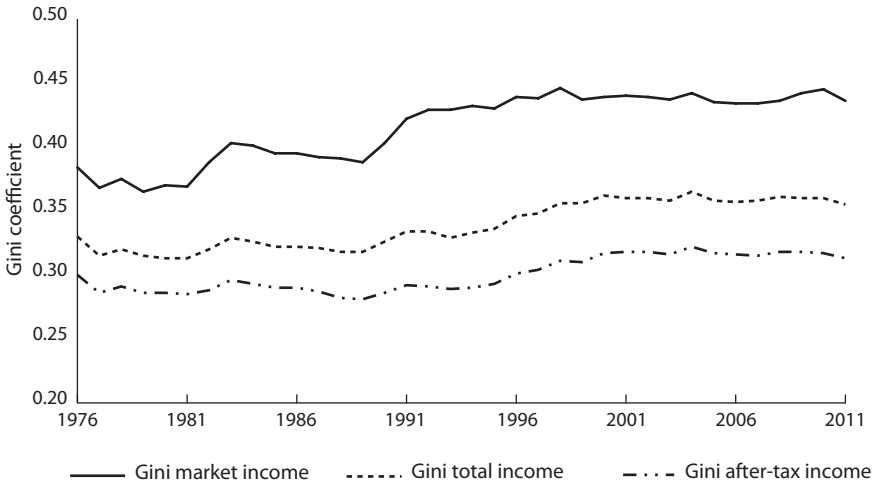
Finally, we also use Statistics Canada's Social Policy Simulation Database and Model (SPSD/M), which is a nonconfidential, statistically representative database of individuals in their family context, with enough information on each individual to compute taxes paid to and cash transfers received from government.[7] The SPSD/M allows us to model changes in redistribution, average tax and benefit rates and progressivity, while holding market income distributions and population characteristics constant. We can then compare estimates from the SPSD/M with those from the SCF and SLID to separate the part of the change in redistribution or progressivity that is driven by changes in the tax-and-transfer system from the part that is caused by macroeconomic or demographic changes. We can also assess what effect payroll taxes have on the results.[8]

The Redistributive Effect of Taxes and Transfers

As is well known, taxes and transfers reduce income inequality through redistribution, but by how much? As figure 3 shows, the Gini coefficient for market income in 2011 was 0.436. Adding transfers reduced inequality such that the Gini estimate for total income declined to 0.355 (a 19 percent decrease in the Gini coefficient). Adding taxes reduced the Gini coefficient to 0.313 (a 12 percent decrease). Together, taxes and transfers decreased inequality by 28 percent from its market income level.

Figure 4 shows the point reduction in the GINI coefficients associated with taxes and transfers for the period from 1976 to 2011 (these are estimates of R, R_t and R_b, described earlier). Our results reflect those in earlier studies on redistribution in Canada. Total redistribution peaked around 1994, following waves of increasing redistribution starting in the early 1980s. In 1994, redistribution through taxes and transfers reduced the Gini coefficient by 0.142, which was about one-third the size of the market income Gini. The Gini reduction from transfers was larger, at 0.099, while the Gini reduction from taxes was 0.043. After 1994, however, government

Figure 3
Income inequality before and after transfers and taxes, Canada, 1976-2011

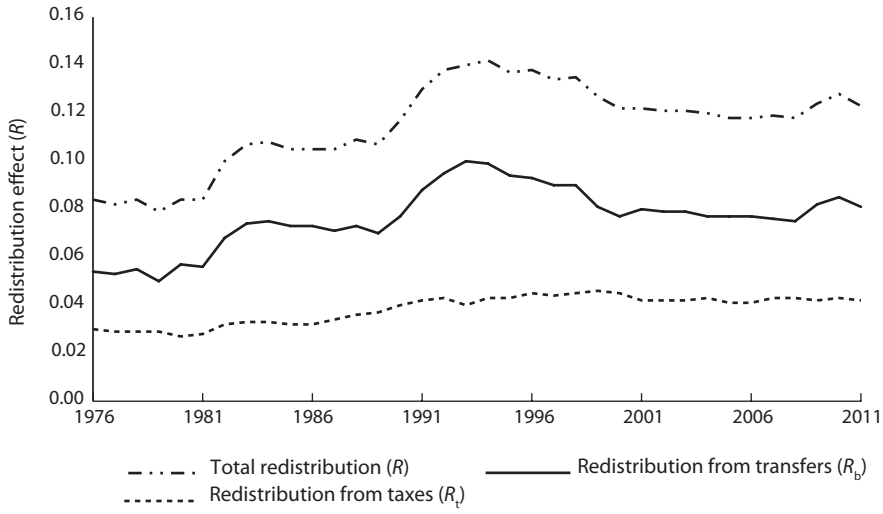


Source: Statistics Canada, CANSIM table 202-0709.

redistribution declined, mainly due to a reduction in transfer redistribution. This decline resulted in part from the improving economy (and increased market incomes) following the 1990-92 recession, but, as noted earlier, tax-and-transfer programs changed in such a way that redistribution would have declined even in the absence of an economic recovery.

These results reflect the now well-known storyline regarding the evolution of inequality and redistribution in Canada over this period. Market income inequality ratcheted up — that is, it rose without later falling — during the economic downturns of 1981-82 and 1990-92. Total redistribution also rose during these recessions, although it remained at a higher level after the end of the 1980s recession but fell following the 1990s recession. It was from 1994 through 2000, when market income inequality remained high and total redistribution through taxes and transfers fell, that after-tax income inequality rose. Through the 2000s, at least up to 2008, market income inequality remained high but "flat," with only a small uptick in 2009 and 2010 that appears to have been offset completely by increased transfer redistribution.

Figure 4
Estimates of redistribution through transfers and taxes, Canada, 1976-2011



Source: Authors' calculations based on Statistics Canada, Survey of Consumer Finances, 1976-1997, and Survey of Labour and Income Dynamics, 1993-2011.
Note: This shows the point reduction in the Gini coefficients associated with taxes and transfers.

Looking separately at transfers and taxes, this storyline closely reflects the changes in transfer redistribution. Although a steady increase in redistribution through the tax system occurred between 1982 and 2000, the changes in redistribution through transfers appear to be the principal factor behind the changes in total redistribution.

Figures 5 and 6 show the results for the overall redistributive effect and progressivity of the tax-and-transfer system, as derived from equations (4), (6), (7) and (9) in appendix A. The line for transfer redistribution in figure 5a is the same as the middle line shown in figure 4. Changes in total transfer redistribution appear to be mainly associated with changes in the average benefit rate (figure 5b).[9] Periods of high average benefits coincide with periods of high redistribution. At the same time, there is a marked pattern in progressivity, with the full transfer system becoming steadily more progressive over the 1980s and 1990s, and peaking in 2000 before falling through 2011 (figure 5c).

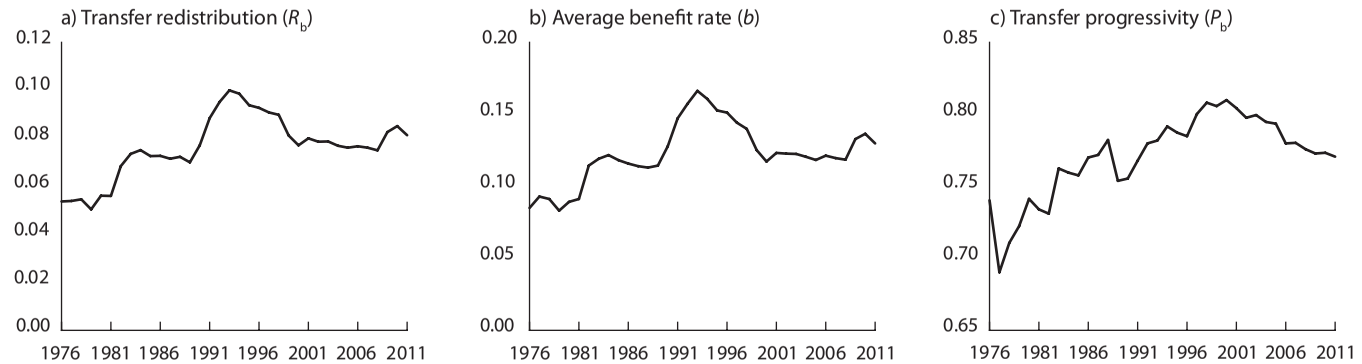
Figure 6 shows the effects of the tax system. Again, figure 6a for tax redistribution corresponds to the bottom line in figure 4. What is new in this figure is the information on how the redistribution through the tax system derives from the average tax rate (figure 6b) and tax progressivity (figure 6c). The evolution of redistribution from taxes can be divided into three periods:

- during the 1980s, tax redistribution rose due to an increase in the average tax rate;
- during the 1990s, redistribution through the tax system rose due to an increase in tax progressivity; and
- during the 2000s, redistribution through taxes remained at a comparatively high level despite falling average tax rates because of a continued increase in the progressivity of the income tax system. In fact, in the face of flat or falling average tax rates, the progressivity of taxes trended steadily upward: following a low point in 1987, it rose steadily through 2010, increasing the amount of redistribution achieved through taxes.

We can confirm these observations by decomposing the redistributive effects of transfers and taxes to identify the part associated with changes in progressivity and the part associated with changes in average benefit and tax rates before and after 1995 — see equation (10) in appendix A. The results of this exercise are shown in table 1. We find that between 1976 and 1995 — the year Frenette, Green and Milligan (2009) identify as the most redistributive — about

Figure 5

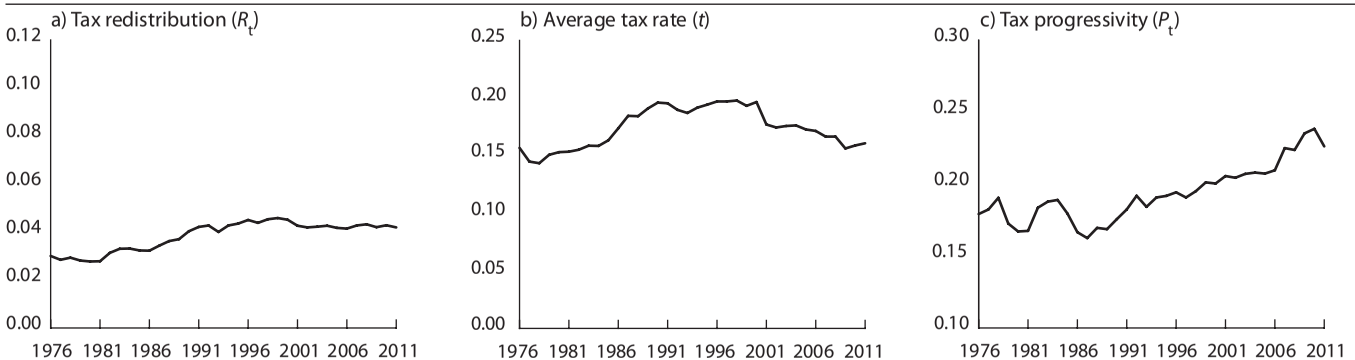
Redistribution through transfers, Canada, 1976-2011



Source: Authors' calculations based on Statistics Canada, Survey of Consumer Finances, 1976-1997, and Survey of Labour and Income Dynamics, 1993-2011.

Figure 6

Redistribution through taxes, Canada, 1976 -2011



Source: Authors' calculations based on Statistics Canada, Survey of Consumer Finances, 1976-1997, and Survey of Labour and Income Dynamics, 1993-2011.

Table 1
Decomposition of changes in redistribution through transfers and taxes, Canada, 1976-2011

	Change in transfer redistribution		
	Overall change in transfer redistribution	**Portion due to change in benefit progressivity**	**Portion due to change in average benefit rates**
1976-1995	0.046	0.006	0.040
1995-2011	– 0.016	– 0.002	– 0.014
	Change in tax redistribution		
	Overall change in tax redistribution	**Portion due to change in tax progressivity**	**Portion due to change in average tax rates**
1976-1995	0.013	0.003	0.010
1995-2011	– 0.003	0.007	– 0.009

Source: Authors' calculations based on Statistics Canada, Survey of Consumer Finances, 1976-1997, and Survey of Labour and Income Dynamics, 1993-2011.

nine-tenths of the increase in transfer redistribution was associated with changes in average benefits. Likewise, three-quarters of the increase in tax redistribution between 1976 and 1995 was associated with increases in the average tax rate. Between 1995 and 2011, transfer redistribution fell, again with about nine-tenths of this due to changes in average benefits. For taxes, the net change in tax redistribution was small between 1995 and 2011 (– 0.003), reflecting a decrease in tax redistribution due to a falling average tax rate (– 0.009), which was mostly offset by an increase in redistribution due to rising progressivity (0.007).

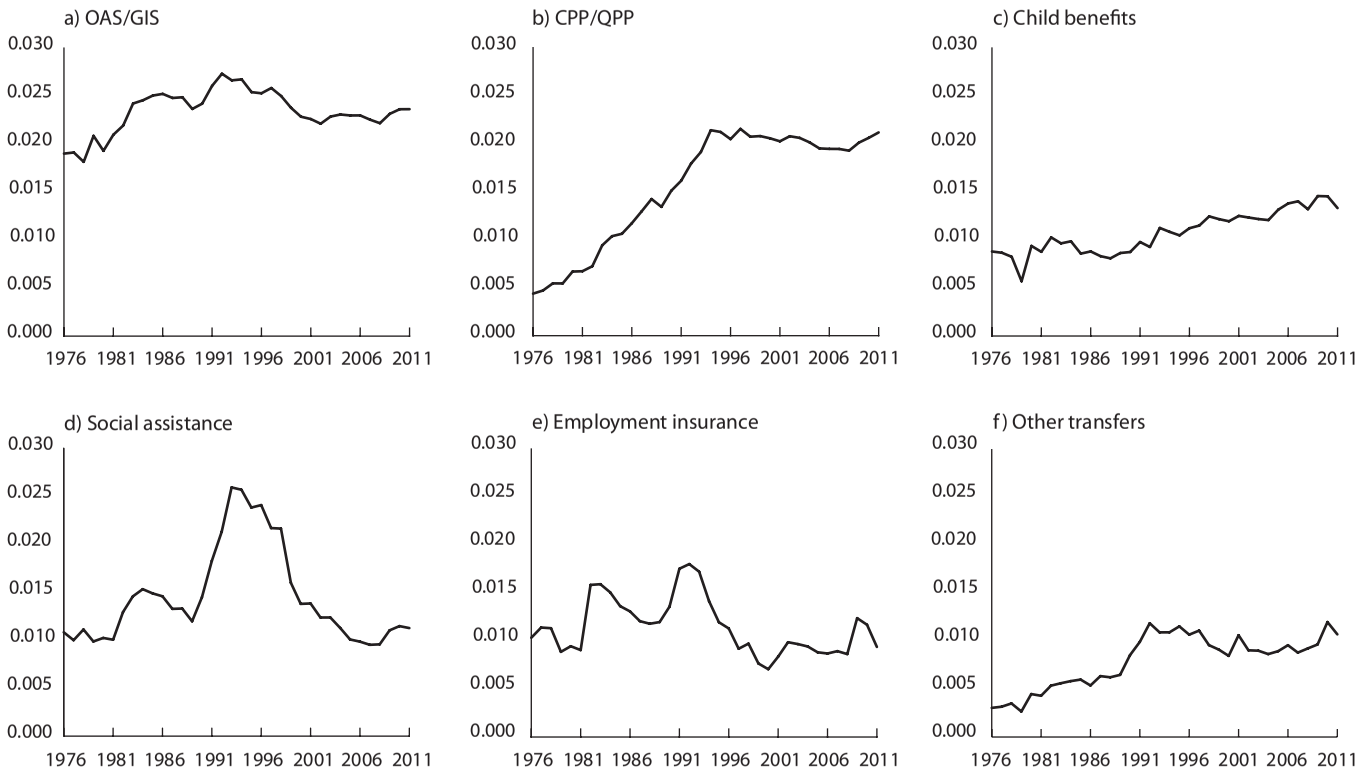
Redistribution and progressivity by transfer program

Looking at the components of transfer and tax redistribution, figure 7 shows the redistributive effects of specific transfers and reveals a variety of levels and patterns. Ranked in order of magnitude in 2011, redistributive effects were greatest for the OAS/GIS and CPP/QPP programs. Child benefits were the next largest, though at an order of magnitude lower. EI, social assistance and other government transfers represented a third, lower grouping of transfers, in terms of the size of their redistributive effect.

The redistributive effects of these transfers have changed over time, with CPP/QPP and child benefits becoming more redistributive, while EI and

Figure 7

Redistribution index (R_b) by transfer program, Canada, 1976 -2011



Source: Authors' calculations based on Statistics Canada, Survey of Consumer Finances, 1976-1997, and Survey of Labour and Income Dynamics, 1993-2011.

especially social assistance have become less redistributive since the early and mid-1990s. The overall increase in transfer redistribution from 1976 through the mid-1990s appears to have been based on increases across all transfer programs, with each transfer grouping in figure 7 becoming more redistributive during that period. The fall in redistribution following the mid-1990s appears to have been the result of reductions in redistribution through social assistance and EI (other transfers do not appear to have fallen so significantly after 1993, although we note a decline in redistribution from OAS/GIS).[10] The increase in redistribution in 2009 and 2010 appears to some degree in all transfer groups, although the increases are largest in EI, social assistance and "other transfers."

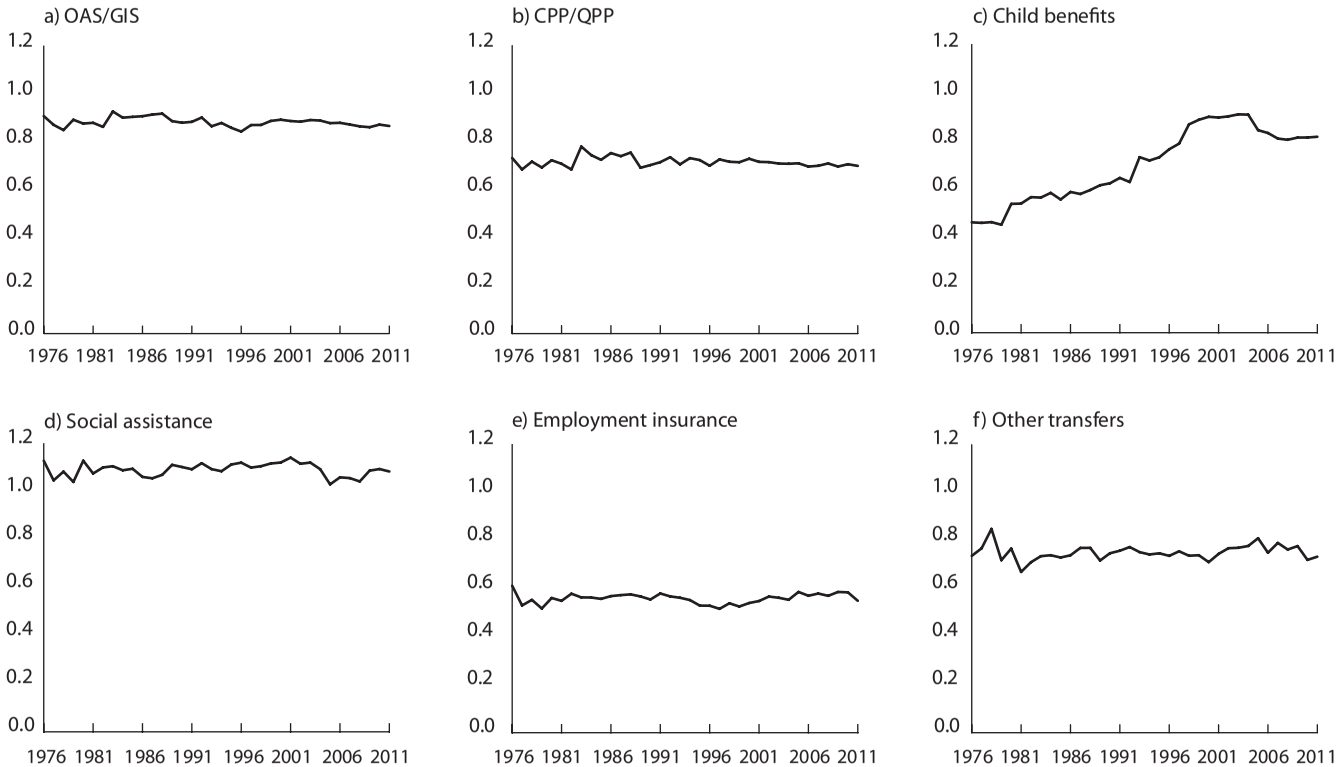
Figures 8 and 9 show the progressivity index and the average benefit rate for separate transfers (or groups of transfers) — the two components of equation (8). Figure 8 indicates a wide range in the levels of progressivity of transfers. In 2011, social assistance benefits were the most progressive, followed, in order, by OAS, child benefits, "other transfers," CPP/QPP and EI. Figure 8 also shows that the level of progressivity of transfers has changed very little for most transfers since 1976. The exception was child benefits, which became steadily more progressive over the period from 1976 to 2003, with a small decrease in progressivity afterwards. Over that period, child benefit programs changed several times, with newer programs typically targeted more toward lower-income recipients. For example, in 1993, the Family Allowance program was replaced by the means-tested Child Tax Benefit; and in 1998, the Working Income Supplement, which was available only to low-income working families, was replaced by the National Child Benefit Supplement, which is available to all low-income families. Such changes would be expected to have led to an increase in the progressivity of child benefits over the period.

Figure 9 shows the average benefit rate for different transfers or groups of transfers. The figure clearly indicates that changes in redistribution from transfers are more strongly related to changes in the average size of the benefit. Most large movements in redistribution in figure 7 mirror movements in the average size of the transfer, rather than changes in the progressivity of the transfer. The exception once again is child benefits, where the increase in the redistributive effect appears due in large part to an increase in the progressivity of these benefits.

We can demonstrate this finding more formally by variance decomposition. As represented in equation (11) in appendix A, the variance in transfer

Figure 8

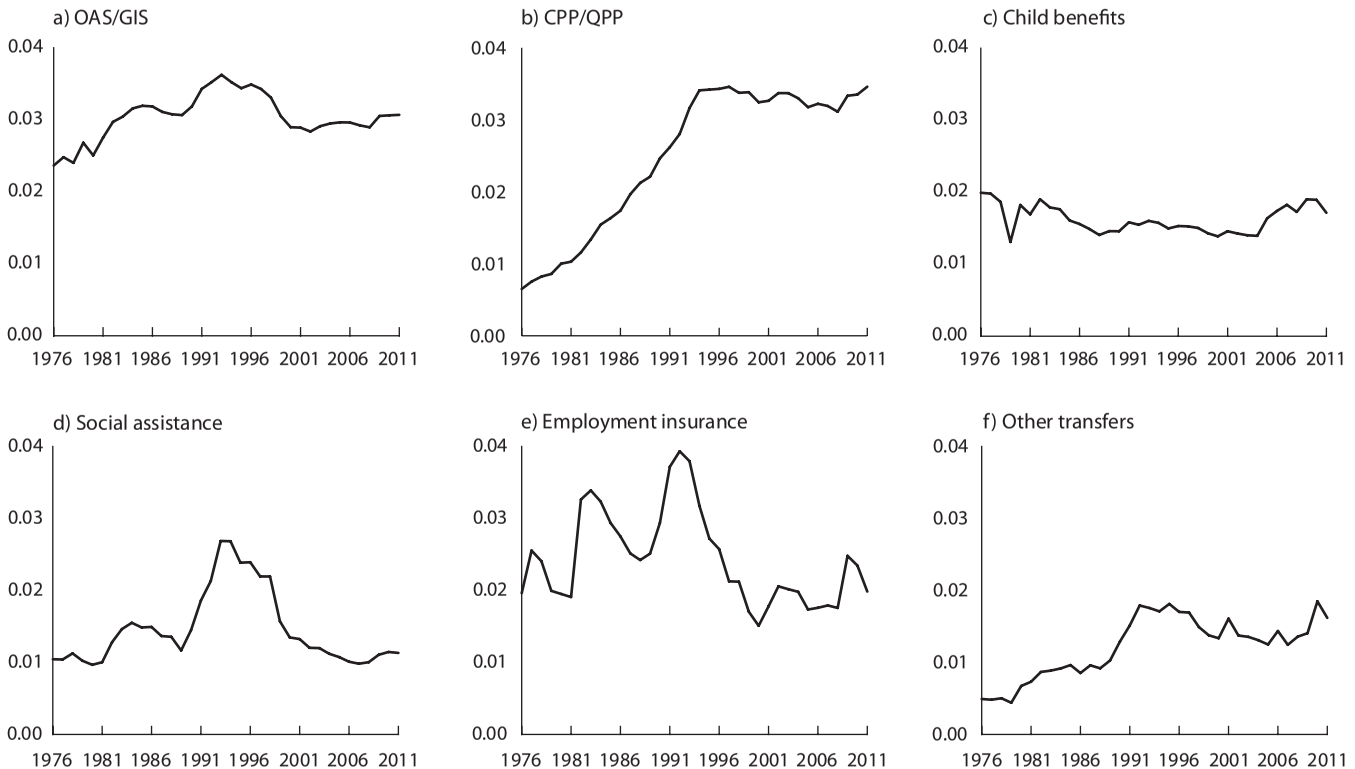
Progressivity index (P_b) by transfer program, Canada, 1976-2011



Source: Authors' calculations based on Statistics Canada, Survey of Consumer Finances, 1976-1997, and Survey of Labour and Income Dynamics, 1993-2011.

Figure 9

Average benefit rate (*b*) by transfer program, Canada, 1976-2011



Source: Authors' calculations based on Statistics Canada, Survey of Consumer Finances, 1976-1997, and Survey of Labour and Income Dynamics, 1993-2011.

Table 2
Variance decomposition of transfer redistribution by type of transfer, Canada, 1976-2011

		Part due to		
	Total variance $var(lnR_b)$	**Variance in average benefit rates** $var\left(ln\frac{b}{1+b}\right)$	**Variance in benefit progressivity** $var(lnP_b)$	**Covariance** $2\,x\,covar\left(ln\frac{b}{1+b}, lnP_b\right)$
CPP/QPP	0.272	0.274	0.001	– 0.002
OAS/GIS	0.011	0.011	0.000	0.000
Child benefits	0.046	0.013	0.051	– 0.017
Social assistance	0.099	0.093	0.001	0.005
Employment insurance	0.066	0.062	0.001	0.003
Other transfers	0.167	0.165	0.002	0.000

Source: Authors' calculations based on Statistics Canada, Survey of Consumer Finances, 1976-1997, and Survey of Labour and Income Dynamics, 1993-2011.

redistribution over the period was due to the variance in benefit rates, plus the variance in transfer progressivity plus twice the covariance in these terms. The decomposition results reported in table 2 indicate that the variance of redistribution is associated nearly entirely with variations in average benefit rates for all transfers with the exception of child benefits. For child benefits, the variance in redistribution is associated more strongly with changes in progressivity.

Together, figures 7, 8 and 9 help to illustrate how the average size of a transfer combines with its progressivity to yield a level of redistribution. For example, the OAS/GIS is slightly smaller than the CPP/QPP (based on average benefit rates), but because it is more progressive, it yields a larger redistribution effect. Social assistance, despite having the highest level of progressivity, has a comparatively small average benefit rate, and so its effect on overall inequality is smaller than another transfer that might be less progressive but is larger. The figures also show how changes in the progressivity of a transfer can lead to more redistribution without changing the size of the transfer. Child benefits, which had an average benefit rate equivalent to about 1.5 percent of market income between 1987 and 2004 (figure 9),[11] became more progressive over the period (figure 8), which, in turn, led to a larger redistributive effect (figure 7).[12]

Child benefits

As indicated above, child benefits include several federal and provincial programs with different purposes and designs. Therefore, examining some of these separately can help describe the underlying income redistribution effects of child transfers. Specifically, we examine the results for three federally delivered child benefits: the Canada Child Tax Benefit, the National Child Benefit Supplement and the Universal Child Care Benefit. We expect each of these child benefits to have different levels of progressivity based on their program design — see appendix B for further details. The main parameters of these programs for the 2012 tax year were as follows:

- The Canada Child Tax Benefit is available to families with children under the age of 18. The benefit depends on the number of children in the family. The benefit is reduced at a rate of 2 percent of the amount of family income that exceeds $43,561 for families with one child and 4 percent for families with two or more children.
- The National Child Benefit Supplement is also available to families with children under the age of 18; as with the Canada Child Tax Benefit, the size of the benefit depends on the number of children in the family. The supplement is reduced at a rate of 12.2 percent of the amount of family income in excess of $25,356 for families with one child and at a rate of 23 percent and 33.3 percent for families with two and three or more children, respectively. Given the lower income threshold at which the benefit reduction starts to take effect and the higher rate of reduction of the benefit for families with income above this threshold, the National Child Benefit Supplement is expected to be more progressive than the Canada Child Tax Benefit (Canada Revenue Agency 2015).
- The Universal Child Care Benefit provides families with a $100 monthly payment for each child under the age of six.[13] There is no income threshold beyond which the benefit is reduced. With these parameters, the benefit should be a less progressive transfer than the Canada Child Tax Benefit or the National Child Benefit Supplement.
- A notable difference between the three programs is that the Canada Child Tax Benefit and the National Child Benefit Supplement are nontaxable benefits, while the Universal Child Care Benefit is taxable.[14]

Table 3
Redistribution through child benefits, Canada, 2011

	Average benefit rate (b)	Progressivity (P_b)	Redistribution (R_b)
Canada Child Tax Benefit (CTTB)	0.015	0.836	0.012
National Child Benefit Supplement (NCBS)	0.008	1.183	0.009
Universal Child Care Benefit (UCCB)	0.008	0.519	0.004

Source: Authors' calculations based on Statistics Canada, Survey of Consumer Finances, 1976-1997, and Survey of Labour and Income Dynamics, 1993-2011.
Note: According to the Survey of Labour and Income Dynamics, in 2011, $5.2 billion was received in benefits from the CCTB, $3.0 billion from the NCBS and $2.7 billion from the UCCB.

The data in table 3 provide an empirical way to describe how total government transfers through child benefits reduce income inequality by more or less, depending on the size of the program and on how progressive it is. To sharpen the illustration of the effect of child benefits on income redistribution, we limit the sample to families with children ages 0 to 17.[15] In terms of the average benefit rate, as the first column of table 3 shows, the Canada Child Tax Benefit was largest, representing 1.5 percent of market income for families with children. The National Child Benefit Supplement and the Universal Child Care Benefit were close in size, each representing 0.8 percent of market income for families with children. The second column shows the level of progressivity of the three child benefits, with the ranking falling out as expected: the National Child Benefit Supplement is the most progressive, the Canada Child Tax Benefit is second and the Universal Child Care Benefit is the least progressive. The final column of table 3 shows the amount by which the transfer reduced inequality. This estimate reflects the combined effect of the progressivity index and the benefit rate, as shown in equation (8) (see page 438). Redistribution was highest for the Canada Child Tax Benefit, followed by the National Child Benefit Supplement and then the Universal Child Care Benefit. Thus, although the Universal Child Care Benefit and National Child Benefit Supplement were of similar size in 2011, the latter was more progressively distributed, yielding a greater reduction in inequality.

Redistribution and progressivity by tax program

Unfortunately, in the SCF and SLID, total income taxes are disaggregated into federal and provincial taxes only from 1998 onward. As a result, we are unable

to illustrate as clearly as for transfers the evolution of tax redistribution and progressivity by tax type.[16] Nonetheless, we can summarize our results as follows:

- federal income taxes were more redistributive than provincial income taxes, and neither showed large trends in redistribution over the period between 1998 and 2011;
- federal and provincial taxes had similar levels of progressivity in each year, and each became more progressive over the period; and
- the average tax rate for both federal and provincial taxes decreased, with federal taxes falling from 12.2 percent of total income in 1998 to 9.7 percent in 2011, and provincial taxes falling from 7.5 percent of total income to 6.1 percent over the same period.

In sum, the same pattern emerges for federal and provincial taxes as for taxes overall. Average tax rates (both federal and provincial) fell and progressivity rose over the 2000s, yielding little change in redistribution from taxes.

Measuring the Effect of Program Changes

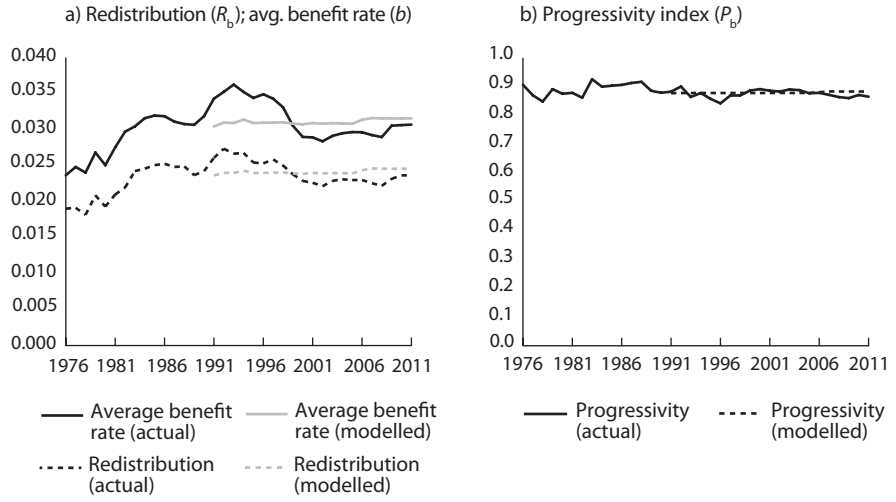
In our analysis so far, we have presented stylized facts on the levels of redistribution from survey microdata. One result that has come to light is that important changes have occurred in the levels of redistribution in Canada since the mid-1970s. Although we have made some effort to unpack these aggregate changes by relating them to changes in particular benefits or taxes, the trends we have observed also might have been driven in part by changes in the underlying market income distribution and/or demographics, such as the share of the population over age 65. In order to test to what extent changes in transfer programs in and of themselves are responsible for observed trends in income redistribution, we use the SPSD/M to simulate what post-transfer and post-tax incomes would have been if population and market income characteristics had held constant. For our purposes, the model holds the population constant at its 2004 characteristics; we then apply the parameters of the tax-and-transfer system for the period from 1991 to 2010 to this fixed population to yield simulated post-transfer and post-tax distributions. The resulting changes in redistribution then reflect only the effects due to changes in policy and programs, not those resulting from changes in the economy and demographics. Unfortunately, however, the SPSD/M does not model social assistance or CPP/QPP benefits, an important shortcoming

considering their importance in post-transfer distribution. Therefore, rather than model transfer redistribution overall, we model only those transfers that are estimated by the SPSD/M — namely, OAS/GIS, EI and child benefits.

Figure 10 presents the results for OAS/GIS. The "actual" redistribution and average benefit rate series show strong cyclical fluctuations, rising during the early 1990s and falling in the postrecession period. The modelled series for redistribution and average benefit rates are flat after 1991, the first year of the simulation. Both the actual and modelled estimates of OAS/GIS progressivity are also flat. From this, we can conclude that fluctuations in OAS/GIS over the period (at least after 1991) were more strongly associated with changes in the underlying population — that is, with changes in their demographic and market income situations — than with changes in program parameters.[17]

Figure 11 shows the results for EI. Here, both the actual and modelled redistribution and average benefit rate series move together, indicating that a good part of the decrease in redistribution through EI, at least after 1991, was associated with changes in EI program parameters. For example, actual

Figure 10
Redistribution through OAS/GIS, actual and modelled, Canada, 1976-2011

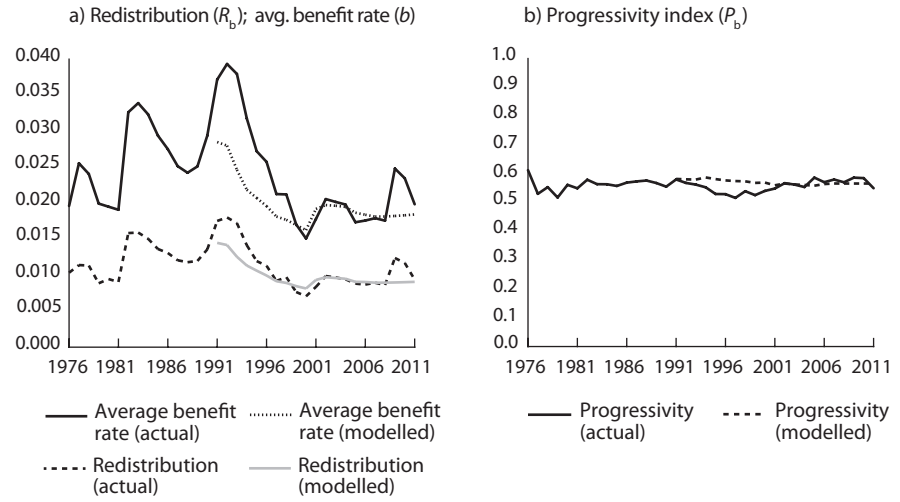


Sources: "Actual" series — authors' calculations based on Statistics Canada, Survey of Consumer Finances, 1976-1997, and Survey of Labour and Income Dynamics, 1993-2010; "modelled" series — authors' calculations based on Statistics Canada, Social Policy Simulation Database and Model.

redistribution through EI fell from 0.017 in 1991 to 0.008 in 1999 (down 0.009). Holding population characteristics constant (including their employment and unemployment characteristics), modelled redistribution fell from 0.014 to 0.008 over the same period (down 0.006). Since, in the modelled series, only program parameters are allowed to change from year to year, we can conclude that about two-thirds of the decline in EI redistribution over the 1990s was associated with changes in program parameters. Most of the decline occurred as a result of reductions in the average benefit level, as in both the actual and modelled series the progressivity indicators showed little change.

Figure 12 shows results for child benefits. Redistribution rises strongly in the post-1991 period in both the actual and modelled series. Similar trends in progressivity occur in both series. Modelled estimates of progressivity in child benefits show a larger discrete "jump" than actual estimates between 1992 and 1993, the year the Child Tax Benefit and Working Income Supplement were introduced. Otherwise, the increase in the progressivity of these benefits from the

Figure 11
Redistribution through employment insurance, actual and modelled, Canada, 1976-2011

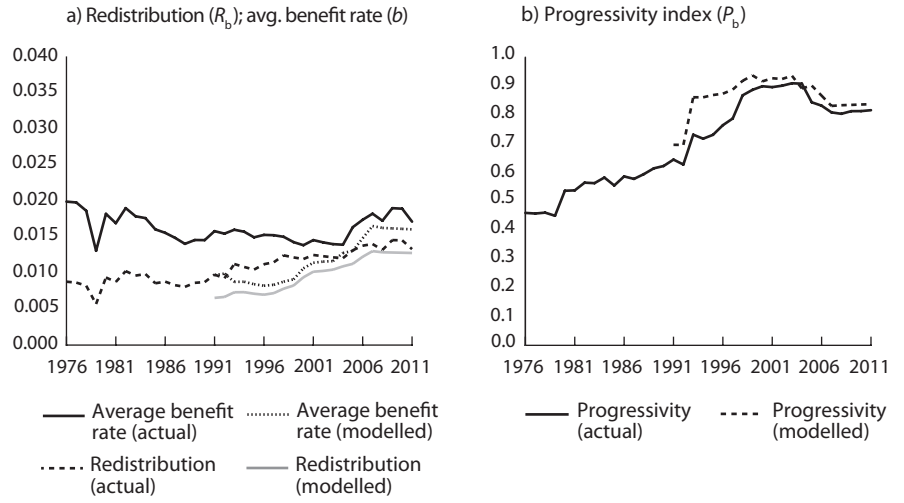


Sources: "Actual" series — authors' calculations based on Statistics Canada, Survey of Consumer Finances, 1976-1997, and Survey of Labour and Income Dynamics, 1993-2010; "modelled" series — authors' calculations based on Statistics Canada, Social Policy Simulation Database and Model.

early 1990s to the early 2000s is preserved in both series, indicating that observed trends were due to program changes, rather than to changes in the characteristics of the underlying population. There are small differences in average benefit rates in the actual and modelled series, with the latter series showing more growth. This suggests that changes in child benefit programs increased average (statutory) child benefit rates more over the period than suggested in the raw data, but this was masked by downward pressure on the effective benefit rate associated with the improving economy in the mid- to late 1990s.

Simulations of tax redistribution are shown in figure 13. The simulated redistribution and simulated average tax rate are quite similar to their actual values, except that the levels of these variables are higher in the simulation in the early to mid-1990s, reflecting the reduction in actual tax revenues during the early 1990s recession. The results for modelled progressivity confirm the results from the survey microdata: both show an increase in the progressivity of the tax system after 1991 (the modelled results lie nearly on top of the actual values). Overall, the results of the tax-modelling exercise indicate that the observed trends

Figure 12
Redistribution through child benefits, actual and modelled, Canada, 1976-2011

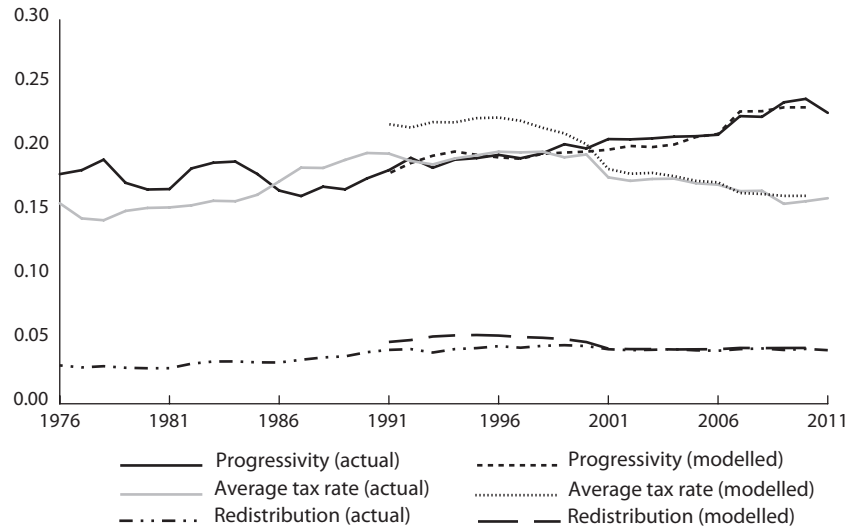


Sources: "Actual" series — authors' calculations based on Statistics Canada, Survey of Consumer Finances, 1976-1997, and Survey of Labour and Income Dynamics, 1993-2010; "modelled" series — authors' calculations based on Statistics Canada, Social Policy Simulation Database and Model.

in tax redistribution are associated mainly with changes in tax policy, rather than with changes in the characteristics of the population or in the economy, especially in the post-2000 period.

A closer look at the results from the SPSD/M allows us to describe more fully the changes in the progressivity of the tax system. Figure 14 shows the average tax rate by centile of total income for 1991 and 2010 derived from the SPSD/M.[18] Since results are generated using fixed population characteristics, the differences in average tax rates between the two years shown in figure 14 are due strictly to changes in the tax system. Average tax rates fell between 1991 and 2010 across the entire income distribution. Figure 14 also shows the ratio of the 2010 rate to the 1991 rate. At the bottom of the income distribution, the 2010 tax rate averaged 25 percent of the 1991 tax rate (aside from higher values for the 1st to 3rd centiles). Between the 20th and 40th centiles, the 2010 rates averaged 55 percent of the 1991 rates. Above the 40th centile, the 2010 rates averaged 73 percent of the 1991 rates. In sum, the results shown

Figure 13
Redistribution through taxes (R_t), average tax rate (t) and tax progressivity (P_t), actual and modelled, Canada, 1976-2011



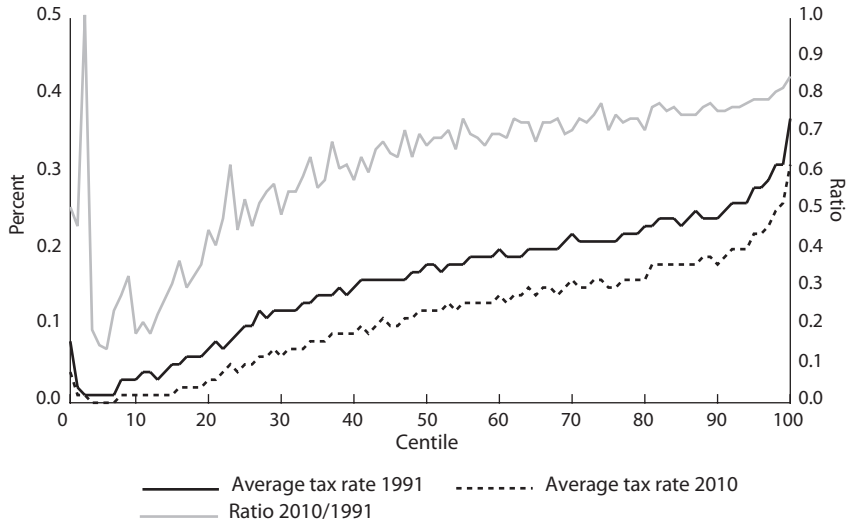
Sources: "Actual" series — authors' calculations based on Statistics Canada, Survey of Consumer Finances, 1976-1997, and Survey of Labour and Income Dynamics, 1993-2010; "modelled" series — authors' calculations based on Statistics Canada, Social Policy Simulation Database and Model.

in figure 14 indicate that the tax system became more progressive between 1991 and 2010 because, although tax rates fell across the income distribution, they fell more at the bottom than at the top.

As described in Davies (2013) and in appendix B, a number of changes in the federal and provincial income tax systems occurred over this period. Some of these changes may have increased progressivity, while others may have reduced it, and further study would be needed to determine their individual effects. Among more recent changes, since 2001, the federal government has reduced tax rates in all brackets, but especially in the lowest bracket, from 17 percent to 16 percent in 2001 and then to 15 percent in 2005. These recent changes in the rate structure would have increased the progressivity of the personal income tax system.

The SPSD/M also allows us to model the progressivity and redistributive effects of payroll taxes, which we have excluded from the analysis so far. (For our purposes, payroll taxes include employee contributions to CPP/QPP and EI.) Results for 2010 are shown in table 4. The results for federal and provincial income taxes combined are as shown in figure 13. What is new in this table

Figure 14
Average combined federal and provincial income tax rate by income centile and 2010/1991 ratio, Canada, 1991 and 2010



Source: Simulations by authors based on Statistics Canada, Social Policy Simulation Database and Model.

Table 4
Redistribution through federal and provincial income taxes and federal payroll taxes, 2010

	Average tax rate *(b)*	Progressivity *(P_b)*	Redistribution *(R_b)*
Federal income tax	0.100	0.240	0.026
Provincial income tax	0.062	0.223	0.014
Federal + provincial taxes	0.162	0.233	0.044
Federal payroll taxes	0.033	– 0.059	– 0.002
Federal + provincial income taxes + federal payroll taxes	0.195	0.184	0.043

Source: Simulations by authors based on Statistics Canada, Social Policy Simulation Database and Model.

is the addition of federal payroll taxes. As expected, federal payroll taxes are regressive — that is, the progressivity index is negative (– 0.059) — meaning that individuals with lower income pay a larger share of their income in payroll taxes, mainly due to the relatively low maximum pensionable/insurable earnings ceilings for contributions under these programs. These payroll taxes are comparatively small, however, at 3.3 percent of total income, compared with 16.2 percent for federal and provincial taxes combined. Thus, their redistributive effect is negative and increases income inequality, but by a small amount. The final row of table 4 shows that payroll taxes reduce the overall progressivity of the income tax system but have little effect on its redistributive effect.

Conclusion

The tax-and-transfer system is an important tool that governments can use to redistribute income, and this in turn can influence the level or trend of income inequality. In looking at changes in income inequality and redistribution in Canada from 1976 to 2011, we find (as have other authors) that the cumulative increases in market income inequality that occurred during the recessions of the 1980s and 1990s were completely offset by a tax-and-transfer system that became more redistributive over this period. As a result, there was no increase in after-tax income inequality up to 1995. This pattern changed during the second half of the 1990s. Market income inequality remained at the higher levels reached in the earlier recession, but the tax-and-transfer system became less redistributive and

after-tax income inequality increased as a consequence. In the 2000s, after-tax household income inequality more or less stabilized as market income inequality and overall redistribution held steady up until the most recent recession. The resulting small rise in market income inequality in 2009-10, however, was once again offset by an increase in transfer redistribution in those years.

Total redistribution through taxes and transfers reached its highest point in 1994, following waves of increasing redistribution during the early 1980s and early 1990s. In 1994, taxes and transfers reduced income inequality by about one-third of its pre-tax-and-transfer level, as measured by the Gini coefficient. In the 2000s, government redistribution reduced market income inequality by about 28 percent, an amount similar to that seen in the 1980s.

In looking at the redistribution generated by individual taxes and transfers, we find that, on the transfer side, aggregate trends were associated with many changes in individual transfer programs:

- In 2011, the OAS/GIS and CPP/QPP programs reduced income inequality by the largest amounts. Child benefits were the next most important, followed by EI, social assistance and other government transfers as a group.
- CPP/QPP and child benefits have become more redistributive over time as more individuals have become eligible for full pension benefits and as child benefit levels have increased and are targeted more to lower-income families.
- The redistributive importance of EI and, especially, social assistance has declined since the mid-1990s following program changes and declining benefit rates (Frenette, Green and Milligan 2009).
- Although the overall increase in redistribution through transfers from 1976 to 1993 reflects increases in redistribution across all transfer programs we examined, the decline in transfer redistribution since 1993 is associated mainly with reductions in redistribution through social assistance and EI.

The progressivity of taxes and transfers also plays an important role in redistributing income. Progressivity measures tell us how "targeted" a transfer or tax is toward particular segments of the income distribution. A progressive transfer provides more benefits to lower-income individuals, while a progressive tax imposes a higher tax rate on those with higher incomes. Indices of progressivity, both for the tax-and-transfer system overall and for individual taxes and transfers,

provide some interesting insights into the ways in which government redistribution has evolved since the mid-1970s:

- The level of progressivity of individual transfer programs differs widely, with social assistance being among the most progressive and EI among the least progressive of the programs we examined. Moreover, the level of progressivity of transfer programs has not changed much over the period, except for child benefits, which have become more progressive following changes in child benefit programs.
- The amount of redistribution a transfer program generates depends on the size (the average benefit rate) and progressivity of the transfer. The following three examples illustrate how this relationship works:
  - Even though the OAS/GIS program is slightly smaller in size than the CPP/QPP (in terms of average benefit rates), the OAS/GIS is more progressive and so it reduces income inequality more than the CPP/QPP does.
  - For a given average benefit rate, an increase in the progressivity of a transfer program can reduce inequality. Child benefits have become more redistributive over the period mainly because of an increase in the overall progressivity of child benefit programs.
  - But size also matters a lot. A highly progressive program can become less redistributive if the average benefit rate falls. Social assistance, which remained the most progressive transfer program throughout the period, moved from being one of the most redistributive programs to being the least redistributive as its average benefit rate declined substantially.
- Redistribution through the transfer system overall has been affected mainly by changes in the average transfer rate, not by changes in the progressivity of transfers.
- The average tax rate has fallen, especially since 2000, but the effect that this might have had on overall redistribution was reduced because the tax system has also become more progressive over the study period. Although average tax rates have fallen across the income distribution, they have fallen more at the bottom of the income distribution than at the top.

We should note, in conclusion, that transfers and taxes are designed with a number of objectives aside from their effect on aggregate income inequality. As

such, our analysis was not intended to be an evaluation of these programs. Nevertheless, we believe that measurements of program progressivity speak to issues of targeting and program size that could be useful in policy development and evaluation. For example, a consideration of the connection between progressivity and redistribution would help policy-makers determine where in the tax-and-transfer system a given-sized intervention would yield the greatest redistributive impact.

Appendix A: Measuring the Progressivity and Redistributive Effects of Taxes and Transfers

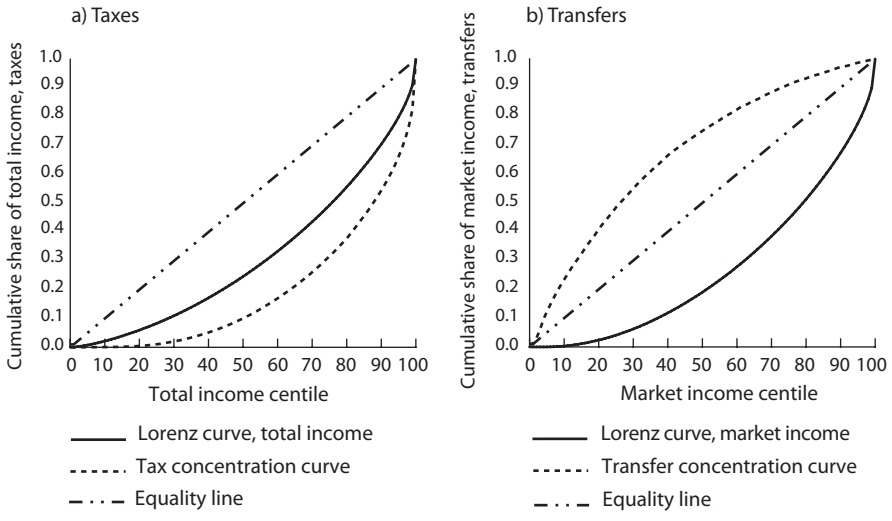
Tax indices

Kakwani (1977, 1984) defines progressivity as divergences from proportionality. As shown in figure A1a, Kakwani indicates that, if a tax is proportional, the tax concentration curve — the cumulative share of taxes paid by persons sorted by pre-tax income — coincides with the Lorenz curve for pre-tax income. If the tax is progressive, the tax concentration curve lies outside the Lorenz curve. Thus, Kakwani's first insight is that the area between the Lorenz curve for pre-tax income and the tax concentration curve represents a measure of tax progressivity. In figure A1a, the progressivity index is equal to twice the area between the concentration curve for taxes and the Lorenz curve for total income.

In algebraic terms, the progressivity of a tax (P_t) equals $C_t - G_T$, where C_t is the concentration coefficient (measured analogously to the Gini) of the tax:

$$P_t = C_t - G_T. \tag{4}$$

Figure A1
Progressivity index for taxes and transfers



To provide a numerical example of how this works, the Gini coefficient corresponding to figure A1a is twice the area between the Lorenz curve for total income and the equality line, which, in 2011, was 0.355. Analogously, the concentration index of taxes — the area between the tax concentration curve and the equality line — was 0.581. Thus, the progressivity index for taxes in 2011 was 0.226. All else being equal, an increase in the progressivity of taxes would shift the tax concentration curve further away from the equality line, which would increase the tax concentration index, and hence the progressivity index.

In Kakwani's measurement system, the progressivity index, P, is also related to R, the term that describes total redistribution. Intuitively, the size of the redistribution index, R, depends on the overall size of the tax or transfer benefit and on the progressivity with which those taxes or benefits are distributed. Referring first to taxes, the relationship between the amount of redistribution generated by a tax, R_t, the average size of a tax as a proportion of total income, t, and the progressivity of the tax, P_t, is approximately:

$$R_t \sim \frac{t}{1-t} P_t, \tag{5}$$

where

$$t = \frac{\sum taxes}{\sum total\ income.} \tag{6}$$

To continue with the numerical example from above, the average tax rate, t, for 2011 was calculated to be 0.161. The right side of equation (5) then would compute to $\frac{0.161}{1-0.161} \times 0.226 = 0.043$. As indicated in equation (5), the relationship is approximate, and the actual value of R_t for 2011 was 0.042.[19]

Transfer indices

Lambert (1985) and Kim and Lambert (2009) provide a similar framework for transfers.[20] Figure A1b shows the corresponding concentration curves for transfers. As before, if the transfer is proportional across the market income distribution, the concentration curve of the transfer lies on the same line as the Lorenz curve for market income. Given that income transfers are disproportionately delivered to lower-income recipients, the concentration curve for transfers lies above the Lorenz curve for market income — indeed, it lies above the "line of equality." The more progressive a transfer (here "progressive" also

means "reduces inequality"), the further from the market income Lorenz curve the concentration curve lies, providing a useful index for its progressivity (now using the subscript b for benefits):

$$P_b = G_M - C_b, \tag{7}$$[21]

$$R_b \sim \frac{b}{1+b} P_b \tag{8}$$

and

$$b = \frac{\sum transfers}{\sum market\ income.} \tag{9}$$

In figure A1b, the progressivity index is again equal to twice the area between the concentration curve for transfers and the Lorenz curve for market income.

Decompositions

Using the approximation provided in equation (8), we can then decompose changes in transfer redistribution between year (′) and year (″) using the equation

$$R'_b - R''_b = \frac{b'}{1+b'}(P'_b - P''_b) + P''_b \left(\frac{b'}{1+b'} - \frac{b''}{1+b''}\right). \tag{10}$$

In this simple decomposition, a change in the level of redistribution from benefits can be divided into a component associated with changes in progressivity — the first term on the right side of equation (10) — and a component associated with changes in the average benefits rate (the second term).

More generally, the variance of transfer redistribution over any period is due to the variance in benefit rates plus the variance in transfer progressivity plus twice the covariance in these terms. This can be demonstrated more formally by a variance decomposition suggested by equation (8). If we take the log transformation of equation (8), we can compute the components of the equation:

$$var(lnR_b) = var\left(ln\frac{b}{1+b}\right) + var(lnP_b) + 2 \times covar\left(ln\frac{b}{1+b}, lnP_b\right). \tag{11}$$

Similar decompositions can be done for redistribution from taxes.

Finally, we can define terms R_t, P_t, R_b and P_b for the full tax-and-transfer system, as well as for individual taxes and transfers (see Kim and Lambert

2009). For example, we can compute redistribution indices for child benefits by comparing the Gini of market income with the Gini of market income plus child benefits, and we can compute the progressivity index by comparing the Gini coefficient for market income with the concentration curve for child benefits. This approach allows us to define redistribution and progressivity indices for individual transfers and taxes.

A criticism of using the Kakwani approach for estimating the progressivity of individual taxes or transfers is found in Lerman and Yitzhaki (1985), who note that the results depend on the ordering of income sources. For example, one could compute the redistributive effect of a transfer, b, by comparing the Gini coefficient for market income, G_M, with the Gini coefficient for income after the transfer is added in (G_{M+b}), as we do in our main analysis, or by comparing the Gini coefficient for total income, G_T, with the Gini coefficient for total income after the transfer is subtracted out (G_{T-b}), or indeed some other ordering of transfers. Lerman and Yitzhaki develop an approach for estimating the marginal effect of a change in an income source on overall inequality. We conducted sensitivity analyses of our results with respect to the ordering of transfers and taxes, and found that this does not affect our results substantially (the results of these sensitivity analyses are available in Heisz and Murphy 2014).

Appendix B: Summary of Tax-and-Transfer Programs since 1976

In this appendix, we describe the taxes and transfer programs examined in the chapter, as well as some of the ways the programs have changed over the study period. Readers interested in more detail could refer to Davies (2013) or House of Commons (2013) or any of the references cited in this appendix.

The Canada Pension Plan/Quebec Pension Plan

The CPP retirement pension provides a monthly benefit to eligible Canadians. The QPP is an equivalent plan operated in Quebec. The standard age to begin receiving the pension is 65. The two plans were implemented in 1966, and the first cohort to receive full CPP/QPP benefits turned 65 in 1976. To qualify, recipients must have made at least one valid contribution to the plan. In this chapter, income from the CPP/QPP includes the disability benefit, the survivor's pension and the children's benefit. CPP/QPP benefits are taxable as income, and benefits are indexed to the Consumer Price Index (CPI). The rising importance of CPP/QPP income since 1976 is a result of more recent larger cohorts of elderly people replacing older cohorts and by a dramatic increase in the proportion of women receiving their own public pension benefits (Myles 2000). The CPP/QPP has changed little over the years, and the amount received from this pension plan has not changed substantially across cohorts (LaRochelle-Côté, Myles and Picot 2008).[22]

Old Age Security/Guaranteed Income Supplement

The OAS program is funded out of the general revenues of the federal government, so, unlike the CPP/QPP, recipients do not pay into it directly. It is available to most Canadians ages 65 and older,[23] and the payment amount is determined by the number of years of residency in Canada (after age 18). OAS is considered taxable income, and is subject to a recovery tax (clawback) if individual net annual income is higher than the income threshold in effect ($70,954 in 2013). The GIS is a nontaxable benefit for persons with low income, and the benefit amount is based on marital status and level of income. The GIS includes the Spousal Allowance, a benefit available to spouses or common-law partners ages 60 to 64 of GIS recipients, and the Allowance for the Survivor, a benefit available to people with low income, living in Canada, ages 60 to 64, and whose spouse or common-law

partner is deceased. OAS provided income to 96.5 percent of Canadians over age 64 in 2011. Aside from the introduction of the OAS clawback in 1989, which affects only a small proportion of seniors (Davies 2013), the OAS and GIS programs have not been affected by major policy changes in recent years, and benefits are CPI-adjusted every year (LaRochelle-Côté, Myles and Picot 2008).

Employment insurance

The EI program provides temporary financial assistance for individuals who are between jobs; who cannot work due to sickness, childbirth or parenting; and for those providing care to a family member who is gravely ill. It includes regular benefits, maternity and parental benefits, sickness benefits, compassionate care benefits, benefits for parents of critically ill children and fishing benefits. The EI program has undergone changes since the 1970s that have resulted in successive reductions in benefit levels and tightening of eligibility requirements (Finnie and Irvine 2011). Until 1996, "employment insurance" was named "unemployment insurance."

Social assistance

Social assistance consists of 13 different provincial and territorial systems for providing income of last resort. The systems differ across jurisdictions, but share a similar basic structure, such as providing for basic needs and imposing financial means tests. In the early 1990s, social assistance benefits declined following federal transfer reforms integrating the Canada Assistance Plan into the Canada Health and Social Transfer and the overhaul of welfare systems in several provinces (Frenette, Green and Milligan 2009), with the result that "eligibility rules have been tightened...and administrative procedures were toughened" (Banting 2005, 423). Following these changes, the use of social assistance declined (Finnie, Irvine and Sceviour 2005), and average benefit levels fell (Banting 2005).

Child benefit programs

Child benefit programs are intended to help cover the cost of child maintenance.[24] They comprise a set of federal and provincial programs that have undergone numerous changes over the past several decades. Those in place during our study period are as follows:

- 1976-92: the Family Allowance was a monthly program instituted in 1945 as a universal benefit. By the 1976-92 period, the Family Allowance was taxable, and by 1989 higher-income families were required to repay their benefits.
- 1978-92: the Child Tax Credit was a refundable tax credit provided through the tax system and incorporated a means test, ensuring more progressivity was built into the child benefit system.
- 1993-97: the Child Tax Benefit consolidated the Family Allowance and Child Tax Credit into a new monthly payment based on the number of children and level of family income. The means-tested Working Income Supplement provided an additional benefit to working families with children.
- 1998 to date: the Canada Child Tax Benefit replaced the Child Tax Benefit, and the National Child Benefit Supplement replaced the Working Income Supplement.
- 2006-14: the Universal Child Care Benefit was a taxable universal benefit provided to parents of children ages 0 to 6.
- 2007-14: a new Child Tax Credit was provided to families.

In the 2015 federal budget, the Universal Child Care Benefit was increased for children under age 6 and a smaller amount was extended for children ages 6 to 17. The enhanced Universal Child Care Benefit has replaced the Child Tax Credit.

In the SCF/SLID database, these programs are aggregated in one variable in all years, and disaggregated in separate variables from 1998 onward. The new Child Tax Credit is not included among child benefits in the SCF/SLID. Income from a number of provincial child benefit programs is also included in the SCF/SLID as part of an aggregated "provincial child benefits" variable, and it is included in "child benefits" in this chapter. Provinces have the flexibility to adjust social assistance benefits by an amount equivalent to the NCBS, which could contribute to the trends observed in social assistance and child benefits.

Other transfers

"Other transfers" includes a number of smaller transfers, plus the Working Income Tax Benefit, the GST credit, workers' compensation and provincial tax credits.

Personal income taxes

Changes to the personal income tax system that are likely to have affected the size and progressivity of taxes are summarized in Davies (2013). These include:

- tax reforms in 1987 that reduced the number of tax brackets from 10 to 3, with tax rates of 17, 26 and 29 percent, respectively, with the top tax bracket reduced from 34 percent; tax brackets were indexed to increases in the CPI only above 3 percent, so there was some indexation between 1987 and 1991, but not thereafter;
- the introduction of federal and provincial surtaxes, which bear most heavily on higher-income taxfilers, in the 1980s and their partial lifting in 1999 and 2000 (Frenette, Green and Milligan 2009);
- the reduction of provincial tax rates in every province between 1995 and 2000 (Frenette, Green and Milligan 2009);
- the reindexing of tax brackets in 2000; and
- the introduction in 2001 of an additional middle federal tax bracket and the reduction of the lowest federal tax rate from 17 percent to 16 percent, and a further reduction in 2005 to 15 percent.

Notes

1. Kesselman and Cheung (2006) describe redistribution through the tax system, but similar methods apply to understanding redistribution through the transfer system.
2. A recent study from the Parliamentary Budget Officer (Canada 2014) looks at the redistributive impact of tax and tax expenditure program changes between 2005 and 2013.
3. A period of overlap exists from 1993 to 1997, when both surveys were active. The SCF, which ended in 1997, was a cross-sectional survey conducted annually in April, collecting income data from the previous year. The number of households sampled in the SCF ranged from 12,000 to 14,000 in 1976, 1978, 1980 and 1983, and from 30,000 to 43,000 in other years. The SLID, which ended in 2011, was a longitudinal survey featuring six-year panels, with a new panel started every three years, and annual representative cross-sectional versions are produced to calculate annual income statistics. The sample sizes were about 17,000 households from 1993 to 1995 and expanded to about 34,000 households in 1996. We pooled annual data for 1993 to 1997, the period during which both the SCF and the SLID were active, with appropriate weights. The working paper version of this chapter (Heisz and Murphy 2014) contains a discussion of the appropriateness of using the SCF/SLID series for conducting distributional analyses.
4. To be clear, some of what we describe as "transfers" — for example, refundable tax credits such as the Canada Child Tax Benefit and the GST credit — are actually delivered through the tax system. Readers should be aware that, in some other studies, such as Milligan (2013), refundable tax credits are included as part of the tax system.
5. Statistics Canada, CANSIM database, table 202-0407.
6. In this chapter, we apply the most common adjustment method, which is to divide household income and its components by an adjustment factor equal to the value of the square root of n for a household of size n, and then assign this value to each individual in the household. This adjustment serves to distribute household income among its members, while also accounting for the fact that larger households can benefit from economies of scale and so need less income to achieve the same standard of living.
7. The SPSD/M is a static accounting model that processes each individual and family, calculates taxes and transfers using legislated or proposed programs and algorithms, and reports on the results (Bordt et al. 1990). The base data in the SPSD/M are derived from the SLID; to these are added administrative tax data, administrative data on EI recipients and data from the census and the Survey of Household Spending, among other sources.
8. The SPSD/M also allows us to include commodity and property taxes in the analysis, but we leave an analysis of the progressivity of the tax system including these components for further work. Murphy (1998) provides another example of using the SPSD/M to model taxes and transfers holding market income constant.
9. Davies (2013) comes to the same conclusion.
10. Brzozowski et al. (2010) come to similar conclusions regarding the comparative redistributive effects of tax and transfers, as well as the effects of social assistance, EI and child benefits on inequality.
11. This is not to say that child benefits did not increase over this period, only that total child benefits as a proportion of total market income did not increase.

12. Kakwani (1977, equation 3.8) indicates that the progressivity index of all taxes together equals the weighted average of the progressivity of the individual taxes (or transfers), with the weights equalling t_i/t, where i indexes individual taxes. This means that changes in the average tax rate affect the progressivity index of all taxes together. The same logic applies to transfers. Thus, there is an interaction between tax rates and progressivity that might be interesting to investigate further. Our investigations show that this effect is important, but it does not affect our conclusions regarding overall trends in total tax or transfer progressivity.
13. As of January 2015, the benefit has been increased to $160 per month for children under age 6. The program has also been extended to children ages 6 to 17, whose parents will now receive $60 per month.
14. In a separate analysis not included in this chapter, we estimate the net Universal Child Care Benefit assuming it is reduced at the average tax rate measured for each recipient, and find that the results presented in this section are not sensitive to this difference in taxation.
15. Data providing details on child benefits by program are available in the SCF/SLID series from 1998 onward. Earlier in the chapter, we showed that child benefits were the one transfer group that became more progressive over the study period. It would be interesting to investigate this further to see what factors might have underpinned the increase in progressivity, but details on transfers to children are available only from 1998 onward, prohibiting this analysis.
16. Our definition of taxes measures the largest and most progressive component of household taxes in Canada. Commodity taxes and property taxes are all more regressive, so changes in the GST and harmonized sales tax are not reflected in our estimates, although we do account for the GST credit. Detailed results for federal and provincial taxes are available from the authors.
17. The SPSD/M allows for the modelling of OAS/GIS less the OAS clawback on high-income recipients. As expected, the clawback increases the progressivity of the OAS by a small amount.
18. The average tax rate for a particular centile equals average taxes paid in that centile divided by average total income in that centile.
19. As discussed in Kakwani (1984) and Lambert (1985), the relationships in equations (6) and (9) are approximate, and in practice an extra term must be added to account for the reranking of observations. This reranking term is important though comparatively small, and we do not discuss it further, focusing our attention on estimates of R, R_t, R_b, P_t, P_b, t and b. Overall, our approach differs from that of Kim and Lambert (2009) in that they calculate postredistribution income as market income plus transfers, post-tax income as market income minus tax, and post-tax and redistribution income as market income plus transfers minus taxes (the difference is in the definition of post-tax income). Our preference is to relate t and P_t back to the tax redistribution as it is most commonly defined in the Canadian literature: $R_t = G_T - G_{AT}$ (for example, in Davies 2013; Heisz 2007; and Sharpe and Capeluck 2012).
20. A similar methodology, however, does not apply for total (transfers and taxes) progressivity. As described in this section, the index of progressivity relies on the computation of a concentration index, which requires the income component to be non-negative. This would not be the case for a large part of the distribution of transfers less taxes.
21. C_b equals twice the area between the transfer concentration curve and the equality line. C_b is negative when the concentration curve is above the equality line.
22. In 1997, the CPP and QPP were reformed, reducing benefits slightly (Davies 2013).
23. Starting in April 2023, the age of eligibility for OAS/GIS will gradually increase from 65 to 67 over six years, with full implementation by January 2029.
24. This section draws on National Child Benefit (2006).

References

Banting, K.G. 2005. "Do We Know Where We Are Going? The New Social Policy in Canada." *Canadian Public Policy* 31 (4): 421-30.

Beach, C.M., and G.A. Slotsve. 1996. *Are We Becoming Two Societies? Income Polarization and the Myth of the Declining Middle Class in Canada*. Toronto: C.D. Howe Institute.

Bordt, M., G. Cameron, S. Gribble, B. Murphy, G. Rowe, and M. Wolfson. 1990. "The Social Policy Simulation Database and Model." *Canadian Tax Journal* 38 (1): 48-65.

Brzozowski, M., M. Gervais, P. Klein, and M. Suzuki. 2010. "Consumption, Income, and Wealth Inequality in Canada." *Review of Economic Dynamics* 13: 52-75.

Canada. 2014. Office of the Parliamentary Budget Officer. *Revenue and Distribution Analysis of Federal Tax Changes: 2005-2013*. Ottawa: Office of the Parliamentary Budget Officer.

Canada Revenue Agency. 2015. "Child Tax Benefit (CCTB) Payment Amounts Tax Years 2011 to 2013." Accessed May 21, 2015. http://www.cra-arc.gc.ca/bnfts/cctb/cctb_pymnts_prv-eng.html

Davies, J.B. 2013. *Redistribution of Income: Policy Directions*. School of Public Policy Research Papers 6 (23). Calgary: University of Calgary.

Finnie, R., and I. Irvine. 2011. "The Redistributional Impact of Canada's Employment Insurance Program, 1992-2002." *Canadian Public Policy* 37 (2): 201-18.

Finnie, R., I. Irvine, and R. Sceviour. 2005. *Social Assistance Use in Canada: National and Provincial Trends in Incidence, Entry and Exit*. Analytical Studies Branch Research Paper 245. Ottawa: Statistics Canada.

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.

———. 2009. "Taxes, Transfers and Canadian Income Inequality." *Canadian Public Policy* 35 (4): 389-411.

Heisz, A. 2007. *Income Inequality and Redistribution in Canada: 1976 to 2004*. Analytical Studies Branch Research Paper 298. Ottawa: Statistics Canada.

Heisz, A., and B. Murphy. 2014. *The Role of Taxes and Transfers in Reducing Income Inequality*. Ottawa: Income Statistics Division, Statistics Canada.

House of Commons Canada. 2013. Standing Committee on Finance. *Income Inequality in Canada: An Overview*. Ottawa: House of Commons.

Kakwani, N. 1977. "On the Measurement of Tax Progressivity: An International Comparison." *Economic Journal* 87 (345): 71-80.

———. 1984. "On the Measurement of Tax Progressivity and Redistributive Effect of Taxes with Applications to Horizontal and Vertical Equity." *Advances in Econometrics* 3: 149-68.

Kenworthy, L., and J. Pontusson. 2005. "Rising Inequality and the Politics of Redistribution in Affluent Countries." Luxembourg Income Study Working Paper 400. Luxembourg: LIS.

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

Kim, K., and P. Lambert. 2009. "Redistributive Effects of U.S. Taxes and Public Transfers, 1994-2004." *Public Finance Review* 37 (1): 3-26.

Lambert, P.J. 1985. "On the Redistributive Effect of Taxes and Benefits." *Scottish Journal of Political Economy* 32 (1): 39-54.

LaRochelle-Côté, S., J. Myles, and G. Picot. 2008. *Income Security and Stability during*

Retirement in Canada. Analytical Studies Branch Research Paper 306. Ottawa: Statistics Canada.

Lerman, R.L., and S. Yitzhaki. 1985. "Income Inequality Effect by Income Source: A New Approach and Applications to the United States." *Review of Economics and Statistics* 67 (1): 151-6.

Milligan, K. 2013. *Income Inequality and Income Taxation in Canada: Trends in the Census 1980-2005*. School of Public Policy Research Papers 6 (24). Calgary: University of Calgary.

Murphy, B. 1998. "The Impacts of Changing Tax/Transfer Systems on the Lifetime Distribution of Net Taxes: 1984 to 1995." In *Government Finances and Generational Equity*, edited by M. Corak. Ottawa: Statistics Canada.

Musgrave, R.A., and T. Thin. 1948. "Income Tax Progression, 1929-48." *Journal of Political Economy* 56 (6): 498-514.

Myles, J. 2000. "The Maturation of Canada's Retirement Income System: Income Levels, Income Inequality and Low Income among the Elderly." *Canadian Journal on Aging* 19 (3): 287-316.

National Child Benefit. 2006. "The National Child Benefit Progress Report: 2006." Accessed May 14, 2015. http://www.nationalchildbenefit.ca/eng/06/chap1.shtml

Reynolds, M., and E. Smolensky. 1977. *Public Expenditure, Taxes and the Distribution of Income: The United States, 1950, 1961, 1970*. New York: Academic Press.

Sharpe, A., and E. Capeluck. 2012. *The Impact of Redistribution on Income Inequality in Canada and the Provinces*. CSLS Research Report 2012-08. Ottawa: Centre for the Study of Living Standards.