

## LONG RUN CANADIAN WEALTH INEQUALITY IN INTERNATIONAL CONTEXT

BY JAMES B. DAVIES\*

*University of Western Ontario*  
AND

LIVIO DI MATTEO

*Lakehead University*

A gap in estimates of the personal distribution of Canadian wealth between 1902 and 1970 is partly filled, using estate multiplier estimates for 1945–1968. The historical record is extended by adjusting the upper tail in survey results since 1970 to make it consistent with respected journalists’ “rich lists.” Top wealth shares decline from 1892 to 1902 and from 1945 to the late 1960s, consistent with the downward trend in most advanced western countries over much of the 20th century. Since 1984 there has been a clear upward trend in wealth inequality in Canada, as in many other countries, and in the United States. Currently, wealth inequality is higher in Canada than in the U.K. and much of continental Europe, somewhat lower than Austria or Germany, and distinctly lower than the U.S. Contrasts between Canada and the U.S. in wealth inequality trends are discussed.

**JEL Codes:** D3, N0

**Keywords:** Canada, estate tax, inequality, wealth

### 1. INTRODUCTION

Long run trends in economic inequality are a growing focus as demonstrated by the interest aroused by Piketty (2014) and the global preoccupation with the rising shares of the top one percent in wealth and income distributions.<sup>1</sup> There is debate over whether long-term economic development and industrialization reduced or increased both income and wealth inequality.<sup>2</sup> Indeed, recent literature is reexamining wealth inequality and the timing of growth and industrialization, especially for new regions and time periods.<sup>3</sup> Much of this new work is creating more consistent data sets over time that reconcile different sources.<sup>4</sup>

\*Correspondence to: James B. Davies, Department of Economics, University of Western Ontario, London, Ontario, Canada N6A 5C2. (jdavies@uwo.ca)

<sup>1</sup>See for example: Piketty and Saez (2003), Saez and Veall (2005), Davies *et al.* (2011), Oxfam (2015), Bengtsson *et al.* (2016), Freund and Oliver (2016), Davies *et al.* (2017b), Wolff (2017), and Di Matteo (2018).

<sup>2</sup>Kuznets (1955, 1966), Roine and Waldenström (2015).

<sup>3</sup>Lindert and Williamson (2016, 2017). See also Milanovic *et al.* (2010), Alfani (2015, 2017), Alfani and Ryckbosch (2016), Milanovic (2016), Abad and Junquera (2017), and Reis (2017).

<sup>4</sup>For example, see Bricker *et al.*, (2016, 2018), Garbinti *et al.* (2016), Saez and Zucman (2016), and Vermeulen (2016, 2018).

Roine and Waldenström (2015) compile evidence from numerous studies to examine the distribution of wealth starting from circa 1750—the beginning of the British industrial take-off—for ten developed countries.<sup>5</sup> They find that in the nineteenth century wealth inequality was high and constant but it decreased over the first 80 years of the 20th century except in Switzerland. Subsequent years saw divergent trends across countries.

For Canada, while some regional estimates are available at earlier points in time and there are national data at intervals since 1970, wealth inequality measures for longer historical periods are needed. Recent economic history needs to be studied in a manner recently done elsewhere to establish trends and place modern Canadian wealth inequality in historical and international perspective. There is a large gap from the early twentieth century to 1970 for which we have no estimates of the distribution of wealth.

This paper begins by reviewing the already available Canadian evidence. This includes late 19th/early 20th century wealth inequality, based on probate data for all of Ontario in 1892 and 1902 used in related work by Di Matteo (2016) and estimates based on the series of national surveys done by Statistics Canada in the period 1970 to 2016. We add two features that make the time series more complete, and more reliable. First, we apply the estate multiplier technique to published compilations of federal estate tax<sup>6</sup> returns for the years 1945 to 1953 and 1961 to 1968, the periods for which compilations are most complete.<sup>7</sup> Second, we adjust the upper tail of the Statistics Canada survey estimates to make them consistent with respected journalists' "rich lists," yielding a time series that should be more consistent with the estate multiplier estimates for earlier years than the unadjusted survey estimates. These two steps result in the most consistent long-term estimates of Canadian wealth inequality available to date.

We also compare our results to trends in other countries, including the United States. The histories of Canada and the U.S. are inter-twined. They have important similarities but also differences. For much of the 20th century Canada had heavy trade protection against the U.S. This was gradually reduced over the decades after World War II, culminating in the 1988 Canada-US Free Trade Agreement (FTA) and the 1994 North American Free Trade Agreement (NAFTA). Three quarters of Canada's trade is now with the U.S. and the economies of the two countries have become highly integrated. This integration raises the prospect of convergence in other social and economic indicators. Indeed, although the trend has been more pronounced in the U.S. the two countries have both seen rising income inequality over the last few decades.<sup>8</sup> So it is not surprising that we find they also share a ris-

<sup>5</sup>Australia, Denmark, Finland, France, Netherlands, Norway, Sweden, Switzerland, U.K., USA.

<sup>6</sup>We use "estate tax" to refer to any tax levied directly on estates or bequests at death. This does not include income tax on the deemed realization of capital gains on death. "Estate Tax" will be used to refer specifically to the levy introduced under the Federal Estate Tax Act of 1959.

<sup>7</sup>Tables were published for 1941 to 1944, but for that period as a whole rather than for individual years. The 1959 and 1960 numbers are not used here because the Estate Tax had not been in force long enough to have a full sample of filers. After 1968 most wealth passing to a spouse on death became exempt, making the returns for those later years un-useable.

<sup>8</sup>See e.g. Atkinson *et al.* (2017), whose charts may be accessed via <https://www.chartbookofeconomicinequality.com/inequality-by-country/>. We see, for example, that from 1980 to 2008 the share of the top 1 percent in gross income rose from 8.3 percent to 14.4 percent in Canada and from 8.2 percent to 17.9 percent in the U.S.

ing trend in wealth inequality, although the *level* of Canadian wealth inequality is distinctly lower than that in the U.S.<sup>9</sup>

The remainder of the paper is organized as follows. The next section provides context and a review of previous Canadian work on wealth distribution. Section 3 then reviews the Canadian probate and estate tax data and sets out the estate multiplier methodology. Section 4 describes the survey data and how we adjust it in this paper. Results are summarized in Section 5, which also considers international comparisons. Four appendixes that provide more data and technical detail are available online.

## 2. CONTEXT

Several wealth inequality studies have been done for 19th century Canada. Siddiq (1988), Osberg and Siddiq (1988) and Siddiq and Gwyn (1991) looked at the distribution of wealth in Nova Scotia using probate records for 1851 and 1871. Darroch (1983) used municipal property assessment rolls and analyzed inequality of real estate holdings for Toronto for the period 1861 to 1899. Di Matteo (2016) and Di Matteo and George (1992) provided estate multiplier estimates for Wentworth County from 1872 to 1902 and Ontario as a whole in 1892 and 1902. The results in these studies of nineteenth century Canada find high wealth inequality during industrialization as in other international jurisdictions but not always as high as in the United States or the United Kingdom (Di Matteo, 2012, 2016, 2018).

Di Matteo (2016) takes a longer-term perspective, comparing the estate multiplier estimates for Ontario in 1892 and 1902 with unadjusted wealth distributions for Canada constructed using microdata from Statistics Canada's Survey of Consumer Finances (SCF) and Survey of Financial Security (SFS) for the years 1984 and 2005. For 1892 and 1902, Di Matteo (2016) explored a range of assumptions regarding the wealth of non-probate families, showing that estimated wealth inequality was high in all cases and also that there was a robust finding of a decrease in inequality between these two years.

A series of Statistics Canada surveys have covered assets and debts. This began with surveys in 1956, 1959 and 1964 for the non-farm population that covered a gradually expanding range of assets and debts (Podoluk, 1974). The first wealth surveys for the whole country were conducted as part of the Survey of Consumer Finance (SCF) in 1970, 1977 and 1984. The Survey of Financial Security (SFS), succeeding the SCF, was conducted in 1999, 2005, 2012 and 2016. The SFS extended asset coverage significantly relative to the SCF by including employer-based pension plans. It also oversampled family units expected to have high wealth with the

<sup>9</sup>Not only is wealth inequality in Canada now lower than in the U.S., the same has been true since Statistics Canada began its national wealth surveys in 1970, and a similar difference has been found in historical research. Wealth inequality was lower in Canada than in both the U.S. and the U.K. in the 19th century and much of the early 20th century according to smoothed results in Di Matteo (2018, p. 80, 82). As well, Di Matteo (2018) found less inequality of estates left on death in Canada than in the U.S. in the period 1950-60.

help of a file created from income tax records.<sup>10</sup> In the future Statistics Canada plans to conduct the SFS every three years, and to integrate it into a system aligned with the National Balance Sheet Accounts that will allow estimates of wealth distribution to be interpolated between survey years (Statistics Canada, 2018).

Surveys have limitations in estimating the personal distribution of wealth. As is well-known, these surveys are subject to both sampling and non-sampling errors that may especially affect the upper tail of the distribution (Atkinson and Harrison, 1978; Davies, 1979; Curtin *et al.*, 1989; Vermeulen, 2016, 2018). Without some kind of adjustment, the estimated upper tail tends to be truncated and too thin, and wealth inequality is underestimated. For Canada, adjustments made by Davies (1979, 1993), provide estimates of the shares of top wealth groups and overall wealth inequality higher than suggested by Statistics Canada's surveys.

There has been a gap in the historical record on wealth inequality in Canada from the early twentieth century to 1970. This is somewhat surprising since, from 1941 to 1958 Canada had a federal Succession Duty, which was followed by an Estate Tax from 1959 to 1972.<sup>11</sup> In quite a few other countries, including the U.K., several continental European countries and the U.S., the data provided by such taxes have been a major source of estimates of personal wealth distribution, with the application of the estate multiplier technique (see e.g. Roine and Waldenström, 2015). The latter views estate tax filers in a year as a sample of those who were alive at the beginning of the year, with the sampling rate equal to the individual's mortality probability. It is unfortunate such estimates have not previously been made in Canada not only because it leaves a gap in the historical record, but because they would have complemented the wealth distributions generated using Statistics Canada's earlier surveys of assets and debts. Here we fill in part of the historical record by supplying estate tax-based estimates of the shares of the highest wealth groups in the period from 1945 to 1968.

### 3. THE ESTATE MULTIPLIER METHOD AND ITS APPLICATION IN CANADA

Table 1 outlines the data sources and methods we have used to provide our estimates of wealth distribution in Canada. As indicated there, for 1892 and 1902 we use probate data for Canada's largest province, Ontario, while the estimates for 1945–1968 use federal estate tax data for the whole country.

#### 3.1. *Probate Based Estimates for Ontario, 1892 and 1902*

Our estate multiplier estimates for the province of Ontario in 1892 and 1902 were generated from the individual records of probated decedents. In our

<sup>10</sup>In urban areas, information from the T1 family file, such as age and income, is used to stratify dwellings into groups expected to have similar net worth. Higher net worth strata are then oversampled. See <http://www23.statcan.gc.ca:81/imdb/p2SV.pl?Function=getSurvey&xml:lang=en&db=imdb&adm=8&dis=2&SDDS=2620>

<sup>11</sup>For details on the removal of Canadian estate taxes, see Perry (1984) and Goodman (1995). After the federal government abandoned the estate tax seven provinces continued their succession duties or re-enacted them. However, tax competition set in and by 1980 only Quebec still levied a succession duty, which was terminated in 1986.

TABLE 1  
DATA SOURCES AND METHODS

Years	Jurisdiction	Data	Source of Wealth Distribution Estimates	Type of Units	Estimation Method	Adjustment Method
1892, 1902 1945–1953	Ontario Canada	Probate records Federal Succession Duty returns Federal Estate Tax returns	Di Matteo (2016) Authors' calculations using published tables	Families Adults	Estate multiplier	Differential mortality rates for top wealth groups
1961–1968	Canada	Federal Estate Tax returns	Davies (1993)	Families	Statistics Canada's weighted survey returns	Pareto tail based on journalists' "rich lists"
1970, 1977, 1984	Canada	Survey of Consumer Finance, Statistics Canada	Authors' calculations using microdata			
1999, 2012, 2016	Canada	Survey of Financial Security, Statistics Canada				

unadjusted estimates reported in Section V we use mortality rates from historic life-tables constructed for Canada by Bourbeau and Légaré (1982). Each probated decedent is treated as the head of a family. Applying multipliers equal to the inverse of his or her age-sex specific mortality rate yields an estimated size distribution of “probate-type” family units.

Subtracting the number of probate-type family units from the number of Ontario families recorded in the censuses of 1891 and 1901 provides an estimate of the number of “non-probate family units” in 1892 and 1902. Averaging over these two years, we find that 32.5 percent of Ontario families are of the probate-type. In order to estimate the wealth shares of centiles or other population groups, an estimate of mean wealth needs to be made for non-probate family units. The results we show in Section V are based on the upper bound wealth assumption for non-probate families that their wealth equalled the mean wealth of the bottom 10 percent of probate-type family units. This was \$227 in 1892 and \$229 in 1902.<sup>12</sup>

We believe the Ontario estimates for 1892 and 1902 provide a lower bound on wealth inequality for Canada as a whole. National inequality includes a between-province component of potential significance in the late 1800s given that inter-provincial *income* differences were not small, as shown by Inwood and Irwin (2002). Ontario’s share of both national output and population between 1890 and 1910 was over 40 percent, so it would weigh heavily in computing average within-province inequality. In addition, wealth inequality in Ontario paralleled the two other provinces for which estimates are available—Nova Scotia and Manitoba—over the same period. (See Siddiq, 1988, Siddiq and Gwyn, 1991, and Di Matteo, 2012, 2018.) The Gini coefficient and top 10 percent shares for Nova Scotia in 1871, and those for Manitoba in 1892 and 1902 were similar to the Ontario numbers for 1892 and 1902. See also Darroch and Soltow (1994). Thus, Ontario may represent within-province inequality in this period fairly well.<sup>13</sup>

### 3.2. *Estate Tax Based Estimates for Canada, 1945–1953 and 1960–1968*

The federal government introduced taxes on wealth transfers at death in 1941, under the Succession Duty Act, which was replaced by the Estate Tax Act in 1959.<sup>14</sup> Initially, estates with net value less than \$5,000 were not taxed but that cutoff was raised to \$50,000 in 1948, and remained at that level until the Estate Tax was

<sup>12</sup>Wealth distribution results are affected by the assumptions made regarding the non-probate types. For example, if we redo the 1892 and 1902 estate multiplier estimates under the assumption that the bottom three deciles have zero wealth and the remaining non-probate types (next three deciles) get \$1000 each then the wealth share of the top 1 percent in 1892 becomes 32 percent and 24 percent in 1902. As a central or intermediate case, if we assign the non-probates in 1892 \$113.5 and the non-probates in 1902 \$114.5, then the share of the top 1 percent in 1892 becomes 37.8 percent and for 1902 it is 33.8 percent.

<sup>13</sup>A family basis for estimates from the 19<sup>th</sup> century makes sense given the more dynastic nature of families in that time-period and the fact that many adults (e.g. unmarried siblings, widows, widowers) lived in more extended households, especially in rural areas. However, doing the estate multiplier estimates on an adult basis would result in a more unequal distribution of wealth. For 1892 for example, the top ten percent in adult population-based estimates would own over 90 percent of the wealth. However, such estimates would make Ontario in 1892 out of sync with other estimates of new world wealth inequality in this time-period for places such as Nova Scotia, Wisconsin, Toronto and Australia. See Di Matteo (2016, 2018).

<sup>14</sup>As indicated earlier, throughout this paper “estate tax” may refer either to the Succession Duty or the Estate Tax. “Estate Tax” is used to designate the specific tax levied under the Estate Tax Act.

abolished in 1972.<sup>15</sup> The top marginal tax rate was 54 percent in 1946, on estates with net taxable value of more than \$5,000,000.<sup>16</sup> When the Estate Tax was introduced in 1959 the top rate remained the same but applied above a threshold of \$2,000,000.

The original estate tax returns are not available for Canada but tables giving detail on estate size and composition by age and sex as well as the overall frequency distribution of estates were published annually beginning in 1945, with some interruptions, making it possible to apply the estate multiplier approach under reasonable assumptions. After 1949 the level of detail fell off but it remains possible to apply the approach, with further assumptions.

The overall size distribution of estates was reported on an annual basis in Department of National Revenue (1945–1972) for 1945 to 1953 and for 1959 through 1971.<sup>17</sup> <sup>18</sup>We do not use the data for 1959, 1960 or 1969–1971, however, because its coverage is less complete than for the other years.<sup>19</sup> The level of disaggregation is good as there were 20 estate size groups initially, and while the number fell for a while after 1948 it was never below 11 and rose to 14 in the years 1960–1968. From 1945 to 1948, a breakdown by five-year age groups and sex was given.

We will first explain how the estate multiplier method can be applied with grouped data, without considering practical problems of implementation. We will then go on to explain how we have dealt with the latter.

### 3.3. Estate Multiplier Methods with Grouped Data

Under the estate multiplier approach the sample of decedents is weighted by multipliers equal to the inverse of observed mortality rates to estimate the distribution of wealth among the living. It is often assumed that the probability of death in a year is the same for all members of an age-sex group. It equals the mortality, or death rate,  $d_{ij}$  where  $i$  is the age group,  $j$  is sex,  $i = 1, \dots, s$  and  $j = 1, 2$ . The correct  $d_{ij}$  are not necessarily general population rates, since death rates tend to decline with income, wealth, or social status. In view of the high thresholds above which estate tax applied in Canada, the estate multiplier technique can only be applied to the top few percent of decedents.<sup>20</sup> Using a single  $d_{ij}$  for each age-sex group in that

<sup>15</sup>Net national income per capita in Canada was \$962 in 1948 and \$3,655 in 1972. Hence per capita income increased by a factor of about 4 between these dates. The ten-fold increase in the nominal estate tax threshold thus still meant a rise in relative terms when estate tax had come to its end.

<sup>16</sup>Rates were doubled in the budget of June 1946. Prior to that the top rate was 27 percent.

<sup>17</sup>Returns were published on a fiscal year basis ending March 31<sup>st</sup>. We refer, e.g. to the 1945–1946 year as 1945 for simplicity and because the bulk of the returns filed in 1945–1946 would have been for individuals who died in 1945.

<sup>18</sup>Returns for 1941 to 1944 were aggregated and so are difficult to interpret. They have not been used here.

<sup>19</sup>The data report the estates assessed in each fiscal year. When the Estate Tax had been in force for more than a year those estates would include some where death occurred in a prior calendar year. For example, the 1961–1962 assessments would include some estates for people who died in 1959 and 1960. The number of estates assessed in the 1959–1960 and 1960–1961 fiscal years was reduced because the Estate Tax had not been in force long enough to develop a full set of late-filing estates from earlier years. For the 1969–1971 period a considerable portion of wealth left on death that was covered in earlier years, that passing to a surviving spouse, was exempt from the tax in most cases and not recorded.

<sup>20</sup>The situation is currently similar in the U.S. although in the past there were years where as many as 7 percent of decedents were liable for U.S. federal estate tax (Kopczuk and Saez, 2004). In the U.K. the threshold for tax has generally been lower and a third or more of decedents have filed returns in some years (Alvaredo *et al.*, 2018).

case is considered sufficient, as long as the mortality rates used are those for individuals with high income, wealth or social status. Each estate is assumed to correspond to  $m_{ij} = 1/d_{ij}$  living individuals with wealth equal to the estate size.

When individual tax or probate records are available, the distribution of estates becomes an estimated distribution of wealth by applying the multipliers as sample weights. More explanation is needed in the case of grouped data. To begin, assume that the frequency distribution of estates is known within age-sex groups and that the thresholds for estate size ranges  $k = 1, \dots, r$  are the same for each age-sex group. Denote the number of estates and the mean reported estate in size range  $k$  as  $n^k$  and  $\mu^k$  respectively. The corresponding variables for the age  $i$  - sex  $j$  group will be denoted  $n_{ij}^k$  and  $\mu_{ij}^k$ . The number and mean for an age-sex group will be  $n_{ij}$  and  $\mu_{ij}$ . Similarly, the number and mean for all estates will be denoted  $n$  and  $\mu$  respectively.

In order to move from the distribution of estates to that of wealth we apply the mortality multipliers. The estimated number of individuals in the age-sex wealth group  $ij$ ,  $\hat{N}_{ij}^k$ , is given by:

$$\hat{N}_{ij}^k = m_{ij} n_{ij}^k$$

and the estimated mean wealth of group  $ij$  in range  $k$  is:

$$\hat{M}_{ij}^k = \mu_{ij}^k.$$

The grouped overall distribution of wealth is described by:

$$\begin{aligned} \hat{N}^k &= \sum_{i=1}^s \sum_{j=1}^2 \hat{N}_{ij}^k \\ \hat{M}^k &= \frac{1}{\hat{N}} \sum_{i=1}^s \sum_{j=1}^2 \hat{N}_{ij}^k \hat{M}_{ij}^k \\ \hat{L}^k &= \sum_{l=k}^r \hat{N}^l \\ \hat{N} &= \sum_{k=1}^r \hat{N}^k \end{aligned}$$

where  $\hat{N}^k$  and  $\hat{M}^k$  are the estimated number and mean wealth of individuals in range  $k$ ,  $\hat{L}^k$  is the estimated total number of people in wealth groups  $k, \dots, r$ , and  $\hat{N}$  is the estimated number with wealth above the estate tax threshold.

Note that an average multiplier  $m^k$  can be defined for each estate-size group. The expression for  $\hat{N}^k$  can be written:

$$\hat{N}^k = n^k \sum_{i=1}^s \sum_{j=1}^2 m_{ij} \frac{n_{ij}^k}{n^k} = n^k m^k$$

where  $n^k = \sum_{i=1}^s \sum_{j=1}^2 n_{ij}^k$  and  $m^k = \sum_{i=1}^s \sum_{j=1}^2 m_{ij} \frac{n_{ij}^k}{n^k}$

is the weighted average mortality rate for estate-size group  $k$ . The problem of finding the  $\hat{N}^k$  s can therefore be thought of as that of finding the overall average multiplier for each estate size group.<sup>21</sup>

In order to obtain the wealth share of the individuals in range  $k$  as a fraction of the total wealth in the country one also needs to know the population size,  $Q$ , which we take as known, and the estimated total personal wealth,  $\hat{V}$ , which for the moment we assume is available independently. The estimated population share of the individuals in wealth range,  $k$ ,  $P^k$  is:

$$P^k = \frac{\hat{N}^k}{Q}$$

and their wealth share,  $S^k$  is then:

$$S^k = \frac{\hat{N}^k \hat{M}^k}{\hat{V}}$$

If one wishes to know the wealth share of a group that does not correspond with one or more of the wealth ranges coming from the estate tax grouping it is necessary to interpolate. We do that by assuming that the shape of the distribution within a group is Pareto, as illustrated in Appendix C in conjunction with Tables C5a and C5b.

### 3.4. Practical Aspects of Implementing the Estate Multiplier Method

The estate multiplier method has significant advantages. Response is not voluntary and under-reporting is illegal, which should reduce both sampling and non-sampling error compared with surveys. However, there are practical problems in implementation. One issue is that even in the years 1945–1947 when considerable detail was provided in the published tabulations, the size distributions of estates within age-sex groups were not provided. We therefore proceed by imputing the age-sex composition within estate size classes. With that imputation we take a weighted average of the age-sex specific multipliers to get an estimate of the appropriate overall multiplier for each estate size group,  $m^k$ . Details of how this is done are provided in Appendix C.

<sup>21</sup>This insight provides the starting point for our estate multiplier calculations, as set out in Appendix C.

Some of the challenges facing the estate multiplier method can be grouped under the headings “missing people” and “missing wealth” (Atkinson and Harrison, 1978). There is a minimum threshold for estate filing, so there are missing people even if returns are filed for all those who are legally liable. The estimated wealth of missing people needs to be included in the denominator when computing top wealth shares. Missing wealth can arise due to tax evasion or because some assets are not taxable<sup>22</sup>. Also, estates only include assets that have value after the death of the decedent. Thus, if the individual had a pension or annuity for his/her own lifetime, it does not appear in the estate. On the other hand, the payout of life insurance benefits to the beneficiaries of the estate *is* included, tending to somewhat over-state the wealth of the living.<sup>23</sup> To some extent, the exclusion of pensions and annuities and the inclusion of life insurance payouts offset each other.

What of tax avoidance? Its most common forms are dividing up wealth among family members and making gifts in anticipation of death. These aspects are for the most part unproblematic. Dividing wealth among family members changes not only the measured distribution of wealth, but also the actual distribution.<sup>24</sup> Making gifts when death appears near is not a successful method of avoidance since gifts given within a few years of death (three years in the Canadian case) are normally included as part of the estate for tax purposes. A method of avoidance with more potential for distorting results is the use of trusts. Evidence from the U.S. for the 1950s and 60s is that while trusts accounted for a small portion of overall wealth at that time they increased the estimated share of the top 1% by from 1.9 to 2.4 % points.<sup>25</sup>

<sup>22</sup>Note that property owned jointly, for example with a spouse, is not missing. Under the 1941 Dominion Succession Duty Act property held jointly with one or more other persons was subject to taxation to the extent of the interest held—treatment that continued under the Estate Tax introduced in 1959. See Cap 14. Dominion Succession Duty Act, 4-5 Geo. VI. Part I, 3(e), available at: <<<https://archive.org/stream/actsofparl194041v01cana#page/60/mode/2up>>>

<sup>23</sup>Life insurance benefits were taxed under both the federal Succession Duties in force from 1941 to 1958 and the subsequent Estate Tax (1959 to 1972). See e.g. Jameson (1960, pp. 362–71 and 599). That the value of insurance in the hands of a living policy holder is less than the death benefit or face value is clear for term insurance, where the expected present value of the death benefits is generally less than that of the insurance premiums. Under whole-life policies, which were popular during the period studied here, the holder may withdraw or borrow against part or all of the policy’s cash value. This option increases the value of the policy, although the effect is muted because the death benefit is reduced by the amount of any withdrawal or borrowing. Both Atkinson and Harrison (1978, p. 42) and Kopeczuk and Saez (2004, p. 41) found that the value of life insurance policies to living policy holders was less than their face value, for the U.K. and U.S. respectively.

<sup>24</sup>Note that the incentive for such division is reduced, especially for moderately sized estates, by special tax provisions for family members. The federal Succession Duty, in force up to 1958, taxed bequests, with exemptions for different classes of heirs, rather than the estate. The Estate Tax that followed allowed a basic exemption of \$40,000 for domiciled decedents with additional exemptions if there were surviving spouses and children. See Mockler and Fields (1964) and Perry (1984).

<sup>25</sup>Smith and Franklin (1974) examined the size of wealth held in trusts in the U.S. in the period 1953 to 1969 using IRS data and found that it was only 2.6 percent of total household wealth in 1965, the year for which there was the best evidence. Including trusts raised the share of the top 0.5 percent from 21.5 percent to 23.7 percent in 1965, and the share of the top 1 percent from 26.8 percent to 29.2 percent. While these results are informative, it should be kept in mind that the use of trusts does vary across countries and their importance could be greater or less in Canada.

A final comment on missing wealth is that we are most interested in the trend in wealth inequality rather than its level. If the relative size of missing wealth is fairly constant, then the trend in wealth inequality may be identified with reasonable reliability even if the effect of missing wealth is not known with certainty.

Another challenge is selecting mortality multipliers. The correct estate multiplier is the inverse of a filer's true probability of death, usually proxied by an age-sex specific mortality rate. However, as noted earlier, general population mortality rates are higher than those of the wealthy individuals liable to estate tax. In some countries, e.g. the U.K., social class-specific mortality rates have therefore been used. Another alternative is to use the mortality rates found by life insurance companies, since policy holders are mainly from the middle class or above.

Canada does not have social class mortality rates, and we have not found publicly available mortality rate data from the insurance industry. U.S. research has used insurance-based estimates. Since Canadian adult mortality rates paralleled those of the total population in the U.S. at the time (Appendix B) we assume that mortality differentials for the wealthy were similar and apply the U.S. differentials in our estimates. On average, the implied mortality rate of our high wealth group is 78 percent of that of the general population; that ratio ranges from 53 to 58 percent for those aged less than 55 and from 85 to 90 percent for those aged 75 or more. We have investigated the sensitivity of our results to different mortality rate adjustments. They are not significantly altered for reasonable alternative assumed rates, in line with previous experience in the U.K. and U.S. (Kopczuk and Saez, 2004; Alvaredo *et al.*, 2018). We have been unable to further differentiate mortality rates by wealth.<sup>26</sup> Given age and sex, the mortality rate for a person with \$50 million is assumed to be the same as for someone with \$1 million. While mortality risk may continue to fall with wealth at high levels, evidence needed to model that is lacking.

Recently, there has been concern in the U.S. that the trend in estate multiplier estimates may have been biased due to an unrecognized differential decrease in mortality rates for the wealthy over time (Kopczuk, 2015; Reeves, 2015). However, the available studies, surveyed by Bosworth (2018), suggest that while the differences in mortality rates by wealth and income have grown over time in the U.S., they have not done so for Canada or high-income countries in Europe.

Real-world mortality rates vary with health as well as with age and sex. Estate tax filers are not a random sample since the probability of dying depends on health and the wealth of those in ill health may have been eroded for a range of reasons. However, the latter effect is weakened by the fact that gifts made shortly before death are included in the estate for tax purposes, and by the existence of a gift tax. It would be very difficult to adjust for these effects and we are not aware of any study that has been able to do that in other countries.

<sup>26</sup>Other researchers in the field have also been unable to make such an adjustment. See e.g. Smith (1974) and Kopczuk and Saez (2004).

### 3.5. Aggregate Wealth

In order to derive the shares of the top 0.1 percent, 0.5 percent and 1.0 percent from the estate tax data, we need an estimate of the total wealth of the personal sector in each year,  $\hat{V}_t$ . Official estimates are provided in Canada's National Balance Sheet Accounts (NBSA), which begin in 1961. For years before 1961 we have made our own estimates.<sup>27</sup> We built them up in two stages.

First, we calculated the total wealth revealed by the estate multiplier method for the population with wealth above the estate tax threshold for year  $t$ ,  $\hat{V}_t^e$ . (As we have discussed, this estimate may err to some extent as a result of elements of wealth being missing from the recorded estates. We deal with that at a final stage below.) In the period 1961–68 when both estimates are available, estate multiplier wealth averaged 33 percent of the NBSA total.<sup>28</sup> We concluded that the estate multiplier aggregate forms an important part of personal sector wealth and should be used to help estimate it before 1961.

Next, we estimated the wealth of the “missing population” over 1945–1961. In this period, the estate tax threshold was initially \$5,000, but rose to \$50,000 on Jan 1, 1948. To estimate the mean wealth of those below the threshold we proceeded as follows, where the estate tax threshold in current dollars for year  $t$  is  $W_{bt}^1$ :

- (i) For 1945 to 1947 we assumed a uniform distribution of wealth between 0 and \$5,000, giving mean wealth below  $W_{bt}^1$ ,  $M_{bt}^0$ , equal to \$2,500 (where  $k = 0$  for the group below the estate tax threshold).<sup>29</sup>
- (ii) For 1948 and later years we converted  $W_{bt}^1$  to 1947 dollars,  $W_{bt}^{1c}$ , and found the mean wealth below  $W_{bt}^{1c}$  in 1947,  $M_{bt}^{0c}$ . The latter was converted to year  $t$  dollars to estimate  $M_{bt}^0$ , the current dollar mean wealth below the year  $t$  nominal threshold, allowing us to calculate  $\hat{V}_t^0$ , the estimated “estate-type” wealth of the missing population.

A preliminary estate-based estimate of overall total wealth for each  $t < 1962$ ,  $\tilde{V}_t$ , was found using:

$$\tilde{V}_t = \hat{V}_t^e + \hat{V}_t^0$$

<sup>27</sup>We considered doing this based on the observed ratio of personal wealth to net national income in the 1960s, but it has been found elsewhere that it can change significantly over time (Piketty, 2014). Table C5 in Appendix C shows that this ratio is not entirely stable over the 1960s in Canada either.

<sup>28</sup>In this period the personal sector included non-profit institutions serving households (NPISH) and the NPISH component cannot be separated out. However, in 1990, when separate totals begin, NPISH net worth was only 0.2 percent of personal sector net wealth, suggesting that inclusion of this component in the 1960s is not a significant problem.

<sup>29</sup>The number of estates exceeding the estate tax threshold in this period indicates that only about 7 percent of Canadian adults had “estate tax wealth” exceeding \$5,000. In the first country-wide wealth survey, the 1970 SCF, mean wealth of the bottom 93 percent of families was \$Y, or X percent of the upper limit of their wealth at \$Z. If the same relationship had held for individual adults in 1946 the mean wealth of those below the estate tax threshold would have been \$Z. Using that figure instead of \$2,500 would have very little effect on our results.

This preliminary estimate was then adjusted by a multiple calibrated to make the resulting aggregate equal the NBSA estimate for 1961.<sup>30</sup> That is, for each  $t < 1961$ :

$$\hat{V}_t = \tilde{V}_t \left( \frac{\hat{V}_{1961}}{\tilde{V}_{1961}} \right)$$

We refer to the difference between  $\hat{V}_t$  and  $\tilde{V}_t$  as “excluded wealth”. It is the element of personal wealth that is not found even when the estate multiplier results are extended to include the population below the estate tax threshold.

### 3.6. *Portfolio Composition*

Appendix C examines the composition of estate by estate size, age and sex in 1946, one of the estate tax years with the most detailed published tabulations. Table C3 shows that stocks and bonds make up 48 percent of total assets. Real estate is next in size, at 18.1 percent. Together, stocks, bonds and real estate thus make up about two thirds of assets. Leaving aside the top estate size category (\$1 million or more), which has a relatively small sample, stocks and bonds together increase strongly with the size of estate, with bonds dominating stocks for the smaller estates and the reverse being true for large estates. The percent of total assets in cash, real estate and personal effects falls with estate size. Insurance and mortgages show a non-monotonic pattern, but trend downward above estate size of \$50,000. Debts fall in relation to total assets up to estate size of \$125,000, but do not show a trend above that level.

Table C4 in the appendix shows composition according to sex and age. The most notable gender differences are that women have more in bonds and less in stocks or insurance. The skew towards bonds for women is consistent with the common view that female investors are more conservative than male, although the explanation could lie elsewhere. With respect to insurance, labor force participation by married women was quite low in the 1940s, so husbands would be much more likely to have life insurance than wives. The median age of the women was 83, while that of the men was 78, which could also help to explain the portfolio differences by sex, since bonds tend to rise in importance with age while insurance does the opposite. (Stocks show no distinct trend with age for either sex after about age 50.)

In seeking to understand gender differences in the portfolio composition of estates it is also useful to keep in mind that a disproportionate number of women caught in the estate tax net were widows. This helps to explain, for example, why insurance is so unimportant for female estate leavers, and perhaps also why the importance of real estate falls with age for women. Younger widows may have tended to remain in the family home whereas older widows may have been more likely to downsize and convert the family home into other assets.

<sup>30</sup>The required multiple was 1.417 when using our differential mortality-adjusted results.

The Canadian estate tax data for 1945–1968 represent only the very top of the wealth distribution. Our 1892/1902 probate results for Ontario cover a much larger slice of the population. Stocks and bonds were a much smaller proportion of portfolios seen in the 1892/1902 data than in the 1945–1968 data, making up only 10 percent of assets in the 1892 data and 13 percent in 1902. Real estate, on the other hand, was 47 percent of all assets in 1892 and 40 percent in 1902.

### 3.7. *Validation of Approach*

Our methods adapt the estate multiplier approach to deal with a situation in which the available data record the marginal distribution of estates but not the shape of the distribution within age-sex groups. It is important to try to check the validity of the methods we have used to deal with these data limitations. We have done so by using the microdata from the most recent SFS survey to create an artificial sample of estates using the 2016 mortality tables. We then group those estates and delete all information on the distribution within age-sex groups except for the number and mean. The methods described above are then applied and the resulting estimate of the distribution of wealth is compared with the SFS distribution. We find close agreement of the artificial estate-generated distribution with the SFS distribution. The share of the top 1 percent of wealth-holders is the same in the two distributions. Other top shares, and the grouped frequency distribution are similar (see Appendix C.)

## 4. SURVEY-BASED ESTIMATES, 1970–2016

The first wealth surveys for Canada as a whole were conducted as part of the Survey of Consumer Finances in 1970, 1977 and 1984 (Davies, 1979; Oja, 1983, 1987). The SCF covered most financial assets—including Registered Retirement Saving Plans or RRSPs, which are similar to Individual Retirement Accounts (IRAs) in the U.S.<sup>31</sup> It also included business equity, principal residences, vacation homes, other real estate and vehicles. The SCF, like the SFS and the surveys of the 1950s and 1960s was on a family unit basis.<sup>32</sup>

The Survey of Financial Security (SFS), succeeding the SCF, was conducted in 1999, 2005, 2012 and 2016, although the 2005 survey had a relatively small sample size and is considered less reliable than the SFS surveys in other years. The SFS extended asset coverage significantly relative to the SCF by including Registered Pension Plans (RPPs), but we remove RPP amounts in the results we show in Section V in order to maintain comparability with the SCF estimates. The SFS uses a dual sample structure to oversample families expected to have high net worth.

<sup>31</sup>The financial assets included deposits, cash on hand, stocks, bonds and mutual funds, as well as RRSPs and Registered Home Ownership Saving Plans (RHOSPs). While the 1970 survey included RRSPs and RHOSPs in principle, in “other financial assets,” unlike the 1977 and 1984 surveys it did not ask for their amounts explicitly. However, it did inquire whether or not the family held any RRSPs, which may have helped to remind respondents to include them when reporting the amount of other financial assets.

<sup>32</sup>Both unattached individuals and families with two or more members are referred to as “family units.” A family of 2+ members is a group of individuals sharing a common dwelling unit and related by blood, marriage or adoption, that is an “economic family.”

Surveys are subject to both sampling and non-sampling error. Sampling error is a particular problem in the wealth context since the upper tail is of special interest. Most high-quality wealth surveys now over-sample at the top end to deal with this problem, using a special sampling frame composed of family units expected to have high wealth. This method is most effective when it is based on individual information rather than e.g. geographic location (Vermeulen, 2018). It would be difficult, even with this method, to obtain a good sample in the very highest reaches of the upper tail. For this reason, although the Federal Reserve's Survey of Consumer Finance in the U.S. does an excellent job of oversampling the wealthy it has excluded the Forbes 400 richest U.S. families from its inception. In Canada, where the SFS oversamples at the high end, the very richest have not been excluded from the sampling frame but in practice, no respondents report wealth in, or close to, the Forbes 400 wealth range.

The main forms of non-sampling error affecting wealth surveys are under-reporting of assets and debts and differential response according to wealth level (Davies, 1979). These problems are addressed by Statistics Canada itself, to the extent possible, within the survey methodology. For example, imputations are made for the value of an asset or debt that the respondent reports having but whose amount is not reported. Imputation techniques have become more sophisticated and appear to correct much of the under-reporting. And families are carefully weighted to ensure that the weighted sample has the same composition as the population according to location and demographic characteristics, removing some of the differential response problem. We believe these adjustments result in a good estimate of the shape of the main body of the wealth distribution. However, they do not solve the whole problem.

The limitations of the survey data are seen most dramatically in the extreme upper tail. For example, the wealthiest families observed in the 2012 and 2016 surveys had net worth of \$23.7 and \$27.3 million respectively. *Canadian Business* magazine published lists of the "100 wealthiest Canadians" for both years. The lowest wealth on the 2012 list was \$654 million, and that on the 2016 list was \$875 million.

#### 4.1. *Adjusting the Upper Tail*

Surveys are of course not the only source of information on wealth distribution. Journalists and others have long compiled "rich lists" of the wealthy, and in some cases, such as those of the *Fortune* and *Forbes* magazines in the U.S., these have been well respected. This is a natural approach and likened to making a list of the brightest stars in the night sky, rather than relying on random sampling, to study the upper tail of the distribution of stars by their magnitude. In the case of wealth, some people who should be on the list may be missed and even expert estimates of the wealth of those on the list may err, but these problems tend to be reduced by the scrutiny the lists attract and the fact that they are generally repeated annually, giving opportunity for improvement and correction over time.

For 1970 and 1984 Davies (1993) reviewed rich lists prepared by Newman (1975) and Francis (1985) specifically for Canada, and the *Fortune* magazine list of the world's billionaires in 1984, which included six Canadians. These lists were used to adjust the upper tail of the 1970 and 1984 distributions, in the range of

\$4 million in net worth or more in 1970 and \$10 million or more in 1984. Above these levels a Pareto tail was added<sup>33</sup>, while below them no adjustment was made to the SCF distribution. With this procedure, the share of the top 1 percent in 1970 rose from 18.0 percent to 22.9 percent and the share of the top 5 percent went up from 39.2 percent to 42.8 percent.

Since 2010, the Forbes billionaire list has been used to adjust survey-based distributions from around the world in the annual Credit Suisse world wealth study (Davies *et al.*, 2017b; Shorrocks *et al.*, 2018). The method used here follows the most recent version of that approach, but with two differences. First, Davies *et al.* (2017b) and Shorrocks *et al.* (2018) use quantile share data to construct large synthetic data files based on each country's survey data, preparatory to adjusting the upper tail. Here, for the four most recent years studied (1984, 1999, 2012 and 2016) we use Statistics Canada's microdata, while for one earlier year (1970) we use a finely grouped unpublished tabulation of the survey data. So, there is no need to create a synthetic data file. Second, in the Davies/Shorrocks procedure a fitted Pareto distribution is used for the whole upper tail whereas here, for the years 1999, 2012 and 2016, where the rich lists include estimated wealth for each entry, it is only used up to the range of the rich list data. The original rich list estimates of wealth are used above that point.

Vermeulen (2018) has investigated the statistical properties of a related approach, in which Forbes billionaire data are pooled with survey data and the Pareto tail is estimated using two different econometric methods. He applies the method to recent data for the U.S., U.K. and nine European countries, finding that the share of the top 1 percent is revised upward considerably in surveys that have not oversampled the rich, or have done so using geographic methods. In contrast, relatively little adjustment is needed where individual information has been used in oversampling.

Table 2 compares survey and National Balance Sheet Account (NBSA) estimates of household wealth aggregates for Canada in the six years in which large-sample national wealth surveys have been conducted by Statistics Canada. The first three years—1970, 1977 and 1984, had a Survey of Consumer Finances (SCF), while the last three—1999, 2012 and 2016, had a Survey of Financial Security (SFS). In order to maintain comparability, all the estimates shown here omit the value of employer-based pension plans, known as Registered Pension Plans (RPPs), since these pensions were not included in the SCF.

Davies (1979) drew attention to the fact that the 1970 SCF aggregates for both assets and debts were considerably below NBSA levels. Here we see that total assets in the 1970 SCF were only 62.7 percent of the NBSA figure. Net worth was 65.8 percent of the independent total, but that higher figure was due to debts being an even smaller fraction of the NBSA estimate, at 49.8 percent, than assets. However, the 1977 and 1984 surveys achieved better results, with assets reaching 81–82

<sup>33</sup>The main resource was the Newman list, which does not estimate wealth for each entry, but instead puts the entries in three wealth-size groups. This limited the options for estimating the Pareto distribution. The log of the number of persons above each wealth threshold was regressed by OLS on the log of wealth, a common approach that gives a consistent estimate of Pareto's  $\alpha$ , but incorrect standard errors (Quandt, 1966).

TABLE 2  
SURVEY AND NATIONAL BALANCE SHEET ACCOUNT (NBSA) WEALTH AGGREGATES

	1970		1977		1984	
<b>I. Survey of Consumer Finance (SCF) vs. NBSA</b>						
a) Amounts (\$million)	SCF	NBSA	SCF	NBSA	SCF	NBSA
Financial assets	\$31,941	\$97,770	\$87,911	\$217,013	\$198,027	\$474,353
Non-financial assets	82,282	122,677	265,074	305,319	511,017	637,523
Business Equity	24,069	-	84,177	-	192,313	-
Total Assets	138,292	220,447	427,161	522,332	901,357	1,111,876
Liabilities	20,894	41,944	66,372	107,210	112,974	200,601
Net Worth	117,398	178,503	370,990	415,122	788,383	911,275
b) SCF as % of NBSA						
Total Assets	62.7%		81.8%		81.1%	
Liabilities	49.8		61.9		56.3	
Net Worth	65.8		89.4		86.5	
<b>II. Survey of Financial Security (SFS) vs. NBSA</b>						
a) Amounts (\$billion)	SFS	NBSA	SFS	NBSA	SFS	NBSA
Financial assets	773	\$1,335.5	\$2,794.9	\$2,809.2	\$3,519.9	\$3,804.4
Non-financial assets	1,693	1,855.3	4,701.5	4,490.9	6,142.0	5,764.1
Business Equity	355	-	-	-	-	-
Total Assets	2,821	3,190.8	7,496.4	7,300.1	9,661.9	9,568.5
Liabilities	458	594.8	1,337.1	1,657.4	1,755.0	2,003.7
Net Worth	2,362	2,596.0	6,159.3	5,642.6	7,906.8	7,564.8
b) SFS as % of NBSA						
Financial assets	-		99.5%		92.5%	
Non-financial assets	-		104.7		106.6	
Total Assets	88.4%		102.7		101.0	
Liabilities	77.0		80.7		87.6	
Net Worth	91.0		109.2		104.5	

Notes: i) Where there is no entry for business equity the assets and debts of businesses are consolidated with the rest of the balance sheet. ii) Life insurance and pensions are excluded.

Sources: Davies (1993), Statistics Canada (2001, 2018).

percent of the NBSA figure and debts averaging 59.1 percent of the NBSA number. The SFS was launched in 1999 with stronger methods, including over-sampling of families at the top end. It saw further convergence with the NBSA, on both the asset and debt sides, resulting in SFS net worth equaling 91.0 percent of NBSA net worth. Finally, in 2012 and 2016 the SFS totals both for assets and net worth slightly exceeded the NBSA totals.

What are the implications of the Table 2 comparisons for our exercise? We need to acknowledge that there is a margin of error around NBSA estimates, which in many cases are derived as residuals from the accounts for other sectors. Also, there are legitimate differences between the survey and NBSA totals, in some cases, due to differences in valuation. For example, credit card debt is measured as the amount carried over from one month to the next in the surveys whereas it is measured as the amount outstanding at the end of quarter in NBSA. That difference accounts for a significant amount of the shortfall of the survey total for liabilities below the NBSA total (Statistics Canada, 2018). Thus, we cannot regard the NBSA totals as the “correct” numbers and the survey numbers as necessarily less reliable. Nevertheless, the NBSA estimates have been compiled on a consistent basis over time and it is clear that while the recent surveys capture personal wealth well, that is not true for the early surveys. Hence, we align our adjusted survey-based wealth distribution estimates with the NBSA for all years.

Our upper tail adjustment proceeds as follows when microdata are available. First, the family units are arranged in ascending order of wealth,  $w_i$ , and  $(\ln w_i, \ln u_i)$  is noted for each unit  $i$ , where  $u_i$  is the number of families with wealth above  $w_i$ . If the data followed a Pareto distribution in the upper tail exactly, the absolute value of the slope,

$$g_i = (\ln u_{i+1} - \ln u_i) / (\ln w_{i+1} - \ln w_i)$$

would equal the single parameter of Pareto’s  $\alpha$  for all  $i$  in the upper tail. In practice, the absolute value of  $g_i$  tends to increase with wealth in survey data. While that is not surprising in the main body of the distribution, if the upper tail of the true distribution is Pareto, as we will assume, then a correction is in order. Rich list data both confirm that an upper tail adjustment is needed and provides a crucial ingredient for making that adjustment. We assume that the  $(\ln w_i, \ln u_i)$  observed for the entry with the lowest wealth on the rich list falls sufficiently close to the true Pareto line that it can be used to anchor that line toward its upper end. We only need to find one other point on the line to have fitted a Pareto distribution. To do so, note that if  $g_i$  is rising in absolute value in the main body of the distribution, and that main body is accurately estimated, then the  $(\ln w_i, \ln u_i)$  graph should show a smooth transition from its concave main portion to the straight line of the Pareto tail.<sup>34</sup> If it is to do so in our adjusted distribution, then the Pareto line must extend back from the  $(\ln w_i, \ln u_i)$  at the bottom of the rich list to the rest of the  $(\ln w_i, \ln u_i)$  graph in such a way that it “asymptotes” to it. By finding the point

<sup>34</sup>If we were working with continuous data, a discrete change in  $g_i$  would imply a jump in the distribution function.

where that occurs in our data, we can provide a second point on the Pareto line, and also ascertain the wealth threshold at which the Pareto tail should be substituted for the unadjusted survey tail.

Two other aspects of our upper tail adjustment should be noted. One arises from the goal of having total wealth in the adjusted distribution equal the NBSA figure. We accomplish that by making a uniform proportional change in the unadjusted survey observations of the net worth of each family unit.<sup>35</sup> The other is that for the 1999, 2012 and 2016 adjusted distributions we use the actual wealth reported for members of the rich lists, rather than the fitted Pareto distribution in the wealth range covered by the lists.<sup>36</sup>

Table 3 provides summary information about our treatment of the rich list sources and the resulting Pareto tails fitted to our distributions.<sup>37</sup> For 1970 we rely on the list provided by Newman (1975). Newman's entries fall in the categories of \$20–\$50, \$50–\$100 and over \$100 million in net worth. While most entries refer to a wealthy individual, some are for “families” or “brothers.”<sup>38</sup> These larger units are broken into economic families assuming equal division of wealth among them. The number of brothers is known in each case and is most commonly two. The number of economic families in a “family” is based either on the commentary in Newman (1975), internet search or on the default assumption that a “family” includes three economic families.<sup>39</sup> If division of a “family” or brothers generates economic families with wealth less than the \$20 million lower bound on Newman's original list, then those units are deleted from the list.<sup>40</sup>

For 1984 we use both an updated rich list provided by Newman (1979) and an independent list by Francis (1985). We cannot rely exclusively on the latter since Francis did not aim to provide a complete rich list. Rather, she listed 32 individuals or families who had a controlling interest in one or more major Canadian corporations, indicating that they all had net worth of at least \$100 million. Our goal in using Newman (1979) as well was to “fill in” Francis's list with other economic families, taking into account developments such as deaths, estate division, and

<sup>35</sup>The required proportional change is established in an iterative process, with a new Pareto tail being fitted in each iteration. Vermeulen (2016) uses a similar procedure except that separate proportional changes are made for financial assets, non-financial assets, and debts, targeting their NBSA totals. That procedure cannot be followed here because for our first four surveys business equity is reported as a single number, rather than business assets and debt being integrated with the rest of the balance sheet as in the NBSA.

<sup>36</sup>This approach cannot be used for the 1970 and 1984 distributions since the rich lists used for those years group the rich in wealth ranges rather than giving an estimate of net worth for each entry on the list.

<sup>37</sup>Note that 1977 does not appear in this table. We have not been able to use it in our adjusted results due to unavailability of microdata or sufficiently detailed tabulations for 1977.

<sup>38</sup>An economic family is a group of people related by blood, marriage or adoption who live in the same dwelling. This is the definition of family unit used in Statistics Canada's wealth surveys.

<sup>39</sup>For 1970 there were three “families” that Newman or internet search indicated could be divided into 13 economic families. Ten “families” were divided by the default rule. There were two entries for brothers—two brothers in one case and four in the other. Altogether “families” or brothers were divided into 29 economic families.

<sup>40</sup>Retaining these units would be an error since although their wealth might be reasonably well reflected, Newman's list contains no entries for units comprising a single economic family that have net worth below \$20 million. Thus, the resulting list would have only partial coverage below \$20 million.

TABLE 3  
UPPER TAIL SURVEY ADJUSTMENT DETAILS

	1970	1984	1999	2012	2016
<b>I. Rich Lists</b>					
Lowest wealth, millions of 2016\$	\$95.2m	\$197.5m	\$316.5m	\$674.7m	\$875.0m
Number of family units	141	59	96	91	91
Source: List derived from...	Newman (1975)	Newman (1979) and Francis (1985)	<i>Canadian Business</i> magazine, annual lists of the wealthiest 100 Canadians		
<b>II. Imputed Pareto tail distributions</b>					
$\alpha$	1.517	1.543	1.460	1.383	1.376
Gini coefficient implied by $\alpha$	.492	.479	.521	.566	.571
Lowest wealth, millions of 2016\$	\$1.195m	\$1.691m	\$2.688m	\$4.374m	\$4.907m
Lowest wealth as ratio to overall mean wealth	6.75	8.13	9.39	10.80	9.96
Number of family units	63,070	82,414	106,883	142,868	151,657
Number of family units as % of overall family units	1.00%	0.90%	0.88%	0.98%	0.99%

Notes: i) the rich lists are edited to remove non-residents, and for 1970 and 1984 take into account deaths and inheritance occurring between publication dates for the references given and the survey year, ii) rich list entries for "families" or "brothers" are split into economic families and are omitted if the resulting net worth per family unit is below the wealth of the lowest original entry on the list for a single economic family (see the text for further details).

Source: Authors' compilation.

collapsing fortunes between Newman’s writing and 1984.<sup>41</sup> The \$100 million threshold was maintained in doing so.

In 1999 *Canadian Business* magazine began publishing annual lists of the 100 wealthiest Canadians, which we have used as the basis for upper tail adjustments in 1999, 2012 and 2016.<sup>42</sup> As indicated in Appendix D we have compared these lists with Canadian entries on the Forbes world list of billionaires. Almost all of the Forbes billionaires appear on the *Canadian Business* list and the respective estimates of net worth are in reasonable agreement. But the *Canadian Business* list appears to do a better job of spotting new and younger billionaires, which does not seem surprising as Canadian journalists could tend to become aware of them before Forbes’ staff. The comparison with Forbes bolsters our confidence in the *Canadian Business* list. The latter has the advantage, of course, of penetrating well below the billion USD Forbes cut-off.

Table 3 also provides detail on the imputed top-end Pareto distributions that we use to adjust the survey-based distributions. The imputed distributions apply to between 0.88 percent and 1.0 percent of family units. The estimated  $\alpha$  values are in a tight and plausible range from 1.376 to 1.543. The threshold at which the imputed distribution takes over from the strict survey-based distribution ranges between 6.75 and 10.80 as a multiple of overall mean net worth.

Interestingly, the values of  $\hat{\alpha}$  shown in Table 3 decline after 1984, meaning that the upper tail becomes longer and also that there is more inequality within the tail. There is a simple relationship between Pareto’s  $\alpha$  and the Gini coefficient,  $G$ :

$$G = \frac{1}{2\alpha - 1}$$

(Cowell, 2011, p. 156). As the table indicates,  $G$  increases from 0.479 in 1984 to 0.571 in 2016. This is in line with the observation that inequality within the upper tail of the wealth distribution has been rising in other countries as well in recent decades (Atkinson, 2008; Alvaredo *et al.*, 2018).

#### 4.2. Portfolio Composition

In principle, Statistics Canada’s wealth surveys should provide us with detailed information about changes in portfolio composition for the Canadian household sector over time. Unfortunately, one major definitional change that occurred after 1999 makes it difficult to discern more than the largest changes. Up to and including 1999, unincorporated business assets and debts were reported simply as business equity, and this category made up from 17 to 21 percent of total assets (Table D1 in Appendix D2). We do not know the breakdown of this business equity into

<sup>41</sup>The same three “families” as in 1970 could be divided into 13 economic families. Three “families” were divided into nine economic families by the default rule. There were three entries for brothers—two brothers in two cases and four in the other. Altogether these divisions yielded 30 economic families.

<sup>42</sup>*Canadian Business* did not provide sufficient information to break “families” into economic families, so the default assumption of three of the latter in each of the former was used, giving an average of 29 economic families in 9.7 “families” across 1999, 2012 and 2016. Brothers were in pairs in all cases: two pairs in 1999 and 2016 and three in 2012.

financial assets, non-financial assets and liabilities. Nevertheless, some important trends in portfolio composition can be seen.

As shown in Table D1 of Appendix D, in all the survey years real estate is the dominant asset type, making up from 46 to 57 percent of total assets. The striking increase in this proportion from 1999 (45.8 percent) to 2012 and 2016 (average of 56.6 percent) is a reflection of rapidly rising house and other real estate prices in Canada's largest cities. Associated with this has been a climb in mortgage debt. Cash and deposits have declined in importance over time while registered savings plans have risen strongly as a percent of total assets. The rise in real estate and tax-sheltered savings would be expected to boost the wealth of the middle class, since these assets are relatively more important for these groups than they are for those either lower or higher than them in the wealth distribution. Such trends would be predicted to reduce e.g. the wealth share of the top 1 percent (Wolff, 2017). We find in the next section that the trend in top Canadian wealth shares over the last few decades has been solidly upward, indicating that other forces have been at work as well.

## 5. RESULTS

Tables 4 and 5, and Figures 1 and 2 show results for our three data series: estate multiplier estimates for families in 1892/1902 and for adult individuals from 1945–1968, and survey-based estimates for families from 1970 to 2016. It is important to emphasize that these estimates do not form a single time series. For the most part we confine our comments regarding trends to those seen *within* the three separate periods.

Figure 1 and Table 4 show unadjusted estimates, while Figure 2 and Table 5 show results that are adjusted for differential mortality in the estate multiplier periods, and for consistency with external evidence on the upper tail in the survey-based period from 1970 onward. Some smoothing is effected in the 1945–1968 period by averaging annual results for sub-periods. (Appendix A provides the year-by-year numbers.)

The 1892 and 1902 results cover the whole population while the 1945–1968 estate multiplier estimates only indicate the wealth shares of the top 0.1 percent, 0.5 percent and 1.0 percent. This is because the 1892 and 1902 Ontario probate data cover a much larger portion of the population (32.5 percent on average) than the Canada-wide estate tax-based estimates for 1945–1968.

The share of the top 1 percent is available for all three of our series.<sup>43</sup> In the unadjusted data it falls over the 1892–1902 interval and from 1945 to 1968, but although it also does so from 1970 to 2012, it rises sharply from 15.9 percent in 2012 to 17.3 percent in 2016. Similar behavior is seen in the shares of the top

<sup>43</sup>The share of the top 1 percent gets much attention in the literature on wealth distribution. As here, it is the indicator that most studies have in common, partly because estate multiplier estimates are often only available for the extreme upper tail. Also, the high concentration of wealth-holding makes the top end of special interest. However, where data allow, it is important to look at broader indicators, which may include summary inequality indexes. For a discussion of the advantages and disadvantages of the main alternatives indexes in the wealth context see Davies *et al.* (2017a).

TABLE 4  
WEALTH SHARES AND OTHER WEALTH DISTRIBUTION INDICATORS, 1892–2016, FOR UNADJUSTED DISTRIBUTIONS

	Wealth Share of...								Other Indicators		
	Top 0.1%	Top 0.5%	Top 1%	Top 5%	Top 10%	Top 20%	Bottom 40%	Gini Coeff.	Mean 2016 \$s	Median 2016 \$s	
<b>I. Estate Multiplier Estimates, Ontario, families</b>											
1892	14.3%	28.2%	36.3%	60.4%	74.4%	87.7%	4.8%		52,874	6,212	
1902	10.4	23.9	32.2	57.6	72.6	86.4	5.6		44,472	6,267	
<b>II. Estate Multiplier Estimates, Canada, adults</b>											
1945–1949 av.	11.2	19.9	25.2						46,583		
1950–1953 av.	10.2	18.7	23.7						50,299		
1961–1964 av.	8.3	15.5	20.1						80,610		
1965–1968 av.	7.4	13.7	17.7						98,229		
<b>III. Estimates based on Statistics Canada Surveys, Canada, families</b>											
1970 SCF			18.0	39.2	53.3	70.9	0.6	.716	147,449	61,359	
1977 SCF					50.7	68.3	1.6	.689	171,779	80,757	
1984 SCF	4.3	11.5	16.8	37.5	51.3	68.8	2.1	.686	176,013	82,240	
1999 SFS	3.4	10.6	16.2	37.2	51.5	69.4	2.5	.687	261,738	109,520	
2012 SFS	3.3	10.2	15.9	38.2	52.7	70.9	1.6	.703	444,683	181,011	
2016 SFS	3.9	11.8	17.3	38.8	53.5	71.5	1.7	.707	518,902	201,938	

Note: Employer-based pension plan amounts are not available prior to 1999. They are excluded from the 1999, 2012 and 2016 estimates shown here, for comparability.  
Source: Table A1 in Appendix A.

TABLE 5  
WEALTH SHARES AND OTHER WEALTH DISTRIBUTION INDICATORS, 1892–2016 FOR ADJUSTED DISTRIBUTIONS

	Wealth Share of...							Other Indicators		
	Top 0.1%	Top 0.5%	Top 1%	Top 5%	Top 10%	Top 20%	Bottom 40%	Gini Coeff.	Mean 2016 \$	Median 2016 \$
<b>I. Estate Multiplier Estimates, Ontario, families</b>										
1892	16.2%	31.9%	41.0%							
1902	11.8	27.0	36.4							
<b>II. Estate Multiplier Estimates, Canada, adults</b>										
1945–149 av.	12.6	22.7	28.8						51,606	
1950–1953 av.	12.0	22.5	28.6						53,297	
1961–1964 av.	10.2	19.1	24.7						80,819	
1965–1968 av.	9.4	17.4	22.6						98,033	
<b>III. Estimates based on Statistics Canada Surveys, Canada, families</b>										
1970 SCF	10.5	18.1	22.9	41.7	55.1	71.9	0.6	.725	171,225	68,683
1984 SCF	10.5	18.4	23.5	42.6	55.5	71.6	1.8	.713	203,404	96,210
1999 SFS	13.2	21.5	26.6	45.0	57.6	73.3	2.2	.725	286,258	105,473
2012 SFS	14.5	23.5	28.7	47.6	59.9	75.3	1.4	.746	405,093	138,437
2016 SFS	14.9	23.6	28.7	47.2	59.9	75.4	1.4	.746	492,840	163,956

*Notes:* i) The estate multiplier estimates are adjusted for differential mortality; the estimates based on Statistics Canada surveys are adjusted to align the upper tail with independent “rich lists”. See text for details. ii) Employer-based pension plan amounts are not available prior to 1999. They are excluded from the 1999, 2012 and 2016 estimates shown here, for comparability.

*Source:* Table A2 in Appendix A.

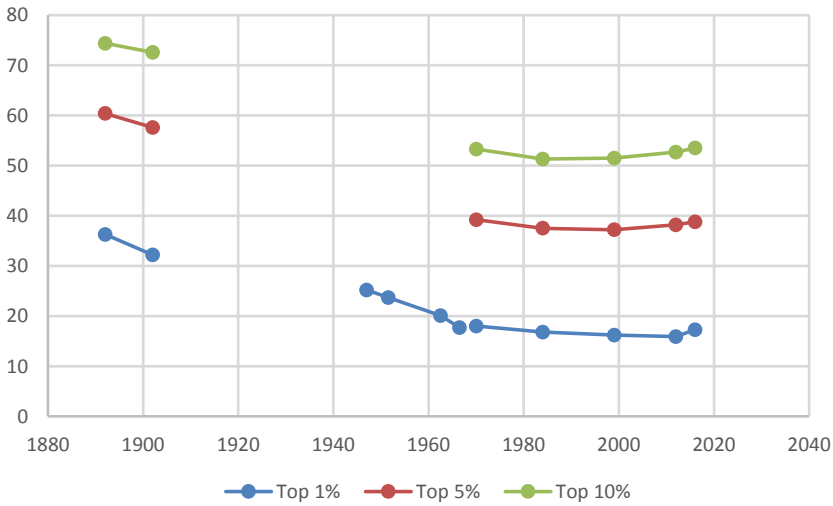


Figure 1. Wealth shares of top wealth groups, Canada, different series: families 1892–1902, adults 1945–1968, families 1970–2016; unadjusted (%)

Note: The three series shown here are estate multiplier estimates for Ontario in 1892 and 1902 and for Canada from 1945 to 1968, and adjusted Statistics Canada survey estimates from 1970 to 2016. [Colour figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]

0.1 percent and 0.5 percent. Figure 1 and Table 4 also show the shares of the top 5 percent and 10 percent for the 1892–1902 and 1970–2016 periods. Trends echo those already noted, except that in the most recent period the shares rise after 1984 or 1999, rather than in 2012. The share of the top 5 percent rises from 37.2 percent in 1999 to 38.8 percent in 2016, while that of the top 10 percent increases from 51.3 percent to 53.5 percent from 1984 to 2016. The Gini coefficient rises after 1984, from .686 in that year to .707 in 2016.

Table 5 and Figure 2 show our adjusted estimates, with Appendix A again providing the year-by-year numbers (see Table A2). The estate multiplier estimates are adjusted using age-dependent mortality rate differentials for the high wealth population as explained in Section 3. The upper tails of the survey-based distributions are adjusted to make them consistent with external evidence according to the procedure set out in the previous section. These adjustments raise the shares of top wealth groups quite strongly. For example, the share of the top 1 percent rises, on average, by 4.5 percent points over both the estate multiplier periods of 1892/1902 and 1945–1968, and by 9.2 percent points in the survey-based data from 1970 to 2016. In 2016 the rise for the top 1 percent from the unadjusted to adjusted estimates is from 17.3 percent to 28.7 percent. The Gini coefficient increases from an average of .700 to .731 in the 1970–2016 estimates.

It is interesting to see that the adjustment in the share of the top 1 percent is large here not only in the early years (1970 and 1984) when the upper tail was not oversampled, but in the SFS period when urban strata expected to have higher net worth were oversampled. This appears to be consistent with the conclusion of Vermeulen (2018) that oversampling on a geographic basis typically has little effect in reducing the required upper tail adjustment.

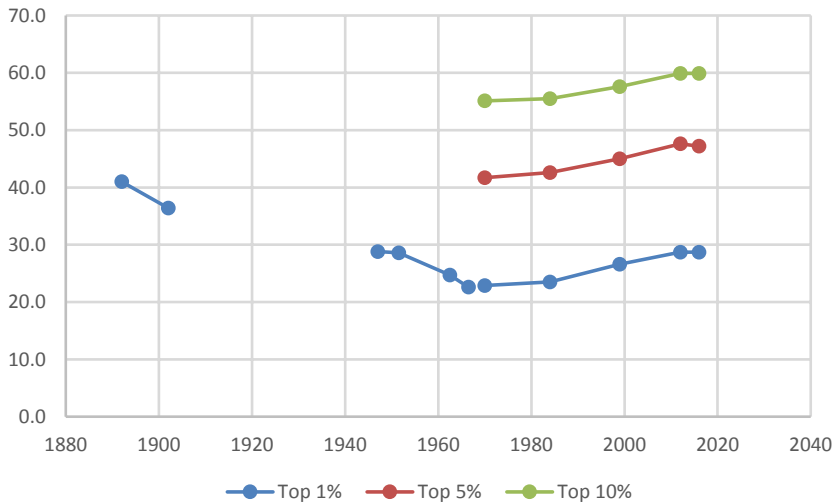


Figure 2. Wealth shares of top wealth groups, Canada: different series: families 1892–1902, adults 1945–1968, families 1970–2016; adjusted (%)

Note: see note to Figure 1. [Colour figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]

The decline in the top 1 percent share over time, which was a striking feature of the unadjusted estimates, is preserved in the adjusted data in the two estate multiplier periods, but the picture changes significantly within the survey-based period. The shares of the top 0.1 percent, 0.5 percent, 1 percent, and 5 percent all rise from survey to survey from 1970 to 2012, the only exception being that the share of the top 0.1 percent is steady from 1970 to 1984. A mild increase is seen in the shares of the top 0.1 percent and 0.5 percent from 2012 to 2016 as well. However, note that inequality as measured by the Gini coefficient fell from 1970 to 1984 (due to increased shares for bottom wealth groups), and remained constant from 2012 to 2016, as did the share of the top 1 percent. Hence, although the broad picture is one of rising inequality over the 1970–2016 period as a whole, there are some nuances.

### 5.1. International Comparisons

Roine and Waldenström (2015) show that in both France and the U.K., the share of the top 1 percent declined up to the late 1960s, as in Canada (see Table A3 in Appendix A). In the U.S., however, there was a mild upward trend from 1945 to the early 1960s and a drop only in the late 1960s, in both household survey and estate multiplier estimates (again see Table A3 in Appendix A). From 1970 to 2012 Canada shows a constant upward trend in the share of the top 1 percent, which is qualitatively similar to what is seen in the U.S. (see also Saez and Zucman, 2016; Bricker *et al.*, 2016, 2018; Wolff, 2017). However, in France the rise in the share of the top 1 percent did not begin until 1984, and in the U.K. there was a sharp drop in the share of the top 1 percent from 1970 to 1984, before a rising trend took over. Broadly speaking, wealth inequality fell internationally over most of the 20<sup>th</sup>

century, but began an increase toward the end of that period that persisted into the 20<sup>th</sup> century.<sup>44</sup> While we do not have a single continuous time series for Canada, the trends shown within our three data periods are consistent with this pattern.

In recent years, there has also been considerable development and improvement of wealth surveys, for example with the Household Finance and Consumption Surveys (HFCS) in the Eurozone and the Wealth and Assets Survey (WAS) in the U.K. Vermeulen (2018) provides a nice basis for us to compare our results with these European countries, as it adjusts the upper tail of the distributions by pooling Forbes billionaire lists with the survey data with the same objective as our upper tail adjustment of the Statistics Canada survey evidence.

Briefly, using his midpoint adjustments for each country Vermeulen (2018, tables 9, 10) shows seven European countries with shares of the top 1 and 5 percent distinctly lower than our adjusted 2012 shares of 28.7 percent and 47.6 percent.<sup>45</sup> On average he finds shares of 17.3 percent and 34.1 percent for the top 1 percent and 5 percent in Belgium, Finland, France, Italy, the Netherlands, Spain and the U.K. Portugal is close to Canada, with shares of 25 percent and 43.5 percent for the top 1 and 5 percent. Finally, Austria and Germany have similar shares that are higher than Canada's, averaging 32.3 percent and 52.8 percent for the top 1 percent and 5 percent. U.K. These comparisons suggest that wealth inequality may be higher in Canada than in most of Western Europe.

Comparison with the U.S. is interesting as its economy is so closely linked with that of Canada. Despite that linkage there are striking differences in wealth inequality and its trends. As noted above, while wealth inequality drifted up in the U.S. from 1945 to the early 1960s it fell in Canada, according to our results. Since then, while wealth concentration has risen in both countries, it has been lower in Canada than in the U.S. In 2016 the share of the top 1 percent of households reached 38.6 percent in the U.S. according to the Survey of Consumer Finance, in contrast with our estimate of 28.7 percent for Canada. Further, while this share rose strongly in the U.S. between 2013 and 2016 it did not change in Canada after 2012. Careful investigation of the reasons for these and other differences between the two countries in wealth inequality and its trends could be a productive avenue for future research.<sup>46</sup>

<sup>44</sup>Roine and Waldenström (2015) also provide time series for several other western countries. All show a history of wealth inequality that fits the characterization we give here—except in the case of Switzerland, which is unusual for having escaped not only both world wars, but also highly progressive income or wealth taxation.

<sup>45</sup>Vermeulen (2018) uses the first wave of the HFCS, whose collection periods ranged between 2008 and 2010, and the second wave of the WAS, also collected between 2008 and 2010. For Canada, 2012 is the year of the SFS survey that is temporally closest to these European surveys.

<sup>46</sup>Light is shone by recent studies on methods that could be used. For the U.S. Saez and Zucman (2016) and for France Garbinti *et al.* (2016) analyzed changes in wealth inequality over time by decomposing into income inequality, savings rate, asset price and portfolio effects using synthetic saving rates—an approach that could be applied to cross-country comparisons. Cowell *et al.* (2018) compared the impact of demographic and economic characteristics on the wealth distribution in five countries, but found that they explain little of the country differences, which remain attributable to “strong unexplained country effects.”

## 6. CONCLUSION

We have assembled the existing Canadian evidence on long-term wealth inequality that includes probate-based estimates for Ontario in 1892 and 1902 and national survey results produced by Statistics Canada for the period 1970 to 2016. We fill in the gap between these two data sets by constructing estate multiplier estimates for the period 1945 to 1968 taking into account the lower death rates of the wealthy. Further, we have adjusted the upper tail of the Statistics Canada survey estimates to make them consistent with journalists' rich lists. The results have been put in international context.

Our results for the period since 1970 indicate that making an upper tail adjustment is important in the Canadian case. This is true not only in the earlier years when the surveys did not oversample the upper tail (1970 and 1984), but also in the more recent period (1999–2016) when urban strata expected to have higher net worth have been oversampled.

Although our results are from three different data series, covering separate timespans, together they tell an interesting story about the long run evolution of wealth inequality in Canada. In the decade before 1902 wealth inequality fell in Canada's largest province, Ontario, and in the period 1945 to 1968 it fell as well, for the country as a whole. From 1970 to 1984, there was a small increase in most top wealth shares. After 1984 our results indicate that Canada saw a clear increase in wealth concentration up to 2012. The apparent decline in wealth inequality through most of the 20<sup>th</sup> century followed by a rising trend resembles what is seen in most other developed countries for which data are available.

We have noted differences between Canada and the U.S. whose explanation could be sought in future research. One is that while wealth inequality rose mildly in the U.S. from 1945 to the early 1960s, it fell in Canada. Another is that although wealth concentration has trended upwards in both countries since the 1970s, its level has been distinctly lower in Canada than in the U.S. throughout those years. Finally, after 2012 wealth inequality continued to increase strongly in the U.S. but did not rise in Canada. Understanding these differences could help to illuminate the determinants of wealth inequality in both countries.

## REFERENCES

- Abad, L. A. and P. A. Junquera, "Latin American Earnings Inequality in the Long Run," *Cliometrica*, 11, 349–74, 2017.
- Alfani, G., "Economic Inequality in Northwestern Italy: A Long-Term View (Fourteenth to Eighteenth Centuries)," *Journal of Economic History*, 75, 1058–96, 2015.
- , "The Rich in Historical Perspective: Evidence for Preindustrial Europe (ca. 1300–1800)," *Cliometrica*, 11, 21–348, 2017.
- Alfani, G. and W. Ryckbosch, "Growing Apart in Early Modern Europe? A Comparison of Inequality Trends in Italy and the Low Countries, 1500–1800," *Explorations in Economic History*, 62, 143–53, 2016.
- Alvaredo, F., A. B. Atkinson, and S. Morelli, "Top Wealth Shares in the U.K. Over more than a Century," *Journal of Public Economics*, 162, 26–47, 2018.
- Atkinson, A. B., "Concentration among the Rich," in J. B. Davies (ed.), *Personal Wealth from a Global Perspective*, Oxford University Press, Oxford, 64–92, 2008.
- Atkinson, A. B. and A. J. Harrison, *The Distribution of Personal Wealth in Britain*, Cambridge University Press, Cambridge, 1978.

- Atkinson, A. B., J. Hasell, S. Morelli, and M. Roser. "The Chartbook of Economic Inequality" *Institute for New Economic Thinking at the Oxford Martin School*, University of Oxford ([https://chartbookofeconomicinequality.com/wp-content/uploads/Chartbook\\_Of\\_Economic\\_Inequality\\_complete.pdf](https://chartbookofeconomicinequality.com/wp-content/uploads/Chartbook_Of_Economic_Inequality_complete.pdf) accessed January 12, 2018), 2017.
- Bengtsson, E., A. Missiaia, M. Olsson, and P. Svenson, "The Wealth of the Richest: Inequality and the Nobility in Sweden, 1750–1900," Presented at the Social Science History Meetings, Chicago, IL, November, 2016.
- Bosworth, B., "Increasing Disparities in Mortality by Socioeconomic Status," *Annual Review of Public Health*, 39, 237–51, 2018.
- Bourbeau, R. and J. Légaré, *Evolution de la mortalité' au Canada et au Québec, 1831–1931*. Presses de l'Université de Montréal, Montreal, 1982.
- Bricker, J., A. Henriques, J. Krimmel, and J. Sabelhaus, "Measuring Income and Wealth at the Top Using Administrative and Survey Data," *Brookings Papers on Economic Activity*, 2016, 261–331, 2016.
- Bricker, J., A. M. Henriques, and L. P. Hansen. "How Much has Wealth Concentration Grown in the United States? A Re-examination of Data from 2001–2013," *Board of Governors of the Federal Reserve System, Finance and Economics Discussion Paper Series* 024, 2018.
- Cowell, F., *Measuring Inequality*, 3rd ed, Oxford University Press, Oxford, 2011.
- Cowell, F., E. Karagiannaki, and A. Mcknight, "Accounting for Cross-country Differences in Wealth Inequality," *Review of Income and Wealth*, 64, 332–56, 2018.
- Curtin, R. T., F. T. Juster, and J. N. Morgan, "Survey Estimates of Wealth: An Assessment of Quality," in R. E. Lipsey and H. S. Tice (eds), *The Measurement of Saving, Investment and Wealth*, National Bureau of Economic Research, Cambridge, MA, 473–552, 1989.
- Darroch, G., "Early Industrialization and Inequality in Toronto, 1861–1899," *Labour/Le Travailleur*, 11, 31–61, 1983.
- Darroch, G. and L. Soltow, *Property and Inequality in Victorian Ontario: Structural Patterns and Cultural Communities in the 1871 Census*. University of Toronto Press, Toronto, 1994.
- Davies, J. B., "On the Size Distribution of Wealth in Canada," *Review of Income and Wealth*, 25, 237–59, 1979.
- , "The Distribution of Wealth in Canada," in D. J. Slottje and E. N. Wolff (eds), *Research on Economic Inequality, Studies in the Distribution of Household Wealth*, Vol. 4, JAI Press, Greenwich, CT, 1993.
- Davies, J. B., S. Sandström, A. Shorrocks, and E. N. Wolff, "The Level and Distribution of Global Household Wealth," *The Economic Journal*, 121, 223–54, 2011.
- Davies, J. B., N. M. Fortin, and T. Lemieux, "Wealth Inequality: Theory, Measurement and Decomposition," *Canadian Journal of Economics*, 50, 1224–61, 2017a.
- Davies, J. B., R. Lluberas, and A. F. Shorrocks, "Estimating the Level and Distribution of Global Wealth, 2000–2014," *Review of Income and Wealth*, 63, 731–59, 2017b.
- Di Matteo, L., "Land and Inequality in Canada 1870–1930," *Scandinavian Economic History Review*, 60, 309–34, 2012.
- , "Wealth Distribution and the Canadian Middle Class: Historical Evidence and Policy Implications," *Canadian Public Policy*, 42, 132–51, 2016.
- , *The Evolution and Determinants of Wealth Inequality in the North Atlantic Anglosphere, 1668 to 2013*. Palgrave MacMillan, Cham, Switzerland, 2018.
- Di Matteo, L. and P. George, "Canadian Wealth Inequality in the Late Nineteenth Century: A Study of Wentworth County, Ontario, 1872–1902," *Canadian Historical Review*, 53, 453–83, 1992.
- Francis, D., *Controlling Interest: Who Owns Canada?*, Macmillan, Toronto, 1985.
- Freund, C. and S. Oliver, *The Origins of the Superrich: The Billionaire Characteristics Database*, Working Paper Series, 16–1, February, Peterson Institute for International Economics, Washington, DC, 2016.
- Garbinti, B., J. Goupille-Lebret, and T. Piketty, "Accounting for Wealth Inequality Dynamics: Methods, Estimates and Simulations for France (1800–2014)," *World Wealth and Income Database*, Working Paper No. 2016/5, 2016.
- Goodman, W. D., "Death Taxes in Canada, in the Past and in the Possible Future," *Canadian Tax Journal*, 43, 1360–76, 1995.
- Inwood, K. and J. Irwin, "Land, Income and Regional Inequality: New Estimates of Provincial Incomes and Growth in Canada, 1871–1891," *Acadiensis*, XXXI (2), 157–84, 2002.
- Jameson, M. B., *Canadian Estate Tax*, Butterworths, Toronto, 1960.
- Kopczuk, W. and E. Saez, "Top Wealth Shares in the United States, 1916–2000: Evidence from Estate Tax Returns," NBER Working Paper 10399, 2004.
- Kopczuk, W., "What Do We Know about the Evolution of Top Wealth Shares in the United States?," *Journal of Economic Perspectives*, 29, 47–66, 2015.

- Kuznets, S., "Economic Growth and Income Inequality," *The American Economic Review*, 45, 1–28, 1955.
- \_\_\_\_\_, *Modern Economic Growth: Rate, Structure and Spread*, Yale University Press, New Haven, CT and London, 1966.
- Lindert, P. H. and J. G. Williamson, *Unequal Gains: American Growth and Inequality Since 1700*, Princeton University Press, Princeton, NJ, 2016.
- \_\_\_\_\_, "Inequality in the Very Long Run: Malthus, Kuznets and Ohlin," *Cliometrica*, 11, 289–95, 2017.
- Milanovic, B., *Global Inequality: A New Approach for the Age of Globalization*, Harvard University Press, Cambridge, MA, 2016.
- Milanovic, B., P. H. Lindert, and J. G. Williamson, "Pre-Industrial Inequality," *The Economic Journal*, 121, 255–72, 2010.
- Mockler, E. J. and D. B. Fields, *Studies of the Royal Commission on Taxation, Number 13, Gift Tax*, Queen's Printer, Ottawa, 1964.
- Newman, P. C., *The Canadian Establishment: Volume 1*, Toronto, McClelland and Stewart, 1975.
- \_\_\_\_\_, *The Canadian Establishment, Revised and Updated: Volume 1*, Seal Books, McClelland and Stewart-Bantam Ltd., Toronto, 1979.
- Oja, G., "The Distribution of Wealth in Canada," *Review of Income and Wealth*, 29, 161–73, 1983.
- \_\_\_\_\_, "Changes in the Distribution of Wealth in Canada, 1970–1984," *Statistics Canada*, 13–588 No. 1, 1987.
- Osberg, L. and F. K. Siddiq, "The Inequality of Wealth in Britain's North American Colonies: The Importance of the Relatively Poor," *Review of Income and Wealth*, 34, 143–63, 1988.
- Oxfam, "Wealth: Having it All and Wanting More," *Oxfam Issue Briefing*, January, 2015.
- Perry, J. H., *Taxation in Canada*, 4th ed, Canadian Tax Paper no. 74, Canadian Tax Foundation, 1984.
- Piketty, T., *Capital in the 21st Century*, Harvard University Press, Cambridge, MA, 2014.
- Piketty, T. and E. Saez, "Income Inequality in the United States, 1913–1998," *The Quarterly Journal of Economics*, 118, 1–39, 2003.
- Podoluk, J. R., "Measurement of the Distribution of Wealth in Canada," *Review of Income and Wealth*, 20, 203–16, 1974.
- Quandt, R. E., "Old and New Methods of Estimation and the Pareto Distribution," *Metrika: International Journal for Theoretical and Applied Statistics*, 10, 55–82, 1966.
- Reeves, R. V., *What's Really Happening to Wealth Inequality*, Brookings, Washington, DC (<https://www.brookings.edu/opinions/whats-really-happening-to-wealth-inequality/>), 2015.
- Reis, J., "Deviant Behaviour? Inequality in Portugal 1565–1770," *Cliometrica*, 17, 297–319, 2017.
- Roine, J. and D. Waldenström, "Long-Run Trends in the Distribution of Income and Wealth," in A. B. Atkinson and F. Bourguignon (eds), *Handbook of Income Distribution*, Vol. 2A, Elsevier, Amsterdam, 469–592, 2015.
- Saez, E. and M. Veall, "The Evolution of High Incomes in Northern America: Lessons from Canadian Evidence," *American Economic Review*, 95, 831–49, 2005.
- Saez, E. and G. Zucman, "Wealth Inequality in the United States Since 1913: Evidence from Capitalized Income Tax Data," *The Quarterly Journal of Economics*, 131, 519–78, 2016.
- Shorrocks, A., J. Davies, and R. Lluberias, *Global Wealth Databook 2018*, Credit Suisse Research Institute, Zurich, 2018.
- Siddiq, F. K., "The Size Distribution of Probate Wealthholdings in Nova Scotia in the Late 19th Century," *Acadiensis*, 18, 136–47, 1988.
- Siddiq, F. K. and J. Gwyn, "The Importance of Probate Inventories in Estimating the Distribution of Wealth," *Nova Scotia Historical Review*, 11, 103–17, 1991.
- Smith, J. D., "The Concentration of Personal Wealth in America 1969," *Review of Income and Wealth*, 20, 143–80, 1974.
- Smith, J. D. and S. D. Franklin, "Concentration of Personal Wealth in the United States, 1922–1969," *American Economic Review, Papers and Proceedings*, 64, 162–7, 1974.
- Statistics Canada, *The Assets and Debts of Canadians, An Overview of the Results of the Survey of Financial Security*, Catalogue no. 13–595-XIE, 2001.
- \_\_\_\_\_, *Distributions of Household Economic Accounts, Estimates of Asset, Liability and Net Worth Distributions, 2010 to 2017, Technical Methodology and Quality Report*, Catalogue no. 13–604-M—No. 087, 2018.
- Vermeulen, P., "Estimating the Top Tail of the Wealth Distribution," *American Economic Review, Papers and Proceedings*, 106, 646–50, 2016.
- \_\_\_\_\_, "How Fat is the Top Tail of the Wealth Distribution?," *Review of Income and Wealth*, 64, 357–87, 2018.
- Wolff, E. N., *A Century of Wealth in America*, Harvard University Press, Cambridge, MA, 2017.

## SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article at the publisher's web site:

**Appendix A:** Detailed Results

**Appendix B:** Death Rates and Mortality Differentials

**Appendix C:** Estate Multiplier Estimates, 1945-1968

**Appendix D:** Survey Data