

**SHARING THE WEALTH FROM GROWTH:  
COMPARING THE CANADIAN AND US EXPERIENCES**

By

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## Abstract

The purpose of this paper is to compare Canadian and US performances with respect to economic growth and inequality. We find that Canada, with little economic growth in the past two decades (in fact, negative in the most recent decade), has had an increase in inequality of market income (in the absence of government taxes and money transfers), but almost no increase in inequality of after-tax incomes (after deducting taxes and adding money transfers). This experience is remarkably different than that of the United States. The United States has grown more quickly than Canada but inequality in income in that country has increased on both market income and an after-tax income basis. In fact, the increase in inequality in market income was similar in the United States as in Canada, even though inequality is greater in the United States.

We find that after accounting for time trends, average market income and inequality are negatively correlated in both Canada and the US, while after-tax income and inequality are negatively related in Canada and positively related in the US. Tests suggest that changes in market income are “Granger causing” changes in market income inequality in Canada

Although the above suggests that one of the major differences in Canadian and US experiences is that Canadian governments have been more “equalizing” than US governments, a number of factors should be considered when analyzing the data. We discuss how policy and non-policy factors need to be explored further to understand better the relationship between economic growth and inequality.

## I. Introduction

The relationship between economic growth and inequality is of great concern for policymakers. Per capita income provides a measure of the income available to the average citizen, while the distribution of income among members of society serves as a measure of the relative economic position of citizens and social justice. The purpose of this paper is to compare the trends for Canada and the United States in growth in income and economic inequality, measured in terms of the absence (market income) and presence (after-tax income) of government.

Market income inequality in both Canada and the United States is rising. In 1979, inequality of incomes, measured conventionally by the “Gini coefficient”<sup>1</sup> before taxes and government transfers for families and individuals, was 0.436 in Canada and 0.453 in the United States. By 1997, the value of this popular measure of inequality jumped to 0.495 in Canada and 0.504 in the United States, indicating greater inequality in both countries. However, when government transfers are added to income and taxes are subtracted, the picture is quite different. The Gini coefficient based on after-tax income had virtually remained the same in Canada during the 1980s and 1990s, while in the United States, it rose from 0.363 in 1979 to 0.412 in 1997. Given this fact, the more progressive Canadian tax-transfer system is a primary reason for this difference in experience between the two countries.

In terms of economic performance, there seems to be a more consistent story. Comparing the 1980s’ average with that between 1990 and 1997, market income and after-tax income, adjusted for family unit size, remained almost unchanged in real terms in Canada, while in the United States both measures rose. Other economic indicators, such as real GDP per capita growth, productivity, and unemployment, also show that the Canadian economy underperformed relative to its neighbour in the south. Depending on

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<sup>1</sup> For a lucid discussion of measures of inequality, see Sen (1973). As defined later in the text, the Gini coefficient is only one of several possible measures. Generally, a measure of inequality should satisfy several axioms, including comparing every pair of outcomes of all members of society and being sensitive to transfers from richer to poorer members of society. Some measures, such as comparing the highest to lowest per capita incomes, violate reasonable axioms for developing a measure of inequality.

the income definition used, this description can point either to a negative relationship between growth and inequality or to no relationship at all.

As stated above, this paper examines the relationship between economic growth and income inequality in Canada and the United States during recent decades. To this end, we consider different measures of income and income inequality, and we apply econometric analysis. The rest of the paper is organized as follows. In section II, we review the literature on the relationship between growth and inequality. In section III, we describe the trends in Canada and the United States, and in section IV we discuss the relationship between growth and inequality in the two countries. In the last section, we offer our conclusions.

This paper is very much a preliminary step in the analysis of a complicated issue. While we look for explanations of the difference between US and Canadian trends, further research will be required to explain these trends fully. In addition to earlier work (for example, Blackburn and Bloom 1993; Dinardo and Lemieux 1997; and Freeman and Needles 1993), recent work comparing inequality in the United States and Canada on a regional basis (Wolfson and Murphy 2000; Osberg (2000) and wage inequality among males in the two countries (Donald et al. 2000) is an important step in this direction. We suggest several other important hypotheses to consider.

## **II. A Review of the Literature**

Recent literature that has stressed the relationship between growth and inequality has focused on whether inequality hampers growth or growth results in more inequality.<sup>2</sup> It is important to recognize, as many researchers have done, that growth and inequality are both endogenous variables that depend on a number of exogenous influences, including non-policy factors (such as demographic and social trends) and policy factors (education, land reform, etc.).

### *Growth's Impact on Inequality*

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<sup>2</sup> For example, see the survey by Aghion, Caroli and GarcPa-PeZalosa (1999).

Economists have contrasting views on the relationship between economic growth and income inequality. Some argue that rapid growth leads to a widening income gap while others argue that it reduces such gaps. The argument that growth leads to more inequality is based on several hypotheses, including the following two leading ones.

The first is that the adoption of most technologies, including information technology, tends to favour the demand for highly paid skilled labour. Skilled labour is complementary to the use of technology and, with a growing economy resulting from technological change, the incomes of skilled workers are bid up relative to those of unskilled workers. The demand for unskilled workers is less favoured since technological change leads to a substitution of these workers for capital and skilled labour, even though general growth in the economy could lead to a demand for the services of unskilled workers. Thus, under this scenario, technological change that favours skills-intensive labour leads to greater economic inequality.

The second hypothesis is that greater economic integration at the international level improves economic growth prospects, as economies are able to reap economic gains from increased trade, including the transfer of technology from abroad. However, with economic integration, countries will specialize in the production of goods and services that rely on their most abundant factors. Thus, industrial economies will specialize in the production of skills-intensive goods while developing economies will specialize in less skills-intensive production. Thus, with falling barriers to trade, businesses can more easily shift low-cost production to low-wage economies. The forces of globalization result in greater economic inequality in industrialized economies as the demand for low-skilled workers declines relative to that for skilled labour, whose wages then adjust upward.<sup>3</sup>

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<sup>3</sup> A variant of the globalization effects is taking into account intermediate goods, such as forest and mineral products and manufacturing goods, that may be complementary in demand for skilled labour and substitutes for unskilled labour. If increased economic integration results in greater competition for intermediate goods, the prices of such goods will fall in international markets. This could result in a decrease in the demand for unskilled relative to skilled workers, thereby leading to greater inequality in an industrial economy.

Although these arguments suggest that economic growth results in greater economic inequality, several counteracting forces suggest otherwise.

First, greater growth may simply reduce unemployment rates and, therefore, income inequality.

Second, increased wages for skilled labour encourage individuals to invest in education. Thus, rising wages are accompanied by an increase in the supply of human capital so that the number of unskilled workers declines in the economy. In turn, the decline in unskilled workers bids up the wages of unskilled workers, resulting in greater per capita incomes with little change in inequality.

Third, governments play an active role in redistributing income from the rich to the poor. Thus, economic growth, resulting in higher incomes, also means higher taxes (due to the progressivity of the tax system) and more transfers paid to support the poor. This can reduce inequality, rather than increase it.

Simon Kuznets (1955) looked at the experience of the United States, England and Germany. He found that, at the early stages of development, inequality rises as the shift takes place from low- to high-productivity jobs. As development enters a later stage, high-productivity sectors tend to be the dominant job providers, and inequality falls. This inverted U-shaped relationship, known as the Kuznets curve, explains the experience in many developed countries until the 1970s. Since then, however, inequality has been trending upward, in contrast to what the Kuznets curve predicts. An examination of 30 years of data covering both rich and poor countries leads Deininger and Squire (1997) to conclude that the data do not support the existence of the Kuznets Curve, although they note that 30 years might not be long enough for the curve to take effect. They also find that the number of cases where periods of rapid growth are associated with an increase in inequality almost equals the number of cases where the opposite is true. The authors further find that, in periods of overall growth, the income of the poorest quintile tends to rise. Thus, their findings do not support the notion that growth leads to greater inequality.

In Canada, there is empirical evidence that inequality rises with unemployment and the proportion of part-time workers, and that a rising participation rate reduces it.<sup>4</sup>

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<sup>4</sup> See Sharpe and Zyblock (1997); Buse (1982); McWatters and Beach (1990); and Richardson 1994.

There is also evidence, however, in both Canada and the United States, that the link between improved macroeconomic conditions and lower poverty rates has been weakening.<sup>5</sup> Explanations suggested for this phenomenon include the increase, since the late 1970s, in the proportion of single-parent families, who demonstrate weak labour force attachment, and a decrease in the relative wages of the low skilled.

### *Inequality's Impact on Growth*

So far, we have discussed the impact of economic growth on income inequality. However, inequality itself can have an impact on rates of economic growth. Alesina and Perroti (1996) advance the argument that high-income inequality can result in political instability, which, in turn, results in macroeconomic instability that reduces the incentive to invest and, therefore, impedes economic growth. The political economy argument can also be used to suggest that inequality reduces growth (Alesina and Rodrick 1994; Persson and Tabellini 1994). With high-income inequality, the median voter elects a government that implements more redistributive policies and sets higher tax rates. The high tax rates reduce the incentive to work and invest and therefore reduce growth. However, Saint-Paul and Verdier (1993) use the same political economy argument to show that inequality can have a positive effect on growth. Redistribution by government, including investment in public education, increases the skills level of the work force, and this contributes to economic growth. Credit markets also play a role. As a result of the inability to borrow money to fund micro-investments or education, lower-income individuals have insufficient resources to make investments that could provide high returns. Matsuyama (2000) — and, along similar lines, Lloyd-Ellis and Bernhardt (2000) — show that there are two possible outcomes for economies when individuals are constrained in their borrowing.

Suppose an economy is at a low stage of development. Wealthier and more able entrepreneurs are able to accumulate wealth and invest in projects that earn economic rents. Eventually, the wealthy are constrained to invest in new projects and must borrow

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<sup>5</sup> See Zyblock and Lin (1997).

from lower-income households. If interest rates (or wages) rise, low-income households become wealthier through greater income from their own savings (or work effort). If interest rates (or wages) rise sufficiently, inequality eventually declines, as predicted by the Kuznets curve. However, if interest rates (or wages) rise only a little or not at all, inequality remains a permanent feature of a market-based economy.

The credit-rationing argument, which suggests there is no tradeoff between inequality and growth, has important implications for policy. Arguably, those policies that decrease inequality by providing more resources to the poor could improve economic growth rates in the economy. As a counter to this argument, however, the provision of public support could deter individuals from seeking high-return activities if that support causes inefficiencies by encouraging recipients to invest in poor economic activities or not at all. In this case, a reduction in inequality may cause less economic growth.

The empirical findings on the impact of inequality on growth are somewhat contradictory. Most recent studies have included a measure of inequality as an explanatory variable in a growth model. Bénabou (1996) reviews 23 studies that examine the relationship between inequality and growth or investment. He concludes that initial inequality impairs growth, and that countries with substantial income inequality tend to have lower growth rates. This conclusion is supported by Tanninen (1999), who finds that a reduction in measured income inequality today will increase the average yearly growth rate during the next one or two decades. In contrast, Forbes' (2000) empirical findings support a positive and significant relationship between growth and inequality in the short and medium term. Forbes explains the difference between her findings and those of others by claiming to have an improved data set that reduces measurement errors and allows for estimation using a panel technique, which means that country-specific shocks can be more easily incorporated into the analysis.

### **III. Recent Experience in Canada and the United States**

Canada and the United States are relatively similar in terms of their market orientation, wage-setting process, and social trends. Some differences between the two countries



exist, however, including their process of integrating immigrants, the extent of their social programs, and their relative macroeconomic performance. These factors, as well as the fact that the two countries are each other's largest trading partners, make the comparison between them very appealing.

Before getting into our analysis, we should first explain and define our measures of inequality and growth, and then show the trends in the two countries. As a caveat, we stress that data constraints allowed us to examine only a limited number of years. However, the relationship between inequality and growth tends to be a long-run issue, which is more properly addressed with a longer time series. Nonetheless, many observers have commented that inequality has risen in the past decade or so in the presence of greater incomes. We will look at the data to see if this conclusion is borne out.

### *Measuring Inequality*

Researchers use several measures of income inequality. The most popular is probably the Gini coefficient. To explain how it is calculated, we first need to introduce the Lorenz curve (Figure 1), which shows the percent of cumulative income held by any given cumulative percent of the population. A perfectly egalitarian society has an income distribution described by a straight 45-degree line coming out of the origin. The Gini coefficient measures the distance between the Lorenz curve and the 45-degree line. It is defined as the area between the 45-degree line and the Lorenz curve divided by the area under the 45-degree line. Higher values for the Gini coefficient indicate a greater distance and therefore greater inequality. At one extreme, perfect inequality, the coefficient has a value of 1. At the other extreme, perfect equality, the coefficient equals zero.

As mentioned earlier, the Gini coefficient makes pair-wise comparisons of all members of society. It is also sensitive to transfers of income from rich to poor in that the coefficient declines in value when such transfers are made. There are, however, at least four limitations to the Gini coefficient as a measure of income inequality. First, as Sen (1973) points out, the coefficient is not sensitive to income levels but, instead, depends on

the number of people at each income level. Second, growth itself can cause the coefficient to change in value as people bunch up at different income levels (Petersen 1979). Third, the coefficient is very sensitive to the middle of the income distribution (Wolfson 1997). Fourth, income does not include in-kind government transfers that could result in a lower value when considering both taxes and transfers.

Another measure of income inequality is the ratio of the average income of people in the top quintile to the average income of those in the bottom quintile. While the Gini measure is sensitive to the middle of the income distribution, this measure is very sensitive to the tails of the income distribution. It is, however, a poorer measure of inequality since it ignores the inequality of income at other quartiles and is much more sensitive to business cycles. Nonetheless, the quintile ratio, due to its relative simplicity, is appealing to the public.

Our analysis focuses on the Gini coefficient and the quintile ratio, but there are also other measures of income inequality, such as the variance of the logarithm of income, the coefficient of variation, and the Theil-Bernoulli and Atkinson measures.

### *Measuring Economic Growth*

Economic growth is most often measured by the annual percent change in real gross domestic product (GDP). Our analysis, however, focuses on the average real income of the population. When presenting these income trends, we adjust for family size by dividing average income by the square root of the size of the family unit (rather than by the family unit size) in order to account for economies of scale that exist when family members share expenditures such as housing costs.<sup>6</sup>

While we were able to adjust income for changes in family unit size using the published data, we did not make such an adjustment for the inequality measures. Adjusting for family unit size results in somewhat different inequality levels. Wolfson and Murphy (2000) show that such an adjustment reduces inequality measures in both Canada and the United States, implying that larger families tend to have a higher income.

But they also show that adjusting for family size does not alter inequality trends in the two countries. This finding, and the fact that changes in family unit size were almost identical in Canada and the United States over the sample period, with a correlation coefficient between them of 0.9, indicates that the relevance of our analysis would be little affected.

We chose real income as a measure for economic growth and well-being, rather than real per capita GDP growth, for several reasons. First, the Gini coefficients and income are calculated from the same survey, so the correspondence of the data is therefore better. Second, income in levels is less sensitive to business cycles than real per capita GDP growth. This is partly because labour market wages and salaries do not fall as much in the face of a general macroeconomic downturn, as measured by the level of real GDP, and because growth rates are always more volatile than levels. The use of real income as a variable instead of growth rates means that no smoothing procedures, which reduce the number of observations, were needed. Third, although after-tax income should, in principle, include the value of in-kind public services as well as money transfers as stated above, GDP is not necessarily an improvement. GDP includes government expenditures but these are measured in terms of inputs at cost rather than at the value as output.<sup>7</sup> Finally, using average income in levels is consistent with social welfare functions that take average income and its distribution among members of society into account.<sup>8</sup>

### *Data*

Statistics Canada's Survey of Consumer Finances (SCF) provides data on different measures of income. It is an annual sample survey of households, and contains the

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<sup>6</sup> Another way of adjusting for family size and composition is by using adult equivalent scales. For a discussion of such scales, see Deaton and Muellbauer (1982).

<sup>7</sup> For example, a more efficient government will have lower costs, even though output does not change, which will decrease GDP per capita. This could falsely indicate a fall in the standard of living.

<sup>8</sup> For a discussion of social welfare functions and inequality, see Deaton and Muellbauer (1982).

longest consistent series of income and income inequality in Canada.<sup>9</sup> Unfortunately, the survey concluded with the 1997 data and was replaced by the Survey of Labour and Income Dynamics (SLID) in 1998. To keep our data series consistent, we chose not to use the 1998 data in our analysis. In the United States, the Bureau of Labor Statistics' March Current Population Survey (MCPS) is the main source for detailed information on income and its distribution. It provides data on 15 different definitions of income covering the 1979–99 period.<sup>10</sup> The Appendix provides a detailed breakdown of the items included in each definition of income, and shows how we estimated comparable after-tax income and inequality measures for Canada and the United States using the published data. Here, it is sufficient to say that our estimation method should not change the trends that are the focus of our analysis.<sup>11</sup>

### *Describing the Trends*

Figure 2a shows the Gini coefficients in Canada for the two definitions of income. Since the US data begin in 1979 and the Canadian data end in 1997, we focus on the 1979–97 period for comparison purposes. In Canada, the Gini coefficient on market income increased by 13.5 percent, from 0.436 to 0.495, while the coefficient on after-tax income increased by only 2.3 percent.

Figure 2b shows what happened to our other measure of inequality, the quintile ratio (QR). The ratio increased from 19.9 to 24 (20.8 percent) for market income, but decreased from 8.1 to 7.6 (6 percent) for after-tax income, implying a reduction in inequality. We also observe greater variability in the QR for market income. This occurs mainly due to the sensitivity of the bottom quintile to business cycles as the market incomes of those entering unemployment drop more than their total money and after-tax incomes. The Gini coefficient is also sensitive to business cycles. Hence, one might

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<sup>9</sup> For detailed description of this survey, see Statistics Canada, *Income Distribution by Size in Canada, 1997*, cat. 13-207-XPB

<sup>10</sup> Data for total market income for 1967–99 is also publicly available. However, it is not consistent with data on the other income definitions. For more detail on the MSCP, see Internet website: [www.bls.census.gov/cps/ads/adsmain.htm](http://www.bls.census.gov/cps/ads/adsmain.htm)

want to compare inequality between years of similar levels of unemployment. In Canada, unemployment in both 1979 and 1989 was 7.5 percent.<sup>12</sup> The Gini coefficient on market income in 1979 was 0.436, and by 1989 it had climbed to 0.461. Similarly, in both 1986 and 1996, unemployment in Canada was at 9.6 percent. The Gini coefficient rose from 0.467 to 0.498 between those years. The upward trend in market income inequality, therefore, cannot be fully explained by the cyclical behaviour and upward trend of unemployment in Canada.

The US trends are shown in Figures 3a and 3b. Here again, we focus on the 1979–97 period for comparison purposes.

Inequality in the United States rose steadily for both definitions of income. The Gini coefficient on market income increased by 11.3 percent, from 0.453 to 0.504, and on after-tax income by 13.5 percent, from 0.363 to 0.412. The QR ratio also shows an upward trend. For market income, the ratio increased from 41.3 to 55.7 (35 percent) and for after-tax income it rose from 8.4 to 9.8 (17 percent). It is interesting to note that in 1998 and 1999, years of spectacular economic growth in the United States, inequality measures for market income fell (see Appendix Table 1 for figures showing the entire sample period). The 1986 drop in inequality on after-tax income has to do with the fact that, as explained in the appendix, after-tax income deducts taxes on capital gains but does not include the capital gain itself. Since most realized capital gains are earned by high-income earners (see Mintz and Wilson 2000), the rich pay more capital gains taxes. This reduces the after-tax income inequality in 1986, a year in which the average realized capital gain is the highest in the sample.<sup>13</sup>

To take into account the effect of business cycles, as measured by the unemployment rate, we look at inequality in 1979, 1990, and 1995, since unemployment was at similar levels in those years: 5.8 percent in 1979 and 5.6 percent in both 1990 and 1995. The Gini coefficient on market income for those years was 0.453, 0.48, and 0.503,

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<sup>11</sup> We thank Charles Nelson of the Division of Income, Poverty and Health Statistics in the United States for discussing this with us.

<sup>12</sup> In this paper, we use figures from OECD Labour Force Statistics (2000).

<sup>13</sup> An upcoming capital gains tax reform induced many to realize their capital gains.

respectively. Hence, here too the cyclical behaviour of the unemployment rate by itself does not explain the upward trend in US market income inequality.

Overall, inequality is greater in the United States than in Canada. And, as expected, in both countries, income inequality is lower when government transfers and taxes are included in the income definition. However, a striking difference between the two countries arises when we look at the impact of taxes and transfers on inequality over time. Both countries show an upward trend in inequality based on market income, but while in the United States the same upward trend took place for inequality based on after-tax income, this did not happen in Canada. Looking more closely, it appears that, in Canada since the mid-1980s, when the trend for after-tax income inequality became slightly different than that of market income inequality, government transfer payments and the tax system grew more efficient in fighting inequality every year. This was not true for the United States, the difference possibly being accounted for by the fact that Canada's tax-transfer system has a higher degree of progressivity than that in the United States.

Other explanations for the higher inequality in the U.S. relative to Canada include stronger unions and higher post-secondary graduation rates in Canada.<sup>14</sup> Stronger unions reduce inequality more efficiently by bargaining higher wages for employees on the account of employers. Higher post-secondary graduation rates reduce skill-related wage premiums by increasing the relative supply of the skilled. Reducing the skill-related wage premium is equivalent to reducing skill-related inequality.

Our above results are for families and unattached individuals in Canada and for households in the United States,<sup>15</sup> whether employed or not, males and females, since our focus is on the general population. Other studies have focused on individual income earners, the working age population, and gender differences,<sup>16</sup> but they, too, generally bear out our main conclusion that inequality is higher and has been rising faster in the

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<sup>14</sup> See Bar-or et al. (1995), Dinardo and Lemieux (1997), Donald et al. (2000), Freeman and Needles (1993).

<sup>15</sup> There are some differences between the SCF's definition of families and unattached individuals and the MCPS's definition of a household. Nevertheless, these differences are not significant enough to have an impact on overall trends. The exact definitions are shown in the appendix.

United States than in Canada. It is worth mentioning, however, that income inequality among Canadian females has generally been falling, while inequality among males has been rising.

We now turn to a description of income trends in the two countries. As mentioned earlier, we adjusted the income figures for family unit size and economies of scale. To account for inflation, we deflated the figures by the consumer price index (CPI) in both Canada and the United States. As Figures 4 and 5 show, incomes in the United States have trended upward since 1981, but in Canada market incomes and after-tax incomes have, on average, remained quite flat. Fortin (1999) explains the Canada-US income growth gap by noting Canada's lower productivity, private income retention rate, employment rate, and terms-of-trade effects.

#### **IV. The Relationship between Inequality and Growth**

The lower inequality and average incomes in Canada than in the United States may suggest a negative relationship between inequality and growth. This proposition is much more appealing when we limit the comparison to after-tax income. On the other hand, looking at market income, it is much harder to argue that a negative relationship exists between inequality and growth. In both countries, market income inequality has been rising despite lower income growth in Canada. Closer examination of this relationship is therefore required.

##### *Correlation and Granger Causality*

One simple way to examine the relationship between income and income inequality is to look at its correlation. Since our inequality measures are not adjusted for family unit size,

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<sup>16</sup> See Blackburn and Bloom (1993); Beach and Slotve (1996); Picot (1997); Finnie (1997); Wolfson and

we use non-adjusted real income figures. The correlation coefficients are shown in Table 1. A quick test is to consider a correlation coefficient greater than 0.5 as statistically significant. Based on this benchmark, we can conclude that, when the correlation is statistically significant, it is negative in Canada — meaning that, on a year-over-year basis, higher income is associated with lower inequality. In contrast, on the same year-over-year basis, higher income is associated with higher inequality in the United States. Caution is called for, however, since, as the table shows, changing the sample period alters some of the results. This is particularly true for market income and inequality for which a non-significant correlation is shown for the 1971–97 period, but a significant negative correlation is shown for the 1979–97 period. The scatter plot presented in Figure 6 sheds some light on this: observations for 1971–75 “stand out” and are clearly influential outliers.

Furthermore, regressing the inequality measure on average income and a time trend, we find that the positive correlation between market income and inequality in the US is in fact spurious. As Table 2 shows, the coefficient on average market income in this case is significant and negative. Repeating this exercise for the other definition, after-tax income, and for the Canadian data, we find that the interesting difference between Canada and the US remains true for after-tax income. The relationship between after-tax income and inequality is negative in Canada but positive in the US.

Correlation, however, does not imply causation. Causation running from inequality to growth has been the focus of many studies, which we mention in section II. In this paper, given our data set that covers a relatively short period, it is appropriate to test causation running from average income to inequality. For this purpose, we chose to run the Granger causality test.<sup>17</sup> This test concludes that causation is present when past variations in one variable can explain current variations in another variable. The test is conducted by running an autoregression of Y, where Y is regressed on its own past values, and an autoregressive distributed lag model, where Y is regressed on both its own past values and past values of X. Then, using the F-statistic, we can determine whether one of the coefficients on the past values of X is different from zero. If at least one

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Murphy (1998; 2000).



coefficient is different from zero, it implies causation, and we then go to the next step to see whether there is a third variable causing variations in both Y and X. This is done by repeating the above procedure, this time with X being the dependant variable and Y being the independent variable. If the results imply that X is causing Y and Y is causing X, then we conclude that a third variable is playing a role and no Granger causality is present. However, if the results imply that X is causing Y but Y does not cause X, then we can conclude that X is “Granger causing” Y.

Before presenting the results, it is perhaps worthwhile to mention that stationary data are not a requirement when running the Granger test and we therefore see no reason to detrend the data. In fact, it is inadvisable to detrend the data when the objective of the test is to determine how variables relate to each other.<sup>18</sup> The results of the Granger tests are shown in Table 3.<sup>19</sup> The test indicates that, in Canada, market income is a source of Granger causation for the Gini coefficient. This result is true whether we use the full sample of 1971–97, or the 1979–97 sample. It is also quite robust with respect to changes in the number of lags used.<sup>20</sup> Table 3 also shows evidence that after-tax income causes, in Granger’s sense, the Gini coefficient. Given the negative correlation between income and the Gini coefficient in Canada, one might conclude that higher income reduces inequality. Caution is called for, though, since the Granger causality result for after-tax income does not hold for the 1979–97 period. In contrast, the US results do not show Granger causality running from average income to our measures of inequality no matter what income definition is used.

## Conclusion

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<sup>17</sup> Introduced in Granger (1969).

<sup>18</sup> Sims (1972) is a classic paper looking at causation running from one non-stationary series to another: money supply to GNP.

<sup>19</sup> The table shows results for the test of causation running from income to inequality. When the results were significant, we ran the test using income as the dependant variable and found no evidence of causation running from inequality to income.

<sup>20</sup> Pindyck and Rubinfeld (1998) advise checking whether the choice of lags alters the result.

This paper has focused on general trends in income and income inequality in Canada and the United States. The commonly held view that both income and income inequality are higher and are rising faster in the United States than in Canada appears to be true, although both countries have seen similar increases in market income inequality. It is thus wrong to use the Canada-US experience as evidence of a negative relationship between growth and inequality.

Overall, there seems to be a negative year-over-year correlation between income and income inequality in Canada while a positive correlation exists in the United States when after-tax income is considered. Evidence supporting the existence of Granger causality between income and income inequality in Canada suggests that variations in income precede variations in income inequality.

Several important exogenous factors influence both income and income inequality. Recent trends in some of these factors in both countries suggest that government transfers and taxes, union coverage rates, and education can explain some of the Canada-US differences. However, further research is needed to explain more fully the differences in the levels of and growth rates in income and income inequality as well as the differences in the relationships between the two variables. Demographic trends, types of jobs held, technological changes and international trade are some of the exogenous factors that can shed more light on these differences.

## **Appendix: Definitions of Income**

*Canada: Survey of Consumer Finances (SCF)*<sup>21</sup>

*Transfer payments* include employment insurance, old age security, the Canada and Quebec Pension Plans, guaranteed income supplement and the spousal allowance, child

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<sup>21</sup> Taken from Statistics Canada's Income after-tax, distributions by size in Canada, 1994 Cat 13-210-XPB.

tax benefits, other child credits or allowances, social assistance coming from provincial and municipal programs, workers' compensation benefits, GST/HST credits, and provincial and territorial tax credits.

*Total money income* includes wages and salaries, net income from self-employment, investment income (excluding realized capital gains), government transfer payments, pensions and miscellaneous income.

*Income tax payable* for year *t* is the sum of provincial and federal income tax on income and realized *capital gains* earned in year *t*. Provincial tax credits, the child tax credit, and the goods and services tax credit have not been deducted from income tax payable since they were added as part of transfer payments. The value of the Quebec Abatement for residents of Quebec has been removed from income tax payable.

*After-tax income* is simply total income minus income tax payable. Payroll taxes are not subtracted here since the SCF does not include them in its published figures. The other discrepancy here is that capital gains taxes are subtracted while capital gains are not included in income. The reason capital gains are not included has to do with the quality of reporting.

*Market income* is equal to total money income minus government transfer payments.

*Families* are defined in the SCF as a group of individuals related by blood, marriage, or adoption, who share a common dwelling unit at the time of the survey.

*Unattached individual* is a person living alone or in a household where he/she is not related to the other household members.

*United States: Current Population Survey, March Supplement (MCPS<sup>22</sup>)*

*Total money income* includes earnings (including net self-employment earnings), unemployment compensation, workers' compensation, social security, supplemental

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<sup>22</sup> Taken from the US Census Bureau web site, <http://www.census.gov/population/www/cps/cpsdef.html>

security income, public assistance, veterans' payments, survivor benefits, disability benefits, pension or retirement income, interest, dividends, rents, royalties, and estates and trusts, educational assistance, alimony, child support, financial assistance from outside the household, and other income. Capital gains are not included.

*Market income* is total money income less government transfers.

*After-tax income* includes total money income as defined above less federal and state income taxes plus the earned income tax credit. Since payroll taxes and capital gains are not included in the Canadian definition, we excluded them from the US definition as well. Appendix Table 1 shows the Gini coefficient for 15 definitions of income published by the US Census Bureau and a Gini coefficient for an after-tax definition comparable with the above SCF definition that we calculated. The same procedure used in calculating this adjusted after-tax Gini was applied to calculations of the after-tax income and after-tax QR. While it is not a perfectly accurate procedure, it is sufficient for our purpose of describing the trends.

*Households* consists of all the people who occupy a housing unit. A house, an apartment or other group of rooms, or a single room is regarded as a housing unit when it is occupied or intended for occupancy as separate living quarters — that is, when the occupants do not live and eat with any other persons in the structure and there is direct access from the outside or through a common hall. A household includes related family members and all unrelated people, if any, such as lodgers, foster children, wards, or employees who share the housing unit. A person living alone in a housing unit or a group of unrelated people sharing a housing unit such as partners or roomers is also counted as a household. This is the major difference between the SCF and MCPS. If several unrelated individuals live together in one house, each is considered as an individual in the SCF while in the MCPS they are considered as a household. This means that the US figures contain a small upward bias with regard to the average income definition and a small downward bias with regard to the inequality measure.

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**Table 1 - Correlations**

**Comparative Time Period Results: 1979-1997**

<b>United States</b>	<i>Market Income</i>	<i>After-tax Income</i>
Gini	0.78	0.85
QR	0.27	0.82
<b>Canada</b>		
	<i>Market Income</i>	<i>After-tax Income</i>
Gini	-0.71	-0.63
QR	-0.8	0.32

**Full Sample Results: US 1979-1999, Canada 1971-1997**

<b>United States</b>	<i>Market Income</i>	<i>After-tax Income</i>
Gini	0.75	0.87
QR	0.11	0.68
<b>Canada</b>		
	<i>Market Income</i>	<i>After-tax Income</i>
Gini	0.01	-0.64
QR	-0.46	-0.57



**Table 2 - Regressions**

**Canada, Market Income.**

	1971-1997		1979-1997	
<b>Dependent Variable: Gini Coeff.</b>	Coeff	t-prob	Coeff	t-prob
Constant	1.121	0.001	1.987	0.000
Market income	-0.324	0.000	-0.514	0.000
Trend	0.002	0.000	0.003	0.000
R-Sq	0.896		0.970	
	1971-1997		1979-1997	
<b>Dependent Variable: QR</b>	Coeff	t-prob	Coeff	t-prob
Constant	6.582	0.001	11.180	0.000
Market income	-1.147	0.007	-2.155	0.000
Trend	0.001	0.220	0.002	0.049
R-Sq	0.270		0.730	

**Canada, After-Tax Income**

	1971-1997		1979-1997	
<b>Dependent Variable: Gini Coeff.</b>	Coeff	t-prob	Coeff	t-prob
Constant	0.311	0.186	1.271	0.019
After-tax income	-0.165	0.003	-0.375	0.003
Trend	0.000	0.017	0.000	0.152
R-Sq	0.540		0.470	
	1971-1997		1979-1997	
<b>Dependent Variable: QR</b>	Coeff	t-prob	Coeff	t-prob
Constant	3.181	0.000	4.214	0.031
After-tax income	-0.487	0.007	-0.719	0.083
Trend	-0.004	0.000	-0.003	0.000
R-Sq	0.860		0.610	

**United States, Market Income**

	1979-1999		1979-1997	
<b>Dependent Variable: Gini Coeff.</b>	Coeff	t-prob	Coeff	t-prob
Constant	0.361	0.268	0.004	0.990
Market income	-0.161	0.034	-0.083	0.251
Trend	0.003	0.000	0.003	0.000
R-Sq	0.910		0.940	
	1979-1999		1979-1997	
<b>Dependent Variable: QR</b>	Coeff	t-prob	Coeff	t-prob
Constant	11.294	0.000	9.949	0.002
Market income	-2.157	0.001	-1.861	0.008
Trend	0.014	0.000	0.014	0.000
R-Sq	0.570		0.580	

Table 2 Cont.

**United States, After-tax Income**

	<b>1979-1999</b>		<b>1979-1997</b>	
<b>Dependent Variable: Gini Coeff.</b>	Coeff	t-prob	Coeff	t-prob
Constant	-1.797	0.003	-2.380	0.001
After-tax income	0.300	0.020	0.429	0.004
Trend	0.001	0.249	0.001	0.442
R-Sq	0.800		0.800	
	<b>1979-1999</b>		<b>1979-1997</b>	
<b>Dependent Variable: QR</b>	Coeff	t-prob	Coeff	t-prob
Constant	-1.046	0.361	-2.102	0.115
After-tax income	0.432	0.100	0.666	0.031
Trend	0.003	0.115	0.002	0.211
R-Sq	0.760		0.760	

**Table 3 - Granger Tests P-Values**

<b>Canada, Sample Period 1971-1997</b>		
<b>Dependent Variable: Gini Coefficient</b>		
	Market Income	After-tax Income
lags	P- Value	P- Value
1	0.558	0.023*
2	0.005 **	0.067
3	0.017 *	0.039*
4	0.029 *	0.057
<b>Canada, Sample Period 1979-1997</b>		
<b>Dependent Variable: Gini Coefficient</b>		
	Market Income	After-tax Income
lags	P- Value	P- Value
1	0.609	0.107
2	0.0354*	0.166
3	0.0236*	0.804
4	0.074	0.942
<b>United States, Sample Period 1971-1999</b>		
<b>Dependent Variable: Gini Coefficient</b>		
	Market Income	After-tax Income
lags	P- Value	P- Value
1	0.226	0.840
2	0.248	0.420
3	0.177	0.370
4	0.412	0.548

\* Significant at the 5% confidence level.

\*\* Significant at the 1% confidence level.

For Canada, income expressed in 1994 Canadian dollars.

For the US, income expressed in 1994 US dollars.

**Figure 1 - Lorenz Curve**

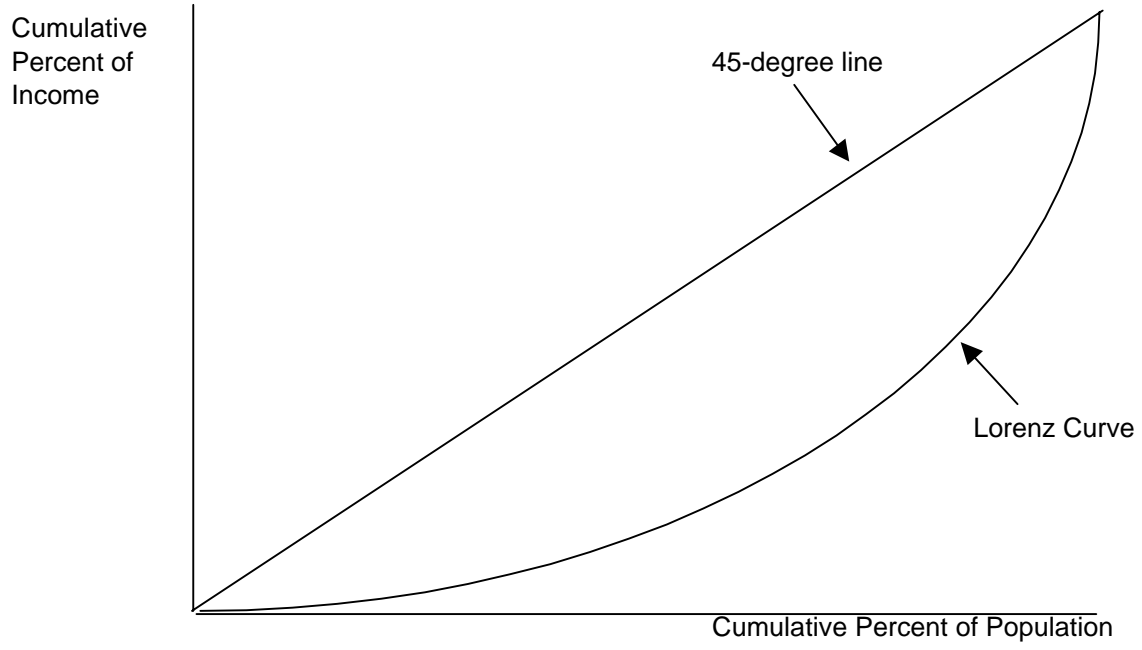
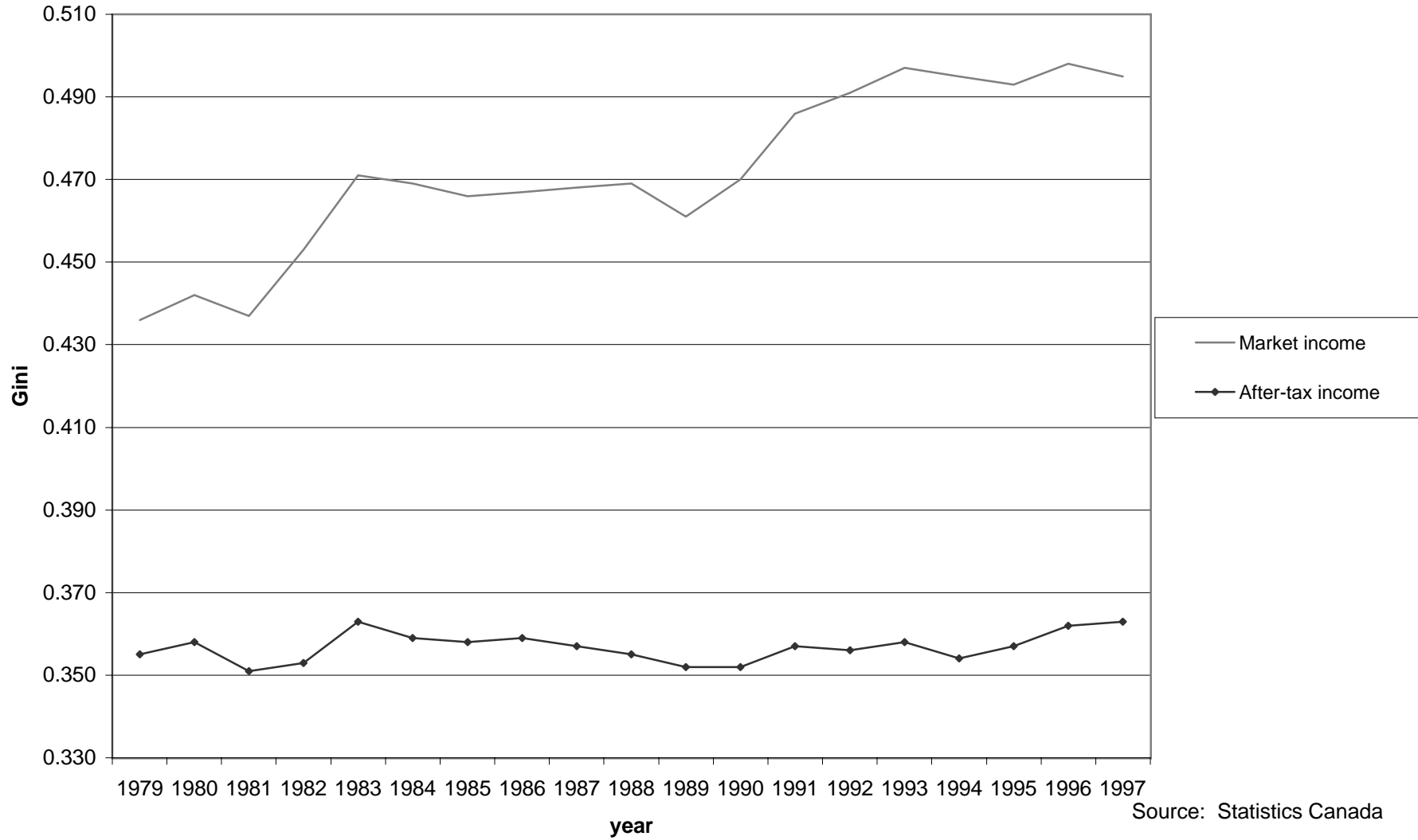
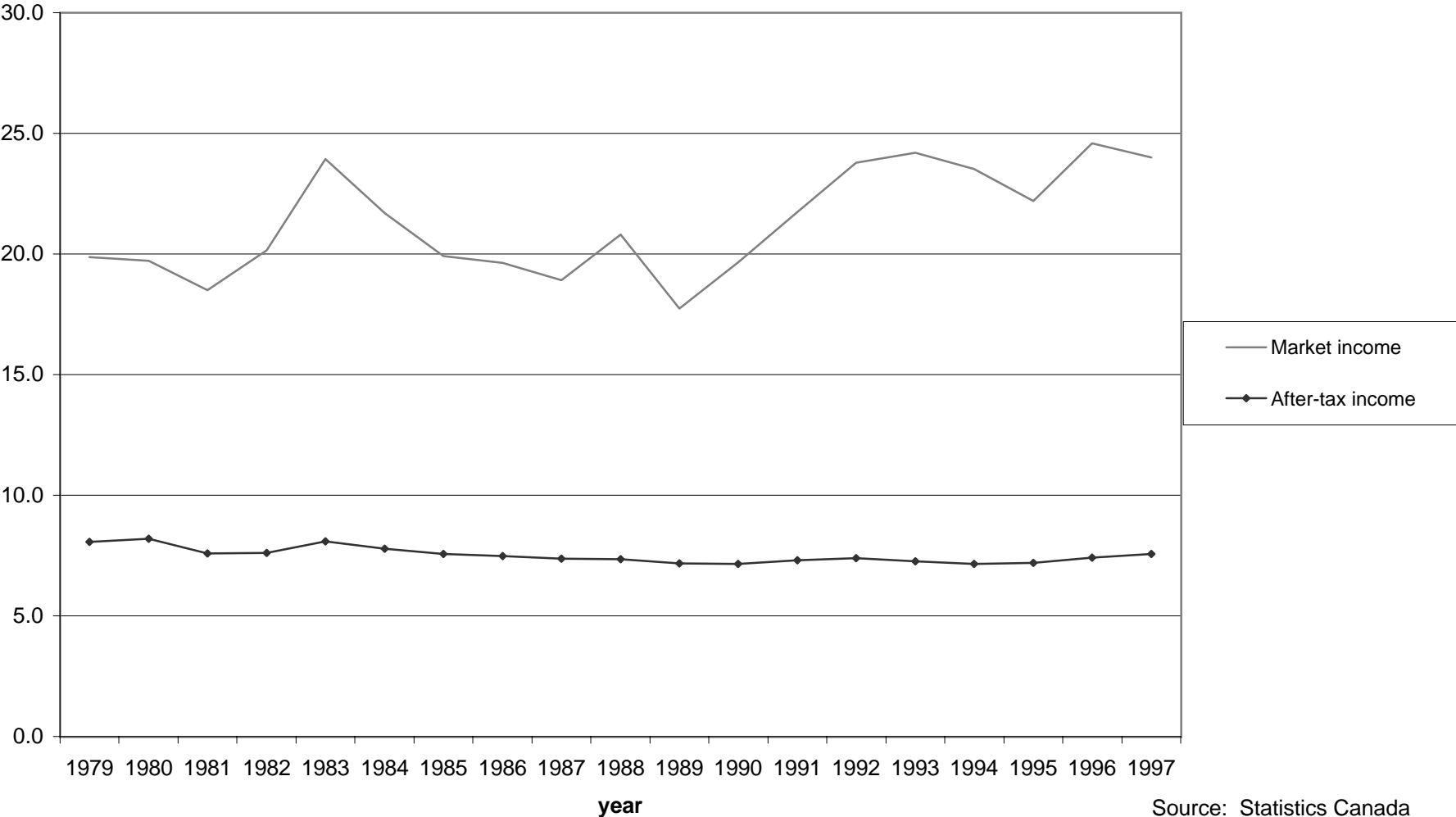


Figure 2a - Gini Coefficients, Canada, 1979-1997.



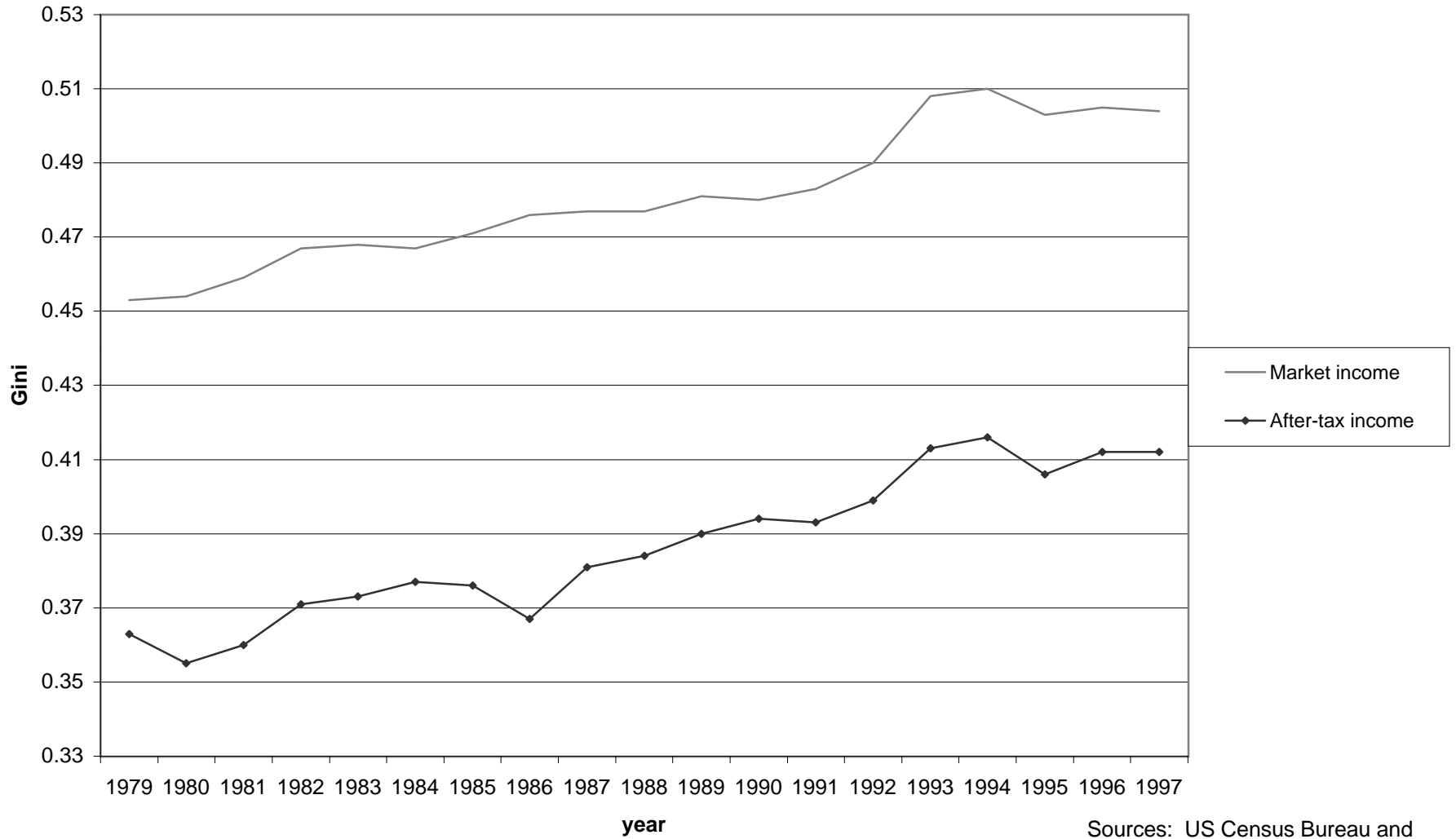
Source: Statistics Canada

**Figure 2b - Ratio of Average Income of Top Quintile to Average Income of Bottom Quintile, Canada, 1979-1997.**



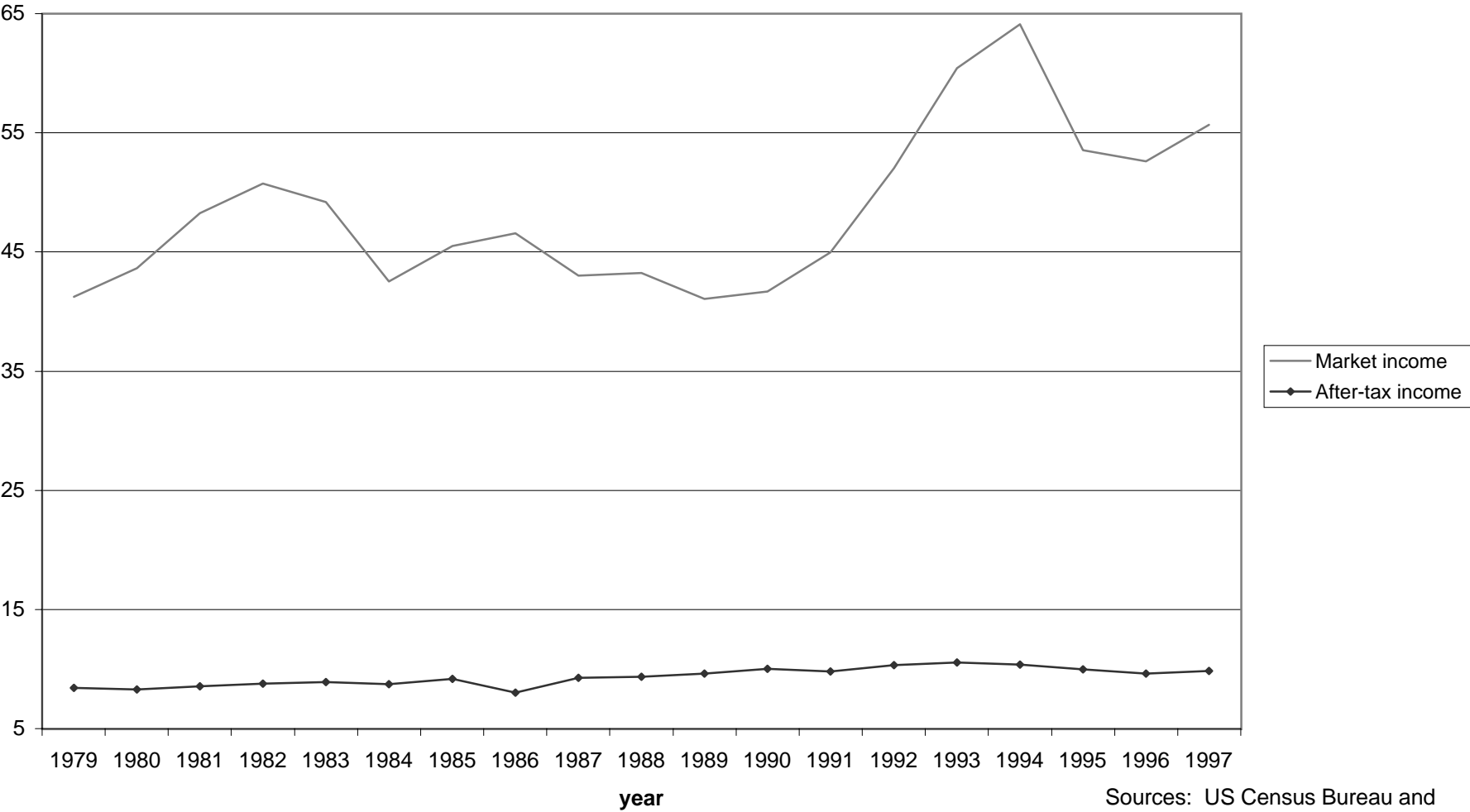
Source: Statistics Canada

Figure 3a - Gini Coefficients, United States, 1979-1997.



Sources: US Census Bureau and authors' calculations

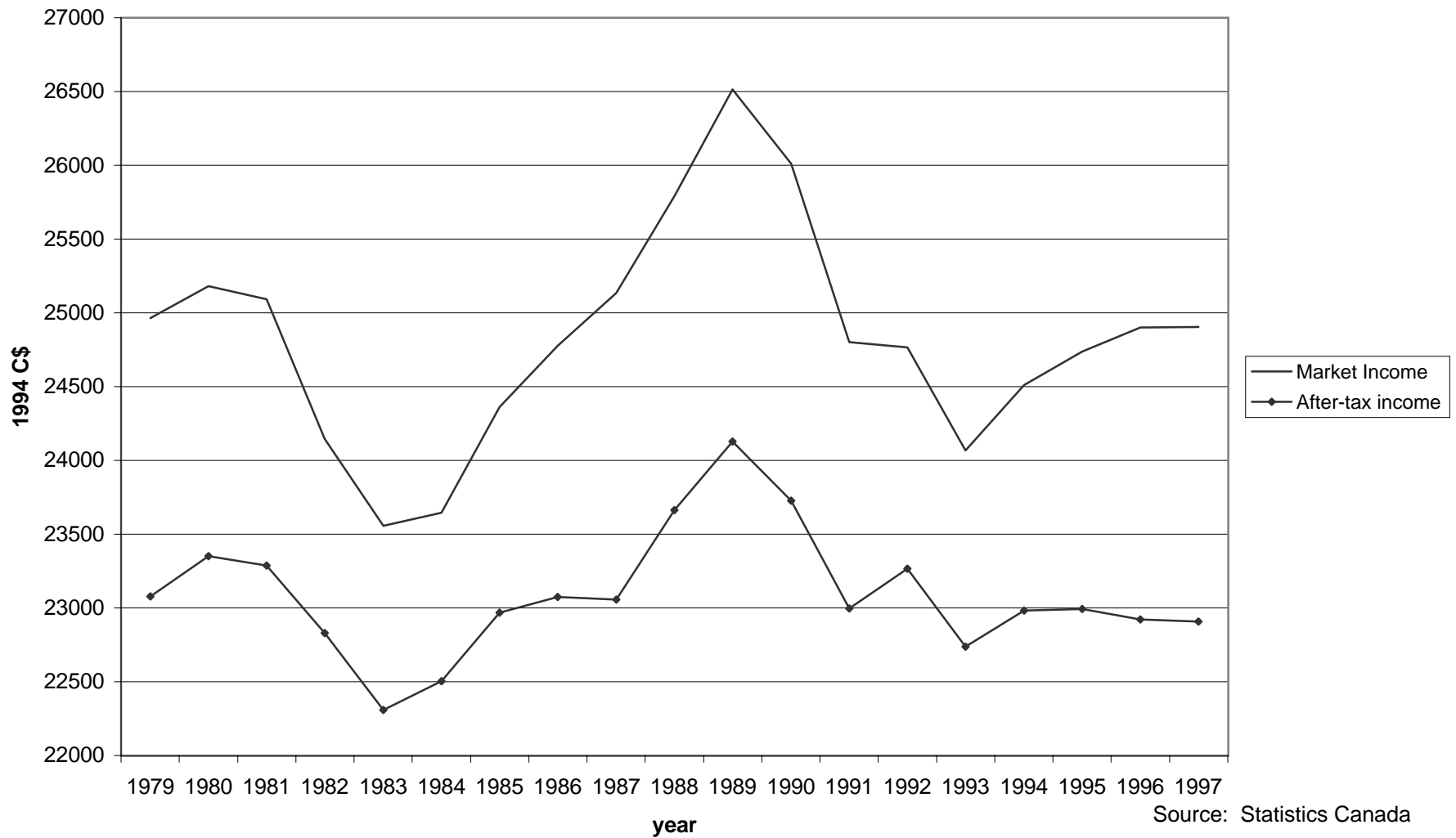
**Figure 3b - Ratio of Average Income of Top Quintile to Average Income of Bottom Quintile, United States, 1979-1997.**



Sources: US Census Bureau and authors' calculations



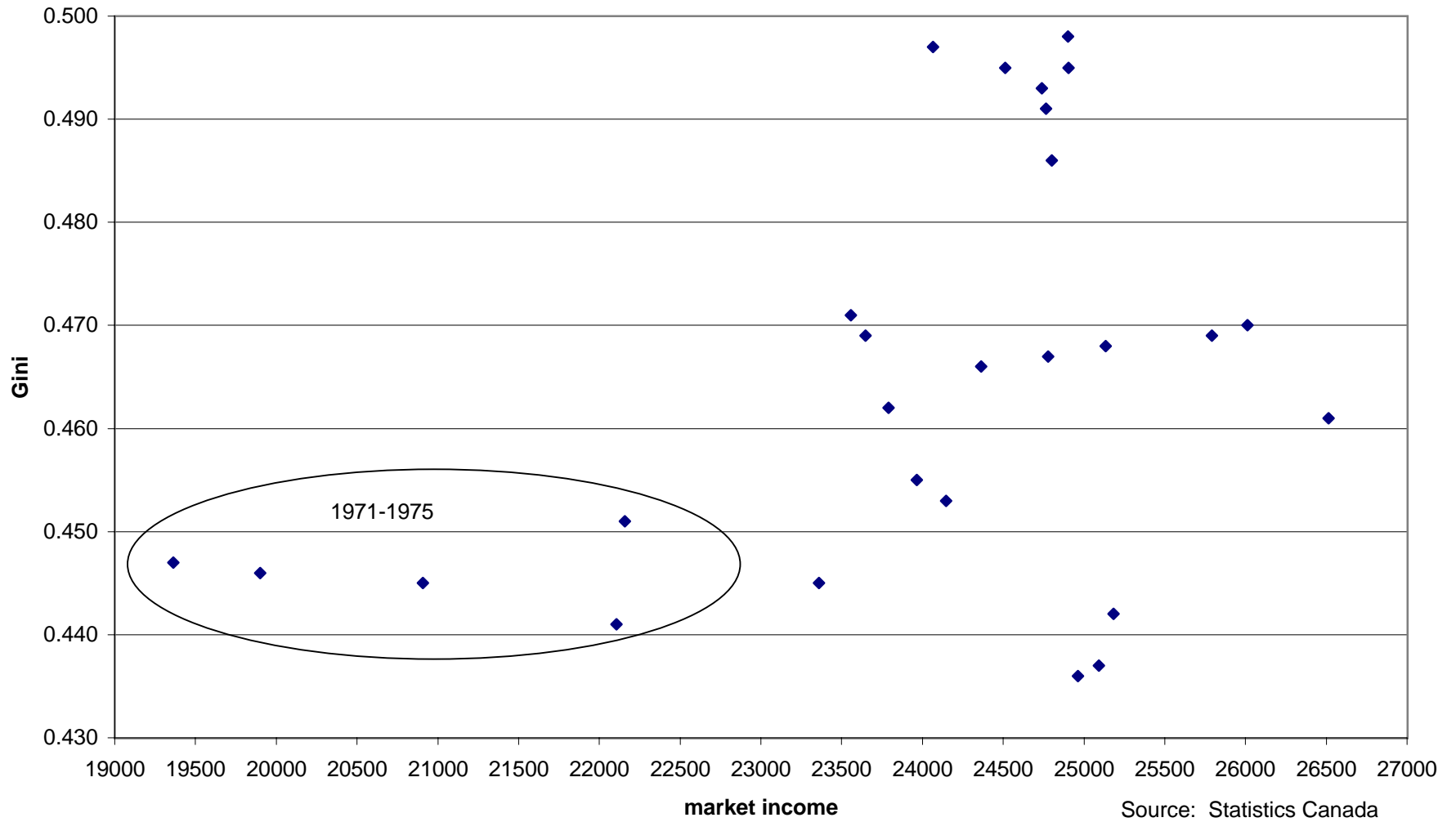
**Figure 4 - Families and Unattached Individuals, Average Income Adjusted for Family Unit Size, Canada, 1979-1997.**



**Figure 5 - Average Household Income Adjusted for Household Size,  
United States, 1979-1997.**



**Figure 6 - Scatter Plot of Market Income and Gini Coefficient on Market Income, Canada, 1971-1997.**



Source: Statistics Canada

**Appendix Table 1: Gini Coefficients for Fifteen Definitions of Income. United States, 1979-1999.**

	<b>Total Money Income</b>	<b>Definition 1 Less Government Transfers</b>	<b>Definition 2 plus capital gains</b>	<b>Definition 3 plus health insurance supplements to wage/salary income</b>	<b>Definition 4 less social security payroll taxes</b>	<b>Definition 5 less federal income taxes</b>	<b>Definition 6 plus earned income tax credit</b>	<b>Definition 7 less state income taxes</b>
<i>Definition No.</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>
Year								
1979	0.403	0.453	0.46	0.46	0.462	0.436	0.434	0.429
1980	0.401	0.454	0.462	0.462	0.465	0.436	0.436	0.43
1981	0.404	0.459	0.466	0.466	0.469	0.44	0.439	0.434
1982	0.409	0.467	0.475	0.475	0.477	0.451	0.451	0.446
1983	0.412	0.468	0.478	0.478	0.48	0.457	0.456	0.451
1984	0.413	0.467	0.477	0.477	0.48	0.458	0.458	0.453
1985	0.418	0.471	0.486	0.486	0.488	0.466	0.466	0.46
1986	0.423	0.476	0.507	0.505	0.51	0.489	0.488	0.483
1987	0.424	0.477	0.489	0.488	0.491	0.466	0.465	0.458
1988	0.425	0.477	0.49	0.489	0.492	0.469	0.468	0.461
1989	0.429	0.481	0.493	0.492	0.495	0.473	0.472	0.465
1990	0.426	0.48	0.487	0.487	0.489	0.468	0.466	0.461
1991	0.425	0.483	0.491	0.49	0.492	0.471	0.47	0.464
1992	0.43	0.49	0.497	0.497	0.499	0.478	0.476	0.471
1993	0.448	0.508	0.516	0.514	0.517	0.494	0.492	0.487
1994	0.45	0.51	0.518	0.515	0.519	0.496	0.492	0.487
1995	0.444	0.503	0.511	0.509	0.514	0.49	0.486	0.481
1996	0.447	0.505	0.515	0.511	0.516	0.492	0.488	0.483
1997	0.448	0.504	0.516	0.513	0.517	0.496	0.492	0.487
1998	0.446	0.5	0.513	0.509	0.514	0.493	0.489	0.484
1999	0.445	0.498	0.513	0.508	0.515	0.493	0.489	0.486

Appendix Table 1: Gini Coefficients for Fifteen Definitions of Income. United States, 1979-1999. Cont.

Definition 8 plus nonmeans tested government cash transfers	Definition 9 plus Medicare	Definition 10 plus regular price school lunches	Definition 11 plus means-tested government cash transfers	Definition 12 plus Medicaid	Definition 13 plus other means-tested government noncash transfers	Definition 14 plus net imputed return on equity in own home	After-tax comparable with Canada's definition*
9	10	11	12	13	14	15	
0.382	0.375	0.375	0.367	0.364	0.359	0.352	0.363
0.379	0.372	0.372	0.363	0.36	0.354	0.347	0.355
0.382	0.375	0.375	0.366	0.364	0.358	0.35	0.36
0.391	0.383	0.383	0.375	0.373	0.366	0.359	0.371
0.399	0.392	0.392	0.383	0.381	0.374	0.368	0.373
0.403	0.395	0.395	0.387	0.385	0.378	0.372	0.377
0.41	0.402	0.402	0.394	0.392	0.385	0.381	0.376
0.434	0.425	0.425	0.417	0.415	0.409	0.404	0.367
0.408	0.399	0.399	0.391	0.389	0.382	0.38	0.381
0.411	0.401	0.401	0.394	0.392	0.385	0.384	0.384
0.415	0.405	0.405	0.398	0.395	0.389	0.387	0.39
0.41	0.4	0.4	0.392	0.389	0.382	0.381	0.394
0.41	0.4	0.4	0.391	0.388	0.38	0.379	0.393
0.415	0.404	0.404	0.395	0.392	0.385	0.381	0.399
0.43	0.419	0.419	0.409	0.406	0.398	0.395	0.413
0.431	0.419	0.419	0.41	0.407	0.4	0.395	0.416
0.424	0.412	0.412	0.404	0.4	0.394	0.388	0.406
0.429	0.416	0.416	0.408	0.405	0.398	0.392	0.412
0.431	0.419	0.418	0.412	0.409	0.403	0.397	0.412
0.431	0.419	0.419	0.413	0.411	0.405	0.399	0.409
0.433	0.421	0.421	0.416	0.413	0.408	0.402	0.406

\* Gini on after-tax income comparable to SCF's definition = 2 - (3-2) - (4-3) - (5-4) + (6-5) + (7-6) + (8-7) + (9-8) - (10-9) - (11-10) + (12-11)

Source: US Census Bureau, available online: <http://www.census.gov/hhes/income/histinc/rdi05.html>