Top wealth shares in the UK over more than a century ☆

Facundo Alvaredo[a,*], Anthony B. Atkinson[b], Salvatore Morelli[c]

[a] Paris School of Economics, France, Conicet, Argentina, and INET at the Oxford Martin School, United Kingdom
[b] Nuffield College, London School of Economics, and INET at the Oxford Martin School, United Kingdom
[c] The Graduate Center and Stone Center on Socio-Economic Inequality, City University of New York, United States

A B S T R A C T

Recent research highlighted controversy about the evolution of concentration of personal wealth. In this paper we provide new evidence about the long-run evolution of top wealth shares for the United Kingdom. The new series covers a long period – from 1895 to the present – and has a different point of departure from the previous literature: we start with the analysis of the distribution of estates left at death. We find that the application to the estate data of mortality multipliers to yield estimates of wealth among the living does not substantially change the degree of concentration over much of the period both in the UK and US, allowing inferences to be made for years when this method cannot be applied. The results show that wealth concentration in the UK remained relatively constant during the first wave of globalization, but then decreased dramatically in the period from 1914 to 1979. The UK went from being more unequal in terms of wealth than the US to being less unequal. However, the decline in UK wealth concentration came to an end around 1980, and since then there is evidence of an increase in top shares, notably in the distribution of wealth excluding housing in recent years. We investigate the triangulating evidence provided by data on capital income concentration and on reported super fortunes.

1. Introduction: the distribution of personal wealth

Economists have recently focused on the distribution of personal wealth. There have been two main sources of impetus. One is the recognition of the importance in macro-economics of assets and liabilities, as demonstrated by the investments being made in launching household financial surveys, and by the renewed interest in balance sheets in national accounts. Another impetus has come from Thomas Piketty's *Capital in the Twenty-First Century*, in which he warned that the main driver of inequality – the tendency of returns on capital to exceed the rate of economic growth – today threatens to generate extreme inequalities. The debate generated by this book has turned the spotlight on the empirical evidence concerning the upper tail of the wealth distribution, and the importance of historical time series. As Kopczuk (2016, p. 2) has underlined, "estimates of the top wealth shares are

much less settled than those of the top income shares, and there is substantial controversy about how they have evolved in recent years."

This paper presents new long-run evidence about top wealth shares – which we believe to be essential in understanding the evolution of the modern economy - for the United Kingdom (UK). It builds on the earlier line of research, summarized in Atkinson and Harrison (1978), and on the work of the official statisticians in Her Majesty's Revenue and Customs (HMRC), but has a different point of departure: we start with the analysis of the distribution of estates left at death, recorded in the administrative data required for estate taxation and the administration of estates. The information on estates has served for the estimation of the distribution of wealth among the living through the application of the mortality multiplier method, but has never been the object of specific analysis.

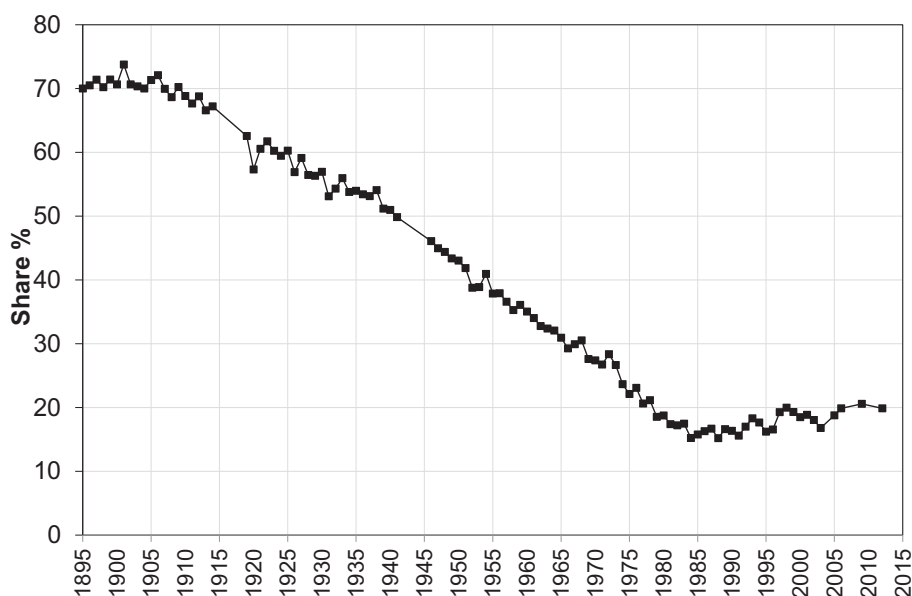The evidence covers an extensive period, starting in the "Gilded

Fig. 1. Wealth share of top 1% in the UK 1895–2013.
Source: Online Appendix Table G1.

Age" before the First World War. The long-run results since 1895 highlight the enormous transformation of the distribution of wealth within the UK over more than a century. Fig. 1, previewing the main estimates, shows that in the wake of the first modern globalization the share of personal wealth going to the wealthiest 1% of UK individuals remained relatively stable at around 70%. The share began to fall after 1914 and the decline continued until around 1980. Although UK top wealth shares certainly fell during the two world war years, most of the reduction was very much a peace phenomenon. By 1980, the share had decreased to some 16%. This is still 16 times their proportionate share, but represents a dramatic reduction. The fall, however, came to an end around 1980, and since the mid-1980s the share of the top 1% – representing approximately half a million individuals today – has moved in the opposite direction.

What lies behind the long-run estimates for the UK presented in Fig. 1? Our investigation begins in Section 2 with the estimation of the distribution of estates from the administrative tax data, which covers a long period (1895 to 2013). In Section 3, we estimate wealth concentration applying the mortality multiplier method to the estate data. In the UK, this involves piecing together data for the different years when sufficient information exists on the demographic structure of estates to implement such method. In Section 4, we link the different estimates of wealth concentration over time to provide a continuous time series from 1895 to 2013. We show that the distribution of estates has substantial informative content in and of itself, and that the application of mortality multipliers does not alter the picture concerning the distribution of the wealth of the living, as commonly believed. The results cover, in addition to the evolution of top wealth shares, the shape of the upper tail, which builds a bridge with the theoretical literature on thick tails of the wealth distribution (see Benhabib and Bisin, 2016, for a recent review). We pay particular attention to the role of housing in understanding the dynamics of wealth concentration, and highlight its equalizing effect over the past decade. The new estimates represent, we believe, an advance on those available to date, but they should be viewed in the context of a variety of potential sources of error, arising both from the underlying method and from the reliance on tax data. In Section 5, we consider the internal validity of the estimates by addressing the main problems with the methods used in their construction. Most notably, recent literature has suggested that aggressive estate tax planning and the decreasing mortality of wealthy individuals can bias downward the estimates of top wealth shares based

on estate data (Saez and Zucman, 2016). Reasonable adjustments to account for tax evasion and avoidance naturally affect the level of estimates, but only marginally the trends. We also show that the sensitivity of top wealth shares to steepening mortality-wealth gradients is an empirical matter, and that such elasticity is small. In Section 6 we apply checks on the external validity of the estimates presented here through an examination as to how far they can be triangulated with evidence from other sources (investment incomes, rich lists). The increase in UK wealth concentration observed since 1980 has been moderate, similar to what the most recent results suggest for France (Garbinti et al., 2016).

The new evidence about top wealth shares for the UK is compared in Section 7 with the evidence for the United States (US). There has long been interest in contrasting wealth distributions in the UK and the US (for example, Lydall and Lansing, 1959, and Lampman, 1962). The juxtaposition of the two countries is of particular relevance given the recent critical reviews of the long-run US evidence (Kopczuk, 2015 and 2016, and Sutch, 2017), and the publication of alternative estimates by Bricker et al., 2016, and Saez and Zucman, 2016, the latter finding a particularly sharp rise in the very top wealth shares. Comparisons made half a century ago found wealth to be more concentrated in England, but today the US is seen as the home of major concentrations. If so, when did the countries change position? There are significant differences in the nature of the estate data – in coverage and in the process of assembly – but the sources are sufficiently similar to make the comparison a meaningful one. In the final Section 8, we summarize the main findings and discuss the implications for the future measurement of the distribution of wealth.

1.1. Measuring the distribution of wealth

The paper is concerned with the distribution of personal wealth, or net worth: the value of the assets owned by individuals, net of their debts. Assets include financial assets, such as cash, bank accounts, bonds or company shares, and real assets, such as houses and farmland, consumer durables, and household business assets. The total wealth considered here differs in important respects from total wealth as measured in the national accounts balance sheets. To begin with, we are concerned only with one sector of the economy: the household sector, where this excludes non-profit institutions serving households. Second, there are differences in the method of valuation, a subject that is often

neglected. The balance sheets are in principle based on values observed in the market, but it is necessary to distinguish between "realization" and "going concern" valuations (Atkinson and Harrison, 1978, p. 5). Here the nature of the data on individual wealth-holdings at our disposal means that we focus on the former: what a person could realize by the sale of all assets, net of liabilities. The "going concern" valuation could well be higher than that recorded in the statistics.[1] In the case of household contents (durables, furniture, etc.), for instance, the price obtained on sale is likely to fall considerably short of the value to a continuing household (or the replacement cost). A less common, but quantitatively important, example is that of business assets, where the realization value is likely to be less than the valuation on "going concern" basis. On balance, moving to a going concern basis is likely to reduce top wealth shares (Atkinson and Harrison, 1978, pp. 112–113), and this should be borne in mind in what follows.

In adopting a realization basis, we are open to the charge of departing from national accounting practice. However, it should be noted that the official UK statement about the basis for the balance sheet valuation states that "market value is an estimate of how much these assets would sell for, if sold on the market" (Office for National Statistics, 2016, Section 2). This sounds more like a realization basis than a going concern basis. What is more, once we depart from observed market transactions, any estimate of what assets "would sell for" involves a number of speculative assumptions. This applies to various classes of assets, but is particularly the case with defined benefit pension rights, both private and state, where there have been a series of official UK estimates, but these have been subject to substantial revisions (see, for example, *Inland Revenue Statistics 1995*, pp. 124–125).

It has also to be remembered that we are concerned about the distribution of wealth not only on account of the potential consumption. Wealth conveys power. The realization basis may be seen as capturing the degree of direct personal control over resources that is one of the major reasons for interest in the concentration of wealth. If, as it has been expressed by Abraham (2016, p. 313), there is concern that "a growing share of income and wealth is controlled by households in the top 1 percent or top 0.1 percent", then it is reasonable to omit assets, such as pension rights, over which the individual has only limited or no control.[2]

There are five main potential sources of evidence about the distribution of personal wealth:

1. Household surveys of personal wealth, such as the UK Wealth and Assets Survey, conducted by the Office for National Statistics, or the Survey of Consumer Finance conducted by the US Federal Reserve;
2. Administrative data on individual estates at death, multiplied-up to yield estimates of the wealth of the living, as utilised in the UK by HMRC (previously, the Inland Revenue);
3. Administrative data on the wealth of the living derived from annual wealth taxes;
4. Administrative data on investment income, capitalized to yield estimates of the underlying wealth;
5. Lists of large wealth-holders, such as the annual Forbes Richest People in America List, or the Sunday Times "Rich List" for the UK, which has been compiled by Beresford (1990, 1991 and 2006).[3]

For the UK and the US, the third source does not exist. Sample surveys are relatively recent: the earliest in the UK and the US were carried out in the 1950s. The Rich Lists are even more recent: the UK Sunday Times list dates from 1989; the US Forbes list started in 1982. This means that long-run historical evidence has to make primary use of sources (2) and (4). The capitalization of investment income has recently been revived in the US by Saez and Zucman (2016), and was the subject of research in the UK in the 1970s (Atkinson and Harrison, 1974 and 1978). However, as explained by Alvaredo et al. (2016), the data necessary to satisfactorily apply this approach in the UK are unfortunately less readily available than in the US.[4]

The main focus of the paper is therefore on the use of estate data. Estates are not the same as the wealth among the living, but it turns out that the estate distribution provides a valuable point of reference.

2. The distribution of estates

The distribution of estates (the net value of worldwide real and financial property of a deceased person) has commonly served for the estimation of the distribution of wealth among the living via the mortality multiplier method, but has never been under extensive scrutiny in and of itself. There are nonetheless reasons to consider the distribution of estates a good starting point, at least in the UK. First, there are tabulated data on the distribution of estates for almost all years from 1895 to 2013.[5] The estimates relate to Great Britain (excluding Ireland) from 1895 to 1973, and the UK (including Northern Ireland) from 1974 onwards. This geographical definition reduces the extent to which the distribution is affected by the division of Ireland in 1921. The estates are taken to refer to adult deaths, where we take adult to mean throughout the period the population aged 18 and over (even though the age of majority changed from 21 to 18 in 1970).[6] The second main reason for beginning with estates is that the underlying concept is relatively straightforward: it is the wealth left at death, and there is inherent interest in the concentration of inheritances. Thirdly, the estate distribution does not involve the multiplying-up process (subject to more stringent data requirements), described in Section 3, and where the choice of mortality multipliers has been the subject of intensive debate, even in the most recent literature.

Fig. 2 shows the upper tail of the distribution of estates over the period from 1895 to 2013.[7] The changes in top shares may be summarized in terms of the three periods marked by vertical lines in Fig. 2. The first of these is the twenty-year period leading up to the First World War. There was a scarcely perceptible decline in the top shares: that for the top 1% went from 69.2% in 1895 to 67.3% in 1914. The groups at the very top saw an actual increase: that of the top 0.5% rose from 23.9% to 25.4%, which means that the top 0.05 had > 500 times their proportionate share of total estates. At the other end of the scale, the bottom 90% had very little wealth at death. In short, estates were highly concentrated at the top, and there was overall little sign of change.

The second period covers more than half the twentieth century:

---

[1] Although this is not invariably the case. In the estate statistics, life assurance policies on the life of the deceased are valued at the sum assured, whereas in the hands of the living their value is less than this amount, whether valued on a going concern or a realization basis. It would be possible to make adjustments to the recorded amounts (see Atkinson and Harrison, 1978, pages 95–99), but this has not been done here. In the same context, no account has been taken of the cash withdrawal/surrender value of defined contribution pensions.

[2] Our estimates equally exclude "human capital" and the value of rights to state benefits in kind such as health care, education, etc.

[3] In some particular cases, population census also provide evidence about the distribution of personal wealth.

[4] The application of the capitalization method in the UK, as well as a re-evaluation of its limitations, is part of a related undergoing project by the authors of this paper.

[5] The missing years are 1915–1918, 1942–1945, 1995 and 2004. The sources of the estate data are listed in Online Appendix Table A1. The data are based on a sample, as described in Online Appendix I.

[6] This definition follows that in the official IR/HMRC estimates of the distribution of wealth. At one point, the IR defined the adult population as those aged 15 and over (see, for example, *Inland Revenue Statistics* (IRS) 1976, Table 108), but with effect from IRS (1978) this was changed to 18 and over (see IRS 1978, page 79). Earlier studies of the distribution of wealth took those aged 20 and over (Lydall and Tipping, 1961) or even 25 and over (Daniels and Campion, 1936). On the grounds that there had been a downward trend in the age of economic independence, Atkinson and Harrison (1978) took a cut-off that began at 23 in 1923 and then fell by 1/10th of a year until reaching 18 in 1972.

[7] The top shares in total estates are interpolated from the published tabulations classified by ranges of estate size. The interpolation makes use of the mean split histogram; see Atkinson (2005). The underlying estimates are given in Online Appendix Table E1.
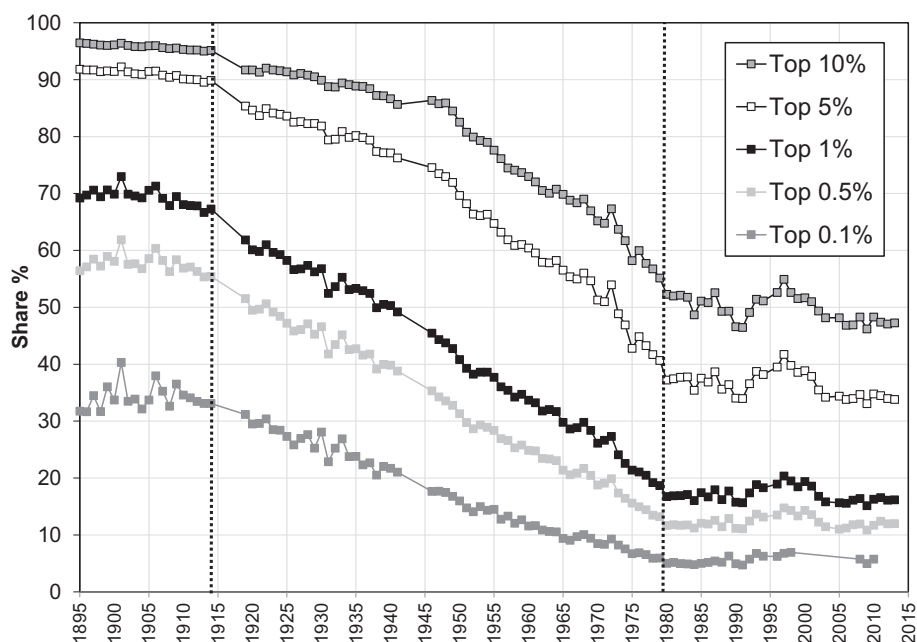
Fig. 2. Distribution of estates in the UK 1895–2013.
Source: Online Appendix Table E1. Note: The figure shows the concentration of estates (the net reported value of all property of a deceased person) at the top of the distribution.

from 1914 to 1980. This encompassed two world wars, and much attention has been paid to the loss of capital during the periods 1914 to 1918 and 1939 to 1945. Top shares certainly fell during the war years, but these only accounted for a part of the large reduction that took place over the period as a whole. The share of the top 1% in total estates fell by 48.7 percentage points between 1914 and 1979, but the war years only contributed 10.5 percentage points. The share of the top 0.1% fell by 27.2 percentage points, but again only a quarter took place during the war years. The large decline in top shares was very much a peacetime phenomenon.

The third period is from 1980 to the present. There have been year-to-year variations, but over the thirty years little change in top estate shares. The share of the top 1% ended in 2013 at virtually the same figure as in 1980.

2.1. The nature of estate data

The estate data are important both in their own right and because they provide the basis for the estimation, using the mortality multiplier method, of the wealth of the living discussed in the next section. The existence of the data reflects the institution of a single Estate Duty in 1894, substituted in 1975 by the Capital Transfer Tax, which was in turn replaced by the Inheritance Tax (IHT) in 1986, currently in place. The data derive from the legal process of administering the estate of a deceased person, which is a complex business. All claims need to be resolved, and the deceased person's property distributed according to the will or according to the legal provisions in the case of the person dying intestate. Before allowing an executor to administer the estate, a Court has to validate and prove the will (granting probate). This legal process of probate defines the true definitive testament of the deceased person and, in doing so, provides (often professional) assessments of estate valuation.[8] The latter are then used to submit the IHT form in order to work out if any tax needs to be paid. After submitting the form (required within one year from the death), the executor or the

administrator of the estate needs to swear an oath stating that the information given is true and accurate. It is after this process that usually the court issues a Grant of Representation (known as confirmation in Scotland and probate in the rest of the UK).[9]

Not every estate needs a Grant of Representation. In particular, a grant is not required for assets below the probate limit (currently £5000), or for assets above the probate limit held jointly and therefore passing automatically to the other joint owner (e.g. a surviving spouse or civil partner). However, assets for which a grant of representation is not required are still recorded in our data to the extent that the estate of the deceased also includes assets for which a grant of representation is needed. As a result, the estates identified in our data, referred to as the "identified" estates, cover a substantial fraction of all deaths in a year (see Online Appendix Fig. C1), currently around a half. Therefore, an estimate of the total value of estates including those not covered by the estate returns, referred to here as the "excluded estates", is required to derive top estate shares. The need to estimate the amount of "excluded wealth" is an important limitation of the estate method. At the same time, on the plus side, the valuation of the identified estates is the result of a much more thorough process than is likely to be carried out when collecting wealth data in other forms.

2.2. The derivation of the estate total

The total of estates is taken as the sum of the identified total in the estate returns plus an estimate of the total of excluded estates. The latter is in turn calculated from the estimated total wealth excluded from the wealth estimates, by making the assumption that the amount of excluded estates passing in a year is given by the mortality rate of the excluded population times the excluded wealth. In other words, it is assumed that the average wealth of the dying among the excluded population is equal to the average for the living in that population. Such an assumption would not be appropriate if applied to estates as a whole,

---

[8] Professionals are engaged in around 70% of cases of probate (National Audit Office, 2004).

[9] The linkage with the probate system significantly reduces the risk of the non-filing of tax returns in the UK (see National Audit Office, 2004, page 25). On the contrary, probate is obtained before paying federal taxes in the US.

but may not be unreasonable as a first approximation when applied to a group whose wealth is by definition limited.[10]

3. The distribution of wealth based on the estate multiplier method

The distribution of wealth of the living is conceptually different from that of the decedents. Death does not "sample" randomly the population. Older individuals, as well as males and people from poorer backgrounds, have, other things being equal, higher mortality risk. Differential mortality multipliers can however be used to transform the estate data into estimates of wealth-holding. Under the assumption that death is random within specific cells of observed demographic and social strata, one can view death occurrence as an effective sampling of the living population.

The inverse of the death rate, and hence the mortality multiplier, varies considerably with age: for example, in 1968 the general mortality multiplier for men varied from 3.74 for those aged 85 and over to 1102.18 for those aged under 25. Applying such differentials could be expected to lead to a distribution of wealth that differs a great deal from the distribution of estates. The impact could be expected to be further affected by the use of adjustments that reflect the lower mortality of the wealthy. In the UK, the assumption was initially made that wealth was correlated with social class as defined by occupational categories, and later refined by the introduction of variables such as marital status, home ownership and housing wealth. In what follows, we make use of the official IR/HMRC estimates of identified wealth for the period from 1960. For much of the period, the official multipliers have been differentiated according to gender, age group, country (England and Wales, and Scotland, in the case of Great Britain), and estate size class. For the period before 1960, we apply the social class mortality multipliers employed in Atkinson and Harrison (1978, Chapter 6) based on occupational classes, where these vary by decade.

The application of mortality multipliers to the pre-1960 estates data, the use of multiplied tabulations by wealth ranges since 1960, and the micro-data from the IHT for 2008–2010, yields estimates of the distribution of *identified wealth* covering 1911 to 2012.[11]

3.1. The derivation of the wealth total

The wealth holdings identified by the multiplier process have to be compared with the wealth total for the population as a whole. The control totals for wealth (and for total population) are given in Table D1. We employ the national balance sheets, but it should be stressed that the control totals are not necessarily equal to the balance sheet totals for the personal sector. It is not simply a matter of replacing the total by one drawn from the published national accounts. Among the major reasons for the difference is the inclusion in the official UK balance sheets of the value of private pensions, which do not fall within the definition of personal wealth adopted here.[12] A further example is

provided by the issue of timing. The balance sheet figures refer to a point in time (31st December); the estate data refer (now) to the date of death. The latter seems appropriate, and there is no reason to make the "end-year adjustment" incorporated in the balance sheets.[13]

The IR/HMRC have, beginning with IRS 1980, published tables on the "Reconciliation of estate multiplier and balance sheet estimates". The aim is to explain the relationship between *total identified wealth,* obtained by multiplying up the estate data by mortality multipliers, and the information available from external sources, drawing on the national balance sheets. Such a reconciliation exercise was a major development with regard to estimates of the distribution of wealth, but it has been unfortunately discontinued. In 2005, the last year available, the total identified wealth is £3432 billion, to which is added £908 billion (26%) for the wealth of the excluded population (including in this case omitted wealth held in trusts). A similar amount (£826 billion) is added for under recording, and £161 billion is subtracted to allow for differences in the valuation (such as in life policies). The end result of these adjustments is total marketable wealth, which is £5005 billion, or 46% higher than total identified wealth - see Fig. 3. This is considerably less than the national balance sheet figure for the wealth of the personal sector, including an estimate of the value of funded private pension rights, which in 2005 was (excluding NPISH) £6292 billion.

The pre-2005 wealth control total in our paper adds the estimates of total identified wealth and the HMRC estimates of the wealth of the excluded population. The addition for the excluded population is necessary, since not all assets and possessions come to notice to tax authorities. In the tax year 2005–6, for example, there were 273,043 estates included in the statistics for the UK, compared with a total of 577,113 adult deaths. When multiplied up to give an estimate for a point in that year, the resulting number of identified wealth-holders fell considerably short of the total adult population: 18.7 million identified wealth-holders compared with an adult population of 47.1 million. Therefore, for 2005–6, it is necessary to make an addition to total wealth for that owned by the excluded 28.4 million.[14]

For years beyond 2005, however, this approach cannot be followed, since this was the last year in which the HMRC made an official estimate of the wealth of the excluded population (EP), and we lack the information required to make such estimates, which depend on the size and composition of the EP. There is therefore an inevitable hiatus in the series. It is true that we have estimates of the total identified wealth from the estate data, and the approach closest to that employed up to 2005 would be to add this to a forward extrapolation of the 2005 total for the excluded population. As however is discussed further in Section 5, we have doubts about the identified wealth totals after 2005, and these spill over into any estimate of the excluded wealth total, which depends on both the size and composition of the group that does not appear in the estate statistics. For simplicity, we begin with an alternative approach, using the year-to-year variation of national accounts balance sheet total for the personal sector. We are therefore departing from our earlier practice in employing an internal control total – but only for the purpose of linking over time.

The resulting main series for total wealth per adult combining the identified wealth and the estimated wealth of the excluded population

---

[10] A check on the assumption is provided by calculating the implications for the overall ratio for the whole population (included and excluded) of the average wealth of decedents to the average wealth of the living. The values in the early part of the period are around 2, falling to 1.5 in the 1950s. These do not seem unreasonable. Moreover, the fact that, until 1975, the values are considerably above those found by Piketty (2011) in the case of France suggests that the allowance should not be increased (see Online Appendix Figure C4).

[11] See Online Appendix C for details.

[12] A further element is that the balance sheet total for the personal sector includes Non-Profit Institutions Serving Households-NPISH (2% of the balance sheet total), and this should be deducted. The national accounts definition of total personal net worth does not include consumer durables. It also differs in adding an end-of-year adjustment. In earlier years, the national accounts included the value of non-marketable tenancy rights (intangible assets including housing and agricultural tenancy rights), but from the 2012 edition of the national accounts and to be aligned to the European System of Accounts 1995, "non-marketable tenancy rights" have been excluded, reducing net worth in 2005 by £487 billion.

[13] On the other hand, in earlier years the IR data referred to the date at which the estate was administered ("year of account"). Since the period of administration varied considerably, the deaths in question could have occurred in another calendar year: IRS 1980 says of the 1976 year of account data that "while the figures related in the main to deaths in 1976, also included were details of estates where death occurred earlier than 1976, and in a few cases in the first quarter of 1977" (p. 101). This may make quite a difference where asset prices are changing rapidly, and when linking the series allowance is made for the potential difference. It should also be noted that the lengthy process of administration may lead to the IR/HMRC making revisions to the data. For example, revisions to the identified wealth tables for 2002 published by HMRC in 2010 led to a 2 percentage points rise in the wealth share of the top 10% (although a much smaller change in the shares of the top 1 and 0.1%).

[14] Differently from the case of the US where only approximately 1% of estates are covered by estate statistics, the substantial coverage of the decedent population in the UK allows the derivation of internal measures of total personal wealth.
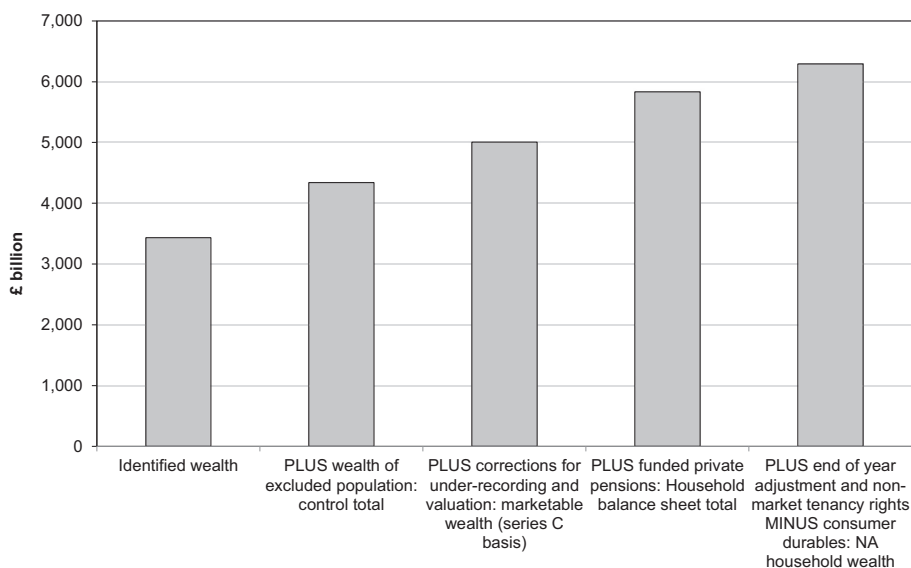
Fig. 3. Wealth control totals in the UK 2005.
Source: Online Appendix Table D1 and HMRC website Table 13.4 'Personal wealth. Summary reconciliation of estimates of Identified wealth and Wealth on a national accounts basis.'
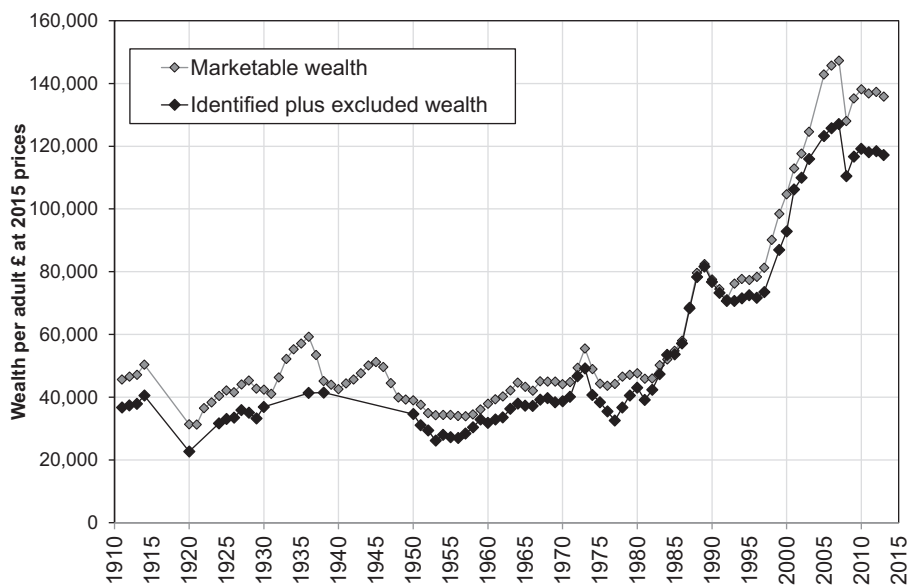

Fig. 4. Wealth per adult in the UK 1911–2013.
Source: Online Appendix Table D1. Note: The series refer to the average wealth per adult. The series in black corresponds to the wealth total in this paper. The series in grey allows for corrections for under-recording and valuation of assets.

are shown in constant price terms in Fig. 4. There is year-to-year variation, but the average remained relatively stable for much of the first three-quarters of the twentieth century: average wealth in 1980 was little higher in real terms than in 1920. There followed a marked rise, with the average at the start of the twenty-first century being some 3 times that in 1980. The threefold increase is similar to that recorded by Kopczuk and Saez (2004a) (Table A) for the US between 1916 and 2001, but the time path is quite different, since average wealth in the US had doubled between 1916 and 1980. Among the reasons for the difference are the impact in the UK of house price booms and the spread of owner-occupation, and the transfer of wealth to the personal sector from the public sector as a result of the privatization of state enterprises and public housing. We return to the role of housing below. Fig. 4 also compares the series used here with our attempt to construct a "marketable wealth" series, which allows for corrections for under-recording and valuation of assets. As is to be expected, the marketable wealth

series lies typically, but not universally above our main series (the adjustments may be negative), but the time pattern is close.

4. Towards a long-run series for top wealth holdings in the UK

The results of the multiplier process, combined with the control totals, provide estimates of the top shares. As is inevitably the case with such a long time series, its construction involves the linking of estimates on different bases across time. There are seven potential breaks in our estimates:

A) At 1923 which is the first year for which we have estate data for England and Wales broken down by gender, age, and estate class;
B) In 1938 when the data begin to cover Great Britain (England, Wales, and Scotland);
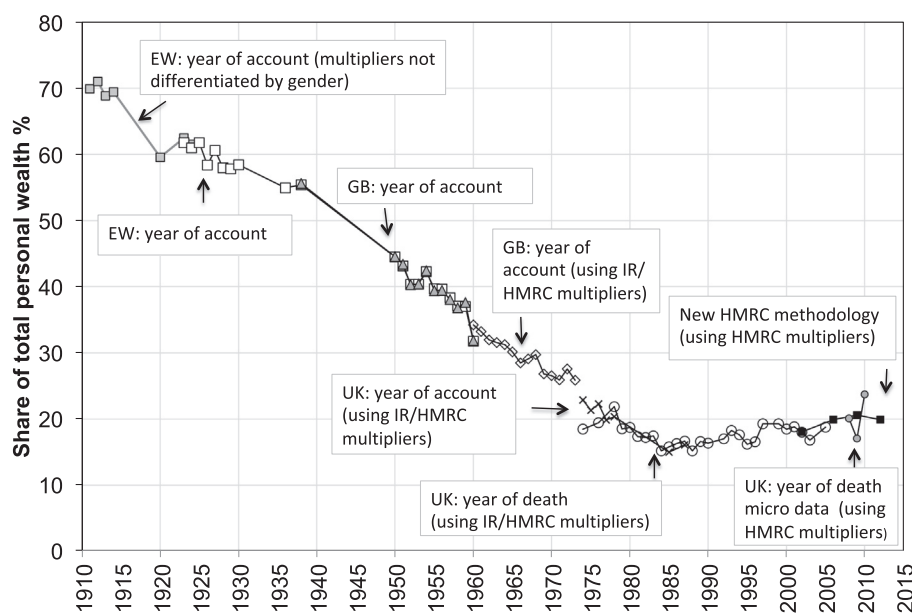C) In 1960 when the IR began to use the estate data to make wealth

Fig. 5. Piecing together different series for the UK top 1% wealth share 1911–2012.
Source: Authors' estimates from Online Appendix Table G3.
Note: The figure shows the estimates of the top 1% wealth share as we piece different series. The geographical coverage differs over time, as well as the nature of the mortality multipliers and the administrative methodologies to record estate data.

estimates;

D) In 1974 when the data begin to cover the UK (Great Britain and Northern Ireland);

E) In the 1970s and 1980s when data switch from a year of account to a year of death basis;

F) After 2002 when HMRC introduced a new methodology;

G) 2008–2010 when it became possible to use a form of microdata from HMRC Datalab.

The different elements are summarized in terms of their implications for the share of the top 1% in Fig. 5. Of the seven, the element G should not in principle lead to any discontinuity. Then there is the geographic coverage (elements B and D). The earlier series constructed by Atkinson and Harrison (1978) showed a break between 1938 (EW) and 1950 (GB). The differences are however very small, and we therefore treat the series as continuous at 1938. In the same way, the change to a UK basis in 1974 is assumed not to have materially affected the estimated top shares (the added population, that of Northern Ireland, is 2.9% of the UK total). This leaves four breaks where the series have to be linked. We made use of overlapping years where possible and, between 1959 and 1960, of the estate data. The adjustments have been assumed to be additive. They take as a base (i.e. no adjustment) in 2002 the new HMRC series (following the national accounts practice where estimates on earlier bases are revised to bring them into line with the most recent methodology), and involve changes measured in percentage points. Although marginal in magnitude on average, we have made four additive adjustments in the course of linking the series, designed to bring them into line with the reference series for the most recent years.[15]

4.1. Comparison of the distributions of estates and of wealth

The series for the distribution of wealth is now brought together with that for the distribution of estates described in Section 2. Fig. 6 compares the shares of the top 1% for the two series. Theoretically, the application of multipliers embedding differential mortality by age and wealth can increase or decrease wealth shares as well as change the time pattern (relative to estate shares), depending on the evolution of the age-gender-wealth profiles. When the age and gender multipliers

were first employed in the UK, it was seen as overcoming a "fatal" objection to the use of estate data, since "the accumulated wealth of an individual increases with years … and is usually greatest when a man dies" (Mallet, 1908, p. 67). Our findings suggest that the objection is in fact less than fatal. In practice, for much of the period the conclusions reached regarding the degree of concentration do not change radically. As shown in Section 7, such a result carries through to the US; it also applies to 19th century Paris, (Piketty et al., 2006).

The exception to the conclusion just described concerns the most recent years, when Fig. 6 shows the wealth series as rising relative to the estate series after 2002, the wealth estimate of the share of the top 1% exceeding the corresponding share for estates by an average of 5 percentage points. This departure may be explained by the limitations of the method used to construct a control total for wealth post-2005, but we believe that it also occurs on account of the changes in multipliers, as part of the changes in methodology adopted by the HMRC since 2002. We return to this in Section 5.

The close relationship between estate distribution and wealth distribution provides a useful measurement benchmark in order to extend the wealth concentration series back in time to 1895, and to fill in missing years. More precisely, we apply the approach to interpolation and extrapolation proposed by Friedman (1962) involving the use of related time series. In the present case, we use the estate series to interpolate the gaps between available observations of top wealth shares. The relationship between top wealth shares and top estate shares, estimated from 1911 to 2005 by ordinary least squares, is shown in Table 1.[16] The predicted values are then used to provide estimates of the top wealth shares for years that are missing from the wealth series from 1895 to 2005. The final series are shown in Fig. 7a and b, and full results are given in Online Appendix Table G1. Figures for the share of top 1% of total wealth are those illustrated in Fig. 1 in the introduction. The remaining gaps are those years for which there are no estate data, mostly during the war years.

---

[15] All breaks and the sensitivity of our results to different linking assumptions are discussed in Online Appendix P.

[16] We have examined the sensitivity of the estimates to the use of semi-parametric or local non-parametric regressions. For our semi-parametric exercise, we used Robinson's (1988) double residual estimator and estimated the nonlinear relation between top estates shares and top wealth shares using a Gaussian kernel weighted local polynomial fit. Our non-parametric findings were based on a locally weighted regression of top wealth shares on estate shares (with running-line least-squares smoothing). It turns out that predicted values of top wealth shares on the basis of these different approaches track each other closely and that our estimates appear quite robust.
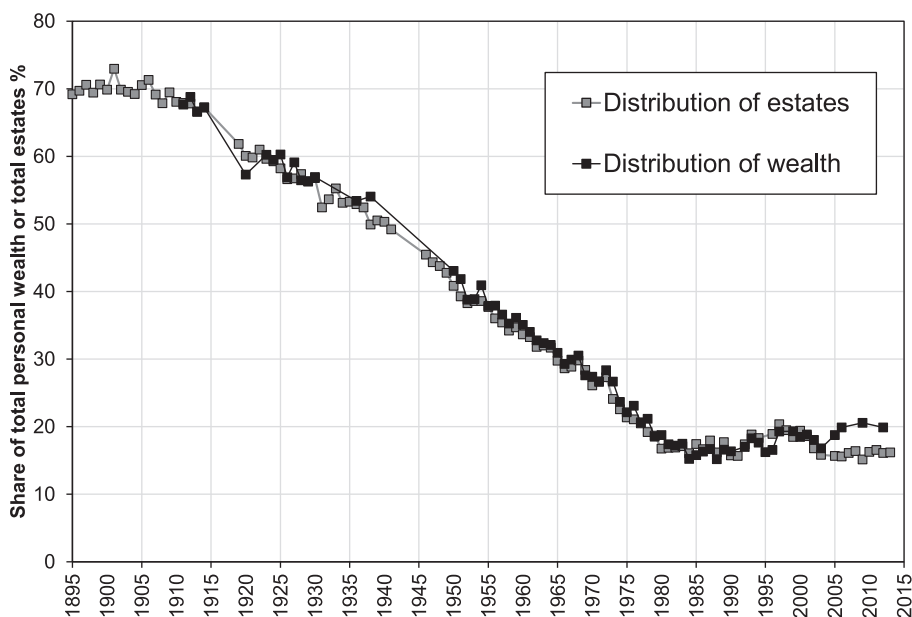
Fig. 6. Comparison of wealth and estate distributions in the UK: share of top 1% 1895–2013.
Source: Online Appendix Table E1 and Table G1.

Table 1
Linear regression of wealth shares on estate shares 1911–2005.

	[1]	[2]	[3]	[4]	[5]
	Top 10% share (wealth)	Top 5% share (wealth)	Top 1% share (wealth)	Top 0.5% share (wealth)	Top 0.1% share (wealth)
Top 10% share (estates)	0.937*** (0.010)				
Top 5% share (estates)		0.965*** (0.008)			
Top 1% share (estates)			1.006*** (0.009)		
Top 0.5% share (estates)				1.005*** (0.012)	
Top 0.1% share (estates)					1.066*** (0.023)
Constant	2.608*** (0.699)	0.846 (0.488)	0.337 (0.337)	0.636 (0.328)	0.451 (0.374)
R-squared	0.993	0.995	0.994	0.991	0.974
Observations	58	68	68	68	60

Notes: Table based on linear regressions of top wealth shares series on the respective top estate shares measured in percentage points.
The sample used is 1911–2005 (included). Standard errors in parentheses.
    *** Denotes $p < 0.001$.

4.2. The distribution of wealth from 1895 to 2013

What does the final series show? The estimated top wealth shares before the First World War were very high. The share of the top 0.1% was at least one third, which meant that they had > 333 times their proportionate share. The share of the top 1% was around 70%, and that of the top 5% around 90%. In particular, it is worth noting that recorded wealth concentration was high despite the lack of correction for settled property (mostly wealth held in trusts); Daniels and Campion (1936, p. 39) estimate that 15 to 20% of the settled capital passing at death was excluded from the estate duty returns in 1911–13, compared with a much smaller fig. (4 to 7%) in 1924–30. If a substantial amount of settled property was missing from the estate duty statistics for the

years 1911 to 1914, then the top shares may be under-stated.[17] After 1914, the top shares then began to fall, with the rate of decline accelerating after the Second World War. By 1979 the share of the top 1%, which had been around three-quarters, was closer to one-fifth. The share of the top 0.1%, which had been a third, was by 1979 around 7%. By any standards, this represents a dramatic reduction in wealth concentration over two-thirds of a century.

Panel b of Fig. 7 demonstrates the importance of looking within the top 10%. The share in total wealth of those in the top 10%, but not in the top 1% (i.e. the "next 9%") saw a rise in their share for the first half of the twentieth century, followed by a period of stability until the end of the 1970s. This underlines the changing shape of the upper tail, to which we return below.

Since 1980, the decline in top shares has come to an abrupt stop. The subsequent behaviour of the top shares is not easily summarized: it depends on the period considered and on the part of the upper tail on which one focuses. The reader of the official report *UK Personal Wealth Statistics 2011 to 2013* is told that over the ten year period 2001/03 to 2011/13 "the distribution of wealth held by each decile has been broadly unchanged" (HMRC, 2016, p. 4): the conclusion is one of stability. However, the distribution in the HMRC report relates only to those identified as wealth-holders, and no account is taken of the existence or wealth of the excluded population. Moreover, grouping in terms of deciles is too crude to capture properly what is happening at the top. The estimates presented in panel a) of Fig. 7 suggest that the trend in the share of the top 1% of all adults was upward. Moreover, panel b) of Fig. 7 shows that the experience was not uniform across top wealth groups. The lower half of the top 1% (those between the 99th and the 99.5th percentiles) saw a relative stability in their share of total wealth, whereas the upper half saw an increase. It is not just the share of the wealthy that has changed but also the *shape* of the upper tail, to which we now turn.

---

[17] This was due to the fact that before 1914 where estate duty had been paid on settled property, duty was not payable a second time the property passed. Daniels and Campion (1936) also show that the settled property reported in 1924 and 1925 rose as a proportion of total property from 7.0% for estates between £100 and £1000 to 21.7% for estates over £100,000 (Table 14).
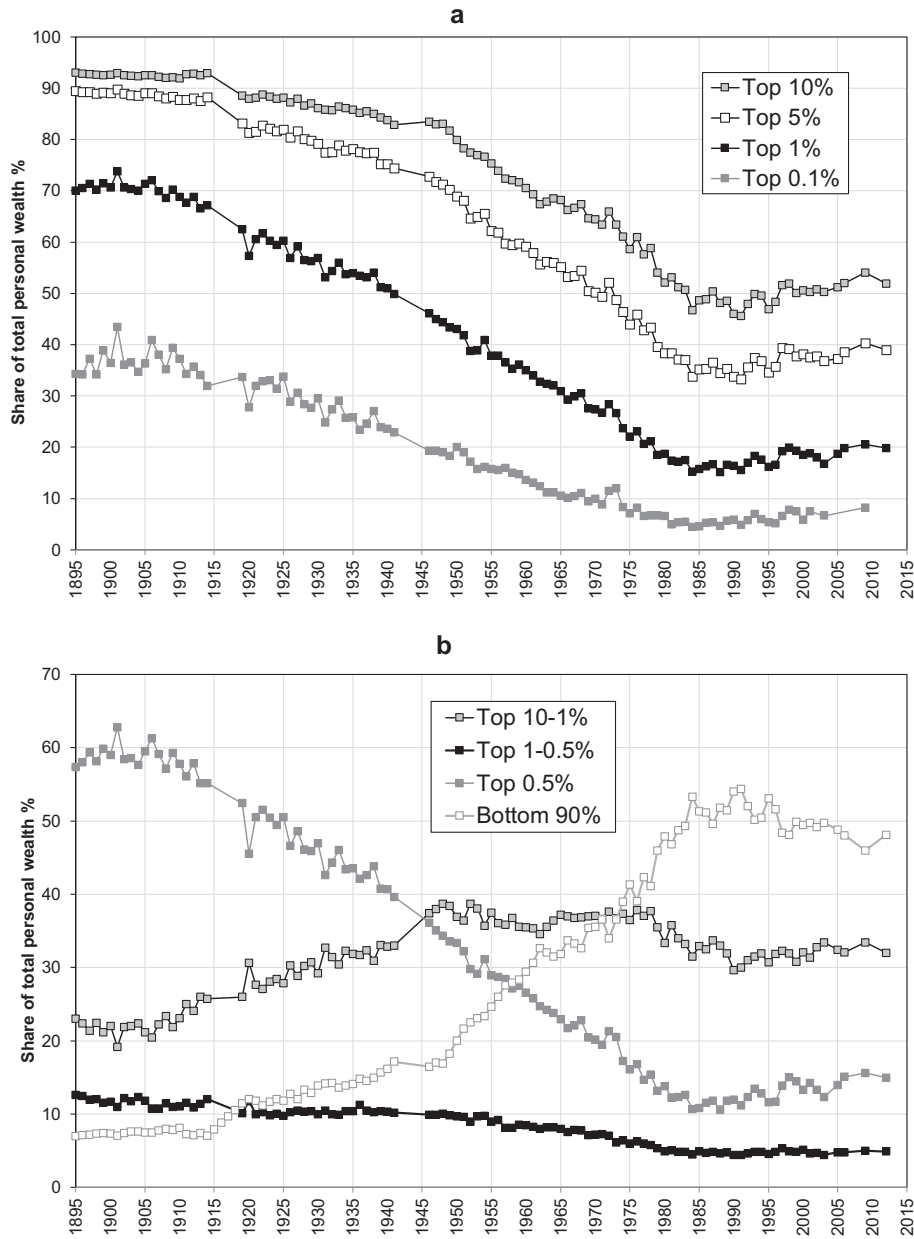
Fig. 7. Top wealth shares in the UK 1895–2013.
Source: Online Appendix Table G1.

4.3. The shape of the upper tail

In seeking to understand further the evolution of wealth concentration, it is helpful to consider the share, S_i, of the top i per cent expressed as a multiple of their population share, $1 - F_i$. The extent to which the wealth share exceeds the population share may then be seen as the product of two components:

$$\frac{S_i}{1 - F_i} = \frac{w_i}{\mu} \; m(w_i)$$

where w_i is the i-th percentile of wealth from the top, expressed relative to μ, which is the overall mean wealth, and $m(w_i)$ is the mean wealth above w_i expressed as a ratio of w_i. The extent to which the top 1%, say, have more than their proportionate share depends, via the first term, on the wealth required to enter this group (w_i/μ), which we refer to as the "entry price". This may be seen as capturing the degree of skewness to the right. The second component is an indicator of the degree of concentration within the top i-th per cent, or of the thickness of the right

tail. If all estates in the top i-th per cent are equal to the i-th percentile, then $m(w_i)$ equals unity. But to the extent that there is inequality within the top i-th per cent, $m(w_i)$ is > 1, and the second component increases the top share. In the case of the Pareto distribution, with Pareto coefficient α, $m(w_i)$ is a constant not dependent on w_i, equal to $\beta = \alpha/(\alpha - 1)$, often taken as a measure of concentration, and referred to as the inverted Pareto-Lorenz coefficient.[18]

We begin with the entry price. For this element of the analysis, we consider the unlinked series, since the linking factors described earlier do not apply to percentiles, and, since we have not attempted to interpolate the percentiles, the decomposition is made only for years where the full wealth distribution has been estimated. This means that the series start in 1911. Again there is differing experience within the

---

[18] The m function is related to the mean excess function, or mean residual life function, used in actuarial science and risk analysis. The mean excess function is equal to $(m - 1)$ times w_i. For distributions with a finite mean, the mean excess function completely determines the distribution via an inversion formula (Guess and Proschan, 1985).
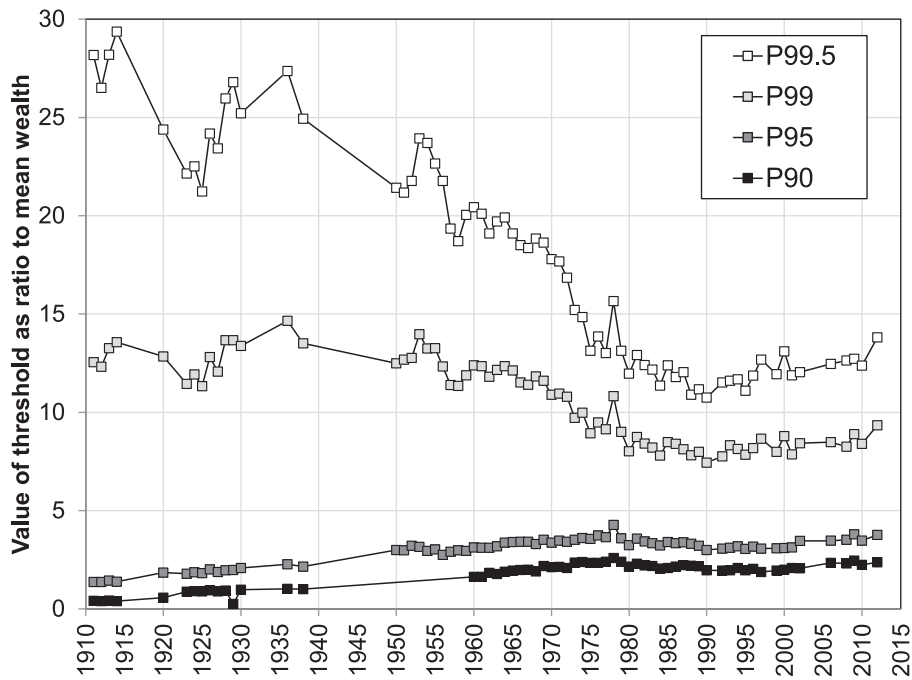
Fig. 8. Entry price to top groups as ratio to mean wealth 1911–2012.
Source: Authors' calculations. Note: The entry price is the minimum wealth required to belong to a specific top group, relative to the overall mean wealth.
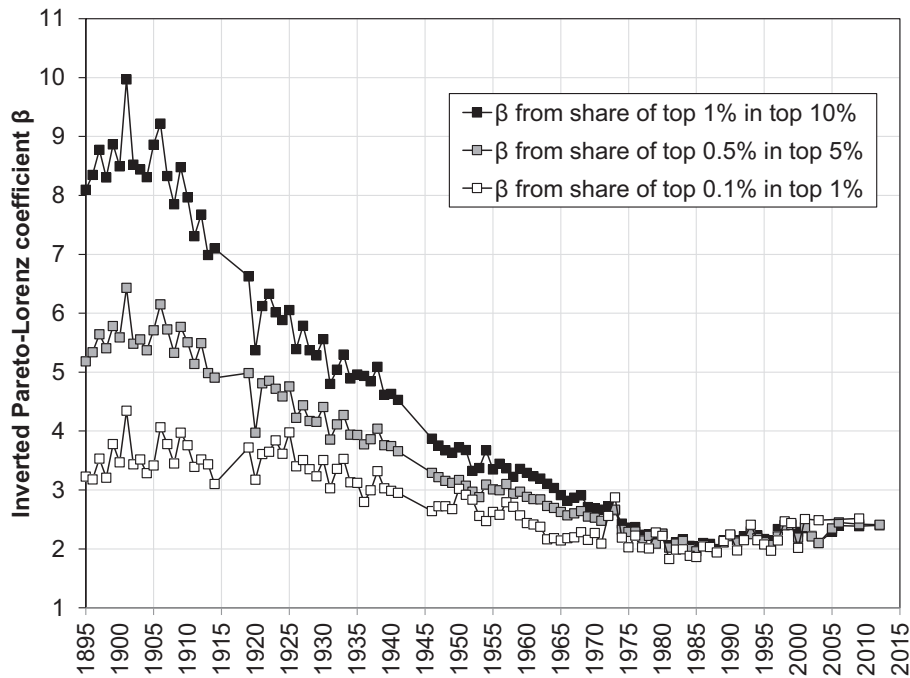

Fig. 9. Inverted Pareto-Lorenz coefficient β 1895–2013.
Source: Authors' calculations from Online Appendix Table G1. Note: The inverted Pareto-Lorenz coefficient is the average wealth of a specific top group relative to the wealth threshold to enter that group.

top 10%. The "entry price" for the top 10% and 5% increased up to the end of the 1970s, and then levelled off. At the other end of the scale, the 99.9th percentile fell steadily up to the 1980s and then began to rise (Fig. 8). Taking the period as a whole, we see that the top percentile (entry price for the top 1%) has halved since 1914.

This evidence for changing shape is complemented by that for the second element: the degree of concentration within the top groups. The degree of concentration within groups is measured in Fig. 9 by the values of β estimated from different "shares within shares": for instance, the share of the top 1% within the top 10%. If the distribution is Pareto in form, then in that case $1/\beta = \log_{10}[S_{10}/S_1]$. The results in Fig. 9 for different groups show that there was a modest decline in the extent of concentration before the First World War, affecting the top 10% but not the very top 0.1%. There was then a sharp fall in the degree of concentration at the top in the inter-war period from 1919 to 1939, followed by a continuing fall from 1946 to the late 1980s. A value of β, such as 8 in the early years, represents a high degree of concentration. Translated into α, the more common Pareto coefficient, this
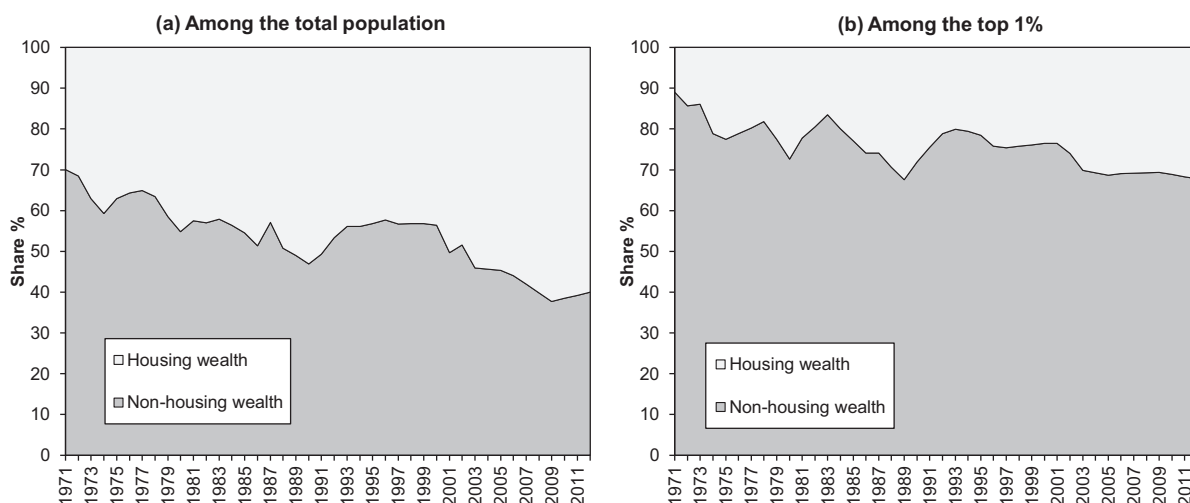
Fig. 10. Composition of wealth in the UK: housing and non-housing assets.
Source: Online Appendix Tables D1, H1 and H3.

corresponds to values before the First World War of 1.4 or lower, which does indeed indicate a very high level of concentration. Of the 152 Pareto coefficients collected for income by Clark (1951, pp. 533–537), only twenty are below 1.4 (many of which were in pre-independence India). By the 1980s, in contrast, β had fallen to around 2, corresponding to a Pareto coefficient α of around the same value, indicating a degree of concentration closer to that found for gross income. Since 1980 there has been a rise in concentration, but the magnitude is in no way comparable with the earlier decline.

Fig. 9 does however cast doubt on the validity of the assumption that the upper tail of the UK wealth distribution has throughout been Pareto in form. As noted above, with the Pareto distribution, the same value of β should apply at all wealth levels. For the latter part of the period, the constancy of β may be a reasonable first approximation, but for the early part this is not the case: the mean difference between the values obtained from S_{10}/S_1 and those with $S_1/S_{0.1}$ is 4.3 in the period 1895 to 1914, and 1.8 in the interwar period. This is a warning that a long-run comparison based on the assumption that the upper tail above the 99th percentile is Pareto in form would miss a potentially important element of the change.[19]

4.4. Understanding the dynamics of wealth concentration: the role of housing

In the discussion of average wealth, we identified the role of housing wealth, and this has been the concern of a number of commentators on the rise of capital described by Piketty (2014) – see, for example, Bonnet et al. (2014), Turner (2014) and Rognlie (2015). Atkinson et al. (1989) referred to one of the key determinants of the dynamics of UK top wealth shares up to the end of the 1970s as "popular wealth" (the sum of owner-occupied housing plus consumer durables) and stressed the role of house prices as reducing the share of the top 1%. Since then, there have been major changes in the UK housing market.

The role of housing wealth has to be seen in terms of the tenure changes. The housing wealth variable depends on both house prices and the extent of owner-occupation. It is changes in the latter that drove much of the variation between 1920s and 1970s: the proportion of owner-occupied in England and Wales rose from 23% of households in 1918 to 50% in 1971, and to 58% in 1981 (all of the figures in this

paragraph come from Office for National Statistics, 2013, unless otherwise indicated). This coincided with the fall in housing owned by private landlords: from 76% in 1918, to 11% in 1981. Both factors led to a decline in the share of the top 1%, which contained a disproportionate number of landlords. The shift from private-rented to owner-occupied did not in itself change the ratio of housing wealth to the total personal wealth (different people owned the same houses), but it *was* affected by the growth of social housing, from 1% in 1918 to 31% in 1981.

In the 1980s, the position changed with the sales of public housing. By 1991 the share of social housing had fallen to 23%, with owner-occupation going up to 68% (private renting having then fallen to 9%). More of the housing stock therefore entered personal wealth. The ratio of residential housing wealth to total wealth rose by some ten percentage points in the 1980s. But then, in the 1990s, there was a change with the return of private landlords as a result of "buy to let": their share, having been 9% in 1991, increased to 18% in 2011. The increased share of private landlords came at the expense of a fall in owner-occupation (-4 points) and a fall in social housing (-5 points). Therefore, we have over the period as a whole three main stories: (i) the equalizing switch from 1918 to the end of the 1970s as owner-occupation replaced private landlords and social ownership replaced private ownership, (ii) the sale of council houses and rise in housing as per cent of total wealth in the 1980s, and (iii) in recent decades, the return of the private landlord. Whereas (ii) may have meant that increases in housing wealth were equalizing in the past, the return of the private landlord could likely imply that they may have the opposite effect in the future.

All of this suggests that it is interesting to first decompose the assets within the top brackets of the wealth distribution between housing and non-housing assets as shown in Fig. 10 for the top 1% group. The construction for a series starts 1971. Indeed, housing only accounts for a relatively small fraction of total wealth at the top: the share of housing wealth for the top 1% is bounded between 10 and 25% of total net worth. Second, we may look at the distribution of wealth minus residential housing, net of mortgage liabilities. Fig. 11 shows the shares excluding housing wealth for the period since 1971, where it should be noted that these shares are not fully comparable since it has not been possible to re-rank the observations in the tabulated data and the interpolation is linear.[20] It appears that, as we should expect, the top shares of the distribution of non-housing wealth are higher: the share of the top 1% averages 24.7% over the period 1971 to 1997, compared

---

[19] The threshold above which the distribution becomes Pareto can be time-varying, or, alternatively, the assumption of Pareto-distributed wealth might not be a compelling one altogether.
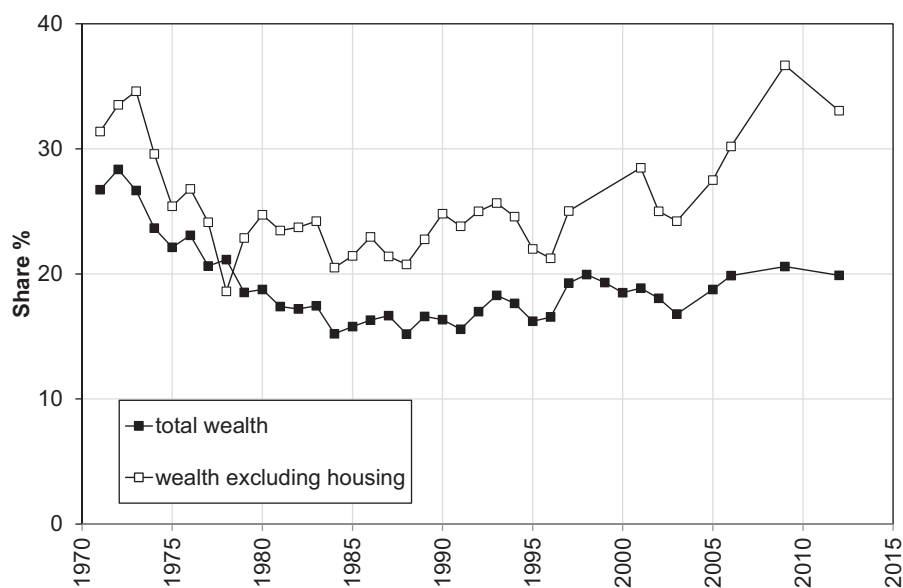
[20] See Online Appendix H.

Fig. 11. Top 1% wealth share: total wealth and wealth excluding housing assets 1971–2012.
Source: Online Appendix Table G1 and Table H2. Note: The estimates excluding housing wealth are based on the original ranges, since re-ranking is not possible, and the shares are obtained by linear interpolation. The estimates of total wealth correspond to our preferred series in Table G1. See Online Appendix H.

with 18.2% for the corresponding share for all wealth. Although there is more variability in the shares excluding housing wealth (shares are smoothed to some degree by the housing element), overall there is little difference in their evolution over the twentieth century. Up to 2000, we do not get a very different story if one just takes non-housing wealth, with a decided fall in the top shares until the end of the 1970s which came to an end in the mid 1980s, and with broad stability until the end of the 1990s.

But in the 21st century, there is a distinct difference. Between 2001 and 2013, the gap between the share of the top 1% in total wealth excluding housing and the share for all wealth widened. The changes over time in top shares are also different when we look only at wealth excluding housing. It appears that housing wealth has moderated a definite tendency for there to be a rise in recent years in top shares in total wealth apart from housing. When people talk about rising wealth concentration in the UK, then it is probably the latter that they have in mind.

Put differently, changes in housing wealth may have relatively little impact on top wealth shares (although they do of course affect the share of owner-occupiers as a group). Simple arithmetic calculations allow an estimate to be made of the sensitivity of top wealth shares to an across-the-board increase in house prices (increasing the value but not affecting the mortgages). The results show how the impact of a general rise in house prices has changed over the period, but it is always equalizing for top 1%. At the beginning of the period a rise of 25% led to a reduction of some 1 percentage point in the share of the top 1% but the effect became smaller over time.

It should be stressed that our analysis refers to top shares: the relative position of owners and non-owner-occupiers in the main part of the distribution has almost certainly been affected by changes in housing wealth. But, if we concentrate on top wealth shares, then, overall, changes in housing wealth do not appear to have played a significant role over the period from 1971 to the end of the twentieth century. On the other hand, in the twenty first century, housing wealth has moderated the tendency for concentration to increase in other forms of wealth. In order to understand the trends in concentration, it is necessary to look at the distribution of non-housing wealth.

5. Internal validity of our estimates

The estimation of top wealth shares series followed a series of building blocks, choices, and assumptions, and it is important to examine how these may affect the reliability of the level of our estimates

as well as their trends over time. Such an examination is necessary if our estimates are to be taken seriously by those who reject the estate method and prefer alternative approaches. In this section, we consider four sources of concerns and potential variation: (a) the implications of lower mortality rates of the wealthy, (b) whether the wealth of the decedent population is representative of that of the living, (c) the implications of *intervivos* gifts, missing wealth held in trusts, international tax shielding, and tax avoidance in general, (d) the use of alternative wealth control totals and mortality multipliers for recent years.[21] Among these issues, the implications of tax evasion and avoidance of taxes appear to be the most worrisome. Indeed, the estate data reflect the nature of the (changing) tax code, and are inevitably influenced by changes in tax rates and by the expansion as well as the shrinking of the tax base, affecting in turn the incentives for estate planning, and for tax evasion. These problems point in the direction of a bias (most likely negative) in the value of wealth represented in the estate data. In turn, this may affect both the level and the trend estimates of top wealth shares.

5.1. How does the increasing longevity advantage of the rich affect our results?

In order to derive estimates of the wealth distribution of the living, multipliers based on the inverse of the mortality rates are employed, but because more wealthy individuals tend to live longer, higher multipliers have typically been applied to the upper estate ranges. The higher multipliers, referred to here as "differential adjustments" are essential to avoid an underrepresentation of the number of very wealthy individuals as well as their wealth. In practice, in the UK, the differential adjustments have been based on social class, or occupation, but this is only an intermediate route to the variation of final concern: that with estate size. The UK differentials used for much of the period were calculated from the Registrar-General's Decennial study of mortality by occupation, with adjustments for errors in occupational statements. The resulting differentials varied over time, and at younger ages showed considerable increase: for example, for male aged 45 to 54 they increased from 18% in 1921 to 35% in 1961 (Atkinson and Harrison, 1978, Table 6.4b). Starting in 1977, the Inland Revenue used two different multipliers according to whether an estate was below or

---

[21] A fifth source of potential variation, the linking of series, is treated in Online Appendix P.

above a pre- specified cut-off (which was gradually increased from £10,000 to £25,000). For the estates above the cut-off, the mortality risk was assumed to reflect those of people living in owner-occupied housing (data taken from the ONS Longitudinal Study of social class and occupational mobility). The multiplier applied to estates below the cut-off was assumed to be an average between that of the general population and that for estates above the cut-off. Since 2002, the biennial waves of the English Longitudinal Survey of Ageing (ELSA) are used to link mortality rates to housing wealth levels (see Online Appendix B).

In the US, there has been considerable discussion on the choice of mortality multipliers for those at the top of the distribution. The estate-based estimates of top wealth shares by Kopczuk and Saez (2004) made use of a "corrective term" obtained from external data on mortality rates of college graduates; in contrast to the UK, the same correction factor was applied over a long period. Renewed interest in the topic was stimulated by recent claims that a failure to capture the increasingly lower relative mortality rates of richer classes may substantially bias downward the level of concentration of wealth at the top in recent years (Saez and Zucman, 2016). On the basis of evidence from income tax filers, Saez and Zucman find that "the top 10% live less long than the top 1% who in turn live less long than the top 0.1%." More importantly, the mortality gradient has been sharply increasing since 1980s; the trend is especially pronounced for men. In recent years (2004–2008), the mortality rate for men aged 65–79 in the top 1% is only 60% of the average mortality rates of male tax filers aged 65–79 versus 90% in 1979–83 (2016, p. 572). The same figures for the top 10% were 95% in 1979–83 and 77% in 2004–2008. They go on to argue that failure to allow for an increasing wealth differential may have caused the estate-based estimates to under-state the rise in top wealth shares. Additional evidence on the mortality advantage of US richer classes is contained in the work by Chetty et al. (2016).

The discussion so far has taken for granted that a rise in the wealth differential will significantly increase the top shares. This may indeed be the case, but the effect of changes in multipliers is "less straightforward than is sometimes supposed" (Atkinson and Harrison, 1978, p. 60). In the simplest case where there are independent control totals for wealth (and population), there is no impact on mean wealth from any variation of mortality multipliers and/or the wealth-differential, so that the effect on the share of the top x per cent depends only on how a change in the differential affects the mean wealth of that group. Increasing the multiplier implies that there are more people estimated to have wealth in excess of £W, and these extra people will displace some of those with smaller estates who had previously just entered the top x per cent. The mean wealth of the top x per cent must consequently rise. The direction of the effect is therefore that expected: top shares rise. The magnitude of the effect, however, depends on the underlying estate distribution. If those displaced are not very much less wealthy than the added new people, then the effect of increasing the differential will be small (indeed, in the limit, it could be zero, as may be seen from the hypothetical example where all those in the top x per cent have the same wealth, in which case the displaced have the same wealth as the newly added).

On the contrary, in the case of an internal wealth control total (that depends on the identified wealth as in this paper), an increased multiplier at the top of the estate ranges increases the identified wealth and (for a given total population) raises mean wealth (see Atkinson and Harrison, 1974 and 1978, Chapter 3). Discovering a clone to the top billionaire reduces his or her relative share, since the mean has risen. The impact may be seen in terms of the upper part of the Lorenz curve showing the proportionate shares of different percentage groups working downwards. When plotted in terms of data grouped by wealth ranges, the slope for the final range is given by the ratio of mean wealth at the top to the overall mean. Applying a larger differential to the group as a whole leaves the group mean unaffected, but raises the overall mean, so the slope for the final range is reduced, causing the shares at the very top to be reduced. At the same time, the segment

based on the top wealth range is extended downwards (see Atkinson and Harrison, 1975, Fig. 2). Where the mean wealth of the next range down is less, there can then be an intersection of the new and old Lorenz curves, and beyond a certain point the top shares are increased. Depending on the precise context, the shares of upper wealth groups may well increase or decrease as a result of applying higher multipliers to the estates of the wealthy.

Ultimately, therefore, the extent to which higher differentials could explain a failure of the estate-based estimates to show a larger increase in top shares becomes an empirical matter, and there are two main reasons why we expect such elasticity to be relatively small in magnitude in the UK irrespective of the treatment of the wealth total. First, differently from the US, the wealth-mortality gradient has not been assumed constant over time: the adjustment varies over the years. Second, the UK mortality ratios of specific wealth groups with respect to the non-wealth-specific population already appear to indicate a steep wealth gradient. For instance, males aged 65–75 in the top 30, top 20 and top 10% of the distribution of housing wealth in 2008–2010 have a mortality rate of 81, 75, and 69% of the population rate for the same age class. Such longevity advantage are not very distant from those of US males aged 65–79 in the top 10%, top 5% and top 1% of the wealth distribution in 2004–2008 as estimated in Saez and Zucman, 2016 (although the figures are not directly comparable).

What is the effect on our series of further increasing the current adjustment to multipliers for wealthy individuals? Suppose that we increase the multipliers above the 95th, 99th or 99.9th percentiles of the wealth distribution by 20 or 50%, or even 100%. Using the microdata from HMRC Datalab, we find (see Online Appendix Table J2) that this does relatively little to change the levels and trend of our series, even in the case of a fixed wealth total. A 20% increase in the multipliers above the top percentile increased the share of the top 1% with internal wealth totals by 2.4 percentage points when averaged over 2008–2010. A 50% rise increased it by 5.8 percentage points. The potential downward bias of our estimates due to lack of adjustments for "appropriate" wealth differentials appears to be more than marginal but less than is commonly asserted. Indeed, to reach the same level of top 1% wealth share of 1950 or 1960, one would need to adjust wealth differentials by an implausible amount: a cut in relative mortality rate of the richest male group aged 65–75 to a level of 40% or 30%, from the benchmark level of 60%.

Our discussion to this point has focused on the differential multipliers applied at the top of the distribution; we return below to the general level of multipliers applied to all those with wealth.

5.2. Are estates representative of the wealth of the living?

The data underlying our analysis reflect the value of the estates for which a grant of probate is required. This implies that any possible inference from this set of data could only be related to the population with "dutiable wealth" (e.g. for which a grant of probate would be required if they were to die). In their recent consultation to cease the publication of Personal Wealth National Statistics, HMRC deems this as a "major issue with the HMRC Personal Wealth National Statistics" as "they do not reliably show the wealth characteristics of all people in the UK" (HMRC, 2015, p. 3).

Although relevant to any attempt to measure the distribution as a whole, this concern can be mitigated in the light of our interest in the top tail of the wealth distribution. It is highly unlikely that the assets of wealthy individuals would entirely escape the probate process; whether or not they would be liable to inheritance tax is irrelevant at this stage. Indeed, it is important to recall that probate is still required for every property (above £5000) not jointly held. To the extent that a high net-worth individual owns at least an asset in her own name (e.g. a bank account with a balance higher than £5000 would be sufficient), the probate of her estate when she dies would reflect all the properties, individually and jointly held. The estate can still benefit from

deductions and reliefs in case one's estate is above the minimum inheritance tax threshold (e.g. spouse reliefs allow to transfer the entire estate to spouses and civil partners tax-free).[22] Moreover, in any given year a portion of all jointly held estates passed in earlier years to a surviving spouse or joint owner would still be recorded when the then-surviving spouse or joint owner dies.

Further issues also suggest that the features of the wealth of decedents, as reported in the estate statistics, may not accurately represent those of the wealth of the living. For instance, decedents are a selected group on health characteristics (e.g. unhealthy people are expected to die earlier) that may affect, among other things, their labour supply, patterns of consumption, saving, passing on wealth via gifts, risk attitudes, and their health care expenses (a less important consideration in the UK than in the US). This would most likely affect the composition of wealth portfolios as well as the level of wealth accumulation, although it is difficult to define the magnitude of such effects.

5.3. How do tax avoidance and evasion affect our results?

Careful estate tax planning (avoidance) and evasion can substantially reduce the liability of the inheritance tax, but for our purpose of estimating top wealth shares the significance of tax avoidance ought to be measured on its ability to impair (or distort) the estate information that is collected by HMRC, not merely on its ability to reduce tax collection altogether.[23] In order to affect our estimates of top shares, based on a control total largely determined by identified wealth, tax avoidance actions have to be disproportionately represented at the top of the wealth distribution. This contrasts with the estate-based evidence for the United States in Kopczuk and Saez (2004), where the use of a fixed external wealth total from the National Accounts makes estimates of top wealth shares more sensitive to tax avoidance irrespectively of whether wealthy individuals are more likely to undertake tax sheltering activities. It has also to be remembered that tax avoidance may reduce, or even eliminate, liability to IHT, but this does not necessarily mean that the wealth is missing from the statistics. Duty may be reduced by claiming, for instance, agricultural relief, but the full value of the property is still reported.

Inheritance tax avoidance can take different forms. Some of them simply affect the reporting arrangement of financial affairs for any given level of wealth and, as such, are less problematic for our work. Indeed, given the large set of reliefs and exemptions available, there are many different ways estates can be structured to reduce their tax liability. For instance, transferring the entire estate (even above the inheritance threshold) to a spouse, a civil partner, or a charity reduces the tax liability to zero without necessarily resorting to under-reporting of estate value.[24]

Other tax avoidance issues are, instead, likely to raise stronger concerns on our measures of top wealth shares, notably the role of *inter-vivos* gifts, the role of wealth held in trusts, and that of international tax sheltering. We investigate them in turn below. In each case, we assess the potential effect of missing wealth on top shares through simple exercises.

Table 2
Assessing the potential effect of unrecorded wealth on top shares 2008–2010.

	Top 1% wealth share per cent
A. Benchmark series	20.6
B. Assessing the effect of unrecorded inter-vivos gifts Assumption: impute 1/3 of inter-vivos gifts from Atkinson (2013) to top 1% group	22.1
C. Assessing the effect of unrecorded wealth in discretionary trusts Assumption: impute 100% of wealth held in discretionary trusts to top 1% group	21.3
D. Assessing the effect of unreported off-shore wealth Assumption: impute 4% of total personal financial wealth to top 1% group	22.7

5.3.1. Gifts inter-vivos

At the time of the first mortality multiplier estimates in the UK, there was much discussion of the extent to which the figures missed wealth transferred through gifts *inter-vivos*. It is important however to distinguish between the impact on estimates of the total amount of wealth passed on from one generation to the next (as investigated by Piketty, 2011, in France, and Atkinson, 2013, in the UK), and the impact on the estimated distribution of wealth among those living at a particular date, which is our concern here. Gifts may change *who* owns the wealth, but still appear in the distribution. As was pointed out by Mallet and Strutt (1915), the recipients are subject to the risk of mortality. Of course, gifts tend to be given by those with a higher mortality risk to those with a lower risk, but provided that this differential mortality is taken into account, the wealth does appear. Where the problem arises is with unobserved heterogeneity in mortality. If, as seems probable, gifts are more likely to be made by those who have unobserved characteristics that lead them to have higher mortality, and the reverse is the case with the recipients, then there is a risk of understatement. This is an example of the more general problem of selection to which we have referred. To the extent that gifts are used for tax optimization, such under-reporting is likely to lead to our under-estimating top wealth shares.[25] On the other hand, in the case of gifts *inter-vivos* there is a specific problem, which may lead to an over-counting of gifts. Since Estate Duty was introduced, there has been an anti-avoidance provision according to which gifts made within a certain period before death are aggregated with the estate. To the extent that some of the recipients die, the wealth is also included in their estate, and there is double-counting. Moreover, the treatment of gifts has changed significantly over the period considered in this paper, and the varying degree of double-counting may affect the comparability of the results over time.[26] As a sensibility exercise, imputing one third of *inter-vivos* gifts (estimated on the basis of Atkinson, 2013) to the top 1% group would increase their share by 1.5 percentage points in 2008–2010 (Table 2, panel B).

5.3.2. Assets held in trusts

Opportunities of estate tax avoidance are provided by the settlement of assets within trusts. Although inheritance tax is payable (at a reduced rate of 20%) for transfers made to discretionary trusts during life-time

---

[22] The minimum estate to belong to the top 5% group in 2011–2013 was £346,000 (£21,000 above the minimum inheritance tax threshold).

[23] In the 2003–2004 fiscal year, according to the National Audit Office (2004), out of 310,000 estates with grant of representation, only 67,500 were above the inheritance tax threshold, of which only 30,000 were actually liable to inheritance tax.

[24] Moreover, by leaving at least 10% of net estate value to charity one can reduce the IHT tax rate from 40% to 36%. Similarly, transfers of business assets and agricultural properties can be done entirely inheritance tax free under the provisions of Business Relief and Agricultural Relief. According to the last available report on the inheritance tax by the National Audit Office (2004, p. 9), "two-thirds of estates which exceed the tax threshold claim reliefs and exemptions to reduce their Inheritance Tax liability, including 10% which are able to eliminate it altogether".

[25] Under the (realistic) assumption that tax avoidance incentives are higher for richer individuals. Larger estates have proportionately more liquid assets (e.g. non-housing assets) compared to lower value estates.

[26] The time limit period was 12 months under the Probate duty (1894 Finance Act) and was increased to 3 years in 1909, a limit that remained in force until the Finance Act 1946 when the threshold was further increased to 5 years. With the Finance Act 1968 the time period threshold was raised to 7 years. A significant change was made in 1975 with the introduction of Capital Transfer Tax (CTT) in place of Estate Duty, which extended the tax to all lifetime transfers, but this provision was short-lived and a 10 year period was in effect from 1981 and returned to 7 years when CTT was replaced by the current Inheritance Tax in the Finance Act 1986.
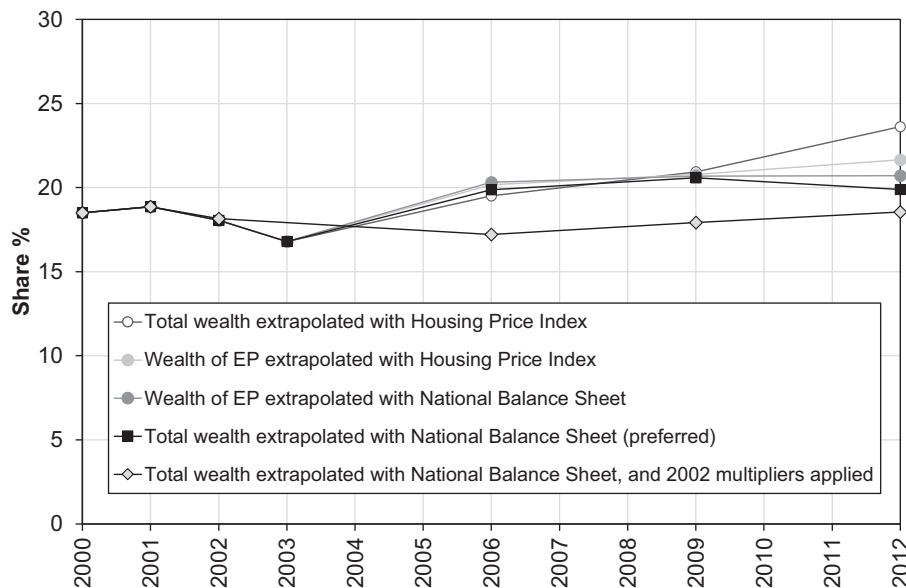
Fig. 12. Top 1% wealth share in the 21st century: sensitivity to total wealth and multipliers.
Source: Online Appendix Table F1 and Table G1.

since 2006, the settled properties within discretionary trusts do not generally require probate as trustees legally acquire the ownership of the assets. This makes discretionary trusts an effective tax avoidance scheme. Similarly to gifts, however, if transfers to a discretionary trust were made during the seven years before the death of the settlor, the estate administrator has to include these transfers within the probate (and an extra tax rate of 20% is due on the assets transferred to match the inheritance tax rate). On the contrary, non-discretionary trusts are dutiable.[27] Between 1994 and 2005, HMRC estimated that wealth in trusts accounted for < 1% of total personal wealth. Those estimates were however based on studies for only two years (1976 and 1988), which were dated. A significant investment would no doubt have been required to bring the estimates up to date, but it is unfortunate that such an investment has not been made.

In an attempt to provide more recent evidence, we capitalized the income earned by trusts from 2001 to 2012, linked the missing wealth in trusts to the previous HMRC estimates, and imputed it to the top 1% group, whose share would increase by 0.5 percentage points every year (0.7 percentage points in 2008–2010, as shown in Table 2, panel C).[28]

5.3.3. Off-shore accounts and the foreign wealth of non-domiciled

Tax shielding wealth in unreported off-shore accounts is not a new phenomenon; it impacts both the levels and trends of the current estimates, particularly if the avoidance incentives have increased disproportionately for the top of the distribution. The manipulation of the residence for tax purposes has similar effects, only UK assets being liable to inheritance tax for non-domiciled.[29] The "non-dom" status for income tax purposes, however, does not shield individuals from IHT

liability for ever. Indeed, individuals residents in the UK for 17 of the previous 20 years are automatically "deemed domiciled" and, as such, all their world estate has to be reported, unless other forms of tax shielding are implemented in anticipation of the event. Similarly, all those individuals who had moved their permanent home abroad within three years from their death are deemed domiciled.

According to Zucman (2013), 4% of US household financial wealth is held off-shore, much of which is unreported. If the same percentage were assumed to apply to the UK top 1% of wealth holders in 2008–2010, it would increase their share from 20.6 to 22.7% (panel D of Table 2). Doubling the number to 8% would bring the top 1 share up to 24.6%. Such changes are salient, although they are not enough to revert the concentration of wealth to pre-1950s levels.

Given the variety of ways to effectively avoid inheritance taxation and their relative appeal to wealthy individuals with potential estates above the minimum tax threshold, it is likely that our estimates represent a lower bound of the true wealth concentration level. The overall extent of the bias is, however, difficult to assess in the absence of reliable empirical anchors. At the same time, there are factors working in the opposite direction. The UK top inheritance tax rate is today much lower than in the past (now 40%, when it had been as high as 85% in 1970), and the tax authorities have over the years been undertaking steps in order to improve tax compliance, restricting existing schemes of avoidance, and improving on fiscal fraud investigation, although it remains the case that, as the National Audit Office (2004, page 3) noted in its review of inheritance tax, that HMRC "has no overall measure of the 'tax gap' on Inheritance Tax [which] provides a measure of the level of tax non-compliance".

5.4. Sensitivity and the estimates for the 21st century

Earlier, we explained that the control totals for wealth could not be taken beyond 2005 in the same way as for earlier years, and that the method adopted in Section 4 departed from that followed in the series up to 2005, in that it used personal sector balance sheet totals as the basis for projecting total wealth. This approach was used *faute de mieux*, since the pre-2005 method could not be applied, but is not fully satisfactory. We now consider the sensitivity of the top share estimates for the 21st century to other approaches. This in turn leads us to probe more deeply into the new methodology introduced by HMRC to construct wealth estimates.

---

[27] Some trusts are set up so that the beneficiaries have ownership or a legal right to the income or assets in the trust (a "bare" trust). In this case both income and assets have to be considered part of their estate when they die and reported in the tax inheritance form.

[28] Online Appendix Q presents the results of the exercise. We capitalize income with a return rate of 5.6% from Table 3, and include realized chargeable gains.

[29] UK residents who are not domiciled in the UK can choose to pay tax on the remittance basis so that any income and gains they hold offshore are only taxable as and when they are brought in to the UK. Since 2008, those who have lived in the UK seven years or more have to pay a charge (up to £90,000), known as the remittance basis charge, for each tax year in which they use the scheme. In 2012–13 110,700 UK taxpayers were registered as non-domiciled, out of whom 46,700 claimed the remittance basis (the rest either had no significant income abroad or paid income tax on it), and 5100 paid the charge; all others presumably lived in the UK for less than seven years.
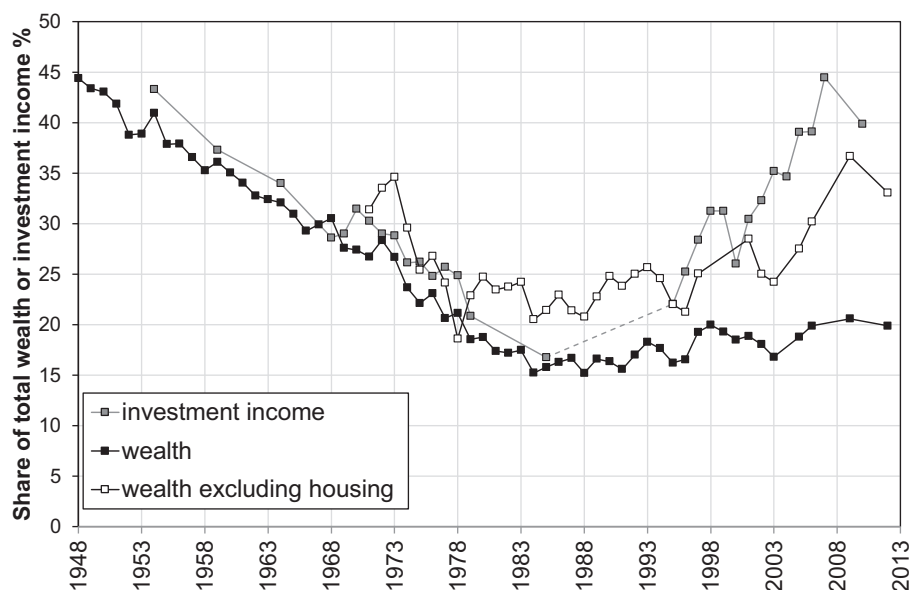
Fig. 13. Comparison of the top 1% share of the distributions of total wealth, wealth excluding housing assets, and investment income.
Sources: Online Appendix Tables G1 and H2 for the distribution of wealth, and Table L1 for the distribution of investment income. Notes: (1) the decline in income shares in 1966–67 was due to the payment of "unusually large dividends in 1965–66 (in anticipation of the introduction of Schedule F)" (IRS 1971, page 69). Similarly, there is spike in 2009 (omitted from the figure but available in Appendix Table L1) as a result of the forestalling of income in advance of the rise in the top income tax rate from 40 to 50%. (2) The distribution of investment income refers to tax units until 1990, and to individuals from that date.

An alternative consists on extrapolating forward the average wealth per person in the excluded population (EP), an extrapolation that does not, for example, allow for any changes in composition. This still leaves open the issue of the variable to be employed when making the extrapolation. Two approaches have been tried: (i) given the importance of housing in joint property passing without need for probate, extrapolation based on the ONS housing price index, and (ii) extrapolation based on average wealth per adult from the personal sector balance sheets. Over the period in question, these two series moved rather differently.

Fig. 12 shows the share of the top 1% series preferred in Section 4, together with alternatives. The main departures come in 2012; until that point the alternative series yield very similar values for the top 1% share. In 2012, the Section 4 estimate was 19.9%. With the wealth of the EP extrapolated using the balance sheet totals, this would rise to 20.7%, and using the house price index it would become 21.7%. From this we conclude that our earlier estimates may have under-stated the rise in top shares in the most recent year. This is re-inforced by the fact that a further variant shown in Fig. 12 – extrapolating the total, not in line with the personal sector balance sheets, but in line with the housing price index - shows the top 1% share rising to 23.6%. It should be stressed that these conclusions relate only to 2011–13; for earlier years the series move closely together. The main conclusion is that the production of reliable estimates requires a major investment in the reconciliation of different sources of evidence about total personal wealth.

6. Triangulation with external evidence

In the previous section, we concentrated on the internal validity of the approach adopted; we now consider whether there are external sources that are helpful in assessing the reliability of our estimates on the concentration of wealth in the UK. We provide evidence on the concentration of investment income and rich lists estimates relying on hybrid methods.[30]

6.1. The distribution of investment income

The capitalization of investment income is one route to obtain estimates of the distribution of wealth, but the available data in the UK

Table 3
Average rate of return implied by the comparison of top wealth levels (excluding housing wealth) and top investment incomes.

	Top 1%	Top 10%
	Implied rate of return	Implied rate of return
	%	%
1995	5.5	4.2
1996	6.3	4.4
1997	6.2	4.7
1998		
1999		
2000		
2001	4.2	3.6
2002	4.5	3.4
2003	5.6	3.9
2004		
2005	5.7	4.8
2006	5.5	5.2
2007		
2008–2010	5.6	4.6

pose some limitations for a robust application of the method in recent decades, and we do not use this approach here. At the same time, the distribution of investment income is a valuable source of complementary evidence. Of course, given that investment income is the product of the rate of return and the level of wealth, there is no reason to expect the degree of concentration to be the same as for wealth on its own. In any case, examining the relation between the two distributions can be instructive. Where, for instance, the rate of return is distributed with a positive variance independently of wealth, the distribution of investment income can be expected to be more dispersed than the distribution of wealth (see Appendix VII of Atkinson and Harrison, 1978). In what follows, we examine how far this is the case in the UK, and how the two distributions – of investment income and wealth – have moved over time.

The main source of the distribution of investment income data in the UK is provided by the regular income tax returns through the Survey of Personal Incomes (SPI), and, in earlier years, the surtax returns.[31]

---

[30] Results from household surveys, estimates relying on hybrid methods, and existing series are compared in Online Appendix K.

[31] The distribution of investment income can be recovered for the top of the capital income distribution in the form of tabulated data from 1948 to 49 to 1979–80. The sources for each year are found in Online Appendix Table A3.

Investment income consists of rent, dividends and interest, and (until 1963) Schedule A imputed income on owner-occupied property. After 1979 the tabulations were no longer published in the necessary form, but for the years 1985–86 and 1995–96 to 2010–11 we have access to micro-data on investment income.

The investment income share of the top 1% is compared with their share of total wealth in Fig. 13 for the top 1%. On account of the hiatus in the investment income data, we consider the results in two parts. For the period up to 1979–80, there is year-to-year variation, but shares of investment income and wealth move closely together. Between 1954 and 55 and 1979–80, the share of the top 1% in investment income halved, as did the share of the top 1% in wealth. For the years from 1995-96, when we are able to access micro-data, the share of the top 1% in investment income is increasingly higher than the share of wealth. There is a strong upward trend from the year 2000. One potential reason for the difference is the change in the reference population: the distribution of capital income changes from tax units to individuals from 1990-91. This is not however likely to account for the widening gap. To understand this, it is informative to look at the distribution of wealth excluding housing. The investment income figures do not include imputed rent, so that the distribution excluding housing wealth does indeed provide a better basis for comparison. From Fig. 13, which shows the share in total wealth excluding housing of the top 1%, it appears that the rising share of the top 1% in investment income supports the view, reached in Section 4, that the UK has seen since 2000 a rise in the top shares of non-housing wealth. The people in the top 1% of the distribution of investment income are not necessarily the same as those in the top 1% of the distribution of wealth excluding housing, but a check on the plausibility of the estimates can be made by comparing their total investment incomes and total wealth. By using our estimates of the distribution of wealth excluding housing assets in Section 4, we can estimate the implied rate of return in money terms. The average rate of return over 1995–96 to 2010–11 was 5.5% for the top 1%, and 4.3% for the top 10% group (see Table 3). These rates of return, which do not include capital gains, do not seem unreasonable.

This examination of the UK investment income data adds to our conviction that a better understanding of the capital side of the account is necessary in order to explain the movements of top shares in recent years. Even stopping short of seeking to capitalize investment income, these data provide a valuable alternative perspective, and we hope that the UK statistics in this area can be developed.

6.2. Comparison with the evidence from Rich lists

Another window through which we can get partial evidence on the concentration of wealth is that of the Rich Lists. It is likely that the estate method does not appropriately capture structural transformations reflecting younger entrepreneurs with lower mortality risks climbing up the pyramid. The Lists could timelier capture such transitions of the sources of concentration, where self-made fortunes become more salient.

In the UK there are two main lists: the global *Forbes List* of (Dollar) Billionaires, published annually by the business magazine since 1987, and the *Sunday Times Rich List*, which has since 1989 published a list of the wealthiest people or families in Great Britain every year. The Sunday Times Rich List aims to include the 1000 richest wealth holders every year, which allows for the identification of the top 0.001% in Britain.[32] The resulting series is represented in Fig. 14, together with our estimate of the share of the top 0.5%. On average, over the period shown, the share of the top 0.5% is some 3.75 times larger, for a group that is 500 times larger.[33] If a Pareto distribution applied, then the
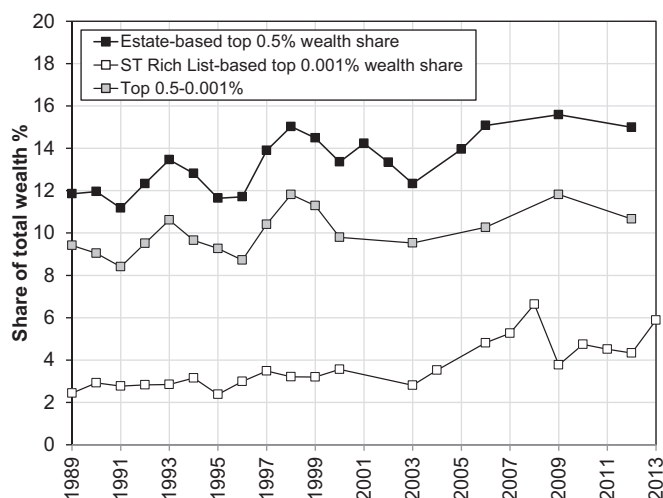

Fig. 14. Rich lists vs. estate-based top wealth shares in the UK.
Source: Online Appendix Table G1 and Table M1.

inverted Pareto coefficient required to generate such a ratio would have to be as high as 4.7, or well above the levels reported for recent decades in Fig. 9. This cautions against assuming that the observations are drawn from the same distribution. On the other hand, we have to distinguish between *level* and *trend over time*. The changes in the Rich List estimates do appear to track quite closely the dynamics of our top 0.5% wealth share, with the exception of the years around the recent financial crises, when the rich list-based shares appear to capture a higher degree of concentration, most likely due to asset market dynamics. This effect seems to operate only at the very top, as illustrated by the line where we subtract the Rich List estimate for the top 0.001% from the estate-based share for the top 0.5% (so we are looking at the top 0.5–0.001%). The 2011–13 estimate is no higher than that at the beginning of the century.

It is not easy to assess the representativeness and reliability of the Rich Lists. The data are often based on journalistic estimates that can be subjected to several types of errors, and the methodology cannot be transparently evaluated. The value of liabilities may be under-estimated and the unit of analysis is not always consistent across observations and time, and it is not comparable to that used in the estate statistics. Whereas the estate-based estimates attributes wealth to individuals, the Lists refer (not always clearly) to individuals, households, or extended families.[34] Fig. 14 assumes that every observation in the rich lists refers to a family of two individuals, but that assumption is arbitrary. The geographical scope of the data may also differ. The list includes people who live and work in Britain, but also British citizens abroad, and people who are married to Britons, who have strong links with Britain, who have estates and other assets there, or who have backed British political parties, British institutions and British charities. The population represented is therefore more extensive than that in the estate-based estimates.

For those millionaires in the Sunday Times List who have passed away, we can compare the wealth given in the list around the year of death with the probate values of their estates. We have identified at

---

(*footnote continued*)

revealing. In 2000, the last available year for comparison, Kopczuk and Saez (2004) estimated the share in total wealth of the top 0.0002% richest individuals from the Forbes data to be equal to 3.7%. The share was virtually identical to the wealth share of the top 0.001% from the estate-based data, a group 200 times larger (3.9%).

[34] In the case of the Rich Lists, the unit may be more extensive than the household. For example, in the 2014 Sunday Times list, the top entry was the Hinduja brothers; third was Lakshmi Mittal and family, which includes his son and daughter; the wealth of number 11 includes that of Galen Weston, his wife and his nephew, George Weston. There are often multiple generations, such as number 19 (Earl Cadogan and his son, Viscount Chelsea).
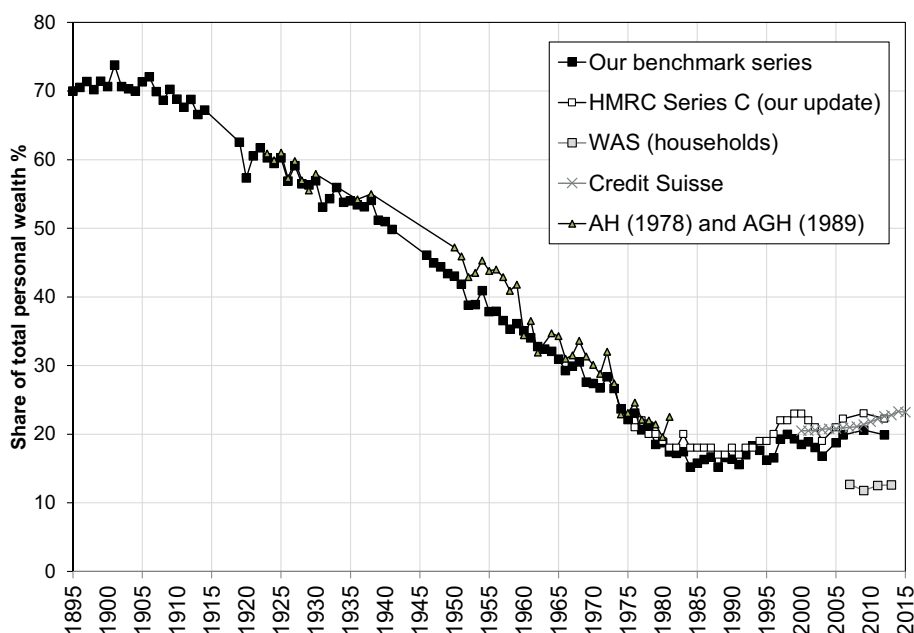
---

[32] With Forbes we can only identify 0.00003% of the Britain adult population from 2002 (approximately 13 individuals per year, see Online Appendix M).

[33] A comparison with similar findings from the US estate-based top wealth shares is

Fig. 15. Comparison with existing estimates of the top 1% wealth share in the UK.
Note: HMRC series C extended to 2012 linking the original series to our benchmark in 2005. Authors' computations. AH is Atkinson and Harrison; AGH is Atkinson, Gordon and Harrison.

least 74 cases, given in Appendix Table N1. General conclusions from this comparison are difficult. Probate values tend to understate the HMRC/IR figures as they are only intended to cover all those assets which an executor must dispose of in accordance with the testator's will (or the intestacy rules), this is, property that the decedent is legally empowered to distribute; this excludes, for instance, the trusts of which the decedent is beneficiary but over which he has no power of disposal. The HMRC/IR valuation covers all assets subject to estate tax, including non-discretionary trusts. At the same time, charitable gifts made during lifetime, which are substantial in many of the shown cases, are not given in the probate. Notwithstanding these facts, the following elements are worth stressing: (i) the relationship between probate values and List values are much higher for people identified as individuals than for extended families; and (ii) it is notable that for the largest estates in probates (above £200 million at 2015 prices) the List considerably underestimates wealth.

6.3. Comparison with existing estimates of the distribution of wealth in the UK

Data on estates at death have long been used for economic research in the UK, ever since Baxter (1869) made estimates of total personal wealth on the basis of the revenue from the Probate Duties (that preceded Estate Duty). Atkinson and Harrison (1978) estimated the first long-run series of wealth concentration starting in 1923 using a methodology similar to that employed here. It is therefore not surprising that available estimates since 1923 are not very distant from our series – see Appendix Table K1. The Inland Revenue (now HMRC) has published its official Series C covering 1966–1976 and its revised version from 1976 to 2005. Series C, in addition to incorporating, as in our series, estimates of the wealth of the excluded population, also corrected for under reporting of wealth of the included population, for missing wealth held in trusts, and adjusted the valuation of included wealth, but the time path is again similar, as shown in Fig. 15. We have extended HMRC Series C from 2005 to 2011–13 following the trend in our benchmark series.

More recently, UK evidence on the distribution of wealth has come from household surveys. The triennial Wealth and Assets Household Survey (WAS) was launched in 2006. This source is important as it provides an independent source of information on wealth. The obvious advantage of the evidence based on household surveys is that the data are unaffected by problems of tax avoidance and tax evasion because, in principle, they are unrelated to the tax administration operations. Moreover, differently from our estate-based definition of wealth, WAS data include information about pension entitlements. The main disadvantages, however, are the exclusion of business assets from wealth, the use of the household as unit of account, the very low rates of co-operation of households, and potentially high non-response rates of wealthier families (see Alvaredo et al., 2016 for a more detailed account). The exclusion of business assets and the issues of non-response and under-reporting at the top mean, in our view, that the Wealth and Assets Survey cannot, at this stage, provide a fully satisfactory representation of the upper tail of the UK wealth distribution. The WAS evidence (including pension wealth), shown in Fig. 15 from 2006 to 2008 to 2012–2014, indicates that the share of total national wealth accruing to the richest 1% of British households was stable and around 12%. These shares are substantially below that estimated using estate-data, even allocating wealth to individuals and excluding pension wealth to make the two series more comparable.

Other scholars have attempted to correct the evidence available in the WAS using that from the Forbes Rich list. The Credit Suisse Research Institute (Davies et al., 2014, 2015) combines the WAS distribution of wealth at 2006–2008 and the number of Forbes billionaires to obtain annual estimates of top wealth shares from 2000 to 2015. Vermuelen (2014) combines extreme observations on the number of billionaires as well as their wealth from the Forbes List with the WAS data, for the year 2009, fitting a Pareto distribution to the data. Such adjustments of household survey data bring the estimated shares of total wealth accruing to the top wealth brackets closer to our estimates.

7. The UK and US compared

Since the US Federal Revenue Act of 1916 imposed the estate tax, statistics of tax returns have been collected by the Internal Revenue Service and information began being published in *Statistics of Income* from 1923. Researchers in the US were, however, slow to make estimates of the distribution of wealth along the lines of studies in the UK and other countries (New Zealand, for example, published official
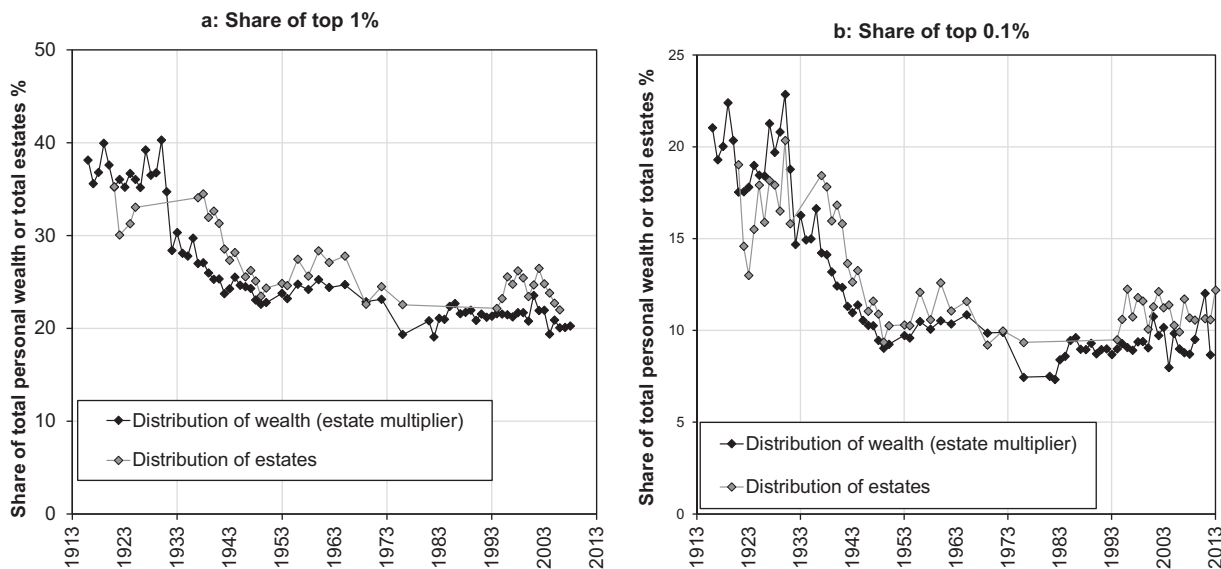
Fig. 16. Comparison of wealth and estate distributions in the US.
Sources: Distribution of estates: Online Appendix Table O3, authors computation; distribution of wealth: Kopczuk and Saez, 2004, and Saez and Zucman, 2016. Notes: The distribution of estates refers to gross taxable estates until 1931, and to gross estates from 1932. The distributions of net taxable estates and gross estates (taxable and non-taxable) are given in Online Appendix Table O3.
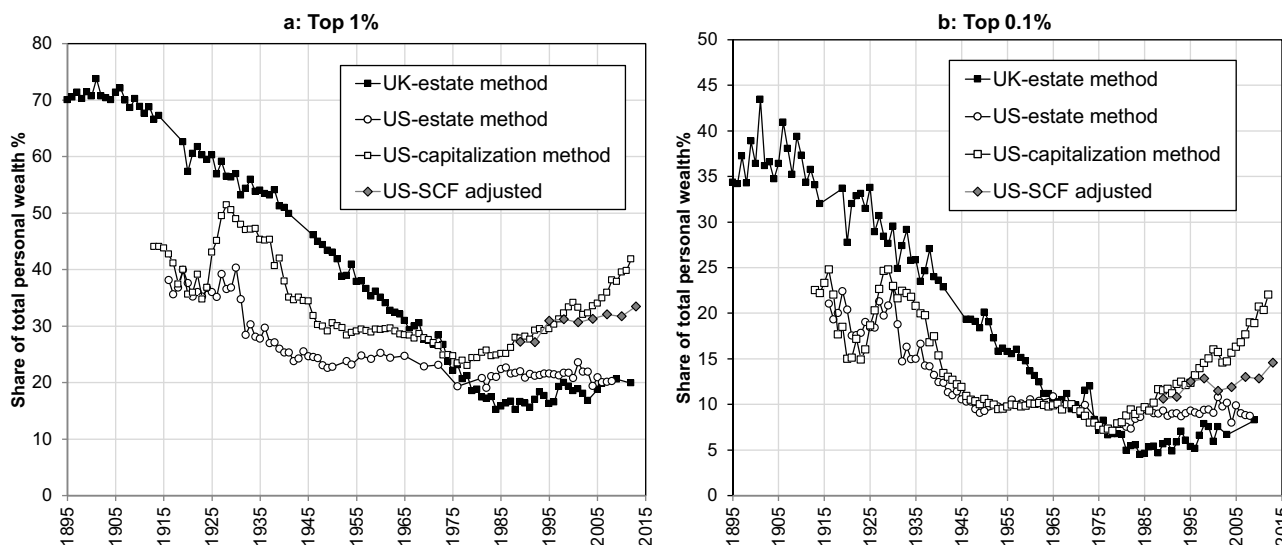

Fig. 17. Comparison of top 1% share in UK and US.
Sources: UK estate method: Online Appendix Table G1, authors' computation; US estate and capitalization methods: Kopczuk and Saez, 2004, and Saez and Zucman, 2016; US SCF adjusted: preferred series in Bricker et al., 2016, based on household distribution.

estimates of the wealth distribution in the 1920s). The first estate-based study in the US was that by Mendershausen (1956). This was followed by Lampman (1962). A number of studies took up the subject later, but the longest and most complete set of estate-based estimates are those by Kopczuk and Saez (2004), which have subsequently been updated by Saez and Zucman (2016) to cover more recent years.

The methods adopted in the US are in principle similar to those in the UK, and Lampman (1962, p. 211) argued that, with the exception of the treatment of life assurance, "the British data seem to be quite comparable with our own". There are however several reasons why the estate data in the US are less satisfactory as a basis for wealth estimates than those we employ for the UK. In terms of process, in the US probate is granted before the payment of the tax, whereas in the UK the two steps are contemporaneous making the inheritance tax forms more reliable as a source of data. In the UK there is a unified system for probate in each country (England and Wales, Northern Ireland, and Scotland),

whereas in the US the administration of probates is a matter for each individual state, going through specific or generic state courts. This means that procedures are not necessarily uniform across the US. Finally, the coverage of the estate tax data in the US is much more limited. In 1921, the estate data covered 1% of adult deaths. By 1976 this had risen to 7.6%, but by 2000 it had fallen back to 0.5%. In contrast, in the UK, the data for 1895 covered some 13% of adult deaths; the proportion rose to a third in the inter-war period; and since 1960 the estate data cover around a half of all adult deaths.

In his comparison of the US and the UK, Lampman (1962, p. 215), drawing on the estimates for England and Wales by Langley (1950, 1954), concluded that, while the "historical picture of decline in the degree of inequality of wealth distribution is similar in the two countries … for the period 1922–46 … throughout the whole period the inequality has been considerably greater in England and Wales than in the United States". In broad terms, the top 1% of adults owned around a

half of total wealth in England and Wales in 1946–47, whereas in the US in 1953 they owned less than a quarter. To today's ears, this may sound like a surprising conclusion. With the aim of seeing whether the same is true half a century later, we follow identical order as with our earlier UK estimates, beginning with the distribution of estates. Not only is this a valuable building block, but also the estate distribution as such has received little attention in the US literature. The US estimates of the distribution of estates shown in Fig. 16 are new. As discussed in Section 2, the estimates depend on the assumption made regarding the total of estates not covered by the estate tax returns. For the US, we have estimated the total estates by applying the ratios between the average wealth of the dying and the average wealth of the living given in Alvaredo et al. (2017) to the wealth series in Kopczuk and Saez (2004) and Saez and Zucman (2016).[35]

The US estate data are multiplied-up in the wealth estimates of Kopczuk and Saez (2004, a) and Saez and Zucman (2016), and these are also shown in Fig. 15a and b, for comparison with the estate distributions. Unlike in the UK, the years covered in the estate and wealth distributions are the same; adopting an estate approach does not extend the coverage. This underlines the greater richness of the UK data. The comparison of estate and wealth distributions does however show the same similarity of time path as in the UK. Again the picture appears to be little affected by the application of the mortality multiplier process. In 1922, the share of the top 1% in gross taxable estates was 35.2% and that of the top 1% in total wealth was 36.0%; fifty years later, in 1972, the shares were 24.1% and 23.1%, respectively. Both series show a reduction of a third in the share of the top 1%.

We turn now to the comparison of the US and the UK, shown in Fig. 17a for the top 1% and in Fig. 17b for the top 0.1%. For the top 1%, there is a clear point of convergence towards the end of the 1970s. The UK top shares started off above those in the US, and at the end of the period were, if anything, lower. This reflected the protracted period of leveling that took place in the UK after 1914 and lasting up to 1979. In contrast, the leveling in the US was largely confined to the 1930s, according to the estate-based estimates. The top 1% share in 2008 was little different from that in 1948. A similar pattern is shown for the top 0.1% in Fig. 17b, and in this case the contemporary UK share is distinctly lower than found in the US using the estate method.

A major issue in the US has been the relation between the estate-based estimates and those using the capitalization of investment income by Saez and Zucman (2016). These estimates differ in a number of respects from those obtained using the estate data. The investment income refers to the tax unit rather than individuals, and the estimates include pension wealth. The income capitalization method does indeed yield higher estimates of the share of the top 1%, as shown in Fig. 17, but until the 1980s the movements over time were close. The estimated shares of the top 0.1% are "remarkably similar" (Saez and Zucman, 2016, p. 570) from 1916 to 1976. In recent decades, however, there has been a major departure, with the capitalization method showing "the comeback of wealth inequality at the top" (Saez and Zucman, 2016, p. 551). Between 1989 and 2012, the share of the top 1% rose from 27.8 to 41.8%, an increase of 14 percentage points, a change which is comparable in magnitude to the fall that took place between 1929 and the Second World War. Half of this increase took place between 2000 and 2012. The difference between the estate-based estimates and those obtained by capitalization is discussed by Saez and Zucman, who emphasize the limitations in the former case of the mortality multipliers

and the unreported wealth held in trusts. As we have explained earlier, we do not believe that this is the full story. While we recognize the shortcomings of the estate approach (see Section 5), we are of the view that, in the present incomplete state of knowledge about top wealth-holdings, all sources of evidence should be taken into account. In this context, we note that the estimates of Bricker et al., 2016, based on the Survey of Consumer Finances, show an increase in the share of the top 1% between 1989 and 2013 which is 6.3 percentage points, or under half of that found using the income tax data, and that most of the increase occurred between 1989 and 1995.

8. Conclusions

The contribution of the paper is summarized under three headings: (i) *methodological and the provision of a new series* on UK wealth concentration, (ii) *substantive findings* in terms of the evolution over time of top wealth shares in the UK and the comparison between the UK and the US, and (iii) *implications for future research*.

8.1. Methodological contribution and new series

This paper has taken a fresh look at the use of administrative data for the UK on the wealth people leave at death: their estates. By exploiting more fully the available data, we have been able to construct a new series of top wealth shares covering virtually the entire period from 1895 to the present day. Time series with > 100 observations are rare in the fields of wealth and income inequality. Construction of this long series has proved possible because the distribution of individual wealth appears to mirror closely the distribution of estates, and we have employed the latter to amplify the picture that can be obtained about wealth concentration. This means the creation in Section 4 of an "estate-interpolated series of wealth-holding" to complete the historical record, the interpolations covering years for which wealth estimates are not possible, and to give a continuous series (in contrast to the earlier series in Atkinson and Harrison, 1978, where there are distinct, but often ignored breaks in 1938 and 1960).

In order to make sense of the relation between estates and the wealth of the living, we have investigated the process by which the latter is obtained via the application of mortality multipliers. The implications of applying such multipliers are often mis-understood. While we believe that critics of existing estate-based estimates are right to point to the likely steepening of the wealth mortality differential, with higher multipliers now being applicable to top wealth-holders, the impact needs to be assessed in terms of its ultimate consequences for the estimated distribution. We have investigated this impact by comparing the distribution of estates and of multiplied-up wealth, and by examining the impact of alternative multipliers. This indicates that the application of a sharper gradient to the mortality multipliers at the top does not radically change the estimated degree of concentration. We have investigated the new methodology with regard to multipliers introduced in recent years by HMRC. While this is followed in the Section 4 series, it leads to a distinct break, and we have given an alternative set of estimates for the years from 2005 as "Memorandum items."

The new series for the UK presented here is more extensive in its time coverage than any available to date, and will, we hope, provide the basis for future time series analyses of wealth dynamics. At the same time, we have tried to stress its deficiencies. Some of these are of long-standing concern, such as tax avoidance and the incomplete coverage of trusts, notably discretionary trusts. Others are of more recent concern, such as the treatment of wealth held by foreigners and non-domiciled, and the problems of constructing appropriate wealth totals. The user may also choose to reject the estate-based interpolation that generates the full run of years.

Since any source is open to challenge, we have sought to triangulate with respect to other evidence, making use of evidence about the concentration of investment income in the UK and from the Sunday

---

[35] The distribution of estates is given in Online Appendix Table O3 on three different bases, none of which corresponds to our preferred choice (we have to make use of the data as published; we have not had access to microdata). "Taxable estate" refers to its size after deduction of the tax exemption, whereas the "gross estate" is before deduction of debts. This means that the gross estate is likely to overstate the top shares, and the "taxable estate net of debt" will understate the shares. The difference is most marked in the recent period. For the sake of simplicity, Fig. 16 focuses on the distribution of gross estates.

Times Rich Lists. We have compared the top shares with those found in household surveys and in estimates relying on hybrid methods. Whereas in the US it has been argued that the estate-based estimates may today substantially understate the wealth concentration at the top (Saez and Zucman, 2016), for the case of the UK the supporting evidence does not appear inconsistent with our account of wealth concentration and its trend over time.

8.2. Substantive findings

The new series for the UK documents the remarkable change that has taken place in the position of top wealth holders in the UK over the past 100 years. Before the First World War, the top 5% of wealth holders owned around 90% of total personal wealth. There were very few owner-occupiers (Keynes never owned a house). A hundred years later, the share was around 40%. The top 1% used to own two-thirds of total wealth; their share is now around one fifth. Half of the wealth of the top 1% used to belong to the top 0.1%; their share is now around 7½ per cent. This is still a highly concentrated distribution: the top 1% have some 20 times their proportionate share. On this basis, wealth is indeed more unequally distributed than gross income. The World Wealth and Income Database shows the top 1% in the UK with 12.7% of total gross income in 2012.

The fall in wealth concentration at the top was slight before the First World War. The UK was not embarked on the downturn of a Kuznetsian process in the nineteenth century: the fall in concentration came after 1914. But the decline in top shares after that date was a continuing process, and cannot be simply attributed to the First or Second World War. Between 1919 and 1939, the share of the top 1% fell by some 7 percentage points; between 1946 and 1979 the share was more than halved. The explanation of UK wealth trends cannot be found solely in terms of war-time disruption.

With the 1980s, the downward trend in top shares came to an end and went into reverse. As we have shown, there are a number of difficulties in reaching firm conclusions about the extent to which top wealth shares are now increasing. The difficulties include the construction of appropriate wealth control totals, the implications of changes in the overall level of mortality multipliers, and the extent of wealth underestimation due to tax avoidance and evasion. Our results show the importance of separating out the role of housing wealth and provide evidence of increasing concentration in the distribution of wealth excluding housing, a conclusion that is re-enforced by evidence from the distribution of investment income.

The different periods can usefully be analyzed in terms of two determinants of top shares: the wealth required to enter the top 1% in the UK and the concentration within the top 1%. Both factors contributed to the decline in top shares between 1914 and the end of the 1970s. The wealth required to enter the top 1% in the UK is now some half the level required before the First World War, but it is also the case that wealth became less concentrated within the top 1%. The fall in the degree of concentration can be represented in terms of the implied Pareto coefficient. Before the First World War, this coefficient was some 1.4, indicating a high level of concentration; by the end of the 1970s, it had risen to around 2, indicating a degree of concentration closer to that found for gross income. At the same time, our analysis showed that for the first half of the twentieth century there are doubts about the adequacy of the Pareto distribution as a description of the upper tail. It may be not just the parameter that has evolved but also the shape of the distribution. A long-run comparison based on the assumption that the upper tail above the 99th percentile is Pareto in form could miss a potentially important element of the change.

8.3. Implications for future research

The distribution of wealth is on the policy agenda for a number of reasons – in addition to concerns about the concentration in a few

hands of economic power. There are concerns linked to the housing market, and we have investigated the role played by rising house prices and the changing extent of owner-occupation. There are concerns about the impact of the large programmes of long-term bond purchases, being pursued in the US, the UK, and by the European Central Bank. For the 90% who make up the majority of wealth-holders, this impact may be monitored via household wealth surveys, but the wealth of the upper tail cannot be adequately captured by such surveys. There are therefore reasons, apart from concerns about social justice, for investment in better statistical evidence about the evolution of the distribution of wealth. The case acquires greater weight from the fact that, as we have shown, our knowledge is particularly poor when it comes to the period from 2005 onwards.

If we are to understand what is happening in the UK to the top of the wealth distribution, there are, in our view, three priorities. The first is to revive and revivify the official Series C based on re-worked estate records; for this, the data must be made available. The second is to develop and reconcile the balance sheets of the household sector. Such a reconciliation exercise must take fully into account the changing nature of the global capital market, and may be best undertaken as part of an international project. The third is to improve the information available about investment income and the underlying assets, so that the capitalization method can be further explored. We believe that there is considerable value in a multi-source approach to investigating the distribution of wealth. No single method is sufficient on its own, and we need to have as full a picture as possible of the advantages conveyed by large wealth-holdings.

HMRC Datalab disclaimer

HM Revenue & Customs (HMRC) agrees that the figures and descriptions of results in the attached document may be published. This does not imply HMRC's acceptance of the validity of the methods used to obtain these figures, or of any analysis of the results.

This work contains statistical data from HMRC which is Crown Copyright. The research datasets used may not exactly reproduce HMRC aggregates. The use of HMRC statistical data in this work does not imply the endorsement of HMRC in relation to the interpretation or analysis of the information.

Appendix. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jpubeco.2018.02.008.

References

Abraham, K.G., 2016. Comment on Bricker et al (2016). Brook. Pap. Econ. Act. (Spring), 313–321.

Alvaredo, F., Atkinson, A.B., Morelli, S., 2016. The challenge of measuring UK wealth inequality in the 2000s. Fisc. Stud. 13: 13–33.

Alvaredo, F., Garbinti, B., Piketty, T., 2017. On the share of inheritance in aggregate wealth Europe and the United States, 1900–2010. Economica 84, 239–260.

Atkinson, A.B., 2005. Top incomes in the UK over the 20th century. J. R. Stat. Soc. Ser. A 168, 325–343.

Atkinson, A.B., 2013. "Wealth and Inheritance in Britain from 1896 to the Present", CASE Paper 178. London School of Economics.

Atkinson, A.B., Harrison, A.J., 1974. Wealth distribution and investment income in Britain. In: Review of Income and Wealth. series 20. pp. 125–142.

Atkinson, A.B., Harrison, A.J., 1975. Mortality multipliers and the estate duty method. Oxf. Bull. Econ. Stat. 37, 13–28.

Atkinson, A.B., Harrison, A.J., 1978. The Distribution of Personal Wealth in Britain. Cambridge University Press, Cambridge.

Atkinson, A.B., Gordon, J.P.F., Harrison, A.J., 1989. Trends in the shares of top wealth-holders in Britain, 1923-1981. Oxf. Bull. Econ. Stat. 51, 315–332.

Baxter, R.D., 1869. The Taxation of the United Kingdom. Macmillan, London.

Benhabib, J., Bisin, A., 2016. Skewed Wealth Distributions: Theory and Empirics. NBER Working Paper 21924.

Beresford, P., 1990. The Sunday Times Book of the Rich: Britain's 400 Richest People. Weidenfeld and Nicolson, London.

Beresford, P., 1991. The Sunday Times Book of the Rich. Penguin, London.

Beresford, P., 2006. The 'Sunday Times' Rich List 2006–2007: 5,000 of the Wealthiest People in the United Kingdom. A and C Black, London.

Bonnet, O., Bono, P.-H., Chapelle, G., Wasmer, E., 2014. Does housing capital contribute to inequality? A comment on Thomas Piketty's Capital in the 21st Century. In: Economics Discussion Paper no. 2014-07 Sciences Po, Paris.

Bricker, J., Henriques, J., Krimmel, J., Sabelhaus, J., 2016. "Measuring income and wealth at the top using administrative and survey data", board of governors of the Federal Reserve System. Brook. Pap. Econ. Act. (Spring), 261–312.

Chetty, R., Stepner, M., Abraham, S., Lin, S., Scuderi, B., Turner, N., Bergeron, A., Cutler, D., 2016. The association between income and life expectancy in the United States 2001–2014. J. Am. Med. Assoc. 315 (16), 1750–1766.

Clark, C., 1951. The Conditions of Economic Progress, second edition. Macmillan, London.

Daniels, G.W., Campion, H., 1936. The Distribution of National Capital. Manchester University Press, Manchester.

Davies, J., Shorrocks, A.F., Lluberas, R., 2014. Global Wealth Databook 2014. Credit Suisse Research Institute, London.

Davies, J., Shorrocks, A.F., Lluberas, R., 2015. Global Wealth Databook 2015. Credit Suisse Research Institute, London.

Friedman, M., 1962. The interpolation of time series by related series. J. Am. Stat. Assoc. 57, 729–757.

Garbinti, J., Goupille-Lebret, J., Piketty, T., 2016. Accounting for wealth inequality dynamics: methods, estimates and simulations for France (1800–2014). In: WID.world WP 2016/5.

Guess, F., Proschan, F., 1985. Mean Residual Life: Theory and Applications. FSU Statistical Report M702 Florida State University.

HMRC, 2015. Statistical Consultation: Possibility of Ceasing Publication of HMRC's Personal Wealth National Statistics. Office for National Statistics, London.

HMRC, 2016. UK Personal Wealth Statistics 2011 to 2013. HMRC, London.

Kopczuk, W., 2015. What do we know about evolution of top wealth shares in the United States? J. Econ. Perspect. 29 (1), 47–66.

Kopczuk, W., 2016. Comment [on Bricker et al, 2016]. Brook. Pap. Econ. Act. (Spring), 321–327.

Kopczuk, W., Saez, E., 2004. Top wealth shares in the United States, 1916–2000: evidence from Estate tax returns. Natl. Tax J., vol: 57 (2, Part 2), 445–488.

Kopczuk, W., Saez, E., 2004a. Top wealth shares in the United States, 1916–2000: evidence from estate tax returns. In: NBER Working Paper 10399.

Lampman, R.J., 1962. The Share of Top Wealth-Holders in National Wealth 1922–56. Princeton University Press, Princeton.

Langley, K.M., 1950–1951. The distribution of capital in private hands in 1936–1938 and 1946–1947. In: Bulletin of the Oxford University Institute of Statistics. vol. 12. pp. 339–359 and vol 13: 33–54.

Langley, K.M., 1954. The distribution of private capital, 1950–1951. In: Bulletin of the Oxford University Institute of Statistics. vol. 16. pp. 1–13.

Lydall, H.F., Lansing, J.B., 1959. A comparison of the distribution of personal income and wealth in the United States and Great Britain. Am. Econ. Rev., vol. 49, 43–67.

Lydall, H.F., Tipping, D.G., 1961. The distribution of personal wealth in Britain. Bull. Oxf. Univ. Inst. Econ. Stat. 23, 83–104.

Mallet, B., 1908. A method of estimating capital wealth from the estate duty statistics. J. R. Stat. Soc. 71 (1), 65–101.

Mallet, B., Strutt, C., 1915. The multiplier and capital wealth. J. R. Stat. Soc. 78 (4), 555–599.

Mendershausen, H., 1956. The pattern of estate tax wealth. In: Goldsmith, R.W., Brady, D.S., Mendershausen, H. (Eds.), A Study of Savings in the United States. vol. III Princeton University Press, Princeton.

National Audit Office, 2004. Inland Revenue Inheritance Tax. Report by the Comptroller and Auditor General, House of Commons, HC 17 Session 2004–2005.

Office for National Statistics, 2013. "A Century of Home Ownership and Renting in England and Wales", 2011 Census Release. ONS, London.

Office for National Statistics, 2016. The UK National Balance Sheet: 2016 Estimates. ONS, London.

Piketty, T., 2011. On the long-run evolution of inheritance: France 1820–2050. Q. J. Econ. 126 (3), 1071–1131.

Piketty, T., 2014. Capital in the Twenty-First Century. Harvard University Press, Cambridge, Mass.

Piketty, T., Postel-Vinay, G., Rosenthal, L., 2006. Wealth concentration in a developing economy: Paris and France 1807–1994. Am. Econ. Rev. 96 (1), 236–256.

Robinson, P.M., 1988. Semiparametric econometrics: A survey. J. Appl. Econ. 3, 35–51.

Rognlie, M., 2015. Deciphering the fall and rise in the net capital share: accumulation or scarcity? Brook. Pap. Econ. Act. 2015 (Spring), 1–54.

Saez, E., Zucman, G., 2016. The distribution of US wealth, capital income and returns since 1913. Q. J. Econ. 131, 519–578.

Sutch, R., 2017. The one-percent across two centuries: a replication of Thomas Piketty's data on the distribution of wealth for the United States. Soc. Sci. Hist. 41 (4), 587–613.

Turner, A., 2014. Wealth, Debt, Inequality and Low Interest Rates: Four Big Trends and some Implications. Lecture at Cass Business School, London.

Vermuelen, P., 2014. How Fat is the Top Tail of the Wealth Distribution? Department, European Central Bank Research.

Zucman, G., 2013. The missing wealth of nations: are Europe and the U.S. net debtors or net creditors? Q. J. Econ. 128, 1321–1364.